Waste Audit Report

Prepared for:

Queen's University

Exterior Waste, Recycling and Organic Bins- Residence

207 Stuart Street
Kingston, ON
K7L 3N6

Prepared by:

Laura McAlpine
Environmental Manager
GFL Environmental Inc.
3525 Mavis Road
Mississauga, ON
L5C 1T7

T. 647-624-1439
E. lmcalpine@gflenv.com

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EXECUTIVE SUMMARY

Queen's University retained GFL Environmental Inc. to conduct a solid, non-hazardous waste audit for the exterior waste, recycling and organic bins, located outside of all campus residence buildings on both the main and west campuses of Queen's University, located in Kingston, Ontario. A point of generation waste audit was performed for the exterior waste, recycling and organic containers, located outside residence buildings on campus on October 19, 2021.

PURPOSE

The purpose of the waste audit was to identify, quantify and analyze the composition of the waste, recycling, and organics streams and to ensure compliance with the requirements outlined in the Ministry of the Environment Ontario (MOE) Regulation 103/94- source separation and waste reduction work plans. In addition, the University is looking to identify the level of contamination within each material stream, for the purpose of keeping in line with sustainability goals and strategies.

AUDIT METHODOLOGY

To collect an appropriate sample of waste for the audit, campus Facilities services staff were asked to save waste produced from the previous day, over an approximate 24-hour period. The GFL Environmental Inc. team then received the waste sample and conducted the audit and analysis of the waste stream at an on-site location. An overall survey was completed by the GFL Environmental Inc. audit team; bags of material were opened and separated into commodity type (paper, plastic, metal, glass, organic and 'other') and the resulting subcategories (as listed in *Appendix I*, pages 43 to 45). Each commodity type and subcategory were weighed individually.

WASTE AUDIT RESULTS

The information contained in this waste audit report was gathered from the on-site point of generation waste, recycling and organic audits; discussions with Queen's University Facilities personnel, and an analysis of the current waste management handling practices used on-site throughout the university campus. The figure below displays the total projected annual waste categories, as represented from the materials analyzed from the exterior waste, recycling and organic containers during the audit.

Audited Waste Category Breakdown (kg/ year)

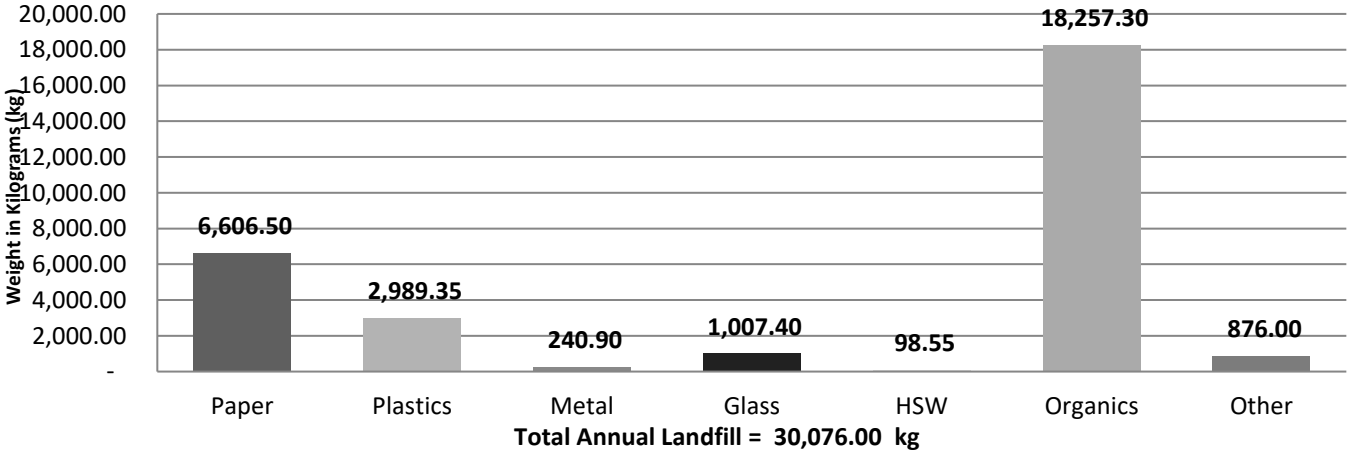

Figure 1 Audited Waste Category Breakdown (kg/ year)

Audited Recycling Category Breakdown (kg/ year) *

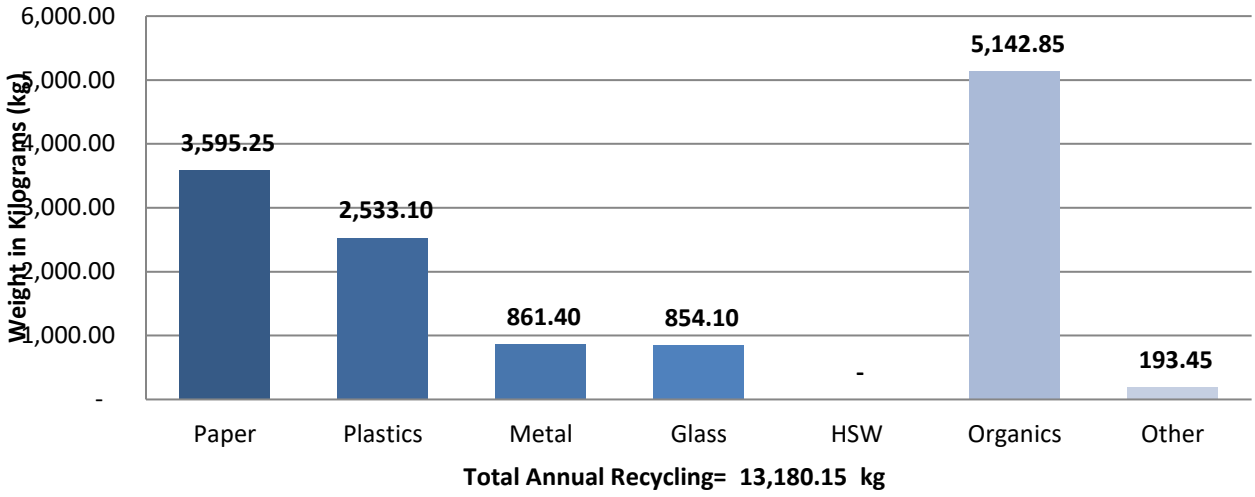

Figure 2 Auditing Recycling Category breakdown (kg/year)

**Organics are recyclable when placed in a separate organic recycling bin. Organics mixed with recyclable materials will be downgraded to waste. Organics reported above are contamination in the recycling stream.*

Audited Organics Category Breakdown (kg/ year)

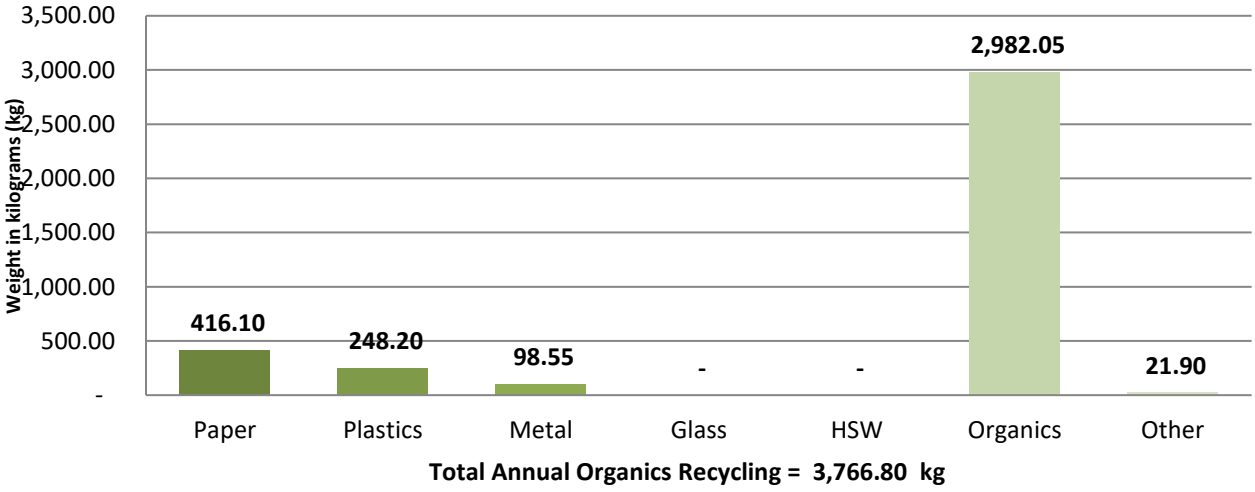

Figure 3 Audited Organic Category Breakdown (kg/year).

**Paper, plastic and metal materials are recyclable when placed in a separate recycling bins. Organics mixed with recyclable materials will be downgraded to waste. Any materials reported above that are not organic are considered to be contamination in the organics recycling stream.*

Total Materials Recycled and/or Sent to Landfill

Material Destination	Annual Total		
	Kilograms (kg)	Metric Tonnes (t)	Percent (%)
Waste	30,076.00	30.07	63.95
Recycling	13,180.15	13.18	28.03
Organics Recycling	3,766.80	3.77	8.02
Total Generated	**47,022.95**	**47.02**	**100.00**

DIVERSION RATE

The 2021 waste diversion rate for the exterior waste and recycling program at Queen's University residence locations is **36.04%,** as shown calculated on page 52 of this report.

RECOMMENDATIONS

Based on the waste audit findings, the top areas of focus should be on initiatives driven towards:

- **Improving signage/container labelling:** Implementing clear and consistent signage will allow for a better understanding of and participation in the program.
- **Remove exterior containers:** By removing the exterior waste, recycling and organic collection containers from outside the residence buildings, Queen's can eliminate the risk and incurred costs associated with collecting waste in areas where the traffic can include more than just residence inhabitants. Residents would then be encouraged to use the collection containers provided for the building itself, and neighbouring residents of the city of Kingston would be required to carry wastes and recycling home for disposal.
- **Training and education:** Educating visitors, students, employees and faculty on a semi-annual basis will help improve and continue the success of the available recycling programs in place on campus.

POTENTIAL DIVERSION RATE

If the above recommendations are implemented, the potential diversion rate for the Queen's University exterior waste and recycling program could be **89.96%**. For full calculation of the potential diversion rate, please refer to page 54 of this report.

STATEMENT OF LIMITATIONS

- The waste audit conducted at Queen's University on October 19, 2021, reflect all materials observed at the time of the audit for the 24-hour sample period;
- Waste audit methodology is based on industry standards as well as the waste auditing team's expertise in waste management. GFL Environmental Inc.'s waste auditors are 3R Certified through the Circular Innovation Council (formerly the Recycling Council of Ontario);
- Data is annualized in accordance with the Ministry of the Environment's reporting requirements. GFL Environmental Inc. cannot guarantee day-to-day generation produces the same quantities of materials;
- Analysis and recommendations are based on our observations, knowledge, judgement, industry best practices and consultations with the client; and
- Overall report and methodology have been designed to meet project objectives/ deliverables.

ANOMALIES

Anomalies are physical items or operational challenges (e.g. work events such as barbecues, scheduled special events, etc.) that would alter the composition of the waste stream as a one off occurrence. Anomalies during this audit include a broken skateboard, weighing 1.34 kilograms, found in the waste tote located at Smith House. It is therefore assumed that skateboards are not generated daily, thus, GFL has accounted for this item as an anomaly and has not been included in the audit data.

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1 INTRODUCTION

Queen's University retained GFL Environmental Inc. to conduct a solid, non-hazardous waste audit for the exterior waste, recycling and organic bins, located outside of all campus residence buildings on both the main and west campuses of Queen's University, located in Kingston, Ontario. A point of generation waste audit was performed for the exterior waste, recycling and organic containers, located outside residence buildings on campus on October 19, 2021.

The overall purpose of the waste audit was to identify, quantify and analyze the composition of the waste, recycling and organics streams and to ensure compliance with the requirements outlined in the Ministry of the Environment Ontario (MOE) Regulation 103/94- source separation and waste reduction work plans. The objective of the audit was to determine the necessity of these exterior collection containers and taking into consideration the removal of these collection bins, thus driving students to utilize the existing waste, recycling and organic diversion programs set up in the residence buildings.

Waste audits are also used to determine:

- The ability to reduce, reuse and recycle materials from the existing waste stream;
- Identify the overall diversion rates for all recyclable materials;
- Identify further opportunities for greater diversion, and;
- Pinpoint new recycling opportunities, and to enhance and strengthen the existing recycling initiatives currently in place.

This analysis aids the formation of a plan to go forward with a successful diversion program, drawing from the audit results and the subsequent diversion recommendations made by GFL Environmental Inc., in partnership with input and insight from Queen's University.

2 AUDITEE PROFILE AND PROJECT SCOPE

The following section provides contextual information regarding Queen's University and the waste audit analysis of the exterior waste and recycling bins that was completed for the university on October 19, 2021.

Established in 1841, Queen's University offers a transformative learning experience, and is one of Canada's leading research-intensive universities. The university grounds are situated in Kingston, Ontario, and is home to a number of faculty buildings, recreation facilities, research laboratories and residence buildings.

2.2 CURRENT WASTE MANAGEMENT PROGRAM- EXTERIOR RESIDENCE COLLECTION

Each residence building is equipped with exterior collection containers for waste and recycling. Additional collection totes were added outside of both Smith and Victoria Hall, including collection totes for organics. Both Smith and Victoria Hall have food outlets operating in each facility, and Leonard, Ban Righ and West Campus have dining halls. The table below outlines the location of the containers, and the container types. All containers, with the exception of the totes, are emptied on a daily basis, Monday through Friday.

Location	Containers
Adelaide	Waste, recycling
BanRigh	Waste, recycling
Brant	Waste, recycling
Chown	Waste, recycling
Gordon-Brockington	Waste, recycling
Harkness	Waste, recycling
Jean Royce I	Waste, recycling
Jean Royce II	Waste, recycling
Leggett	Waste, recycling
Leonard Dining	Waste, recycling
Leonard Residence	Waste, recycling
McNeill	Waste, recycling
Morris	Waste, recycling
Smith House	Waste, recycling and totes, including organics
Victoria Hall	Waste, recycling and totes, including organics
Waldron Tower	Waste, recycling
Watts	Waste, recycling

3 WASTE AUDIT METHODOLOGY

3.1 AUDIT PROCEDURE

To collect an appropriate sample of waste for the audit, Queen's Facilities staff were asked to save waste produced from the previous day, over an approximate 24-hour period. The GFL Environmental Inc. team then received the waste sample and conducted the audit and analysis of the waste stream at an on-site location. An overall survey was completed by the GFL Environmental Inc. audit team; bags of material were opened and separated into commodity type (paper, plastic, metal, glass, organic and 'other') and the resulting subcategories (as listed in *Appendix I*, pages 43 to 45). Each commodity type and subcategory were weighed individually.

3.2 AUDITOR PROFILE

Laura McAlpine, Faye Wood and Evelina Wolejszo were the lead auditors who conducted the audit organization, preparation and supervision; Laura, Faye, and Evelina are all 3R Certified auditors through the Circular Innovation Council (formerly the Recycling Council of Ontario-RCO).

3.3 COMMODITIES SORTED

The following is a list of commodities categories. The major categories of commodities sorted are paper, plastic, metal, glass, household special waste, organics, and 'other' materials. Within these major categories are subcategories, and these help to further sort the commodities.

Paper	
Newspaper	Non-glossy; colour flyers, daily papers
Magazines	Glossy; magazines and cataglogues
Cardboard	Corrugated cardboard boxes and tubes
Boxboard	Thin paper board boxes (cereal, crackers, tissue, etc.)
Mixed paper	Printer paper, envelopes
Molded pulp	Egg cartons, take-out beverage trays
Other paper	Cold beverage cups, layered paper envelopes, waxed papers, etc.
Coffee cups	Take-out, non-styrofoam paper coffee cups
Spiral Wound Containers	Pringles cans, concentrated juice cans, etc.
Gable Top Containers	Milk and juice cartons
Aseptic (Tetra) Containers	Juice boxes, wine cartons, etc.
Plastic	
#1 PET	Single-use water, juice and pop bottles; clear clamshells, take-out packaging, food packaging and bottles
#2 HDPE	Bottles and jugs, buckets, tubs, bags, etc.
#3 PVC	Clamshell packaging
#4 LDPE	Bags, bottles, tubs and containers
#5 PP	Cups and take-out packaging, jugs and tubs
#6 Styrofoam	Take out styrofoam containers

#6 Styrofoam (Packaging)	Styrofoam peanuts, block packaging
#6 Rigid	Coffee cup lids, cups, clamshells, take-out food packaging, etc.
#7 Other	Durable containers, packaging
Rigid Plastic	Pens, tooth brushes, gift gards, straws, cutlery, etc.
Plastic Strapping	Plastic binding for newspapers, packages, etc.
Metal	
Aluminum cans	Pop and juice cans
Aluminum foil	Foil wrap
Aluminum trays	Catering trays, pie plates, etc.
Aerosal cans	Hair spray, paint, compressed air, etc.
Steel cans	Large soup cans
Scrap metal	Wire hangers, nuts and bolts, metal cookie tins, metal strapping
Glass	
Clear/ Coloured	Clear and coloured glass food and beverage packaging
Liquor Bottles	Refundable containers
Other glass	Ceramics, cups, plates, mirrors, window glass, non-LED or fluorescent lightbulbs
Household Special Waste (HSW)	
Batteries	All types
Toner cartridges	Printer toner cartridges
Chemicals/ Liquids	Paints, solvents, oils, etc.; cosmetics, lotions, healthcare products, etc.
E-Waste	Electronics, small appliances, phones, computer equipment, cables, etc.
Lightbulbs	Fluorescent tubes, LED
Organics	
Food waste	All food scraps, peels, bones, skin, pits, coffee grounds and filters, tea bags
Tissue/ Toweling	Facial tissue, napkins, paper towel
Beverage liquids	Water, coffee, pop, juice, soup, etc.
Compostable Ware	Compostable packaging, coffee cups, cutlery; wooden stir sticks, bamboo serveware, wooden chopsticks, etc.
Plants and Flowers	Flowers, potted plants, dead leaves
Other Materials	
Other	Many different other materials are found in audit samples. Additional notes and subcategories are to be recorded on the waste audit sorting sheet.

Note: Commodities sorted consists of materials found in the audit. However, additional materials known to be generated at the facility may not have been in the audit sample. The additional materials have been included in the audit results as part of the diversion program in place.

3.4 METHOD OF ANNUALIZATION

The Mass Ratio Method was used when calculating the mass of materials generated for the entire year in the Queen's University exterior waste and recycling containers. This is the more useful and preferred method when annual waste and recycling records are deemed accurate and verifiable. The Mass Ratio Method formula is as follows:

$$m = \left(\frac{T_s}{T_c}\right)(T_t) + T_r$$

m = total annual mass of each material. Note that this should be calculated for each category of waste and for each method of disposition (reuse, recycling and disposal.)

Ts = total material generated in a specific category found in the audit sample.

Tc = total mass of all materials found in the audit sample with a specific method of disposition (reuse or recycling or disposal.) For materials analyzed during the audit, there will likely be a different value of Tc for all materials sent for disposal, for all materials sent for reuse, and for all materials sent for recycling during the sampling period.

Tt = total annual mass of material, substantiated by records, per container. For example, a site may have records for each haul of a 40-yard bin of waste. Therefore, Tt for this container would be the sum of the mass of all hauls that year for that container.

Tr = annual mass per category of materials of items not found in the audit sample for which there are records or reasonable estimates. These would be materials that would not have been found in the audit sample but are a regularly generated waste stream, such as furniture or wood pallets offered for external reuse. This is quantified and substantiated by records kept by the auditee. These materials should be accounted for in the final calculation.

4 WASTE AUDIT RESULTS

Based on the waste audit sample, the total amount of materials generated and disposed of in the outdoor residence waste containers at Queen's University is estimated to be 82.40 kilograms (kg) or 0.08 metric tonnes (t) during a 24-hour period, which amounts to 30,076.00 kg (30.07 t) annually.

From the audited waste sample, organic materials represent 60.70%; paper materials represent 21.97%; plastic materials represent 9.94%; glass materials represent 3.35%; 'other' materials represent 2.91%; metal materials represent 0.80% and HSW materials represent 0.33% of the total annual waste disposed and sent to landfill.

Total Annual Waste Generated 2021*

COMMODITY CATEGORY	KILOGRAMS (kg)	PERCENTAGE (%)
Organics	18,257.30	60.70%
Paper	6,606.50	21.97%
Plastics	2,989.35	9.94%
Glass	1,007.40	3.35%
'Other'	876.00	2.91%
Metal	240.90	0.80%
HSW	98.55	0.33%
TOTAL	**30,076.00**	**100.00**

Total Annual Waste Stream Composition 2021*

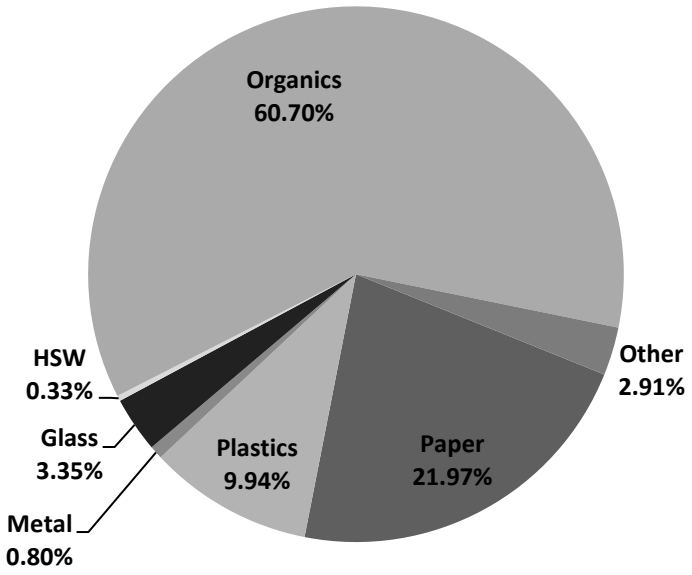


Figure 4 Total Annual Waste Stream Composition 2021

**Figures are based on 24-hour waste audit sample. Annual projection is based on number of operational days.*

Categorical Waste Composition

The following tables and graphs illustrate the composition breakdown of the audited waste sample from the Queen's University Residence exterior waste bins. Seven (7) commodity categories were audited: paper, plastic, metal, glass Household Special Waste (HSW), organics and 'other' materials. Materials were found in all commodity categories.

Total Annual Paper Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Newspaper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
Magazines	-	-	-	-	-	-	-	21.90	-	-	-	-	-	-	-	-	-	-	3.65	-	25.55	0.39%
Cardboard	-	51.10	-	7.30	-	80.30	-	47.45	-	-	-	-	80.30	-	21.90	94.90	7.30	65.70	21.90	-	478.15	7.24%
Boxboard	3.65	87.60	-	51.10	-	14.60	-	51.10	-	-	-	131.40	29.20	14.60	167.90	3.65	14.60	58.40	131.40	29.20	788.40	11.93%
Mixed Papers	-	18.25	-	21.90	-	-	-	956.30	-	-	-	40.15	3.65	7.30	14.60	-	3.65	14.60	3.65	-	1,084.05	16.41%
Molded Pulp	-	58.40	-	-	-	-	-	14.60	-	-	-	14.60	-	-	-	-	-	-	124.10	14.60	226.30	3.43%
Kraft Paper	3.65	94.90	-	58.40	-	36.50	-	36.50	-	-	-	131.40	29.20	138.70	240.90	21.90	65.70	73.00	182.50	73.00	1,186.25	17.96%
Other Paper	18.25	124.10	29.20	102.20	-	138.70	-	262.80	-	29.20	-	131.40	65.70	65.70	248.20	197.10	58.40	131.40	186.15	-	1,788.50	27.07%
Spiral Wound	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
Coffee Cups	43.80	109.50	43.80	43.80	-	21.90	-	29.20	-	7.30	-	113.15	7.30	36.50	153.30	14.60	102.20	58.40	109.50	-	894.25	13.54%
Aseptic Containers	-	-	-	-	-	-	-	-	-	7.30	-	-	-	-	29.20	-	-	14.60	3.65	-	54.75	0.83%
Gable Top Containers	-	-	-	-	-	-	-	14.60	-	-	-	7.30	7.30	-	14.60	7.30	-	29.20	-	-	80.30	1.22%
TOTAL PAPER	69.35	543.85	73.00	284.70	-	292.00	-	1,434.45	-	43.80	-	569.40	222.65	262.80	890.60	339.45	251.85	445.30	766.50	116.80	6,606.50	100.00%

Figure 5 Total Annual Paper Materials Generated (kg/ yr)

The figure above shows the amount of paper materials generated and disposed of as waste, per area. The top two (2) producing areas are Jean Royce I, generating 1,434.45 kg per year, and Smith, generating 890.60 kg per year.
Mixed paper and kraft paper are the highest generated recyclable paper materials found in the waste stream. It is important to keep these materials dry and free of contamination so that they can be recycled at processing facilities.

Total Annual Plastic Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
# 1 PETE Soft Drinks	29.20	116.80	-	40.15	-	43.80	-	7.30	-	-	-	7.30	14.60	3.65	102.20	87.60	76.65	51.10	21.90	29.20	**631.45**	**21.12%**
# 2 HDPE	-	29.20	-	-	-	14.60	-	-	-	-	-	7.30	-	-	43.80	-	-	-	7.30	-	**102.20**	**3.42%**
# 3 PVC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
# 4 LDPE Recyclable Film	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
# 5 PP	7.30	69.35	3.65	21.90	-	36.50	-	43.80	-	3.65	-	87.60	-	7.30	197.10	36.50	58.40	36.50	131.40	7.30	**748.25**	**25.03%**
# 6 PS (Styrofoam)	-	7.30	-	3.65	-	-	-	-	-	-	-	3.65	-	-	51.10	-	-	-	3.65	-	**69.35**	**2.32%**
# 6 PS (Clear/ Hard)	3.65	21.90	7.30	43.80	-	7.30	-	14.60	-	3.65	-	29.20	14.60	29.20	65.70	87.60	14.60	29.20	29.20	14.60	**416.10**	**13.92%**
# 7 Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
Non-Recyclable Film	21.90	116.80	14.60	3.65	-	14.60	-	94.90	-	3.65	-	51.10	14.60	14.60	109.50	14.60	7.30	240.90	58.40	7.30	**788.40**	**26.37%**
Rigid Plastics	3.65	21.90	-	-	-	7.30	-	3.65	-	3.65	-	29.20	3.65	14.60	51.10	29.20	14.60	14.60	21.90	14.60	**233.60**	**7.81%**
Plastic Strapping	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
TOTAL PLASTICS	**65.70**	**383.25**	**25.55**	**113.15**	**-**	**124.10**	**-**	**164.25**	**-**	**14.60**	**-**	**215.35**	**47.45**	**69.35**	**620.50**	**255.50**	**171.55**	**372.30**	**273.75**	**73.00**	**2,989.35**	**100.00%**

Figure 6 Total Annual Plastic Materials Generated (kg/ yr)

The figure above shows the amount of plastic materials generated and disposed of as waste, per area. The top two (2) plastic producing areas are Smith (620.50 kg) and Ban-Righ (383.25 kg).
#5 PP #1 PET are the highest generated recyclable plastic materials found in the waste stream. It is important to encourage the use of reusable water bottles and mugs to reduce overall generation of these materials on site. The majority of these materials were water bottles and takeout food packaging, which can easily be recycled through the existing recycling program in each residence building.

Total Annual Metal Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Aluminum Cans	-	3.65	-	-	-	-	-	14.60	-	-	-	29.20	29.20	14.60	36.50	7.30	14.60	43.80	-	-	193.45	80.30%
Aluminum Foil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.30	-	-	7.30	3.03%
Aluminum Trays	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.60	-	-	14.60	6.06%
Aerosol Cans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
Steel Cans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.30	-	-	-	-	-	7.30	3.03%
Scrap Metal	-	-	-	-	-	-	-	-	-	-	-	3.65	-	14.60	-	-	-	-	-	-	18.25	7.58%
TOTAL METALS	-	3.65	-	-	-	-	-	14.60	-	-	-	32.85	29.20	29.20	43.80	7.30	14.60	65.70	-	-	240.90	100.00%

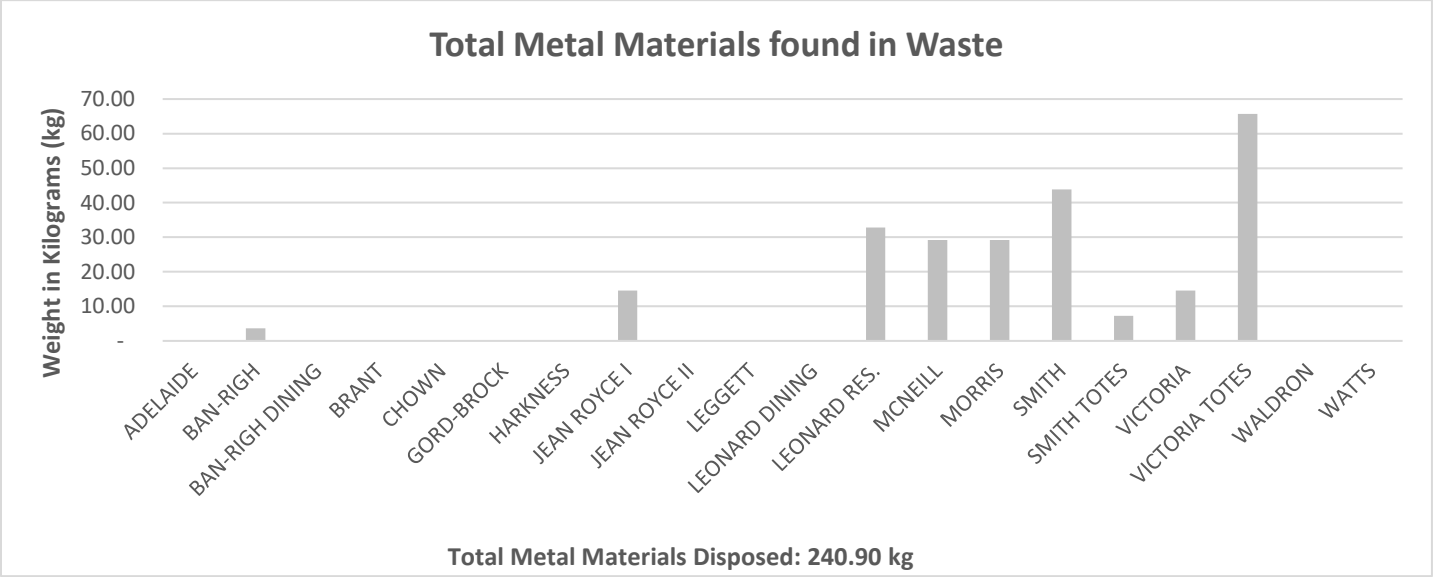


Figure 7 Total Annual Metal Materials Generated (kg/yr)

The figure above shows the amount of metal materials generated and disposed of as waste, per area. The top two (2) metal producing areas are Victoria Hall totes (65.70 kg) and Smith (43.80 kg).
Aluminum cans is the highest generated recyclable metal material found in the waste stream. It is important to keep these materials free of contamination, including liquids and food waste, and ensure that they are placed in the appropriate collection containers provided. A lot of the aluminum generated was alcohol cans (beer and spirits) that can either be recycled on site in the residence recycling program, or returned for a refund to The Beer Store.

Total Annual Glass Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Glass (Clear/ Coloured)	-	87.60	-	-	-	80.30	-	102.20	-	-	-	226.30	-	-	270.10	-	-	43.80	109.50	-	**919.80**	**91.30%**
Other Glass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	87.60	-	-	-	-	-	**87.60**	**8.70%**
TOTAL GLASS	**-**	**87.60**	**-**	**-**	**-**	**80.30**	**-**	**102.20**	**-**	**-**	**-**	**226.30**	**-**	**-**	**357.70**	**-**	**-**	**43.80**	**109.50**	**-**	**1,007.40**	**100.00%**

Figure 8 Total Annual Glass Materials Generated (kg/yr)

The figure above shows the amount of glass materials generated and disposed of as waste, per area. The top two (2) glass producing areas are Smith (357.70 kg) and Leonard Hall (226.30 kg).
Ensure that all glass food and beverage containers are empty before placing into the available recycling containers.

Total Annual HSW Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Batteries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.60	-	-	**14.60**	**14.81%**
Lightbulbs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
Chemicals/ Liquids	-	-	-	-	-	-	-	80.30	-	-	-	3.65	-	-	-	-	-	-	-	-	**83.95**	**85.19%**
TOTAL HSW	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**80.30**	**-**	**-**	**-**	**3.65**	**-**	**-**	**-**	**-**	**-**	**14.60**	**-**	**-**	**98.55**	**100.00%**

Figure 9 Total Annual HSW Materials Generated (kg/yr)

The figure above shows the amount of HSW materials generated and disposed of as waste, per area. The top two (2) HSW material producing areas are Jean Royce I (80.30 kg) and the Victoria Hall totes (14.60 kg).
Chemicals and batteries were the highest subcategory of recyclable HSW material found in the waste. These materials are recyclable through a specialty HSW program. The materials should not be placed in the garbage or recycling bins.

Total Annual Organic Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Food Waste	7.30	554.80	73.00	1,963.70	-	445.30	-	452.60	-	222.65	-	1,051.20	379.60	94.90	3,328.80	1,000.10	1,043.90	1,328.60	1,124.20	29.20	**13,099.85**	**71.75%**
Tissue/ Toweling	14.60	102.20	116.80	29.20	-	43.80	-	65.70	-	-	-	94.90	65.70	65.70	167.90	36.50	43.80	153.30	175.20	14.60	**1,189.90**	**6.52%**
Beverage Liquids	-	105.85	7.30	208.05	-	87.60	-	65.70	-	222.65	-	146.00	29.20	401.50	430.70	328.50	87.60	146.00	284.70	87.60	**2,638.95**	**14.45%**
Compostable Containers	-	29.20	-	153.30	-	43.80	-	14.60	-	7.30	-	43.80	102.20	43.80	335.80	313.90	73.00	58.40	43.80	58.40	**1,321.30**	**7.24%**
Yard/ Plant Waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.30	-	-	-	**7.30**	**0.04%**
TOTAL ORGANICS	**21.90**	**792.05**	**197.10**	**2,354.25**	**-**	**620.50**	**-**	**598.60**	**-**	**452.60**	**-**	**1,335.90**	**576.70**	**605.90**	**4,263.20**	**1,679.00**	**1,255.60**	**1,686.30**	**1,627.90**	**189.80**	**18,257.30**	**100.00%**

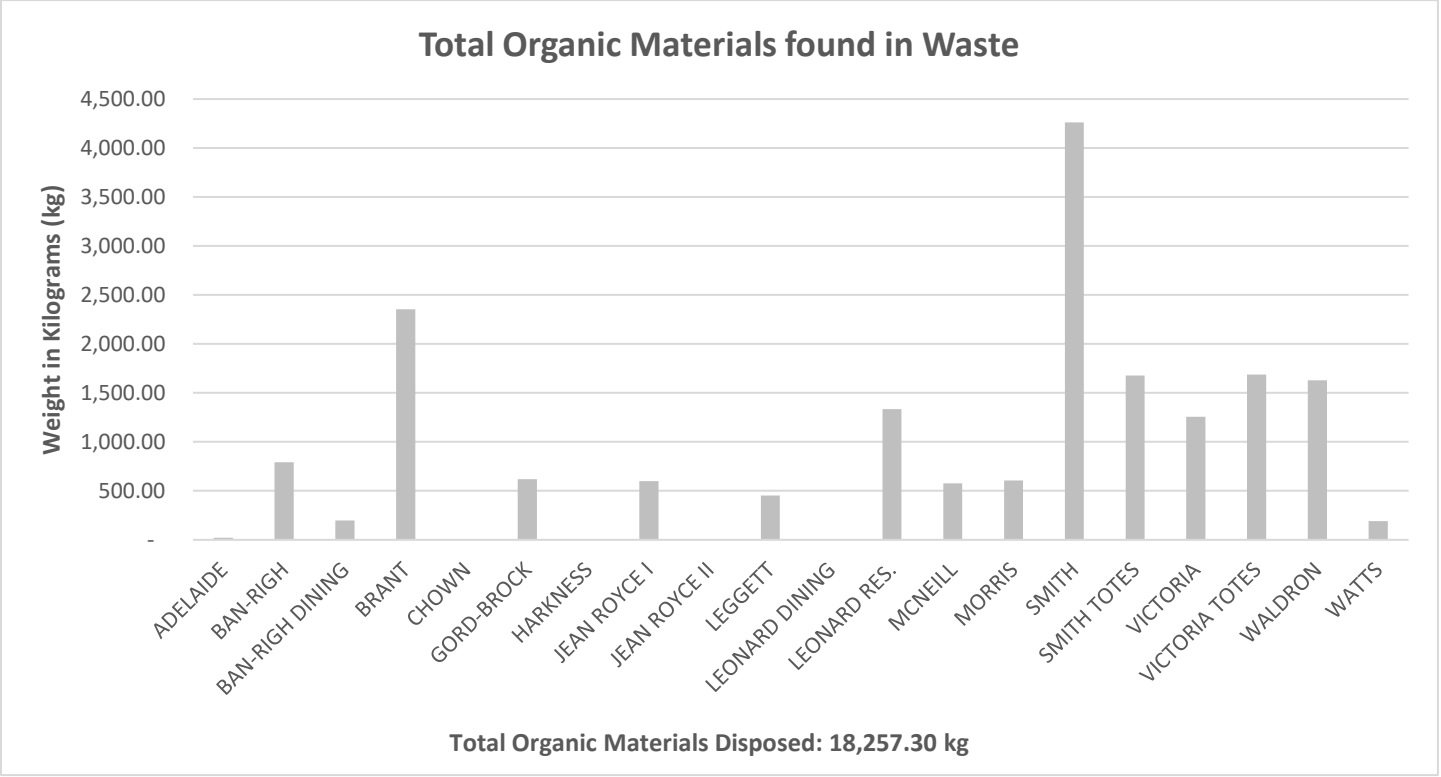


Figure 10 Total Annual Organic Materials Generated (kg/ yr)

The figure above shows the amount of organic materials generated and disposed of as waste, per area. The top two (2) organic producing areas are Smith (4,263.20 kg) and Brant (2,354.25 kg).
Food waste is the highest generated material amongst all organics found in the waste stream. It is important to keep these materials separate from all other waste streams on site, and ensure that this material is diverted to the appropriate recycling containers provided on site.

Total Annual 'Other' Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Textiles	-	113.15	-	-	-	80.30	-	-	-	-	-	3.65	-	-	3.65	-	7.30	80.30	-	-	**288.35**	**32.92%**
Disposable Gloves	-	-	-	-	-	-	-	3.65	-	-	-	10.95	-	-	-	-	7.30	7.30	3.65	-	**32.85**	**3.75%**
Masks	-	3.65	-	7.30	-	-	-	7.30	-	-	-	21.90	-	3.65	14.60	7.30	7.30	21.90	3.65	-	**98.55**	**11.25%**
Coffee Pods	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43.80	-	-	14.60	-	-	**58.40**	**6.67%**
Brita Filter	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58.40	-	-	**58.40**	**6.67%**
Vape Cartridges	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.65	-	14.60	**18.25**	**2.08%**
Pet Waste	-	-	-	-	-	-	-	-	-	7.30	-	233.60	-	-	-	-	-	-	-	65.70	**306.60**	**35.00%**
Cigarettes	-	-	-	3.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3.65**	**0.42%**
Hair Nets	-	-	10.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**10.95**	**1.25%**
TOTAL OTHER	**-**	**116.80**	**10.95**	**10.95**	**-**	**80.30**	**-**	**10.95**	**-**	**7.30**	**-**	**270.10**	**-**	**3.65**	**62.05**	**7.30**	**21.90**	**186.15**	**7.30**	**80.30**	**876.00**	**100.00%**

Figure 11 Total Annual 'Other' Materials Generated (kg/yr)

The figure above shows the amount of 'other' materials generated, per area. The top two (2) Other material producing areas are Leonard Hall Residence (270.10 kg) and the Victoria Hall totes (186.15 kg).
Pet waste and textiles were the highest subcategories of the other materials found in the waste sample. Pet waste is solely generated by neighbouring residents of the City of Kingston, while textiles can be donated through charitable organizations or through clothing swaps organized on campus.

Total Annual Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Paper	69.35	543.85	73.00	284.70	-	292.00	-	1,434.45	-	43.80	-	569.40	222.65	262.80	890.60	339.45	251.85	445.30	766.50	116.80	**6,606.50**	**21.97%**
Plastic	65.70	383.25	25.55	113.15	-	124.10	-	164.25	-	14.60	-	215.35	47.45	69.35	620.50	255.50	171.55	372.30	273.75	73.00	**2,989.35**	**9.94%**
Metal	-	3.65	-	-	-	-	-	14.60	-	-	-	32.85	29.20	29.20	43.80	7.30	14.60	65.70	-	-	**240.90**	**0.80%**
Glass	-	87.60	-	-	-	80.30	-	102.20	-	-	-	226.30	-	-	357.70	-	-	43.80	109.50	-	**1,007.40**	**3.35%**
HSW	-	-	-	-	-	-	-	80.30	-	-	-	3.65	-	-	-	-	-	14.60	-	-	**98.55**	**0.33%**
Organics	21.90	792.05	197.10	2,354.25	-	620.50	-	598.60	-	452.60	-	1,335.90	576.70	605.90	4,263.20	1,679.00	1,255.60	1,686.30	1,627.90	189.80	**18,257.30**	**60.70%**
Other Materials	-	116.80	10.95	10.95	-	80.30	-	10.95	-	7.30	-	270.10	-	3.65	62.05	7.30	21.90	186.15	7.30	80.30	**876.00**	**2.91%**
TOTAL MATERIALS	**156.95**	**1,927.20**	**306.60**	**2,763.05**	**-**	**1,197.20**	**-**	**2,405.35**	**-**	**518.30**	**-**	**2,653.55**	**876.00**	**970.90**	**6,237.85**	**2,288.55**	**1,715.50**	**2,814.15**	**2,784.95**	**459.90**	**30,076.00**	**100.00%**

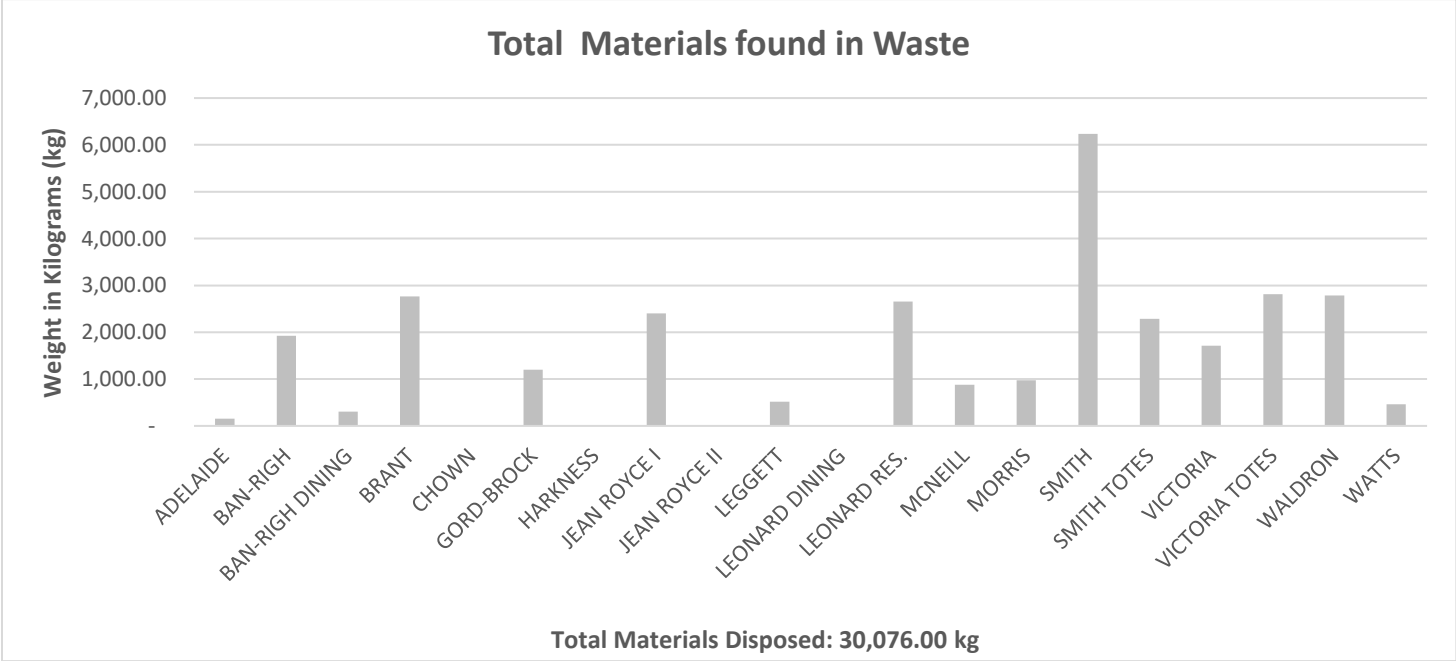


Figure 12 Total Annual Materials Generated (kg/yr)

In summary, the waste audit sample consisted of primarily organic materials (60.70%) and paper materials (21.97%). With these being the highest generated materials on site, it is important to implement/maintain education and awareness surrounding the importance of recycling. Since these are the highest-generated materials, and there are already existing programs in place for the collection of these materials inside residence buildings, eliminating these containers would help to minimize contamination coming from local residents.

5 RECYCLING AUDIT RESULTS

Based on the recycling audit sample, the total amount of materials generated and disposed of through the outdoor residence recycling containers at Queen's University is estimated to be 36.11 kilograms (kg) or 0.03 metric tonnes (t) during a 24-hour period or 13,180.15 kg (13.18 t) annually.

From the audited recycling sample, organic materials represent 39.02%; paper materials represent 27.28%; plastic materials represent 19.22%; metal materials represent 6.54%; glass materials represent 6.48% and 'other' materials represent 1.47% of the total annual recycling disposed and sent to be recycled.

Total Annual Recycling Generated 2021*

COMMODITY CATEGORY	KILOGRAMS (kg)	PERCENTAGE (%)
Organics	5,142.85	39.02
Paper	3,595.25	27.28
Plastic	2,533.10	19.22
Metal	861.40	6.54
Glass	854.10	6.48
'Other'	193.45	1.47
TOTAL	**13,180.15**	**100.00**

Total Annual Recycling Stream Composition 2021*

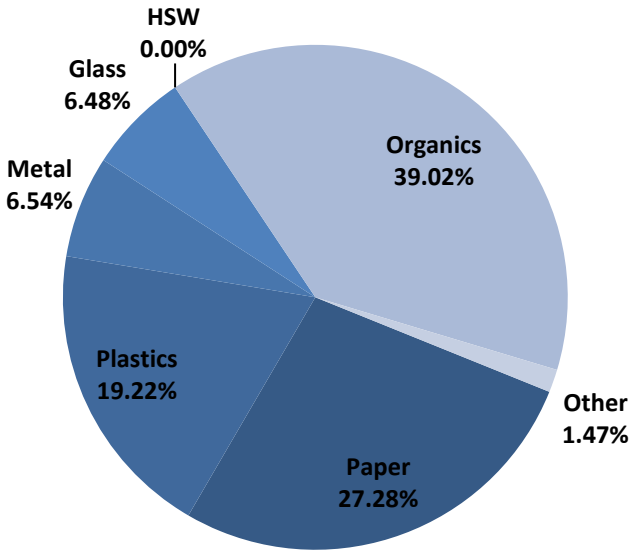


Figure 13 Total Annual Recycling Stream Composition 2021

**Figures are based on 24-hour recycling audit sample. Annual projection is based on number of operational days.*

Categorical Recycling Composition

The following tables and graphs illustrate the composition breakdown of the audited recycling sample from the Queen's University Residence exterior recycling bins. Seven (7) commodity categories were audited: paper, plastic, metal, glass Household Special Waste (HSW), organics and 'other' materials. Materials were found in all commodity categories except HSW.

Total Annual Paper Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Newspaper	-	-	-	7.30	-	-	-	-	-	-	-	-	-	-	160.60	3.65	-	547.50	-	-	**719.05**	**20.00%**
Magazines	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
Cardboard	-	-	-	7.30	-	7.30	-	-	-	-	-	3.65	-	-	277.40	153.30	313.90	-	58.40	-	**821.25**	**22.84%**
Boxboard	-	-	-	7.30	-	-	-	-	-	-	21.90	109.50	-	-	29.20	36.50	36.50	124.10	7.30	-	**372.30**	**10.36%**
Mixed Papers	-	-	-	3.65	-	-	-	-	-	-	10.95	14.60	-	-	3.65	3.65	3.65	3.65	-	14.60	**58.40**	**1.62%**
Molded Pulp	-	-	21.90	14.60	-	-	-	-	-	-	-	-	-	-	29.20	-	58.40	-	-	-	**124.10**	**3.45%**
Kraft Paper	-	-	-	7.30	-	-	-	-	-	-	7.30	14.60	-	-	58.40	29.20	21.90	109.50	7.30	21.90	**277.40**	**7.72%**
Other Paper	-	-	87.60	7.30	-	54.75	-	-	-	7.30	51.10	116.80	-	-	51.10	270.10	65.70	40.15	-	87.60	**839.50**	**23.35%**
Spiral Wound	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
Coffee Cups	-	-	21.90	14.60	-	7.30	-	-	-	-	94.90	51.10	-	-	29.20	36.50	29.20	3.65	-	7.30	**295.65**	**8.22%**
Aseptic Containers	-	-	14.60	-	-	-	-	-	-	-	7.30	14.60	-	-	-	-	-	-	-	14.60	**51.10**	**1.42%**
Gable Top Containers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.30	-	14.60	-	-	14.60	**36.50**	**1.02%**
TOTAL PAPER	**-**	**-**	**146.00**	**69.35**	**-**	**69.35**	**-**	**-**	**-**	**7.30**	**193.45**	**324.85**	**-**	**-**	**646.05**	**532.90**	**543.85**	**828.55**	**73.00**	**160.60**	**3,595.25**	**100.00%**

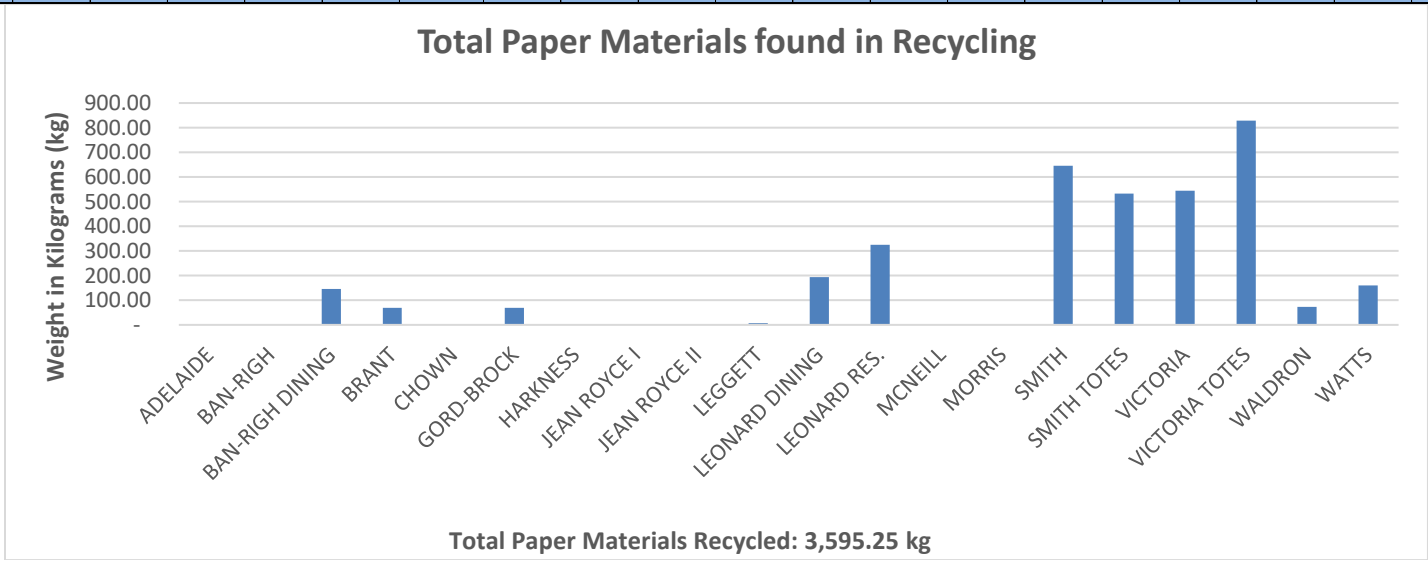


Figure 14 Total Annual Paper Materials Generated (kg/ yr)

The figure above shows the amount of paper materials generated and diverted through recycling, per area. The top two (2) producing areas are the Victoria Hall totes, generating 828.55 kg per year, and Smith, generating 646.05 kg per year.
Other paper and coffee cups are the highest generated non-recyclable paper materials found in the recycling stream. These materials should be disposed of as waste, as they are contaminating the recycling stream, thus relying on further sorting and potential cost increases from the recycling services provider.

Total Annual Plastic Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
# 1 PETE Containers/Packaging	-	-	58.40	94.90	-	73.00	-	-	-	-	58.40	76.65	-	-	65.70	255.50	65.70	109.50	131.40	116.80	1,105.95	43.66%
# 2 HDPE Containers/Packaging	-	-	3.65	-	-	-	-	-	-	-	-	29.20	-	-	-	-	-	-	-	-	32.85	1.30%
# 3 PVC Containers/Packaging	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
# 4 LDPE Containers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	281.05	-	-	281.05	11.10%
# 5 PP Containers	-	-	43.80	51.10	-	43.80	-	-	-	7.30	94.90	43.80	-	-	14.60	43.80	18.25	21.90	43.80	124.10	551.15	21.76%
# 6 PS (Styrofoam)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.30	-	-	-	-	-	7.30	0.29%
# 6 PS (Rigid)	-	-	7.30	-	-	-	-	-	-	7.30	43.80	10.95	-	-	36.50	29.20	14.60	21.90	7.30	7.30	186.15	7.35%
# 7 Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
Non-Recyclable Film	-	-	-	3.65	-	65.70	-	-	-	3.65	21.90	21.90	-	-	36.50	36.50	21.90	10.95	7.30	21.90	251.85	9.94%
Rigid Non-Recyclable Plastics	-	-	7.30	3.65	-	3.65	-	-	-	7.30	14.60	7.30	-	-	14.60	43.80	3.65	7.30	3.65	-	116.80	4.61%
Plastic Strapping	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00%
TOTAL PLASTICS	-	-	120.45	153.30	-	186.15	-	-	-	25.55	233.60	189.80	-	-	175.20	408.80	124.10	452.60	193.45	270.10	2,533.10	100.00%

Figure 15 Total Annual Plastic Materials Generated (kg/ yr)

The figure above shows the amount of plastic materials generated and diverted through recycling, per area. The top two (2) plastic producing areas are the Victoria Hall totes (452.60 kg) and the Smith totes (408.80 kg).
Non-recyclable film and rigid plastics are the highest generated recyclable materials. These include items such as food wrappers, plastic bags, plastic cutlery and plastic straws. These materials cannot be recycled and should be deposited into the waste containers provided.

Total Annual Metal Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Aluminum Cans	-	-	47.45	73.00	-	58.40	-	-	-	10.95	-	102.20	-	-	36.50	262.80	36.50	73.00	14.60	116.80	**832.20**	**96.61%**
Aluminum Foil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
Aluminum Trays	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
Aerosal Cans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
Steel Cans	-	-	-	-	-	29.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**29.20**	**3.39%**
Scrap Metal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
TOTAL METALS	**-**	**-**	**47.45**	**73.00**	**-**	**87.60**	**-**	**-**	**-**	**10.95**	**-**	**102.20**	**-**	**-**	**36.50**	**262.80**	**36.50**	**73.00**	**14.60**	**116.80**	**861.40**	**100.00%**

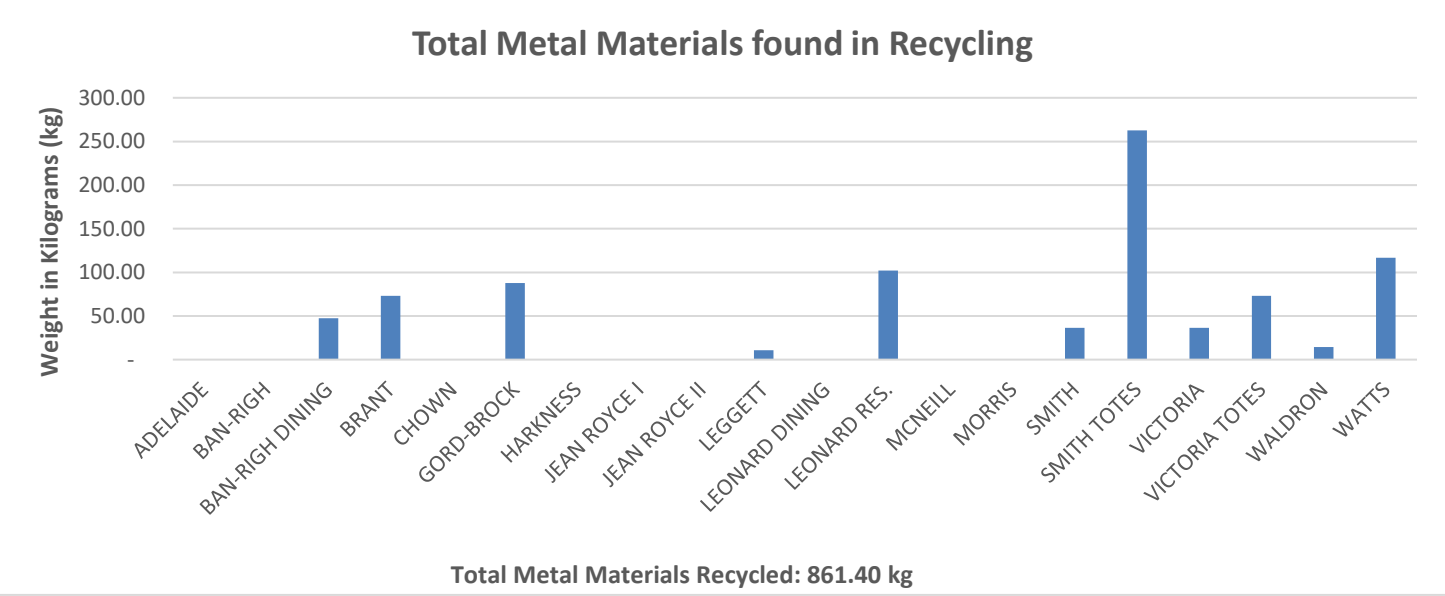


Figure 16 Total Annual Metal Materials Generated (kg/yr)

The figure above shows the amount of metal materials generated and diverted through recycling, per area. The top two (2) metal producing areas are the Smith totes (262.80 kg) and Watts (116.80 kg).
The metals found in the recycling stream are all accepted as recycling, no non-recyclable metal materials were found in the recycling stream.

Total Annual Glass Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Glass (Clear/ Coloured)	-	-	94.90	80.30	-	-	-	-	-	-	21.90	167.90	-	-	58.40	116.80	-	-	124.10	189.80	**854.10**	**100.00%**
Other Glass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
TOTAL GLASS	**-**	**-**	**94.90**	**80.30**	**-**	**-**	**-**	**-**	**-**	**-**	**21.90**	**167.90**	**-**	**-**	**58.40**	**116.80**	**-**	**-**	**124.10**	**189.80**	**854.10**	**100.00%**

Figure 17 Total Annual Glass Materials Generated (kg/yr)

The figure above shows the amount of glass materials generated and diverted through recycling, per area. The top two (2) glass producing areas are Watts (189.80 kg) and Leonard Hall Residence (167.90 kg). The glass found in the recycling stream are all accepted as recycling, no non-recyclable glass materials were found in the recycling stream.

Total Annual Organic Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Food Waste	-	-	14.60	7.30	-	-	-	-	-	131.40	795.70	204.40	-	-	416.10	401.50	204.40	131.40	-	-	**2,306.80**	**44.85%**
Tissue/ Toweling	-	-	-	14.60	-	-	-	-	-	-	131.40	-	-	-	51.10	29.20	7.30	58.40	-	7.30	**299.30**	**5.82%**
Beverage Liquids	-	-	36.50	474.50	-	58.40	-	-	-	21.90	240.90	255.50	-	-	21.90	146.00	478.15	36.50	-	138.70	**1,908.95**	**37.12%**
Compostables	-	-	10.95	7.30	-	-	-	-	-	3.65	14.60	51.10	-	-	7.30	313.90	10.95	189.80	-	18.25	**627.80**	**12.21%**
Yard/ Plant Waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
TOTAL ORGANICS	**-**	**-**	**62.05**	**503.70**	**-**	**58.40**	**-**	**-**	**-**	**156.95**	**1,182.60**	**511.00**	**-**	**-**	**496.40**	**890.60**	**700.80**	**416.10**	**-**	**164.25**	**5,142.85**	**100.00%**

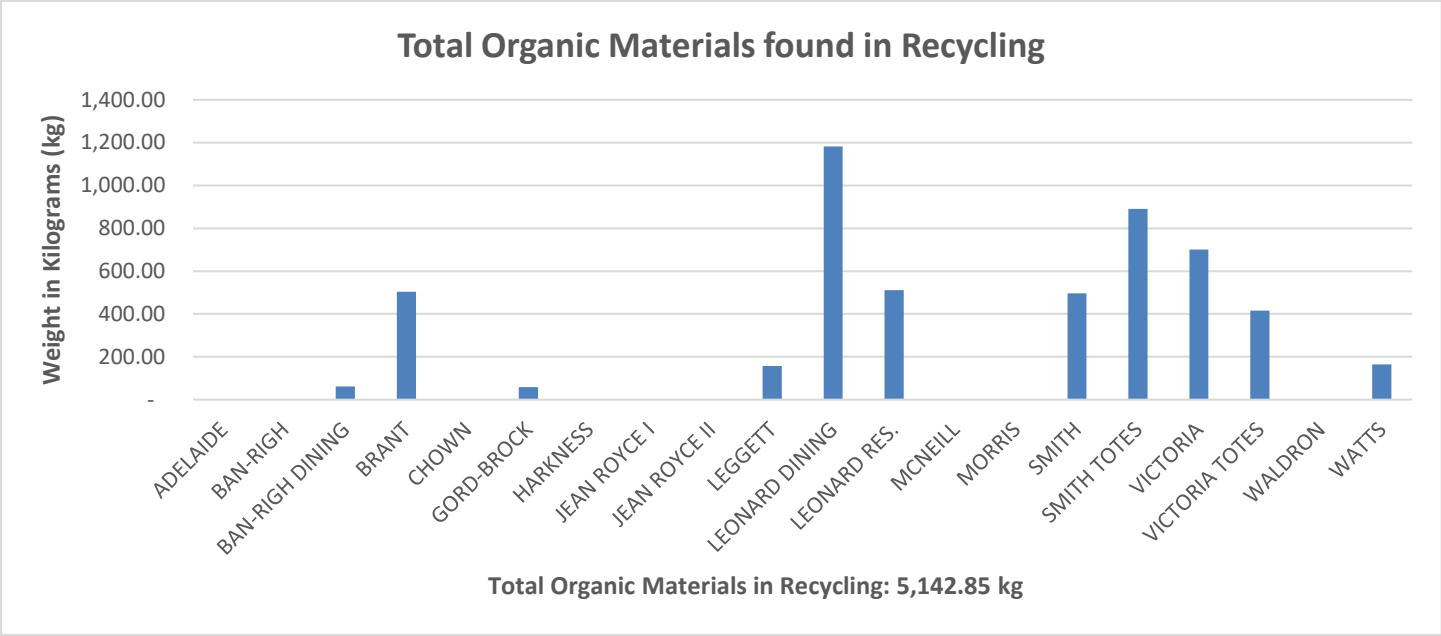


Figure 18 Total Annual Organic Materials Generated (kg/ yr)

The figure above shows the amount of organic materials generated and disposed of as regular recycling, per area. The top two (2) organic producing areas are Leonard Hall dining room (1,182.60 kg) and the Smith totes (890.60 kg).
Food waste is the highest generated material amongst all organics found in the recycling stream. These materials are contaminating the mixed recycling materials. Organics are recyclable but can only be recycled if they are placed in an organics program. Contamination of food waste in the recycling stream can result in downgrades and associated processing charges or landfill fees.

Total Annual Other Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Textiles	-	-	-	-	-	-	-	-	-	-	14.60	-	-	-	-	-	-	21.90	-	-	**36.50**	**18.87%**
Disposable Gloves	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.30	-	102.20	-	-	**109.50**	**56.60%**
Masks	-	-	3.65	7.30	-	-	-	-	-	-	3.65	7.30	-	-	3.65	7.30	7.30	3.65	-	-	**43.80**	**22.64%**
Coffee Pods	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
Cigarettes	-	-	-	-	-	-	-	-	-	-	3.65	-	-	-	-	-	-	-	-	-	**3.65**	**1.89%**
TOTAL OTHER	**-**	**-**	**3.65**	**7.30**	**-**	**-**	**-**	**-**	**-**	**-**	**21.90**	**7.30**	**-**	**-**	**3.65**	**14.60**	**7.30**	**127.75**	**-**	**-**	**193.45**	**100.00%**

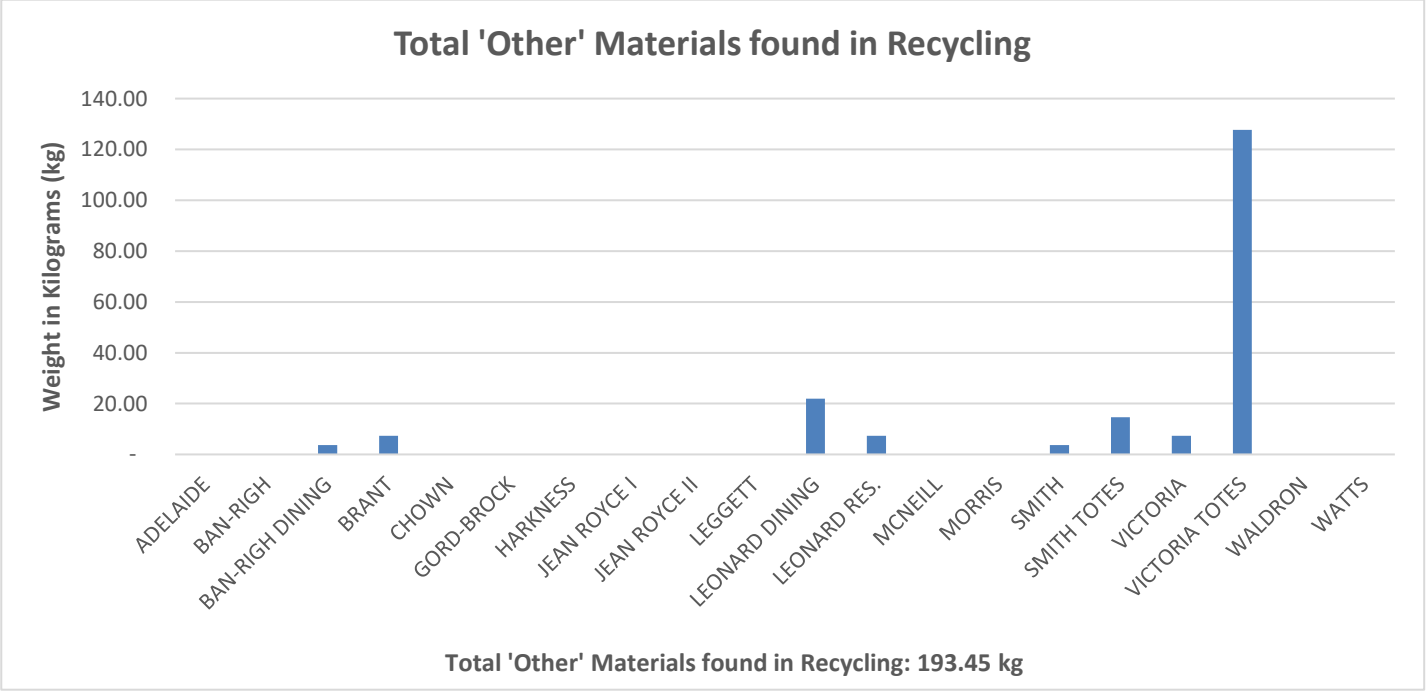


Figure 19 Total Annual Other Materials Generated (kg/ yr)

The figure above shows the amount of 'other' materials generated, per area. The materials in this category are all non-recyclable except for disposable gloves and masks, which can be diverted through dedicated PPE recycling programs. These materials should be removed from the recycling program and placed into either a specialized program or in the waste stream.

Total Annual Materials Generated (kg/yr)

GENERATING AREAS	ADELAIDE	BAN-RIGH	BAN-RIGH DINING	BRANT	CHOWN	GORD-BROCK	HARKNESS	JEAN ROYCE I	JEAN ROYCE II	LEGGETT	LEONARD DINING	LEONARD RES.	MCNEILL	MORRIS	SMITH	SMITH TOTES	VICTORIA	VICTORIA TOTES	WALDRON	WATTS	TOTAL	
Paper	-	-	146.00	69.35	-	69.35	-	-	-	7.30	193.45	324.85	-	-	646.05	532.90	543.85	828.55	73.00	160.60	**3,595.25**	**27.28%**
Plastic	-	-	120.45	153.30	-	186.15	-	-	-	25.55	233.60	189.80	-	-	175.20	408.80	124.10	452.60	193.45	270.10	**2,533.10**	**19.22%**
Metal	-	-	47.45	73.00	-	87.60	-	-	-	10.95	-	102.20	-	-	36.50	262.80	36.50	73.00	14.60	116.80	**861.40**	**6.54%**
Glass	-	-	94.90	80.30	-	-	-	-	-	-	21.90	167.90	-	-	58.40	116.80	-	-	124.10	189.80	**854.10**	**6.48%**
HSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**0.00%**
Organics	-	-	62.05	503.70	-	58.40	-	-	-	156.95	1,182.60	511.00	-	-	496.40	890.60	700.80	416.10	-	164.25	**5,142.85**	**39.02%**
Other Materials	-	-	3.65	7.30	-	-	-	-	-	-	21.90	7.30	-	-	3.65	14.60	7.30	127.75	-	-	**193.45**	**1.47%**
TOTAL MATERIALS	**-**	**-**	**474.50**	**886.95**	**-**	**401.50**	**-**	**-**	**-**	**200.75**	**1,653.45**	**1,303.05**	**-**	**-**	**1,416.20**	**2,226.50**	**1,412.55**	**1,898.00**	**405.15**	**901.55**	**13,180.15**	**100.00%**

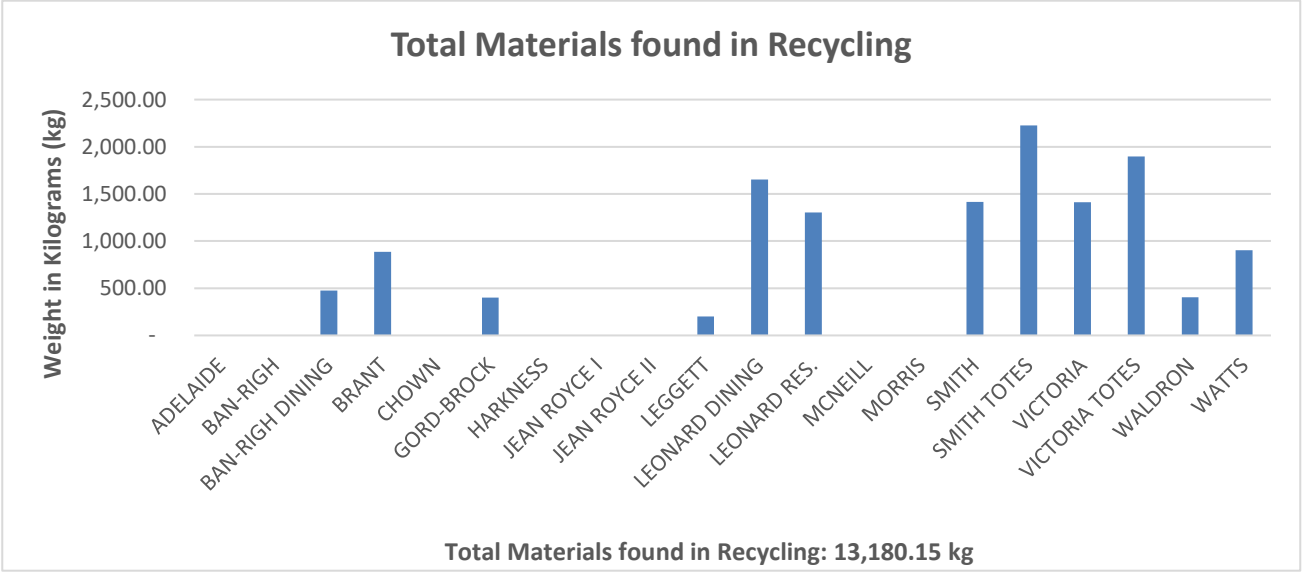


Figure 20 Total Annual Materials Generated (kg/yr)

In summary, the recycling audit sample consisted of primarily paper materials (27.28%) and organic materials (39.02%). With these being the top generated materials on site, it is important to maintain education and awareness surrounding the importance of recycling. 11.08% of the recycling sample was contaminated with non-recyclable materials, not including the organic material which is recyclable, but not recyclable through the regular recycling program.

6 ORGANIC AUDIT RESULTS

Based on the organic audit sample, the total amount of materials generated and disposed of through the residence outdoor organics containers at Queen's University to be 10.32 kilograms (kg) or 0.01 metric tonnes (t) during a 24-hour period or 3,766.80 kg (3.76t) annually. Please note that Smith and Victoria Hall are the only sites that have outdoor organics collection.

From the audited organic sample, organic materials represent 79.17%; paper materials represent 11.05%; plastic materials represent 6.59%; metal materials represent 2.62% and 'other' materials represent 0.58% of the total annual organics collected and sent for processing and recycling.

Total Annual Organics Generated 2021*

COMMODITY CATEGORY	KILOGRAMS (kg)	PERCENTAGE (%)
Organics	2,982.05	79.17
Paper	416.10	11.05
Plastic	248.20	6.59
Metal	98.55	2.62
'Other'	21.90	0.58
TOTAL	**3,766.80**	**100.00**

Total Annual Organics Stream Composition 2021*

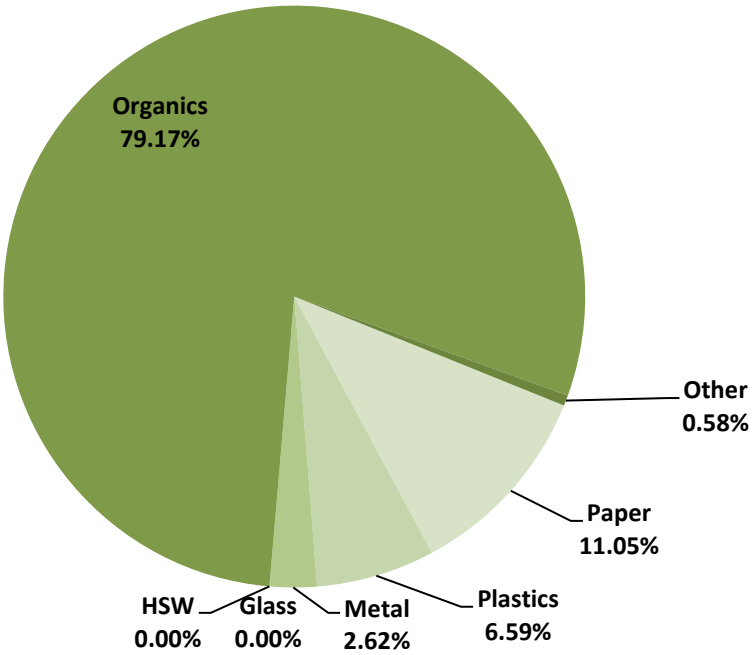


Figure 21 Total Annual Organics Stream Composition 2021

**Figures are based on 24-hour organics audit sample. Annual projection is based on number of operational days.*

Categorical Organics Composition

The following tables and graphs illustrate the composition breakdown of the audited organics sample from the Queen's University Residence exterior organics recycling bins. Seven (7) commodity categories were audited: paper, plastic, metal, glass Household Special Waste (HSW), organics and 'other' materials. Materials were found in all commodity categories except glass and HSW. Only Smith and Victoria Hall have outdoor organics collection.

Total Annual Paper Materials Generated (kg/yr)

GENERATING AREAS	SMITH TOTES	VICTORIA TOTES	TOTAL	
Newspaper	-	-	**-**	**0.00%**
Magazines	-	-	**-**	**0.00%**
Cardboard	3.65	-	**3.65**	**0.88%**
Boxboard	21.90	-	**21.90**	**5.26%**
Mixed Papers	-	3.65	**3.65**	**0.88%**
Molded Pulp	-	-	**-**	**0.00%**
Kraft Paper	109.50	-	**109.50**	**26.32%**
Other Paper	197.10	36.50	**233.60**	**56.14%**
Spiral Wound	-	-	**-**	**0.00%**
Coffee Cups	7.30	29.20	**36.50**	**8.77%**
Aseptic Containers	-	-	**-**	**0.00%**
Gable Top Containers	7.30	-	**7.30**	**1.75%**
TOTAL PAPER	**346.75**	**69.35**	**416.10**	**100.00%**

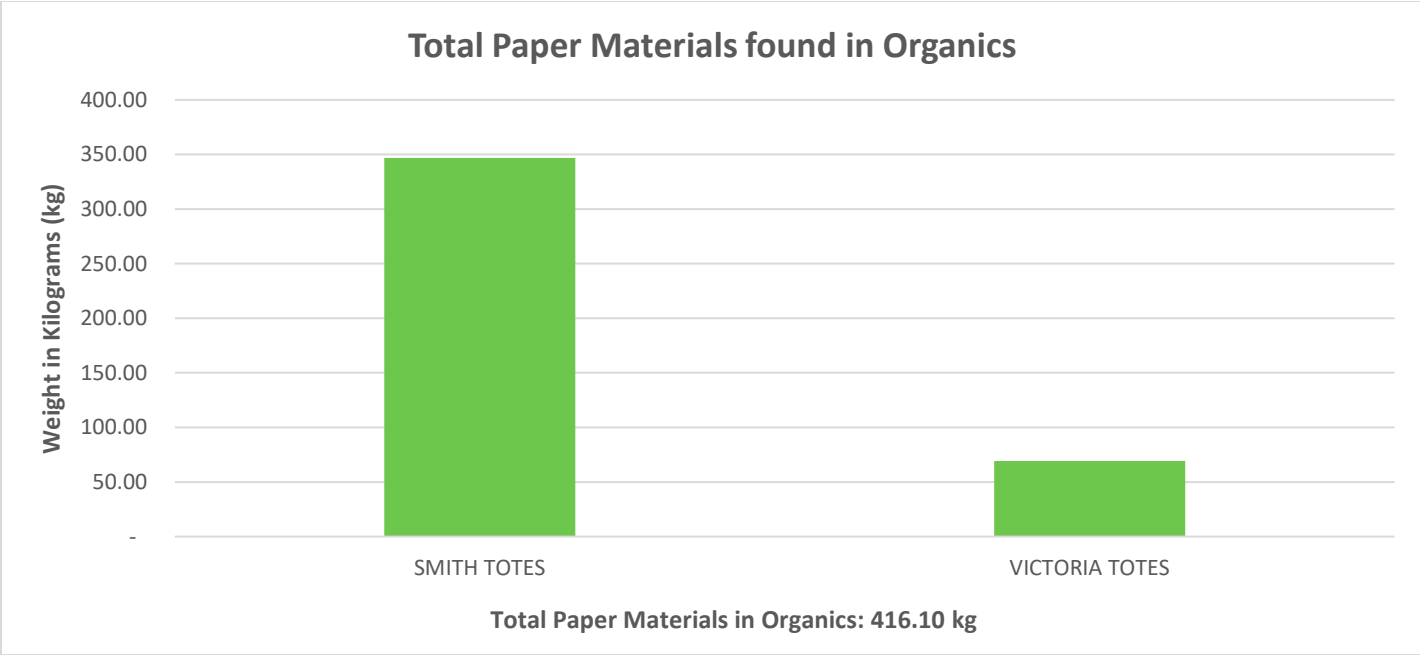


Figure 22 Total Annual Paper Materials Generated (kg/ yr)

The figure above shows the amount of paper materials generated and deposited into the organics stream, per area. Coffee cups and other paper were found contaminating the organics stream, these materials should be placed in the garbage.

Total Annual Plastic Materials Generated (kg/yr)

GENERATING AREAS	SMITH TOTES	VICTORIA TOTES	TOTAL	
# 1 PETE Soft Drinks	65.70	21.90	87.60	35.29%
# 2 HDPE	-	-	-	0.00%
# 3 PVC	-	-	-	0.00%
# 4 LDPE Recyclable Film	-	-	-	0.00%
# 5 PP	14.60	-	14.60	5.88%
# 6 PS (Styrofoam)	-	-	-	0.00%
# 6 PS (Clear/ Hard)	43.80	18.25	62.05	25.00%
# 7 Other	-	-	-	0.00%
Non-Recyclable Film	21.90	21.90	43.80	17.65%
Rigid Plastics	40.15	-	40.15	16.18%
Plastic Strapping	-	-	-	0.00%
TOTAL PLASTICS	186.15	62.05	248.20	100.00%

Figure 23 Total Annual Plastic Materials Generated (kg/ yr)

The figure above shows the amount of plastic materials generated and deposited into the organics stream, per area.
#1 PET and PS #6 rigid were the highest subcategories of non-compostable plastic materials found in the organics stream. It is best to keep all plastics out of the stream, as they are contaminating the stream.

Total Annual Metal Materials Generated (kg/yr)

GENERATING AREAS	SMITH TOTES	VICTORIA TOTES	TOTAL	
Aluminum Cans	65.70	21.90	**87.60**	**88.89%**
Aluminum Foil	-	7.30	**7.30**	**7.41%**
Aluminum Trays	-	3.65	**3.65**	**3.70%**
Aerosal Cans	-	-	**-**	**0.00%**
Steel	-	-	**-**	**0.00%**
Scrap Metal	-	-	**-**	**0.00%**
TOTAL METALS	**65.70**	**32.85**	**98.55**	**100.00%**

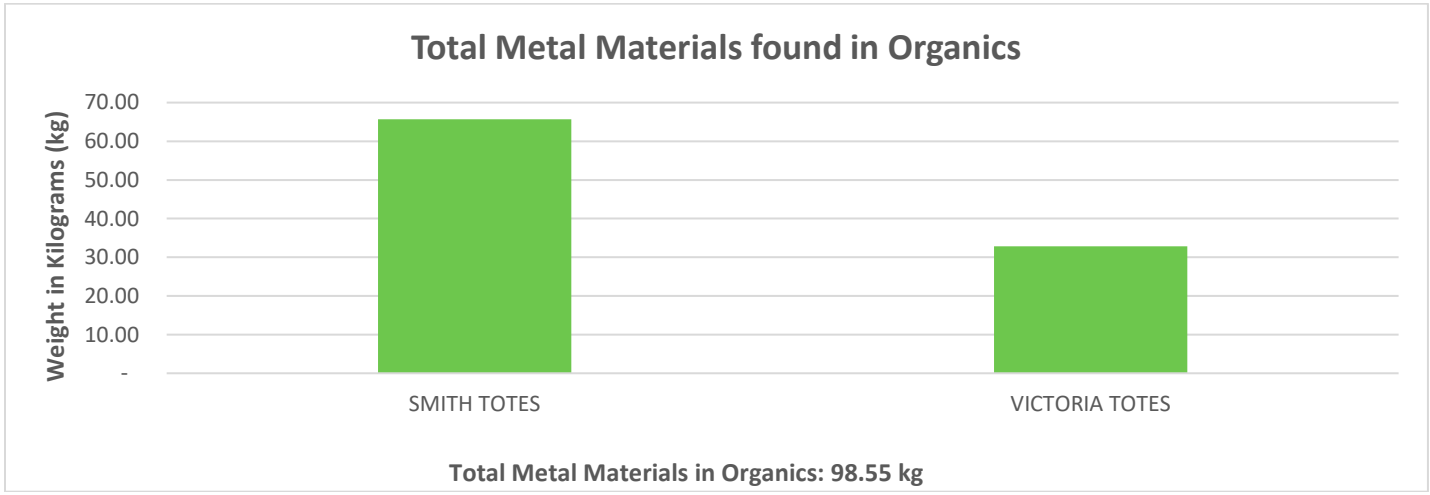


Figure 24 Total Annual Metal Materials Generated (kg/yr)

The figure above shows the amount of metal materials generated and deposited into the organics stream, per area.
Aluminum foil and cans were found in the organics stream. These materials are not compostable and should be placed in the garbage. All metal materials should be kept out of the organic stream and placed in the appropriate stream.

Total Annual Organic Materials Generated (kg/yr)

GENERATING AREAS	SMITH TOTES	VICTORIA TOTES	TOTAL	
Food Waste	1,598.70	262.80	**1,861.50**	**62.42%**
Tissue/ Toweling	36.50	3.65	**40.15**	**1.35%**
Beverage Liquids	146.00	226.30	**372.30**	**12.48%**
Compostables	708.10	-	**708.10**	**23.75%**
Plant/ Yard Waste	-	-	**-**	**0.00%**
TOTAL ORGANICS	**2,489.30**	**492.75**	**2,982.05**	**100.00%**

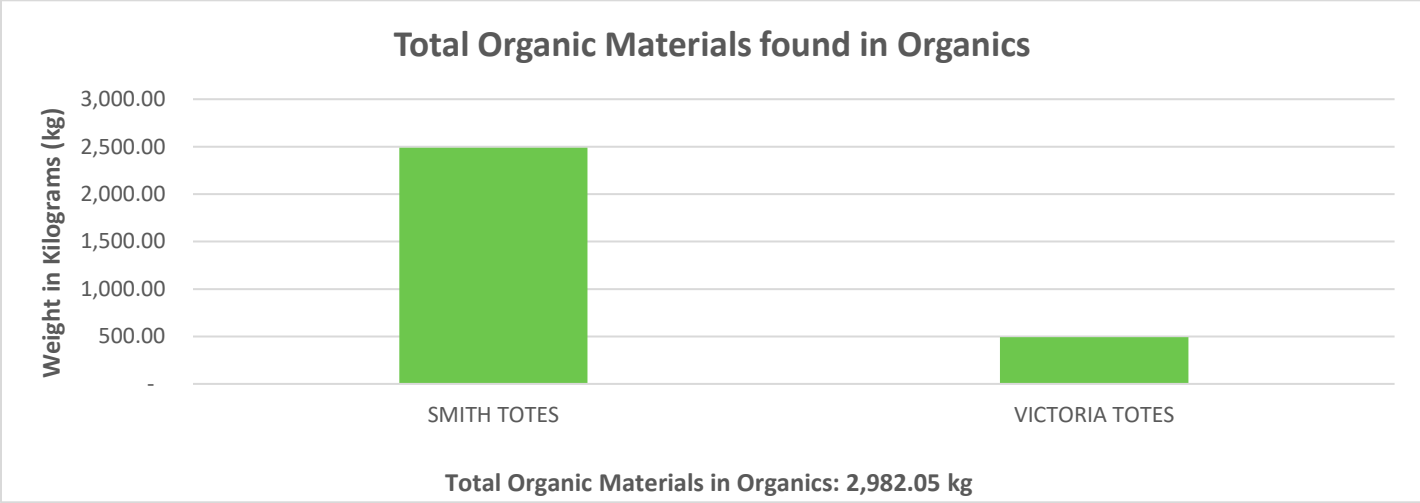


Figure 25 Total Annual Organic Materials Generated (kg/ yr)

The figure above shows the amount of organic materials generated and deposited into the organics recycling program, per area. Food waste is the highest generated organic material found in the organic recycling stream. It is important to keep these materials separate from all other waste streams on site an. This may include improving current organics recycling program.

Total Annual 'Other' Materials Generated (kg/yr)

GENERATING AREAS	SMITH TOTES	VICTORIA TOTES	TOTAL	
Masks	3.65	3.65	**7.30**	**33.33%**
Coffee Pods	-	14.60	**14.60**	**66.67%**
TOTAL OTHER	**3.65**	**18.25**	**21.90**	**100.00%**

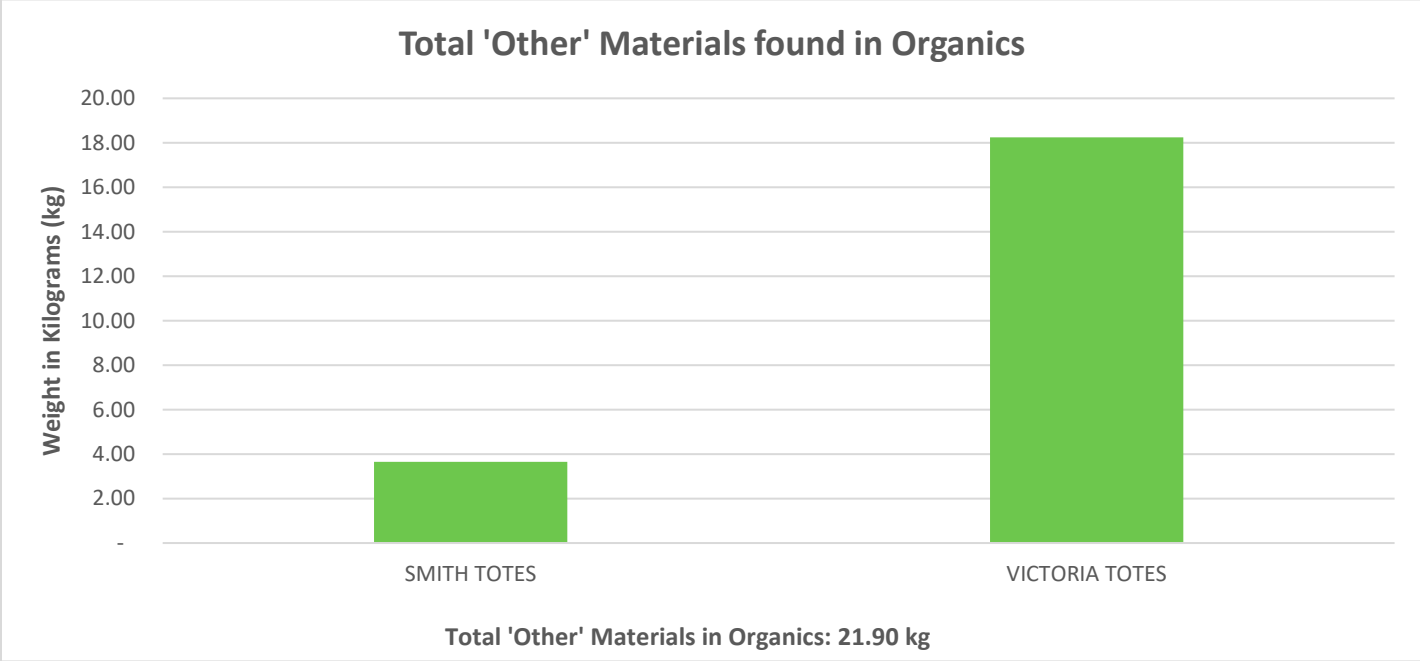


Figure 26 Total Annual 'Other' Materials Generated (kg/ yr)

The figure above shows the amount of other materials generated, per area.
'Other' materials should be kept out of the organics stream; masks and coffee pods are not compostable or recyclable. They should be placed in the garbage.

Total Annual Materials Generated (kg/yr)

GENERATING AREAS	SMITH TOTES	VICTORIA TOTES	TOTAL	
Paper	346.75	69.35	**416.10**	**11.05%**
Plastic	186.15	62.05	**248.20**	**6.59%**
Metal	65.70	32.85	**98.55**	**2.62%**
Glass	-	-	**-**	**0.00%**
HSW	-	-	**-**	**0.00%**
Organics	2,489.30	492.75	**2,982.05**	**79.17%**
Other Materials	3.65	18.25	**21.90**	**0.58%**
TOTAL MATERIALS	**3,091.55**	**675.25**	**3,766.80**	**100.00%**

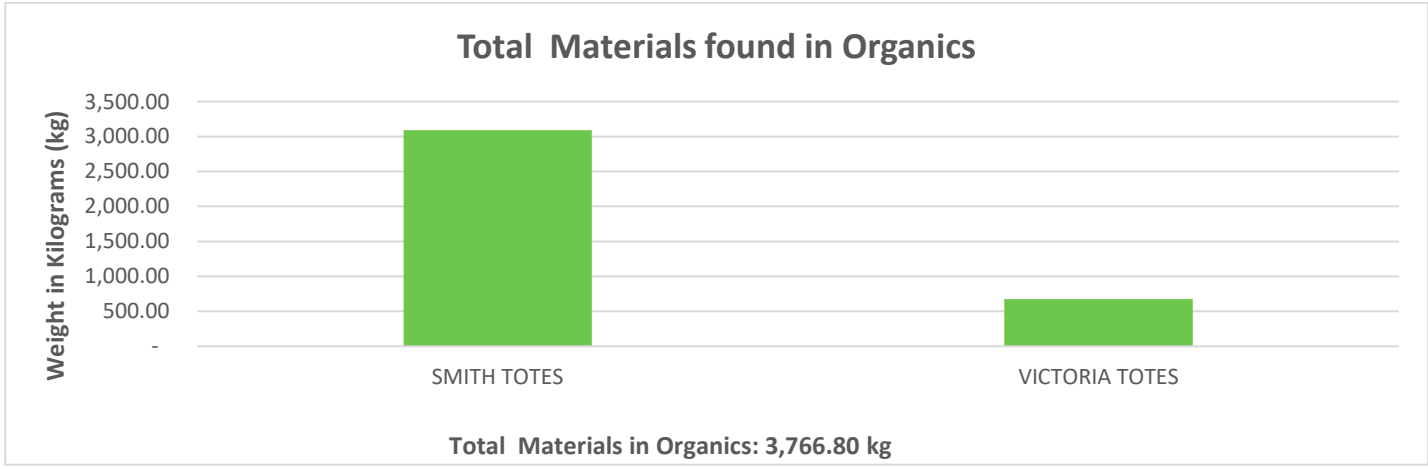


Figure 27 Total Annual Materials Generated (kg/yr)

In summary, the organic recycling audit sample consisted of primarily organic materials (79.17%) and paper materials (11.05%). With these being the top generated materials on site, it is important to implement/maintain education and awareness surrounding the importance of organic recycling and the continued participation in the program. It is also important to ensure that the proper equipment is in place to collect and separate organic waste from other material streams.

7 CONTAMINATION OF AUDIT SAMPLE

The 2021 waste diversion rate for the Queen's University residence outdoor waste and recycling program is **36.04%** based on the audited waste, recycling and organics streams. However, due to levels of contamination in the existing diversion programs, the actual diversion rate, when all contamination items are taken out of the recycling streams and added to the overall waste figure, is **20.50%.**

Actual Diversion Rate Percentage 2021

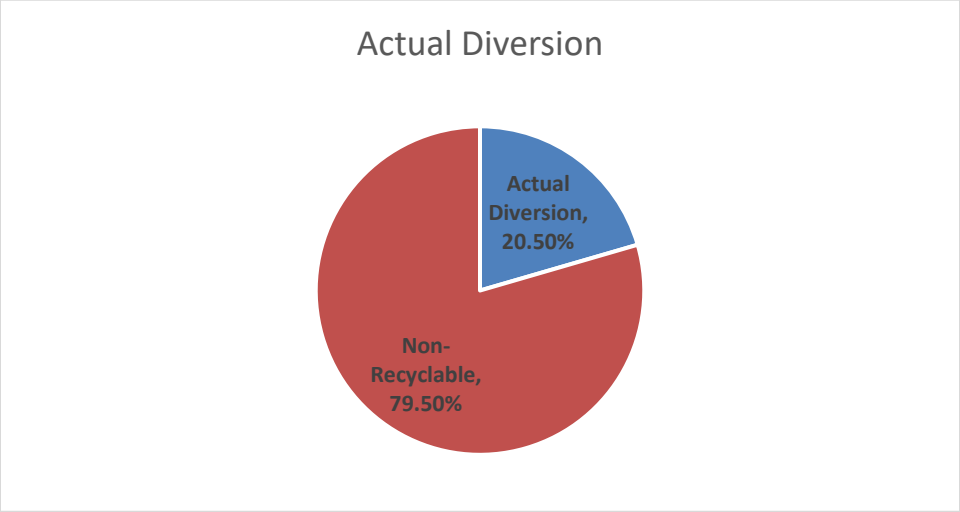


Figure 28 Annual Actual Diversion Rate Percentage 2021

7.1 CONTAMINATION OF WASTE AUDIT SAMPLES

Based on the waste audit results, 25,352.90 kg (84.30%) of the waste sample was contaminated with recyclable materials. Of that total, 18,257.30 kg (18.25 t) was recyclable organic materials; 4,818.00 kg (4.82 t) was recyclable paper materials; 1,898.00 kg (1.90 t) was recyclable plastic; 233.60 kg (0.23 t) was recyclable metal materials; 919.80 kg (0.92 t) was recyclable glass materials; and 98.55 kg (0.09 t) was recyclable HSW materials.

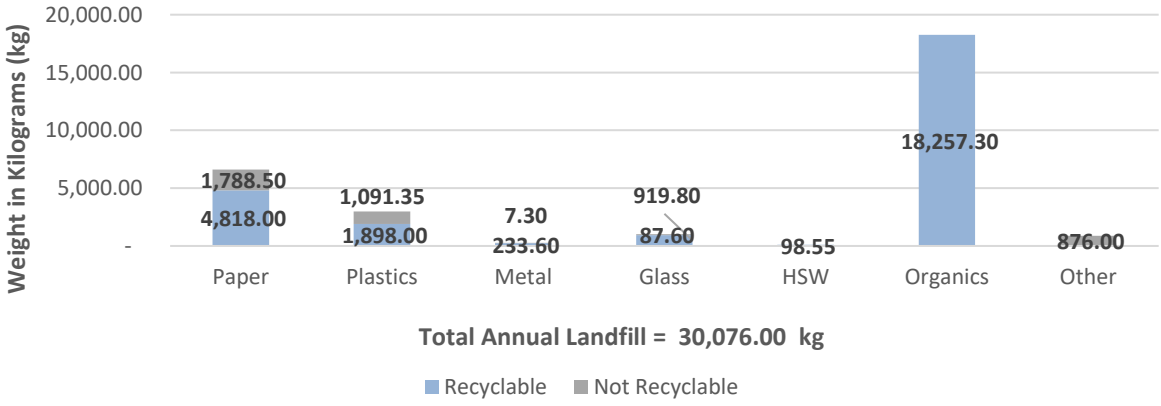


Figure 29 Contamination of Waste Audit Sample

7.2 CONTAMINATION OF RECYCLING AUDIT SAMPLE

Based on the recycling audit results, 6,602.85 kg (50.10%) of the audited recycling sample was contaminated with non-recyclable materials. Of that total, 5,142.85 kg (5.14 t) was organic materials. While these materials are accepted in their own recycling stream, they are considered contaminants in this stream. Of the recycling sample, 839.50 kg (0.84 t) was non-recyclable paper materials; 375.95 kg (0.37t) was non-recyclable plastic materials and 193.45 kg (0.20 t) was non-recyclable 'other' materials.

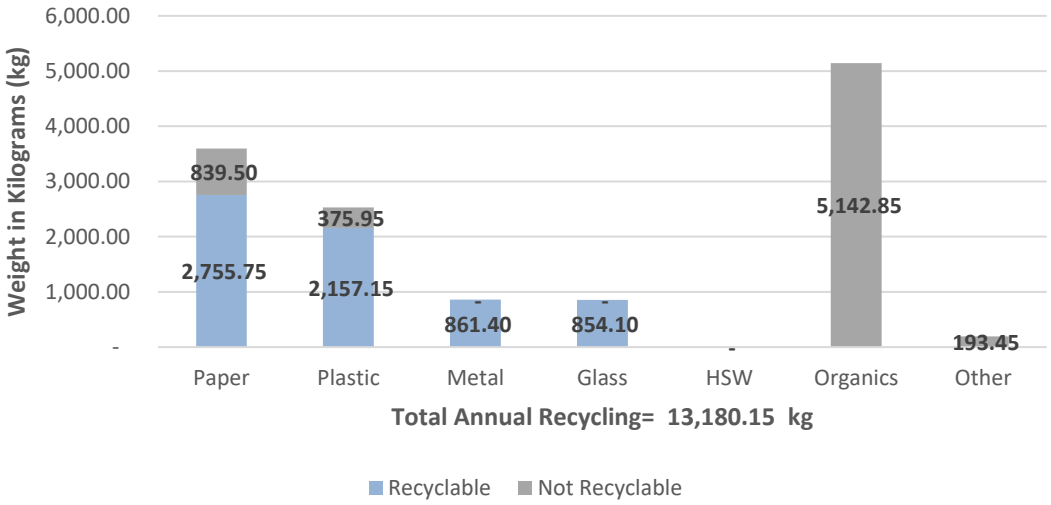


Figure 30 Contamination of Recycling Audit Sample

7.3 CONTAMINATION OF ORGANIC AUDIT SAMPLE

Based on the organic audit results, 784.75 kg (20.83%) of the organic recycling sample was contaminated with non-recyclable materials. Of that total, 299.30 kg (0.30 t) was paper materials; 248.20 kg (0.25 t) was plastic materials; 98.55 kg (0.09 t) was metal materials and 21.90 kg (0.02 t) was 'other' materials.

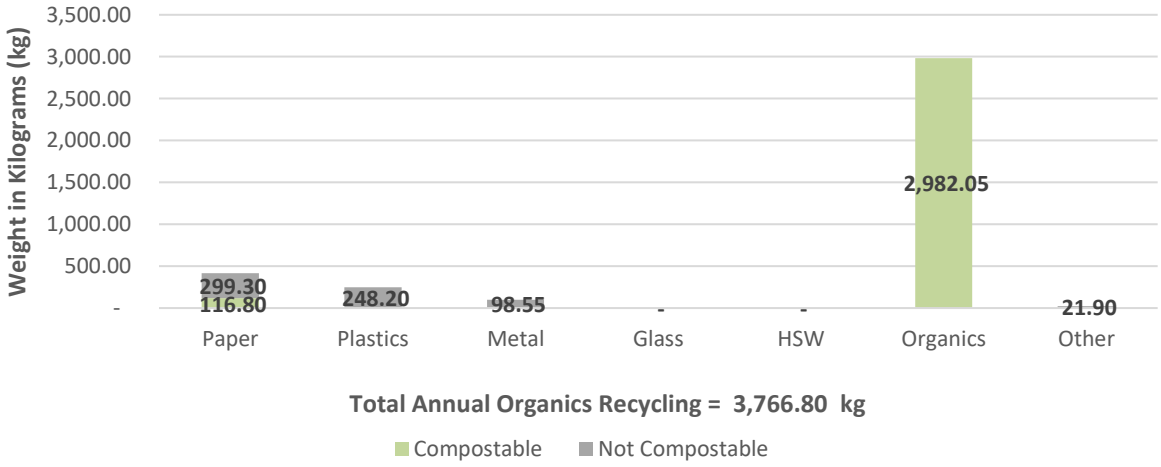


Figure 31 Contamination of Recycling Audit Sample

8 DIVERSION RATE

A **waste diversion rate** is the percentage of total materials that are diverted from the waste to energy facility. The annual diversion rate is calculated as follows:

Total Generated materials is calculated as follows:

Total Generated = Waste + Recycling

30,076.00 + 16,946.95 kg = 47,022.95 kg

Diversion Rate is calculated as follows:

$$\text{Diversion Rate} = \frac{\text{(amount diverted from the facility)}}{\text{(total amount of material generated)}} \times 100\%$$

$$= \frac{16{,}946.95 \text{ kg}}{47{,}022.95 \text{ kg}}$$

= 0.3604 x 100%

= **36.04%**

Based on industry standards, service information and available monthly data reporting, a total of 16,946.95 kg or 16.95 t of materials are recycled from the residence outdoor containers on an annual basis.

Material Destination	Annual Total		
	Kilograms (kg)	Metric Tonnes (t)	Percent (%)
Waste	30,076.00	30.07	63.95
Recycling	13,180.15	13.18	28.03
Organics Recycling	3,766.80	3.77	8.02
Total Recycling	**16,946.95**	**16.95**	
Total Generated	**47,022.95**	**47.02**	**100.00**

Therefore, the current annual diversion rate percentage is **36.04%.**

Annual Diversion Rate Percentage 2021

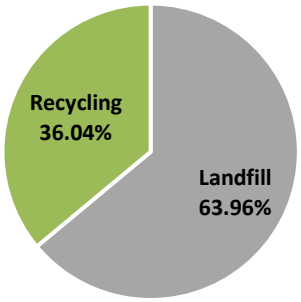


Figure 32 Annual Diversion Rate Percentage 2021

9 CAPTURE RATE

The **capture rate (*c*)** indicates the proportion of divertable waste, expressed as a percentage, which is successfully diverted for disposal. This figure includes all generated divertable waste, from all audited streams.

Total Divertable Materials is calculated as follows:

Total Divertable Materials Generated = Total Recycling Generated + Total Divertable Materials Found in Waste Stream

- Total recycling generated: 16,946.95 kg
- Divertable materials found in waste stream: 25,352.90 kg
- Total divertable material generated: 16,946.95 kg + 25,352.90 kg = 42,299.85 kg

Total Recycling Generated ÷ Total Divertable Materials Generated = Capture Rate

$$c = \frac{42{,}299.85 \text{ kg}}{47{,}022.95 \text{ kg}}$$

$$c = 0.9144 \times 100\%$$

$$c = 91.44\%$$

Therefore, the capture rate for the residence outdoor diversion program is **91.44%.**

Annual Capture Rate Percentage 2021

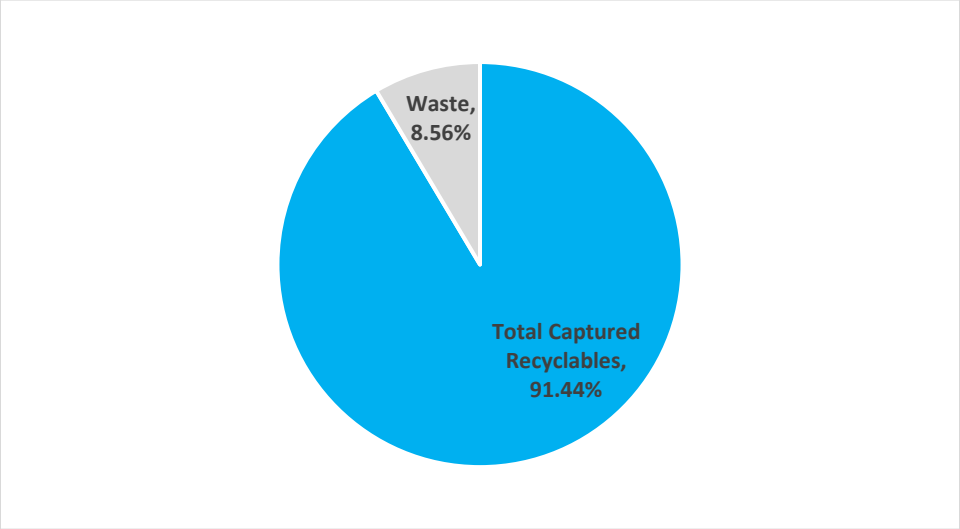


Figure 33 Annual Capture Rate Percentage 2021

10 POTENTIAL DIVERSION

The **potential current diversion rate (*P*)** is the percentage of total materials that could be diverted from landfill if all divertable materials were placed in the proper recycling stream. The potential current diversion rate is calculated as follows:

Total Divertable Materials is calculated as follows:

Total Divertable Materials Generated = Total Recycling Generated + Total Divertable Materials Found in Waste Stream

- Total recycling generated: 16,946.95 kg
- Divertable materials found in waste stream: 25,352.90 kg
- Total divertable material generated: 16,945.95 kg + 25,352.90 kg = 42,299.85 kg

Potential Diversion Rate is calculated as follows:

$$\text{Potential Current Diversion Rate} = \frac{\text{(total divertable materials generated)}}{\text{(total materials generated)}}$$

$$p = \frac{42{,}299.85 \text{ kg}}{47{,}022.95 \text{ kg}}$$

$$p = 0.8996 \times 100\%$$

$$p = 89.96\%$$

Therefore, the potential diversion rate for the Queen's residence outdoor waste program could be **89.96%.**

Annual Potential Diversion Rate Percentage 2021

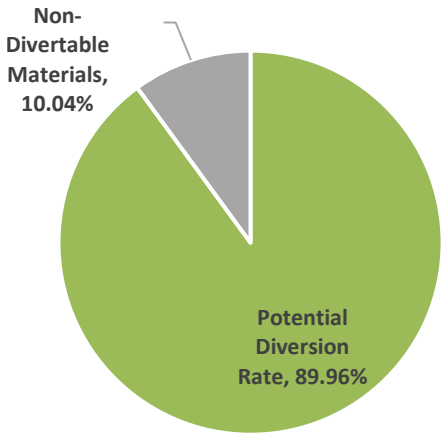


Figure 34 Annual Potential Diversion Rate Percentage 2021

11 RECOMMENDATIONS

Based on the waste audit results, it is important to identify the main areas of improvement to focus on and pinpoint where improvements can currently be made. Tackling one initiative at a time will increase the chances of success. Whether changes need to be made to the existing program itself or increasing education and awareness, narrowing down your options and targeting an issue every quarter or semi-annually, these options will help attain meaningful results.

In order to improve the effectiveness of the recycling program in the Queen's University outdoor waste and recycling collection program, there are several initiatives to take into consideration. To divert as much material from the landfill and into the existing recycling streams, it would be beneficial for the facility to direct all recycling efforts towards further source separating materials in the existing source separation programs provided inside both the residence buildings and other buildings on campus, and consider removing the exterior waste, recycling, and organics collection containers from outside of the residence buildings. This would allow for greater capture of materials overall, in addition to increasing diversion and the quality of recyclables generated on campus.

11.1 IMPROVE ORGANICS RECYCLING

A total of 60.70% of the waste sample was organic material consisting of food waste, paper towel/napkins, and compostable containers and packaging. As organic materials are the heaviest contributor to overall disposal figures, diverting as much organic material from the waste stream as possible will greatly increase the diversion rate and reduce the amount of waste sent to annually. This can be achieved by either removing the exterior waste containers, thus directing users to utilize the organics collection programs already set up in residence buildings or in available recycling collection containers located throughout the campus, or at least ensure that the appropriate/designated recycling collection containers are placed alongside the exterior waste containers, along with descriptive signage indicating acceptable materials in the diversion streams. This will allow for a greater capture of organic waste overall, ensuring that it is collected and sent for processing, thus extending the life cycle of organic waste where it is processed into soil components to be reused in the farming process, rather than sending it to landfill where it serves no purpose.

11.2 IMPROVE PAPER RECYCLING

A total of 21.97% of the waste sample consisted of paper materials, with Mixed paper (20.78%) and kraft paper (15.29%) as the highest generated subcategories of recyclable paper products found in the waste stream. As paper materials are one of the heavier contributors to overall disposal figures, diverting as much recyclable paper material from the waste stream as possible will greatly increase the diversion rate and reduce the amount of waste sent for disposal annually by 2,270.30 kg.

11.3 CONSULT WITH SUPPLIERS TO UTILIZE ALTERNATIVE PACKAGING PRODUCTS

Cold beverage cups and waxed paper wrappers and packaging make up 27.07% of the total paper materials that were found in the waste sample. Comparatively, these items, which are

not currently accepted in any available recycling programs on campus, were also found in the recycling (23.35%) and organic (56.14%) recycling streams, thus contaminating these material streams with items that cannot be diverted.
Consulting with suppliers and vendors to ensure that the products they provide to the university can reduce the amount of waste (landfill) generated. Sourcing alternative products, such as those that can be composted, will result in an overall waste to landfill decrease, and at the same time, increase diversion of waste on campus.

11.4 MINIMIZE CONTAMINATION RISKS BY ELIMINATING EXTERIOR CONTAINERS

Contamination can have serious consequences, such as added service-related fees and downgraded materials that cannot be sorted and are thus sent to landfill. These extra costs can have great implications on the overall operating costs of the university.
84.30% of the waste stream consisted of materials that could have been diverted. This contamination of recyclables in the waste stream not only increases the amount of waste sent to landfill each year and the costs associated with disposal, but also prevents valuable recyclables such as paper, metal, and plastic from being captured sent to a recycling for further processing and reuse.
50.10% of the audited recycling stream consisted of contamination materials- items that should not be placed in that material stream. A significant contributor of contamination in this recycling stream is organic waste, which is recycled when placed in an organics collection container, but seriously downgrades the quality of recycling when placed into a mixed recycling or paper only recycling program.
20.83% of the organics stream consisted of contamination items- materials that cannot be placed in the organics stream and will not break down in the anerobic process. The level of contamination in the organic recycling stream was not overly significant, but it is still important to minimize contamination as much as possible so as not to incur extra or associated contamination fees from the waste services provider.

Ensure that all waste containers at the exterior of residence buildings are accompanied with a recycling container, in addition to descriptive signage indicating what materials can be placed in the recycling stream. Allowing for further source separation at the disposal points will aid in increasing diversion of recyclable materials from landfill.

Another recommendation to minimizing the contamination of the recycling streams is to remove the exterior containers, thus directing students to utilize the source separation programs already established inside the residence buildings. Since students are more familiar with what should be placed into which container in that interior setting, as these source separation programs are situated and consistent in the residence buildings, the risk for contamination of material streams is much lower than the inconsistent outdoor containers. With the removal of the exterior containers, Queen's will also eliminate outside wastes generated from local residents, especially pet wastes and other materials that are not typically generated by Queen's students.

11.5 ADD AND IMPROVE SIGNAGE AND EDUCATION

Employee/Student Education

Educational information should be displayed on an 'Environmental Board' and frequently updated to encourage and engage employee/ student participation. Posting information and signage on the recycling receptacles and/or in common areas will allow for more promotion of the recycling initiatives on campus, while directing users to the proper disposal channels. While education and training on waste reduction should be ongoing, formal education should take place periodically (for example, residence move in days, student orientation, etc.).

Visitor Education

Clear, visible guidelines and signage are very important to the success of the recycling program. All areas of the campus should be equipped with appropriate signage to clearly indicate to students, faculty, and visitors which materials are accepted in the receptacles and to remind them of the importance of their involvement in the recycling program. Recycling guidelines should be posted wherever receptacles and collection containers are stationed. Some examples of the current signs in place are shown below.

11.6 MONITORING AND EVALUATION

One of the keys to a successful recycling program is gathering quantifiable results to follow the progress of the program over the course of time. Ensure that a waste audit is completed once every twelve (12) months and keep track of the data results year to year to compare disposal and recycling rates. Receive monthly diversion reports and display or send out results in a newsletter to reach all employees/tenants to pinpoint where improvements can be made.

It is suggested that waste and recycling disposal areas be monitored so that the number of receptacles and pick up schedule can be adjusted as necessary. Maintain up-to-date records of waste diversion initiatives (e.g. diversion charts, educational or promotional efforts etc.) to see if changes need to be made to the existing waste and recycling programs.

11.7 CONTINUAL PROGRAM REVIEW

The success of the existing recycling program should be continually reviewed by facility management in order to establish goals and monitor improvement over time. This should include but not be limited to:

- The adequacy and accessibility of available bins;
- The disposal methods used by students and faculty, and the location of signage or labels on bins, and;

- The assessment of how materials are being sorted and the potential for new materials to be recycled as the hauler systems and industry changes.

12 CONCLUSION

Based on the waste audit figures, the Queen's University outdoor waste and recycling programs outside of the on-campus residence buildings generates 47,022.95 kg (47.02 t) of material annually, 16,946.95 kg (16.95 t) of which is diverted as recycling and 30,076.00 kg (30.07 t) of which is disposed of as waste. 25,352.90 kg (25.35 t) of the total waste could have been diverted and recycled.

In order to address and monitor the effectiveness of the outdoor recycling program at residences throughout the Queen's University campus, consider the following suggestions to improve the existing program and efforts of employees and visitors:

- Provide recycling receptacles wherever garbage bins exist so that there are no excuses for not participating in the recycling program;

- Ensure that adequate signage is placed on or above all recycling receptacles and that the signage remains consistent throughout the campus;

- Education throughout the facilities can be promoted through promotional and awareness events (especially during Earth Month in April and Waste Reduction Week in October) and on move-in days and orientation, and/or;

- Remove all exterior containers outside of residence buildings on campus, which would eliminate the uncertainty of proper source separating for users, and drive students to use the existing programs inside of the residence buildings.

The success of these initiatives depends on the involvement of all parties, from management to employees. The more involved all parties are in the waste reduction goals of Queen's University, the greater the success of the program.

APPENDIX I - TABLE OF WASTE AUDIT DATA

NAME: Queen's University			WASTE AUDIT DATA			
ADDRESS: 207 Stuart St., Kingston, ON						
DATE: 10/19/21			(KGS)	(KGS)	(KGS)	(KGS)
PAPER	**%**	**%**	**Annual**	**Monthly**	**Weekly**	**Daily**
Newspaper		0.00%	-	-	-	-
Magazines		0.39%	25.55	2.13	0.49	0.07
Cardboard		7.24%	478.15	39.85	9.20	1.31
Boxboard		11.93%	788.40	65.70	15.16	2.16
Mixed Papers		16.41%	1,084.05	90.34	20.85	2.97
Molded Pulp		3.43%	226.30	18.86	4.35	0.62
Kraft Paper		17.96%	1,186.25	98.85	22.81	3.25
Other Paper		27.07%	1,788.50	149.04	34.39	4.90
Spiral Wound		0.00%	-	-	-	-
Coffee Cups		13.54%	894.25	74.52	17.20	2.45
Aseptic Containers		0.83%	54.75	4.56	1.05	0.15
Gable Top Containers		1.22%	80.30	6.69	1.54	0.22
Total Paper	**21.97%**	**100.00%**	**6,606.50**	**550.54**	**127.05**	**18.10**
PLASTICS						
# 1 PETE Soft Drinks		21.12%	631.45	52.62	12.14	1.73
# 2 HDPE		3.42%	102.20	8.52	1.97	0.28
# 3 PVC		0.00%	-	-	-	-
# 4 LDPE Recyclable Film		0.00%	-	-	-	-
# 5 PP		25.03%	748.25	62.35	14.39	2.05
# 6 PS (Styrofoam)		2.32%	69.35	5.78	1.33	0.19
# 6 PS (Clear/ Hard)		13.92%	416.10	34.68	8.00	1.14
# 7 Other		0.00%	-	-	-	-
Non-Recyclable Film		26.37%	788.40	65.70	15.16	2.16
Rigid Plastics		7.81%	233.60	19.47	4.49	0.64
Plastic Strapping		0.00%	-	-	-	-
Total Plastics	**9.94%**	**100.00%**	**2,989.35**	**249.11**	**57.49**	**8.19**
METALS						
Aluminum Cans		80.30%	193.45	16.12	3.72	0.53
Aluminum Foil		3.03%	7.30	0.61	0.14	0.02
Aluminum Trays		6.06%	14.60	1.22	0.28	0.04
Aerosol Cans		0.00%	-	-	-	-
Steel Cans		3.03%	7.30	0.61	0.14	0.02
Scrap Metal		7.58%	18.25	1.52	0.35	0.05
Total Metals	**0.80%**	**100.00%**	**240.90**	**20.08**	**4.63**	**0.66**
GLASS						
Glass (Clear/ Coloured)		91.30%	919.80	76.65	17.69	2.52
Other Glass		8.70%	87.60	7.30	1.68	0.24
Total Glass	**3.35%**	**100.00%**	**1,007.40**	**83.95**	**19.37**	**2.76**
HSW						
Batteries		14.81%	14.60	1.22	0.28	0.04
Lightbulbs		0.00%	-	-	-	-
Chemicals/ Liquids		85.19%	83.95	7.00	1.61	0.23
Total HSW	**0.33%**	**100.00%**	**98.55**	**8.21**	**1.90**	**0.27**
ORGANICS						
Food Waste		71.75%	13,099.85	1,091.65	251.92	35.89
Tissue/ Toweling		6.52%	1,189.90	99.16	22.88	3.26
Beverage Liquids		14.45%	2,638.95	219.91	50.75	7.23
Compostable Containers		7.24%	1,321.30	110.11	25.41	3.62
Yard/ Plant Waste		0.04%	7.30	0.61	0.14	0.02
Total Organics	**60.70%**	**100.00%**	**18,257.30**	**1,521.44**	**351.10**	**50.02**
OTHER MATERIALS						
Textiles		32.92%	288.35	24.03	5.55	0.79
Disposable Gloves		3.75%	32.85	2.74	0.63	0.09
Masks		11.25%	98.55	8.21	1.90	0.27
Coffee Pods		6.67%	58.40	4.87	1.12	0.16
Brita Filter		6.67%	58.40	4.87	1.12	0.16
Vape Cartridges		2.08%	18.25	1.52	0.35	0.05
Pet Waste		35.00%	306.60	25.55	5.90	0.84
Cigarettes		0.42%	3.65	0.30	0.07	0.01
Hair Nets		1.25%	10.95	0.91	0.21	0.03
Total Other	**2.91%**	**100.00%**	**876.00**	**73.00**	**16.85**	**2.40**
TOTAL ANNUAL WASTE	**100.00%**		**30,076.00**	**2,506.33**	**578.38**	**82.40**
Total Annual Divertable Materials	84.30%		25,352.90			
Total Annual Non-Divertable Materials	15.70%		4,723.10			
***The highlighted items are not acceptable items for recycling in the regular recycling bin.**						

NAME: Queen's University			RECYCLING AUDIT DATA			
ADDRESS: 207 Stuart St., Kingston, ON						
DATE: 10/19/21			(KGS)	(KGS)	(KGS)	(KGS)
PAPER	**%**	**%**	**Annual**	**Monthly**	**Weekly**	**Daily**
Newspaper		20.00%	719.05	13.83	13.83	1.97
Magazines		0.00%	-	-	-	-
Cardboard		22.84%	821.25	15.79	15.79	2.25
Boxboard		10.36%	372.30	7.16	7.16	1.02
Mixed Papers		1.62%	58.40	1.12	1.12	0.16
Molded Pulp		3.45%	124.10	2.39	2.39	0.34
Kraft Paper		7.72%	277.40	5.33	5.33	0.76
Other Paper		23.35%	839.50	16.14	16.14	2.30
Spiral Wound		0.00%	-	-	-	-
Coffee Cups		8.22%	295.65	5.69	5.69	0.81
Aseptic Containers		1.42%	51.10	0.98	0.98	0.14
Gable Top Containers		1.02%	36.50	0.70	0.70	0.10
Total Paper	**27.28%**	**100.00%**	**3,595.25**	**69.14**	**69.14**	**9.85**
PLASTICS						
# 1 PETE Containers/Packaging		43.66%	1,105.95	92.16	21.27	3.03
# 2 HDPE Containers/Packaging		1.30%	32.85	2.74	0.63	0.09
# 3 PVC Containers/Packaging		0.00%	-	-	-	-
# 4 LDPE Containers		11.10%	281.05	23.42	5.40	0.77
# 5 PP Containers		21.76%	551.15	45.93	10.60	1.51
# 6 PS (Styrofoam)		0.29%	7.30	0.61	0.14	0.02
# 6 PS (Rigid)		7.35%	186.15	15.51	3.58	0.51
# 7 Other		0.00%	-	-	-	-
Non-Recyclable Film		9.94%	251.85	20.99	4.84	0.69
Rigid Non-Recyclable Plastics		4.61%	116.80	9.73	2.25	0.32
Plastic Strapping		0.00%	-	-	-	-
Total Plastics	**19.22%**	**100.00%**	**2,533.10**	**211.09**	**48.71**	**6.94**
METALS						
Aluminum Cans		96.61%	832.20	69.35	16.00	2.28
Aluminum Foil		0.00%	-	-	-	-
Aluminum Trays		0.00%	-	-	-	-
Aerosal Cans		0.00%	-	-	-	-
Steel Cans		3.39%	29.20	2.43	0.56	0.08
Scrap Metal		0.00%	-	-	-	-
Total Metals	**6.54%**	**100.00%**	**861.40**	**71.78**	**16.57**	**2.36**
GLASS						
Glass (Clear/ Coloured)		100.00%	854.10	71.18	16.43	2.34
Other Glass		0.00%	-	-	-	-
Total Glass	**6.48%**	**100.00%**	**854.10**	**71.18**	**16.43**	**2.34**
HSW						
Batteries		0.00%	-	-	-	-
Lightbulbs		0.00%	-	-	-	-
Chemicals/ Liquids		0.00%	-	-	-	-
Total HSW	**0.00%**	**0.00%**	**-**	**-**	**-**	**-**
ORGANICS						
Food Waste		44.85%	2,306.80	192.23	44.36	6.32
Tissue/ Toweling		5.82%	299.30	24.94	5.76	0.82
Beverage Liquids		37.12%	1,908.95	159.08	36.71	5.23
Compostables		12.21%	627.80	52.32	12.07	1.72
Yard/ Plant Waste		0.00%	-	-	-	-
Total Organics	**39.02%**	**100.00%**	**5,142.85**	**428.57**	**98.90**	**14.09**
OTHER MATERIALS						
Textiles		18.87%	36.50	0.70	0.70	0.10
Disposable Gloves		56.60%	109.50	2.11	2.11	0.30
Masks		22.64%	43.80	0.84	0.84	0.12
Coffee Pods		0.00%	-	-	-	-
Cigarettes		1.89%	3.65	0.07	0.07	0.01
		0.00%	-	-	-	-
		0.00%	-	-	-	-
Total Other	**1.47%**	**100.00%**	**193.45**	**3.72**	**3.72**	**0.53**
TOTAL ANNUAL RECYCLING	**100.00%**		**13,180.15**	**855.48**	**253.46**	**36.11**
Total Annual Divertable Materials	49.90%		6,577.30			
Total Annual Non-Divertable Materials	50.10%		6,602.85			

***The highlighted items are not acceptable items for recycling in the regular recycling bin.**

NAME: Queen's University			ORGANIC RECYCLING AUDIT DATA			
ADDRESS: 207 Stuart St., Kingston, ON						
DATE: 10/19/21			(KGS)	(KGS)	(KGS)	(KGS)
PAPER	**%**	**%**	**Annual**	**Monthly**	**Weekly**	**Daily**
Newspaper		0.00%	-	-	-	-
Magazines		0.00%	-	-	-	-
Cardboard		0.88%	3.65	0.07	0.07	0.01
Boxboard		5.26%	21.90	0.42	0.42	0.06
Mixed Papers		0.88%	3.65	0.07	0.07	0.01
Molded Pulp		0.00%	-	-	-	-
Kraft Paper		26.32%	109.50	2.11	2.11	0.30
Other Paper		56.14%	233.60	4.49	4.49	0.64
Spiral Wound		0.00%	-	-	-	-
Coffee Cups		8.77%	36.50	0.70	0.70	0.10
Aseptic Containers		0.00%	-	-	-	-
Gable Top Containers		1.75%	7.30	0.14	0.14	0.02
Total Paper	**11.05%**	**100.00%**	**416.10**	**8.00**	**8.00**	**1.14**
PLASTICS						
# 1 PETE Soft Drinks		35.29%	87.60	7.30	1.68	0.24
# 2 HDPE		0.00%	-	-	-	-
# 3 PVC		0.00%	-	-	-	-
# 4 LDPE Recyclable Film		0.00%	-	-	-	-
# 5 PP		5.88%	14.60	1.22	0.28	0.04
# 6 PS (Styrofoam)		0.00%	-	-	-	-
# 6 PS (Clear/ Hard)		25.00%	62.05	5.17	1.19	0.17
# 7 Other		0.00%	-	-	-	-
Non-Recyclable Film		17.65%	43.80	3.65	0.84	0.12
Rigid Plastics		16.18%	40.15	3.35	0.77	0.11
Plastic Strapping		0.00%	-	-	-	-
Total Plastics	**6.59%**	**100.00%**	**248.20**	**20.68**	**4.77**	**0.68**
METALS						
Aluminum Cans		88.89%	87.60	7.30	1.68	0.24
Aluminum Foil		7.41%	7.30	0.61	0.14	0.02
Aluminum Trays		3.70%	3.65	0.30	0.07	0.01
Aerosal Cans		0.00%	-	-	-	-
Steel		0.00%	-	-	-	-
Scrap Metal		0.00%	-	-	-	-
Total Metals	**2.62%**	**100.00%**	**98.55**	**8.21**	**1.90**	**0.27**
GLASS						
Glass (Clear/ Coloured)		0.00%	-	-	-	-
Other Glass		0.00%	-	-	-	-
Total Glass	**0.00%**	**0.00%**	**-**	**-**	**-**	**-**
HSW						
Batteries		0.00%	-	-	-	-
Lightbulbs		0.00%	-	-	-	-
Chemicals/ Liquids		0.00%	-	-	-	-
Total HSW	**0.00%**	**0.00%**	**-**	**-**	**-**	**-**
ORGANICS						
Food Waste		62.42%	1,861.50	155.13	35.80	5.10
Tissue/ Toweling		1.35%	40.15	3.35	0.77	0.11
Beverage Liquids		12.48%	372.30	31.03	7.16	1.02
Compostables		23.75%	708.10	59.01	13.62	1.94
Plant/ Yard Waste		0.00%	-	-	-	-
Total Organics	**79.17%**	**100.00%**	**2,982.05**	**248.50**	**57.35**	**8.17**
OTHER MATERIALS						
Masks		33.33%	7.30	0.14	0.14	0.02
Coffee Pods		66.67%	14.60	0.28	0.28	0.04
		0.00%	-	-	-	-
Total Other	**0.58%**	**100.00%**	**21.90**	**0.42**	**0.42**	**0.06**
TOTAL ANNUAL RECYCLING	**100.00%**		**3,766.80**	**285.82**	**72.44**	**10.32**
Total Annual Divertable Materials	79.17%		2,982.05			
Total Annual Non-Divertable Materials	20.83%		784.75			

***The highlighted items are not acceptable items for organics in the regular organics recycling bin.**

APPENDIX II - GLOSSARY OF TERMS

Boxboard	Thick cardstock-like paper used for a variety of consumer product packaging applications.
Capture Rate	The proportion of divertable waste, expressed as a percentage, which is successfully diverted from disposal.
Cardboard	Corrugated containerboard.
Collective Waste Audit	Collective annualized waste audit of waste generated as a whole; no breakdown of separate areas in the building.
Commodity	A raw material product that could be bought or sold, such as metal, cardboard and plastic.
Contamination	Refers to the presence of recyclables in the garbage stream or, conversely, residual waste materials in a recycling stream.
Diversion	The act of diverting waste materials from landfill through reuse off-site or recycling. As well as actions to prevent waste materials from being generated, actions to reduce material generation, reuse (internal or external) source-separation.
Diversion Rate	The proportion by mass of all waste diverted from disposal to the total mass of all waste material generated, expressed as a percentage.
Divertable	Capability of a material being recycled or reused.
Final Destination	The location where materials are sent for disposal by the hauler. This can include a sorting facility
Mass Ration Method of Annualization	A method of annualization of findings by applying the mass ratio of each material to the total mass of material generated that year.
Non-Divertable	Material that is not able to be reused or recycled.
Other Paper	Non-recyclable paper products, glossy paper.
Plastic Resin Codes	The numbers printed on some plastic products, surrounded by a triangle shape of arrows, to indicate

	the plastic resin they are made of. The numbers are 1, 2, 3, 4, 5,6, and 7. They are used by waste haulers to identify what plastic type is recyclable.
Point of generation waste audit	An annualized audit of waste generated by separate areas of the building.
Potential Diversion Rate	Is the percentage of total materials that could be diverted from landfill if all divertable materials were placed in the proper recycling stream.
Circular Innovation Council (Formerly RCO)	Is a not-for-profit membership based organization involved in policy, education and project work around the issues of consumption, waste generation, reduction and diversion, and recycling.
Residual Waste	All material that cannot be diverted in any way with the current program, and thus must be disposed of via the garbage stream. This includes any materials that cannot be reused or recycled.
Source Separation Material	Separating materials by type at the point of discard so they can be recycled.
Source separation program	A program to facilitate the source separation of waste for reuse or recycling.
Waste	Materials that are no longer wanted or needed and are disposed of either through landfill, reuse off-site, or recycling. Waste includes all garbage and recycling materials that is removed from site.
Waste Generation Index	The waste generation index is the unit most closely related to the amount of solid waste generated by the facility such as production units or building population.
Waste per square foot	A measure of total waste used for comparing properties of varying sizes to each other. This measure can also be used to determine the success of waste reduction initiatives.
Waste reduction work plan	From 0.Reg. 102/94, a plan to reduce, reuse and recycle waste.

Waste Stream	A waste, recycling or garbage stream refers to the flow of a group of materials from the generation on-site through to the final destination. For example, Paper stream, landfill stream, commingled stream.

APPENDIX III – CALIBRATION CERTIFICATE

Calibration Certificate

Date of Calibration: October 19, 2021

The Scales used for waste auditing by GFL Environmental Inc. has been checked and calibrated using known mass measures.

To ensure that the scales are performing accurately a 5-pound weight was used in the calibration procedure. The weight was placed on the scale to ensure an accurate reading of 5 pounds on the scale.

Test Weight	Scale Reading	Model # of Scale	Serial # of Scale	Calibrated By (Print Name)	Date
5 lbs	5 lbs	H-5837	02010016008	Blue Top Scale	10/19/2021
5 lbs	5 lbs	H-5837	01804016006	Stainless Steel Scale	10/19/2021

Laura McAlpine
Environmental Manager
GFL Environmental Inc.

APPENDIX IV -PHOTOGRAPHS

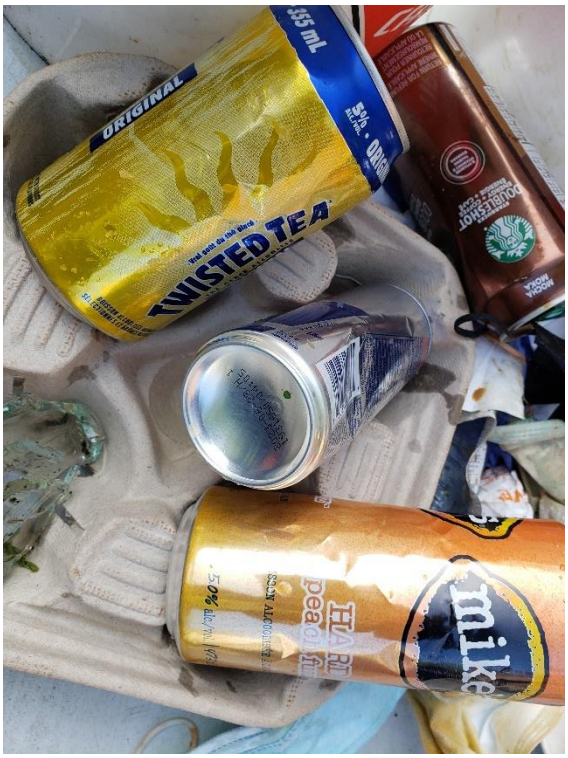
Non-recyclable paper wrappers and cold drink cups found in waste.

Recyclable kraft paper bags/packaging found in waste.

Compostable take-out food containers, straws and wooden chopsticks found in waste.

Food waste and sauce containers found in waste.

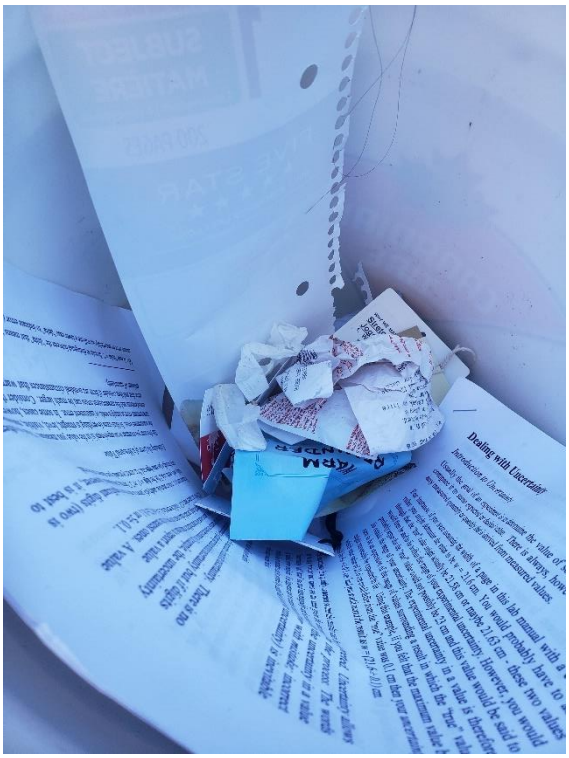
Recyclable plastic #5 cups and lids found in waste.



Aluminum cans found in waste.

Recyclable #1 PETE found in waste.

Pet waste found in waste containers.



Recyclable mixed papers found in waste.

Recyclable file folders found in waste.

Coffee pods found in waste.

Recyclable boxboard found in waste.

Contamination found in recycling.

Non-recyclable masks found in recycling.

Contamination food waste found in recycling.

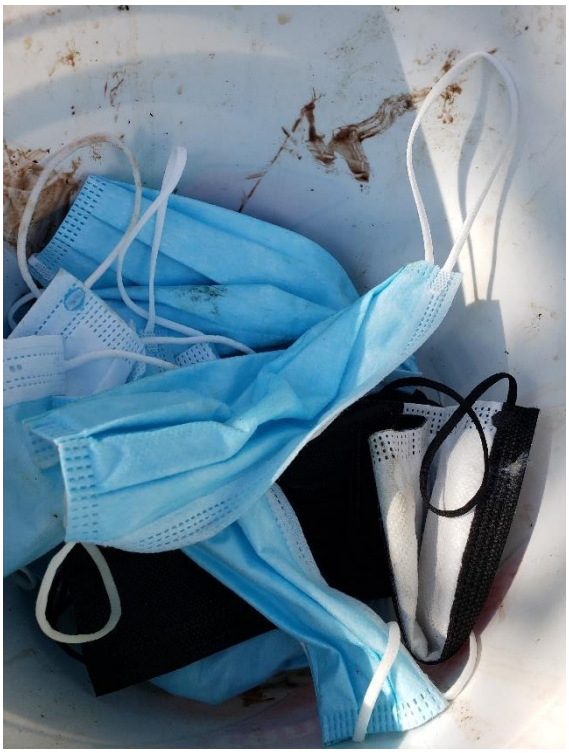
Compostable take-out packaging found in recycling.

Single-use disposable coffee cups found in recycling totes.

Heavy contamination of food waste found in recycling tote.

Recyclable aluminum cans found in waste tote, mixed with other waste materials.

Non-recyclable plastic film found in waste tote.



Masks found in recycling totes. Should be disposed of as waste, or as a special collection item, collected and separated from other recyclables.

Compostable containers and straws found in waste totes.

Battery found in tote service. Should not be disposed of in regular waste, recycling or organics.

Non-recyclable paper materials (cups and wrappers) found in organic totes.