



**waste reduction**

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**McMaster University  
2022 Solid Non-Hazardous Waste Audit**

Prepared for:

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**Waste Reduction Group Project P1355  
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### Executive Summary

McMaster University retained the services of Waste Reduction Group Inc to conduct a solid non-hazardous waste audit at its campus located in Hamilton, Ontario. Twenty-four hour samples of waste were collected from seven (7) different areas on campus, consisting of approximately 282 kg of garbage. The collected samples were audited over two (2) days in October 2022. The following list summarizes the overall garbage composition determined from the audit:

- Mixed Papers: 29.9%
- Non-recyclable 14.6%
- Paper Towels: 11.0%
- Mixed Containers: 10.4%
- Cardboard: 9.9%
- Coffee Cups: 9.0%
- Cold Beverage Cups: 5.0%
- LDPE Plastic Films: 4.1%
- Organic Waste 3.5%
- PPE: 1.5%
- Styrofoam, Scrap Woods, Strapping, Ewastes, Metals, Textiles: Each < 0.5%

Waste diversion programs implemented on campus include cardboard, mixed containers, mixed papers, confidential papers, organics, scrap metals, scrap woods, electronics, concrete, bulbs, batteries, printer toners, oil & grease, organics, wood pallets, LCBO/Beer Store returns, textbook and used furniture donations. Through discussions with McMaster University personnel, estimates of the annual amounts of solid non-hazardous waste materials disposed, reduced, reused, recycled and composted were determined. The following table summarizes the estimated annual quantities of waste materials generated, reduced, reused, recycled, composted and disposed in 2022.

**Annual Quantities of Materials Diverted & Disposed**

Material	Total Annual Amount	
	Metric Tonnes	Percent
Disposed to Landfill	615.33	47.5%
Materials Diverted	679.51	52.5%
Total Waste Generated	1294.84	100%

Based on the total annual amount of waste generated and materials diverted from landfill, the waste diversion rate through existing programs at McMaster University was determined to be approximately 53%. The Ministry of the Environment, Conservation & Parks (MECP) provincial objective for waste diversion rate is 60%. McMaster University's management team are committed to improving their waste diversion rate in order to minimize the amount of materials disposed to landfill.

## Table of Contents

Executive Summary.....	i
1 Introduction.....	1
1.1 Purpose.....	1
1.2 Scope of Work.....	1
2 Methodology.....	2
3 Waste Audit Results.....	3
3.1 Garbage Quantities & Distribution.....	3
3.2 Garbage Composition.....	4
3.3 Garbage Composition per Audit Location.....	5
3.3.1 General Science Building.....	6
3.3.2 Hedden Hall.....	6
3.3.3 John Hodgins Engineering Building.....	7
3.3.4 Woodstock Hall.....	7
3.3.5 Burke Science Building.....	8
3.3.6 McMaster University Student Centre.....	8
3.3.7 Mills Library.....	9
3.4 Percentage of Recyclables in Garbage.....	9
4 Diversion Programs & Waste Systems.....	10
4.1 Waste Diversion Programs.....	10
4.2 Waste Disposal Systems.....	12
5 Performance Metrics.....	13
5.1 Waste Diversion Rate.....	13
5.2 Capture Rate.....	13
5.3 Year over Year Change in Waste Generation.....	14
5.3.1 Year-over-Year Change in Diverted Quantities.....	14
5.3.2 Year-over-Year Change in Garbage Disposed.....	15
6 Waste Audit Summary & Waste Reduction Work Plan.....	15
7 Conclusions & Recommendations.....	16

## Appendices

Appendix A.....	Supporting Documentation
Appendix B.....	Waste Audit Data
Appendix C.....	Waste Audit Summary
Appendix D.....	Waste Reduction Work Plan Summary

## 1 Introduction

McMaster University (MU) retained the services of Waste Reduction Group Inc to conduct a solid non-hazardous waste audit in 2022 at its campus located in Hamilton, Ontario. The waste audit examined representative samples of waste from seven (7) different areas on campus over a two (2) day period in October 2022. The goal of the waste audit was to gain an understanding of the quantities and composition of solid non-hazardous wastes generated on campus.

MU is a multi-building community that has approximately 34,720 Full-Time Equivalent (FTE) students (2020/21; Refer to Appendix A) and staff that generate waste and divertible materials. MU conducted the solid non-hazardous waste audit to comply with the requirements of O.Reg. 102/94 for educational establishments, to confirm compliance with O.Reg.103/94 and to further improve upon their present waste reduction, reuse and recycling programs implemented on-campus.

*Note: This waste audit was conducted during the COVID-19 pandemic response. Due to the pandemic response, the collected waste audit samples and annual service records may not be representative of typical operations and caution should be used when comparing sample data between 2020/21/22 and different years at the same facility.*

### 1.1 Purpose

The purpose of the solid non-hazardous waste audit was to:

- Comply with Part X of O.Reg. 102/94 'Waste Audits and Waste Reduction Work Plans', which requires the operator of an educational institution with more than 350 students enrolled per year, to conduct an annual waste audit and prepare and implement a waste reduction work plan (Refer to Appendix A for a partial excerpt of O.Reg.102/94);
- Confirm compliance with Section 14 of O.Reg.103/94 'Industrial, Commercial and Institutional Source Separation Programs' and Part X 'Educational Institutions' of the Schedule attached to the Regulation (Refer to Appendix A for a partial excerpt of O.Reg.103/94).
- Determine the annual waste diversion rate for MU resulting from existing waste reduction, reuse, and recycling programs;
- Identify point of generation and quantify composition of wastes at MU;
- Identify any additional opportunities for waste reduction and diversion that may exist at MU;
- Address any specific concerns or opportunities identified during the study.

### 1.2 Scope of Work

To satisfy the purpose of the waste audit, the following scope of work was completed:

- Collected data pertaining to waste composition between October 5 and 6, 2022.

- Determined the total quantity of waste materials diverted from landfill by MU through current reduction, reuse, and recycling programs;
- Completed a Waste Audit Report (per MECP protocol) that addressed the amount, nature and composition of the waste, the manner by which the waste was generated, including management decisions and policies that relate to the production of waste, and the way in which the waste is managed on campus; and
- Completed a Waste Reduction Work Plan (per MECP protocol) regarding plans to reduce, reuse and recycle waste on campus. The report set out who will implement each part of the plan, when each part will be implemented and what the expected results shall be.

## 2 Methodology

Discussions were held with MU personnel to review existing waste management and recycling programs implemented on campus. Based on previous waste audit experience and information gathered by MU, a waste audit schedule was developed. The waste audit was performed over two (2) days in October 2022, as summarized in Table 1:

**Table 1: 2019 Waste Audit Sample Schedule**

Date	Building/Location	Sample Type
Oct. 5 & 6, 2022	Burke Science Building	Garbage
Oct. 5 & 6, 2022	John Hodgins Engineering Building	Garbage
Oct. 5 & 6, 2022	Mills Library	Garbage
Oct. 5 & 6, 2022	General Science Building	Garbage
Oct. 5 & 6, 2022	McMaster University Student Centre	Garbage
Oct. 5 & 6, 2022	Hedden Hall	Garbage
Oct. 5 & 6, 2022	Woodstock Hall	Garbage

In coordination with the MU staff, twenty-four hour samples of waste were collected from each of the identified buildings and/or locations on the waste audit schedule. The collected bags of labelled wastes were brought to a designated collection and waste audit area by MU staff. The weights of waste materials from each building and functional area were recorded. Refer to Appendix A for a copy of the Scale Calibration Certificate.

Waste materials were then unloaded, sorted into individual waste categories, weighted, re-bagged and disposed of in the appropriate garbage or recycling bins. Waste samples were sorted by a qualified team from Waste Reduction Group. Materials source separated by MU for recycling were not collected and categorized during the audit however the annual quantity of all diverted materials was reviewed and included in the audit results.

Waste material categories were established prior to the audit based on O.Reg.103/94 requirements for source separation at educational institutions, including:

- Aluminum food or beverage cans (including cans made primarily of aluminum);

- Cardboard (corrugated);
- Fine paper;
- Glass bottles and jars for food or beverages;
- Newsprint; and
- Steel food or beverage cans (including cans made primarily of steel).

In addition to these standard categories other important waste streams such as other mixed containers (PET, HDPE, polypropylene, gable top, aseptic), organic wastes, paper towels, mixed plastics, Styrofoam, yard waste, electronic waste, scrap wood, scrap metal and special wastes (i.e. batteries, bulbs and ballasts) were included depending on what auditors found in the samples.

### 3 Waste Audit Results

#### 3.1 Garbage Quantities & Distribution

A key aspect of O. Reg. 102/94 is for waste generators to gain a good understanding of the areas of their operation that generate the most waste, how it is generated, as well as the waste composition. One can use this information to focus their recycling and waste reduction efforts efficiently and effectively.

Table 2 summarizes the quantity and distribution of garbage materials collected for the waste audit.

**Table 2: Quantity & Distribution of Waste Audit Sample**

Building Name/Location	Waste Audit Sample	
	Sample Weight (kg)	Distribution (%)
General Science Building	101.30	35.9%
Hedden Hall	48.34	17.1%
John Hodgins Engineering Building	37.05	13.1%
Woodstock Hall	35.87	12.7%
Burke Science Building	31.02	11.0%
McMaster University Student Center	21.26	7.5%
Mills Library	7.53	2.7%
Total	282.37	100.0%

Therefore, General Science Building, Hedden Hall, John Hodgins Engineering Building and Woodstock Hall generated the most garbage, representing approximately 79% of the waste audit sample.

In future audits, it is recommended that the garbage sample per building be sub-labelled according to the functional areas within each building. The following areas are typical examples of functional areas at universities:

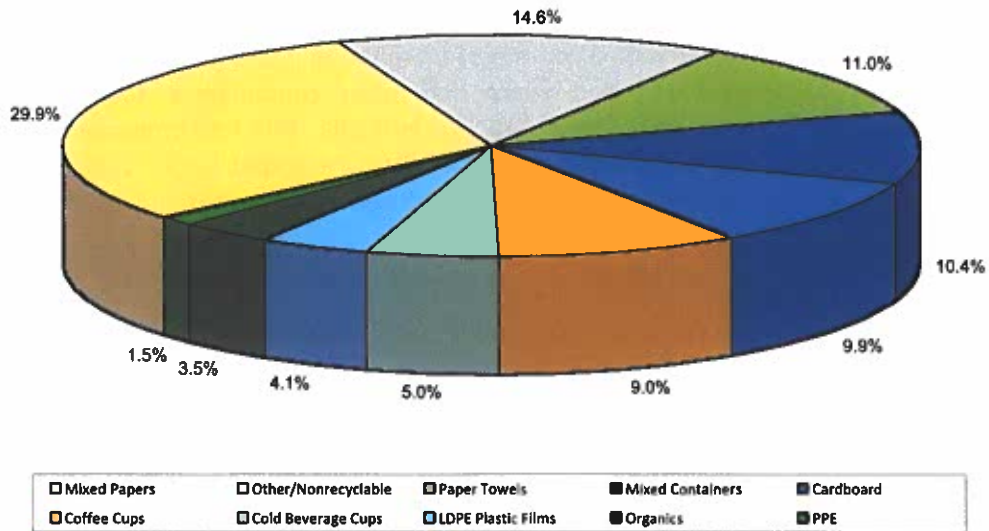
- Office/Administrative Areas
- Public Areas
- Classrooms
- Washrooms
- Food Service/Kitchens
- Dining Areas
- Laboratories
- Residences
- Outdoor Bins

Typically, each functional area has a distinct garbage composition. By reviewing data per functional area, specific recommendations can be generated to maximize the amount of recyclables diverted from landfill.

### 3.2 Garbage Composition

The total weight of waste collected and sorted for the audit was approximately 282 kg. Figure 1 summarizes the overall combined garbage composition from the waste audit.

**Figure 1: Overall Garbage Composition**



Summary tables for each building, including waste composition, weights and percentages, are included in Appendix B. Refer to Appendix A for a photo summary of typical materials found during the sorting activities. Table 3 summarizes the largest primary categories (i.e. >5%) of waste materials per building based on the total amount of garbage sorted for the waste audit:

**Table 3: Primary Material Categories in Garbage Stream per Building**

Building	Percent of Sample (By Weight)	Mixed Papers	Non-recyclable	Paper Towels	Mixed Containers	Cardboard	Coffee Cups	Cold Beverage	Organics	Plastic Films
General Science Building	35.9%	22.3%	16.8%	5.1%	15.1%	16.3%	8.0%	6.3%		
Hedden Hall	17.1%	48.3%		17.0%	5.4%	10.9%				
John Hodgins Engineering	13.1%	14.6%	42.1%	8.8%		11.0%	7.9%	6.5%		
Woodstock Hall	12.7%	40.2%	9.2%	21.7%			5.2%		11.8%	
Burke Science Building	11.0%	22.4%	5.1%	18.5%	9.3%		26.1%			10.9%
McMaster University SC	7.5%	43.1%	6.3%		18.3%		5.4%			7.1%
Mills Library	2.7%	32.9%	8.1%		19.1%		12.9%	13.7%		
Total	100.0%	29.9%	14.6%	11.0%	10.4%	9.9%	9.0%	5.0%		

High quantities of mixed papers and mixed containers were found in the garbage stream from most buildings. The combined amount of mixed papers and mixed containers in the overall garbage stream represented 40.3% or approximately 248 MT annually. MU has implemented recycling programs for mixed papers and mixed containers. Results suggest that better collection systems, improved labels, program promotion and/or improved student/employee/cleaner education may be required to capture more of these materials. Fine paper, newsprint as well as aluminum, steel and glass food and beverage containers are mandatory recyclable materials at educational institutions per O.Reg.103/94.

The percentage of paper towels was fairly high in the garbage from most buildings that were audited. The amount of paper towels in the overall garbage stream represented 11.0% or approximately 68 MT annually. MU may wish to investigate the feasibility of implementing a paper towel recycling program to divert this material from landfill. Paper towels are not a mandatory recyclable material per O.Reg.103/94.

The amount of cardboard in the overall garbage stream represented 9.9% or approximately 61 MT annually. MU has implemented a recycling program for cardboard. Results suggest that a better collection system, improved labels, program promotion and/or improved student/employee/cleaner education may be required to capture more of this material. Cardboard is a mandatory recyclable material at educational institutions per O.Reg.103/94.

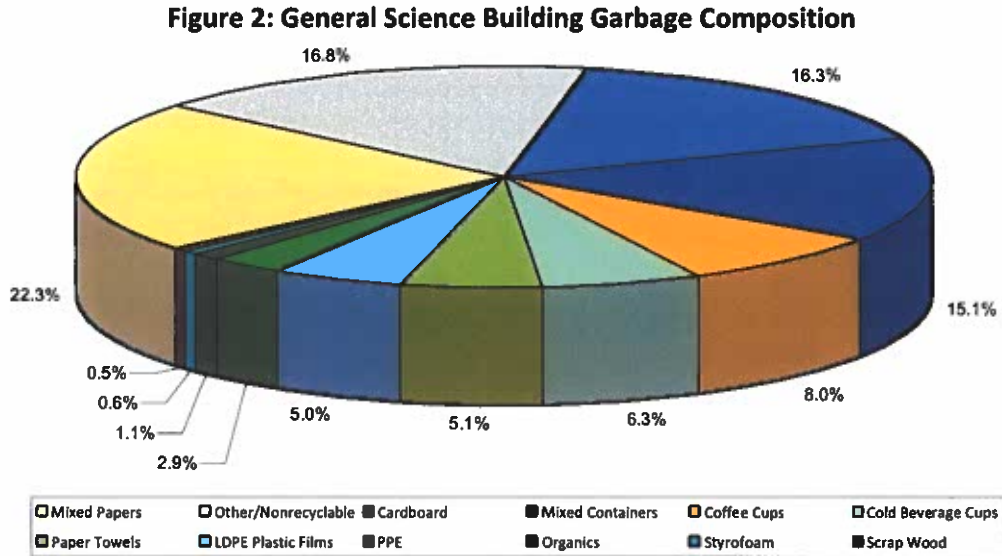
### 3.3 Garbage Composition per Audit Location

The garbage composition determined based on 24-hour sample results for each building is presented below.



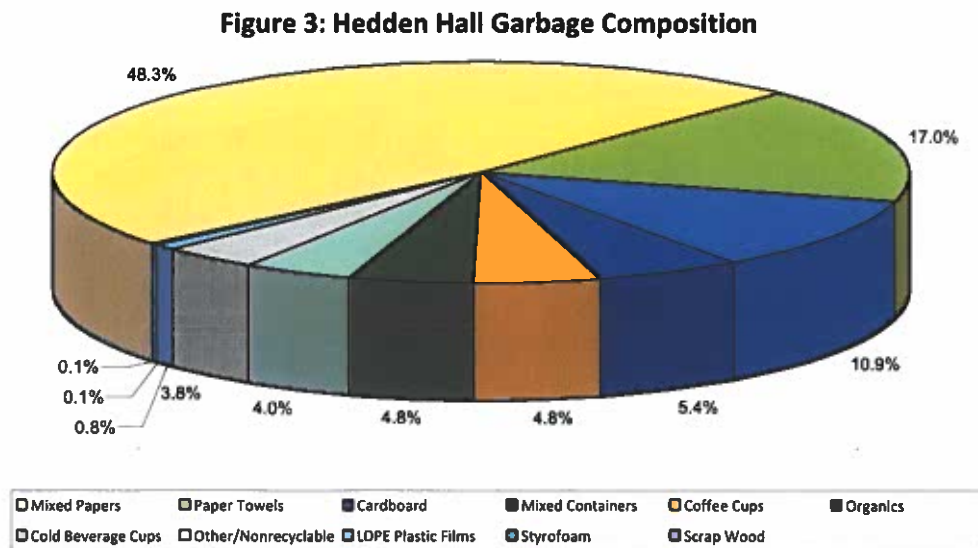
### 3.3.1 General Science Building

Figure 2 summarizes the overall garbage composition determined at General Science Building.



### 3.3.2 Hedden Hall

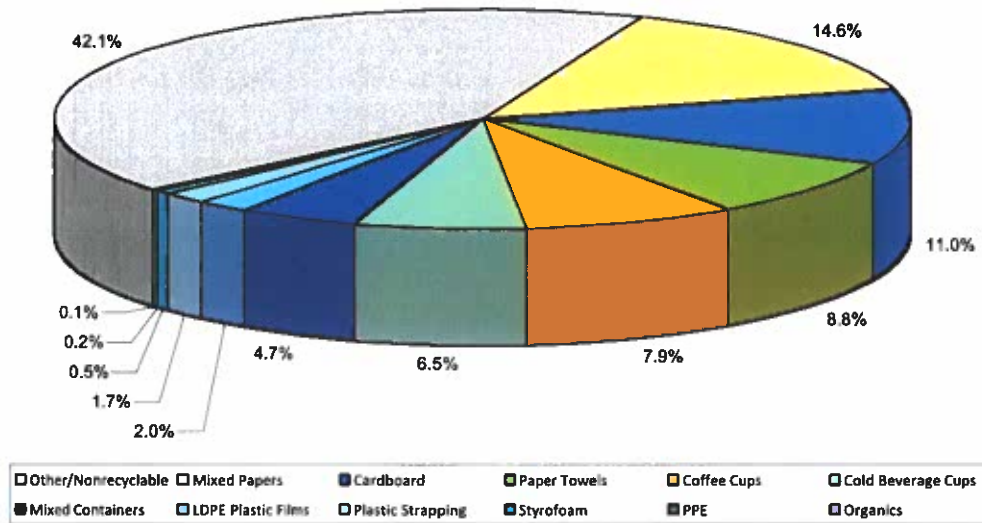
Figure 3 summarizes the overall garbage composition determined at Hedden Hall.



### 3.3.3 John Hodgins Engineering Building

Figure 4 summarizes the overall garbage composition determined at John Hodgins Engineering Building.

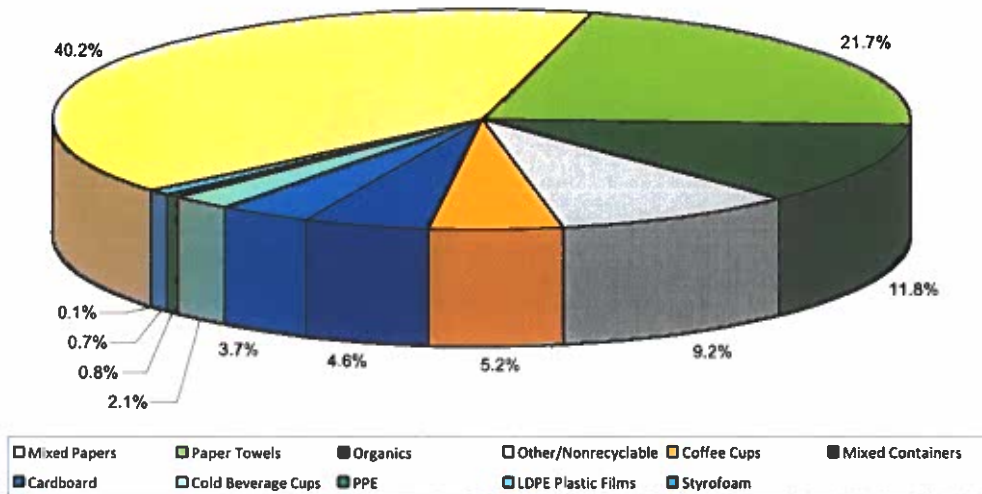
**Figure 4: John Hodgins Engineering Building Garbage Composition**



### 3.3.4 Woodstock Hall

Figure 5 summarizes the overall garbage composition determined at Woodstock Hall.

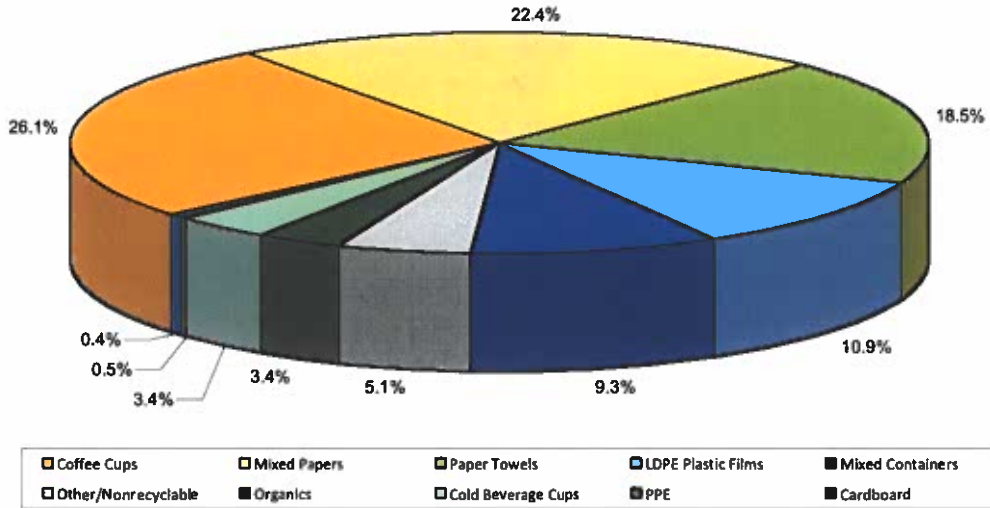
**Figure 5: Woodstock Hall Garbage Composition**



### 3.3.5 Burke Science Building

Figure 6 summarizes the overall garbage composition determined from Burke Science Building.

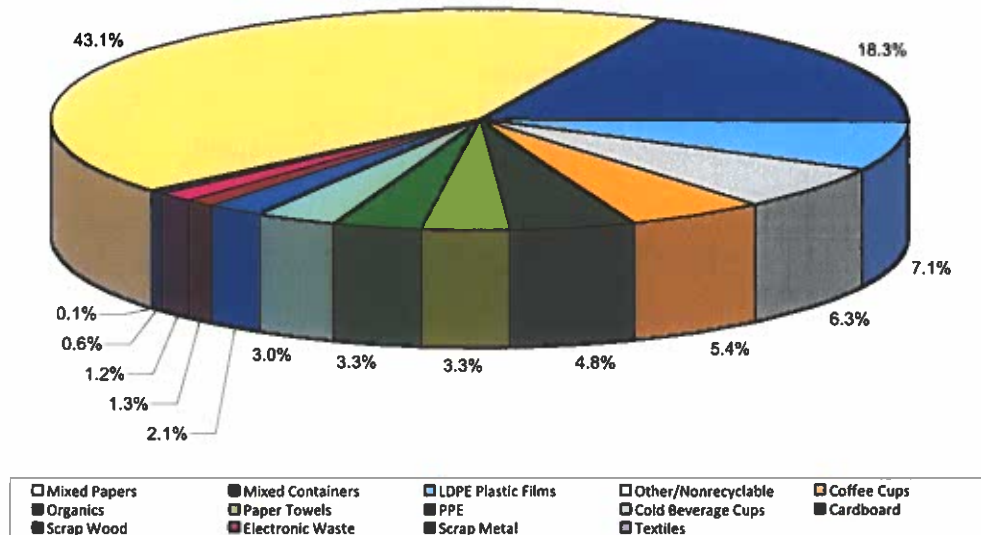
**Figure 6: Burke Science Building Garbage Composition**



### 3.3.6 McMaster University Student Centre

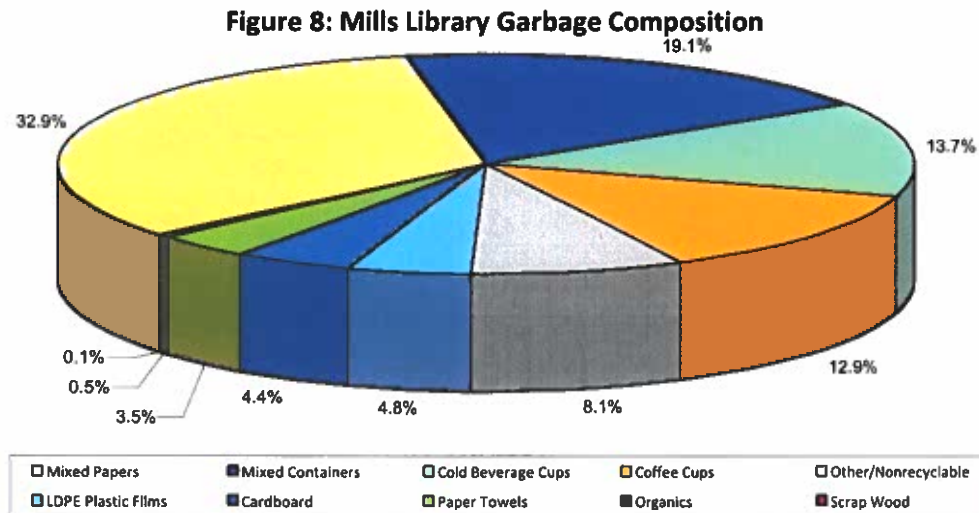
Figure 7 summarizes the overall garbage composition determined at McMaster University Student Centre.

**Figure 7: McMaster University Student Centre Garbage Composition**



### 3.3.7 Mills Library

Figure 8 summarizes the overall garbage composition determined at Mills Library.

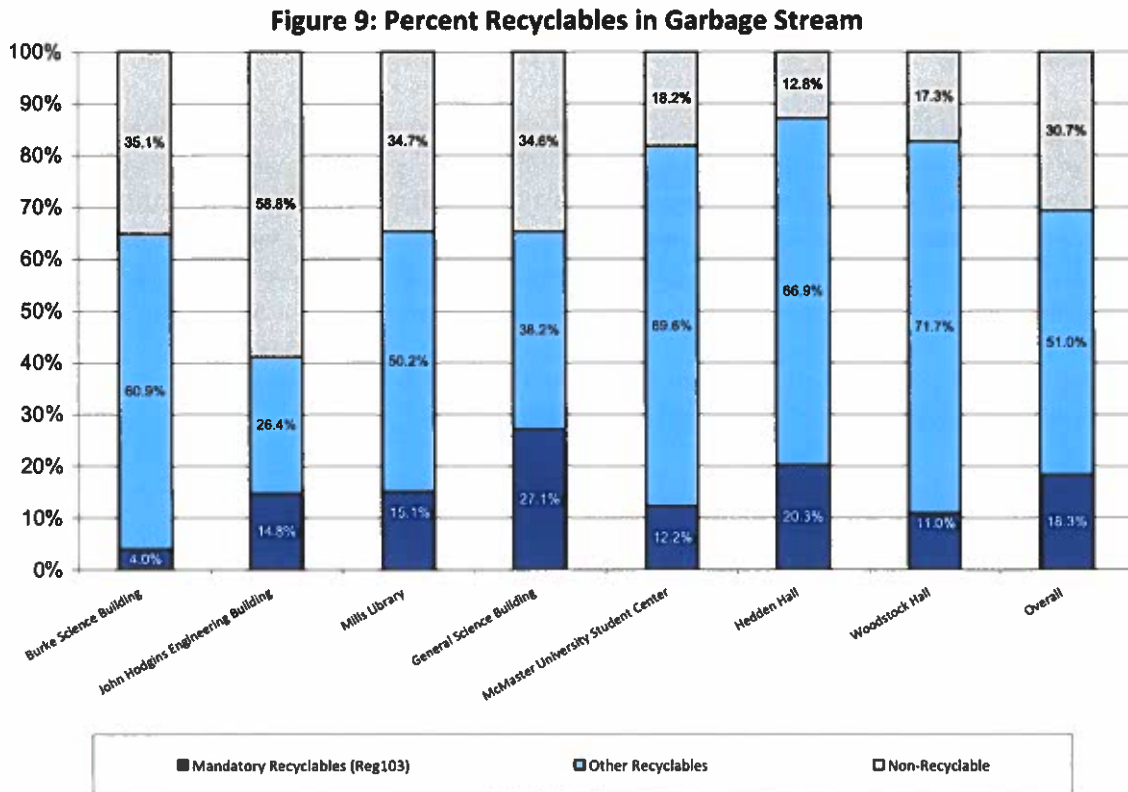


### 3.4 Percentage of Recyclables in Garbage

O.Reg. 103/94 requires that 'educational institutions' source separate the following materials (at a minimum):

- Aluminum food or beverage cans (including cans made primarily of aluminum);
- Cardboard (corrugated);
- Fine paper;
- Glass bottles and jars for food or beverages;
- Newsprint; and
- Steel food or beverage cans (including cans made primarily of steel).

Figure 9 summarizes the quantity of these 'mandatory recyclable' materials found in the waste audit garbage samples compared to 'other recyclable' materials (i.e. organics, paper towels, etc) and 'non-recyclable' materials.



The data suggests that MU has a ‘mandatory’ recyclable content of 18.3% in the combined garbage of the university. The main ‘mandatory’ recyclable materials were cardboard and fine papers. ‘Other Recyclables’ represented 51.0% of the overall sample and consisted mainly of paper towels and other non-mandatory paper fibres. Non-recyclables represented approximately 30.7% of the overall sample.

#### 4 Diversion Programs & Waste Systems

##### 4.1 Waste Diversion Programs

Waste diversion programs have been implemented at MU to reduce/reuse/recycle/compost a wide range of materials as described below.

**Cardboard:** Cardboard recycling is provided across campus. Cardboard boxes are flattened and placed in dedicated bins located across campus. Cardboard bins are serviced as required by Waste Connections.

**Mixed Containers:** Mixed containers include assorted plastics food and beverage containers (PET, HDPE, LDPE, PP, and PS), aluminum and metal cans, glass food and beverage containers, gable top containers and aseptic containers (i.e. tetra paks, etc). Mixed containers are collected throughout campus in dedicated recycle depots, primarily concentrated in high waste generating areas.

Collected materials are disposed into 95 gallon totes by MU staff. Totes are serviced as required by Waste Connections.

**Mixed Papers:** Mixed papers include a range of items such items as (but not limited to) newspapers, fine papers, envelopes, magazines, brochures, boxboard, packing paper, shipping/receiving supplies, paper bags and other clean food paper products. Mixed papers are collected throughout campus in dedicated recycle depots, primarily concentrated in high waste generating areas. Collected materials are disposed into 95 gallon totes by MU staff. Totes are serviced as required by Waste Connections.

**Confidential Papers:** Confidential papers are collected mainly in office/administrative areas in secure consoles or totes. All shredded materials were recycled.

**Organics:** Organic based food waste is collected in some locations for composting. There currently is an on campus organics program. Collected materials are disposed into 32 gallon totes by MU staff. Totes are serviced as required by Waste Connections.

**Scrap Metals:** Recyclable ferrous metals are collected by MU staff. Scrap metal recycling service is provided by a local contractor as required.

**Scrap Woods:** Recyclable scrap woods are collected by MU staff. Scrap wood recycling service is provided by a local contractor as required.

**Electronics Wastes:** Electronic wastes are collected across campus and stored in dedicated locations. Service was provided by Greentec as required.

**Bulbs/Ballasts:** Bulbs/ballasts are collected across campus and stored in dedicated locations. Service was provided by Greentec as required.

**Batteries:** Batteries are collected across campus and stored in dedicated locations. Service was provided by Greentec as required.

**Printer Toners:** Printer Toners are collected across campus and stored in dedicated locations. Service was provided by Greentec as required.

**Concrete:** Recyclable concrete is collected by MU staff. Concrete recycling service is provided by a local contractor as required.

**Oil & Grease:** Oil & grease is collected by MU staff. Oil & grease recycling service is provided by a private contractor as required.

**Wood Pallets:** Wood pallets are collected by MU staff and returned to suppliers or removed by private contractor as required.

**Textbooks:** Used textbooks are stored on-site and donated to various organizations as required.

**Used Furniture/Equipment:** Used furniture and equipment is stored on-site and donated to various organizations as required.

**LCBO/Beer Store Returns:** Empty wine, liquor and beer bottles are returned to LCBO/Beer Store as required.

Table 4 summarizes the estimated annual amount of waste materials diverted from landfills due to waste diversion programs implemented at the university.

**Table 4: Waste Diversion Summary**

Waste Material	Diversion Program	Total Diversion	
		Metric Tonnes	Percent
Cardboard	Recycle	91.00	13.4%
Mixed Containers	Recycle	14.15	2.1%
Mixed Papers	Recycle	35.25	5.2%
Confidential Papers	Recycle	15.67	2.3%
Scrap Metals	Recycle	42.49	6.3%
Scrap Wood	Recycle	37.73	5.6%
Electronic Wastes	Recycle	21.84	3.2%
Bulbs & Ballasts	Recycle	0.07	0.01%
Batteries	Recycle	0.21	0.03%
Oil & Grease	Recycle	14.56	2.1%
Organics	Compost	344.67	50.7%
LCBO/Beer Store Returns	Reused	40.46	6.0%
Textbook Donations	Reused	5.22	0.8%
Wood Pallets	Reused	14.55	2.1%
Printer Toners	Reused	1.64	0.2%
<b>Total Waste Material Diverted</b>		<b>679.51</b>	<b>100%</b>

Therefore, the total amount of waste material diverted from landfill in 2022 was approximately 680 metric tonnes. Evidence of annual quantity data obtained from MU and/or service providers is provided in Appendix B. Waste diversion programs implemented on campus exceed the minimum requirements of O.Reg.103/94 for educational institutions.

#### 4.2 Waste Disposal Systems

Regular solid non-hazardous waste is collected across campus by MU staff and placed in either front-end bins or compactors located at designated waste handling areas. Waste Connections is responsible for the collection of waste as required depending on the waste generating area. The total quantity of solid non-hazardous waste disposed to landfill in 2022 was estimated to be approximately 615 metric tonnes.

## 5 Performance Metrics

### 5.1 Waste Diversion Rate

Waste Diversion Rate is the percentage of waste materials that a facility diverts from landfill due to reduce, reuse and recycling (i.e. 3Rs) programs versus the total amount of waste generated (i.e. 3Rs plus disposed). According to MECP, Waste Diversion Rate is calculated as follows:

$$\text{Waste Diversion Rate} = \frac{\text{Total Waste Diverted (3Rs)}}{\text{Total Waste Generated}} * 100\%$$

Based on the total annual amount of waste generated and materials reduced, reused and recycled, the 2022 waste diversion rate was determined to be approximately 53%. Table 5 summarizes the quantities of wastes diverted and disposed. The MECP provincial objective is 60% waste diversion.

**Table 6: Quantities of Materials Diverted & Disposed**

Material	Total Waste	
	Metric Tonnes	Percent
Disposed to Landfill	615.33	47.5%
Materials Diverted	679.51	52.5%
Total Waste Generated	1294.84	100%
WASTE DIVERSION RATE		53%

Table 6 summarizes the change in waste diversion rate from the base year waste audit.

**Table 6: Waste Diversion Rate Summary (Base Year to Present)**

Waste Audit Period	Waste Diversion Rate	Percent Change from Previous Year	Percent Change from Base Year
Base Year (2012)	36.3%	--	--
2013/14	36.2%	-0.3%	-0.3%
2015	32.9%	-9.1%	-9.4%
2016	36.0%	+9.4%	-0.8%
2017	49.7%	+38.1%	+36.9%
2018	54.0%	+8.5%	+48.7%
2019	51.9%	-3.9%	+43.0%
2022	52.5%	+1.1%	+44.6%

### 5.2 Capture Rate

Capture rate is the proportion of divertible waste materials which are successfully diverted from disposal compared to the total amount of the divertible waste materials generated. According to the Recycling Council of Ontario, Capture Rate is calculated as follows:

$$\text{Capture Rate} = \frac{\text{Total Divertible Material Captured (3Rs)}}{\text{Total Divertible Material Generated}} * 100\%$$



Thus, capture rate assists in determining the effectiveness of recycling programs. Table 7 summarizes the capture rate for the main divertible materials at MU.

**Table 7: Capture Rate Summary**

Divertible Material	Material Generated Annually Metric Tonnes	3Rs Quantity Captured Annually Metric Tonnes	Capture Rate Percent
Cardboard	152.06	91.00	59.8%
Mixed Containers	78.39	14.15	18.0%
Mixed Papers	224.35	35.25	15.7%
Confidential Papers	15.67	15.67	100.0%
Scrap Metals	42.49	42.49	100.0%
Scrap Wood	39.45	37.73	95.6%
Electronic Wastes	24.03	21.84	90.9%
Bulbs & Ballasts	0.07	0.07	100.0%
Batteries	0.21	0.21	100.0%
Oil & Grease	14.56	14.56	100.0%
Organics	366.16	344.67	94.1%
LCBO/Beer Store Returns	40.46	40.46	100.0%
Textbook Donations	5.22	5.22	100.0%
Wood Pallets	14.55	14.55	100.0%
Printer Toners	1.64	1.64	100.0%
Overall Facility	1019.30	679.51	66.7%

Capture rates ranged from approximately 16% for mixed papers to 100% for many materials such as confidential papers, metals, oil & grease and wood pallets. The overall capture rate of all recyclables on campus was determined to be 66.7%.

### 5.3 Year over Year Change in Waste Generation

Waste diversion rate and capture rate do not always demonstrate how effective a site's 3R programs are operating. This is due to the continual change of many important factors involved in waste and recyclable material generation on campus, such as number of students enrolled, floor area of buildings, etc. As student numbers change or more buildings are added to the campus, quantities of waste and recyclables change making it difficult to have a direct comparison of data between years. It is recommended that MU start tracking 'Year over Year' changes in the amount of wastes disposed and/or materials recycled per standard unit. This allows direct comparison of data from year to year, thus assisting the university in gaining an understanding of the effectiveness of their waste diversion programs. For MU, the most applicable standard unit is Full-time equivalent students, or FTE.

#### 5.3.1 Year-over-Year Change in Diverted Quantities

The 'Year-over-Year Change in Diverted Quantities' is the indicator of the amount of materials diverted from disposal through reduce, reuse and/or recycle activities per FTE compared to previous data. Table 8 summarizes the results for the 2022 year. A positive year-over-year change indicates waste diversion programs are improving over time.

**Table 8: Yr-over-Yr Change in Waste Diversion Quantities**

Period	Total Materials Diverted (MT)	FTE	Annual Diverted Quantity (kg/FTE)	Yr-over-Yr Change in Diverted Quantity (kg)
2016	706.84	27,929	25.31	--
2017	1170.49	29,130	40.18	+14.87
2018	1074.95	29,758	36.12	-4.06
2019	1244.11	29,758	41.81	+5.69
2022	679.51	34,720	19.57	-22.24

### 5.3.2 Year-over-Year Change in Garbage Disposed

The 'Year over Year Change in Garbage Disposed' is the indicator of the amount of reduction in waste materials disposed to landfill due to waste diversion activities on campus. A reduction in the year-over-year value will indicate the 3Rs programs are continually reducing wastes disposed to landfill. Table 9 summarizes the results for the 2022 year. A reduction in the year over year value will indicate the university is continually reducing wastes disposed to landfill.

**Table 9: Yr-over-Yr Change in Garbage Disposed**

Period	Total Materials Disposed to Landfill (MT)	FTE	Annual Disposed Quantity (kg/FTE)	Yr-over-Yr Change in Disposed Quantity (kg)
2016	1256.56	27,929	44.99	--
2017	1182.53	29,130	40.59	-4.40
2018	915.93	29,758	30.78	-9.81
2019	1152.00	29,758	38.71	+7.93
2022	615.33	34,720	17.72	-20.99

## 6 Waste Audit Summary & Waste Reduction Work Plan

Refer to Appendix C and Appendix D for the Waste Audit Summary and the Waste Reduction Work Plan respectively. The last page of each set of forms in the appendices need to be signed by an authorized person at the University.

According to O.Reg. 102/94, the Waste Reduction Work Plan (Appendix D) or a summary of the plan must be posted at the University in a place where staff/students can review it. If a summary is posted, the entire Work Plan should also be made available for review by any staff/student upon request.

## 7 Conclusions & Recommendations

Based on the results of the solid non-hazardous waste audit conducted for MU, the following conclusions can be made. Recommendations presented below are intended to assist MU in maximizing their waste diversion potential.

- This waste audit was conducted during the COVID-19 pandemic response. Due to the pandemic response, the collected waste audit samples and annual service records may not be representative of typical operations and caution should be used when comparing sample data between 2020/21/22 and different years at the same facility.
- In 2022, it was estimated that MU disposed of approximately 615.33 tonnes of solid waste in landfills. Approximately 679.51 tonnes of waste materials were diverted through existing waste diversion programs. This represents a waste diversion rate of approximately 53%. The provincial objective is 60% waste diversion.
- MU maintains waste diversion programs for cardboard, mixed containers, mixed papers, confidential papers, organics, scrap metals, scrap woods, electronics, concrete, bulbs, batteries, printer toners, oil & grease, organics, wood pallets, LCBO/Beer Store returns, textbook and used furniture donations. These programs exceed the minimum requirements of O.Reg.103/94 for educational institutions.
- Based on the waste audit results, General Science Building, Hedden Hall, John Hodgins Engineering Building and Woodstock Hall generated the most garbage, representing approximately 79% of the waste audit sample.
- In future audits, it is recommended that the garbage sample per building be sub-labelled according to the functional areas within each building. Typically, each functional area has a distinct garbage composition. By reviewing data per functional area, specific recommendations can be generated to maximize the amount of recyclables diverted from landfill.
- MU has a 'mandatory' recyclable content of 18.3% in the combined garbage of the university. The main 'mandatory' recyclable materials were cardboard and fine papers. 'Other Recyclables' represented 51.0% of the overall sample and consisted mainly of paper towels and other non-mandatory paper fibres. Non-recyclables represented approximately 30.7% of the overall sample.
- Capture rates ranged from approximately 16% for mixed papers to 100% for many materials such as confidential papers, metals, oil & grease and wood pallets. The overall capture rate of all recyclables on campus was determined to be 66.7%.
- The combined amount of mixed papers and mixed containers in the overall garbage stream represented 40.3% or approximately 248 MT annually. MU has implemented recycling programs for mixed papers and mixed containers. Results suggest that better collection systems, improved labels, program promotion and/or improved student/employee/cleaner education may be required to capture more of these materials. Fine paper, newsprint as well as aluminum, steel and glass food and beverage containers are mandatory recyclable materials at educational institutions per O.Reg.103/94.

- The amount of paper towels in the overall garbage stream represented 11.0% or approximately 68 MT annually. MU may wish to investigate the feasibility of implementing a paper towel recycling program to divert this material from landfill. Paper towels are not a mandatory recyclable material per O.Reg.103/94.
- The amount of cardboard in the overall garbage stream represented 9.9% or approximately 61 MT annually. MU has implemented a recycling program for cardboard. Results suggest that a better collection system, improved labels, program promotion and/or improved student/employee/ cleaner education may be required to capture more of this material. Cardboard is a mandatory recyclable material at educational institutions per O.Reg.103/94.
- It is recommended that MU conduct studies to verify the density of wastes disposed to landfill.
- It is recommended that a study be conducted to verify mixed container and mixed paper tote weights as well as to conduct an inventory of bins on-campus. It is recommended that the total number of totes picked-up per week be verified (per season to account for temporal variability).
- It is recommended that a study be conducted to verify organic weights as well to conduct an inventory of bins on-campus. It is recommended that the total number of totes picked-up per week be verified.
- It is recommended that MU conduct studies to add and improve reduction and reuse weights to improve the university's diversion rate. For example, waste reduction credits can be calculated for the university's double-sided printing policy, refillable water bottle stations and lug-a-mug programs if implemented.
- Continue to make use of multi-compartment containers (i.e. recycling depots) for waste collection and recycling as much as possible. Remove all solitary waste bins on campus. We recommend only having waste bins that are attached to or close to multi-compartment recycling containers.
- It is recommended that signs be continually updated on all garbage and recycling bins to assist students/staff in sorting wastes easily and correctly. Signs should be easily visible and instructive, such as those having pictograms. Signs are a very effective method of increasing participation, reducing contamination and increasing capture rate.
- Ensure MU's Environmental Policy is clearly visible in all common areas throughout campus. Emphasize MU's commitment to environmental stewardship in its newsletters, brochures, annual reports and contracts. Regular newsletters promoting the school's waste reduction programs, goals and concerns will increase student/staff cooperation.
- Continue to increase awareness of current recycling programs through staff and student education programs. Such programs can include brief training programs as well as placement of posters in strategic locations around campus, and posting information regarding campus goals and recycling, reuse, and reduction rates at the school. A suggestion box or suggestion email address may be helpful in communicating student/staff concerns and suggestions when developing or changing existing diversion programs.
- It is important that all staff and students at MU be made aware of all available recycling programs. MU staff should provide easy access to contact information for questions and/or help

regarding the various recycling programs. The recycling programs should have as much consistency as possible across campus.

- Throughout the year, waste should be collected in clear plastic garbage bags instead of black garbage bags. This practice allows cleaning staff to monitor waste collection, as well as to ensure that separated waste streams are disposed of in the correct containers/areas. Some of our clients find it beneficial to use clear bags that have a slight blue tint for use in recycling containers.
- Support and encourage the purchase and use of environmentally friendly, reusable or recyclable materials and packaging, and/or those that contain recycled content.
- In order to be successful, the waste diversion program must have the full support of MU's management team.
- According to O.Reg. 102/94, the Waste Reduction Work Plan (Appendix D) or a summary of the plan must be posted at the facility in a place where it can be viewed. If a summary of the work plan is posted, the full Work Plan must be made available for review upon request by any of the university's staff or students.
- The waste audit report and waste reduction work plan must be retained on file for a minimum of five years.
- A waste audit report and waste reduction work plan must be conducted and updated annually.

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**Appendix A**  
**Supporting Documentation**

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