McMaster University
2018 Solid Non-Hazardous Waste Audit

Prepared for:

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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 six (6) different areas on campus, consisting of approximately 574 kg of garbage. The collected samples were audited over two (2) days in November 2018. The following list summarizes the overall garbage composition determined from the audit:

- Non-recyclable 33.6%
- Organic Waste 24.3%
- Paper Towels: 13.6%
- Mixed Containers: 10.8%
- Mixed Papers: 8.1%
- Coffee Cups: 4.3%
- LDPE (#4 Plastic) films: 2.4%
- Electronic wastes: 1.8%
- Cardboard, Styrofoam: Each < 0.5%

An organics sample consisting of approximately 101 kg was also audited in November 2018. The organics stream was found to consist of 70% organics and 24% paper towels. The overall organics stream has a contamination rate of 5.7%.

Waste diversion programs implemented on campus include cardboard, mixed containers, mixed papers, confidential papers, organics, scrap metals, scrap woods, electronics and concrete. 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 2018.

Annual Quantities of Materials Diverted & Disposed

Material	Total Annual Amount	
	Metric Tonnes	Percent
Disposed to Landfill	915.93	46.0%
Materials Recycled/Reused	613.35	30.8%
Materials Composted	461.59	23.2%
Total Waste Generated	**1990.87**	**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 54%. This represents an 8.5% improvement compared to 2017. 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

Appendices

1 Introduction

McMaster University (MU) retained the services of Waste Reduction Group Inc to conduct a solid non-hazardous waste audit in 2018 at its campus located in Hamilton, Ontario. The waste audit examined representative samples of waste from six (6) different areas on campus over a two (2) day period in November 2018. 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 29,758 Full-Time Equivalent (FTE) students (2017/18; Refer to Appendix A) and staff that generate waste and divertible materials. MU took the initiative to conduct a solid non-hazardous waste audit with the intent of complying with O.Reg. 102/94, to confirm compliance with O.Reg.103/94 and to further improve upon their present waste reduction, reuse and recycling initiatives.

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 November 15 and 16, 2018.

- 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 November 2018, as summarized in Table 1:

Table 1: 2018 Waste Audit Sample Schedule

Date	Building/Location	Sample Type
Nov. 15, 2018	Hamilton Hall	Garbage
Nov. 15, 2018	Burke Science Building	Garbage
Nov. 15, 2018	John Hodgins Engineering Building	Garbage
Nov. 16, 2018	McMaster University Student Centre	Garbage
Nov. 16, 2018	Brandon Hall	Garbage
Nov. 16, 2018	Mills Library	Garbage
Nov. 16, 2018	Mckay	Organics
Nov. 16, 2018	Edwards	Organics
Nov. 16, 2018	Whidden	Organics

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 (%)
McMaster University Student Centre	170.93	29.8%
Mills Library	133.99	23.3%
Brandon Hall	116.19	20.2%
Hamilton Hall	56.06	9.8%
John Hodgins Engineering Building	50.27	8.8%
Burke Science Building	46.60	8.1%
Total	574.04	100.0%

Therefore, McMaster University Student Centre, Mills Library and Brandon Hall generated the most garbage, representing approximately 73% 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 574 kg. Figure 1 summarizes the overall combined garbage composition from the waste audit.

Figure 1: Overall Garbage Composition

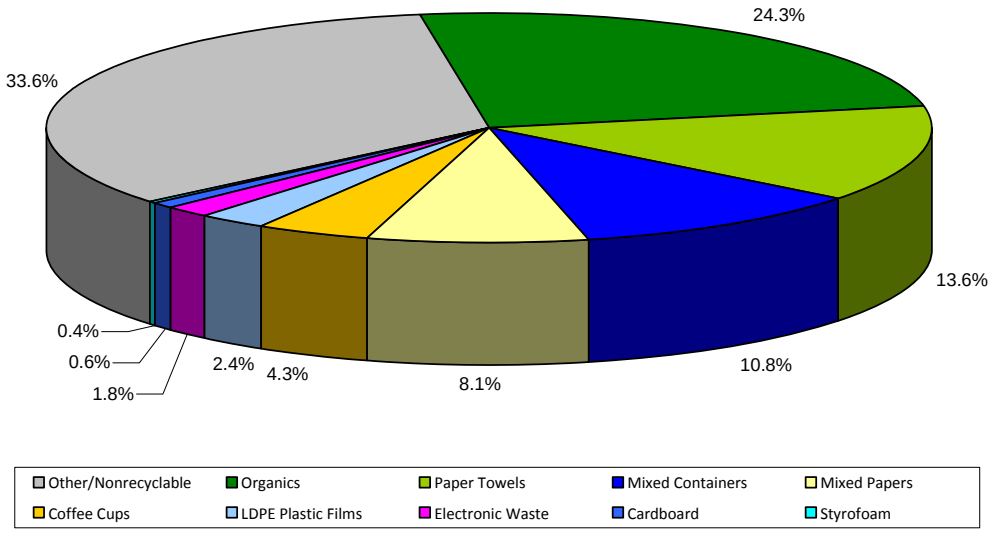


Table 3 compares the overall facility's garbage composition between the 2016, 2017 and 2018 waste audit samples.

Table 3: Comparison of Garbage Stream Waste Audit Samples

Waste Material	2016 Waste Audit	2017 Waste Audit	2018 Waste Audit	
	%	%	kg	%
Non-recyclable	6.0%	13.7%	192.98	33.6%
Organics	37.4%	32.7%	139.76	24.3%
Paper Towels	13.3%	11.4%	78.03	13.6%
Mixed Containers	15.8%	13.4%	62.09	10.8%
Mixed Papers	17.3%	16.7%	46.72	8.1%
Coffee Cups	4.9%	4.1%	24.54	4.3%
LDPE Plastic Films	2.1%	1.2%	13.98	2.4%
Electronic Waste	0%	0.2%	10.24	1.8%
Cardboard	2.3%	6.3%	3.31	0.6%
Styrofoam	0%	0%	2.39	0.6%
Printer Toners	0%	0.3%	0.0	0%
Total	100%	100%	574.04	100%

The data indicates that there was a significant increase in the amount of non-recyclables disposed to the garbage stream in 2018. Also, there is a consistent decrease in the amount of organics, mixed containers, mixed papers and cardboard between 2016 and 2018. The quantities of paper towels, coffee cups and plastic films remained relatively constant.

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 4 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 4: Primary Material Categories in Garbage Stream per Building

Building	Percent of Sample (By Weight)	Non-recyclable	Organics	Paper Towels	Mixed Containers	Mixed Papers	Coffee Cups	Ewastes
McMaster University Student Centre	29.8%	25.9%	28.8%	13.0%	15.3%	8.8%	5.2%	0%
Mills Library	23.3%	36.4%	24.4%	12.9%	9.8%	8.5%	3.3%	0%
Brandon Hall	20.2%	30.3%	32.6%	11.6%	11.3%	5.9%	5.4%	0%
Hamilton Hall	9.8%	42.8%	9.7%	21.9%	4.4%	14.4%	1.5%	2.2%
John Hodgins Engineering Building	8.8%	33.2%	12.4%	14.4%	7.3%	6.0%	6.3%	17.9%
Burke Science Building	8.1%	51.6%	17.8%	12.0%	7.6%	5.2%	1.8%	0%
Total	100.0%	33.6%	24.3%	13.6%	10.8%	8.1%	4.3%	1.8%

Overall, there was an approximate reduction of 25% in the amount of organic materials in the 2018 garbage stream compared to 2017. However, the amount of organics in the overall garbage stream represented 24.3% or 223 MT annually. Organic food wastes were found in high quantities in all areas of the university that were audited. An organics program is implemented in some areas on campus. Results suggest that MU may benefit from expanding the existing program in order to capture more organic materials.

The percentage of paper towels was also high in all areas of the university that were audited. The amount of paper towels in the overall garbage stream represented 13.6% or 124.5 MT annually. MU may wish to investigate the feasibility of implementing a paper towel recycling program to divert this material from landfill.

In addition, high quantities of mixed containers and mixed papers were found in the garbage stream from most areas of the campus. The combined amount of mixed containers and mixed paper in the overall garbage stream represented 18.9% or 173.62 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.

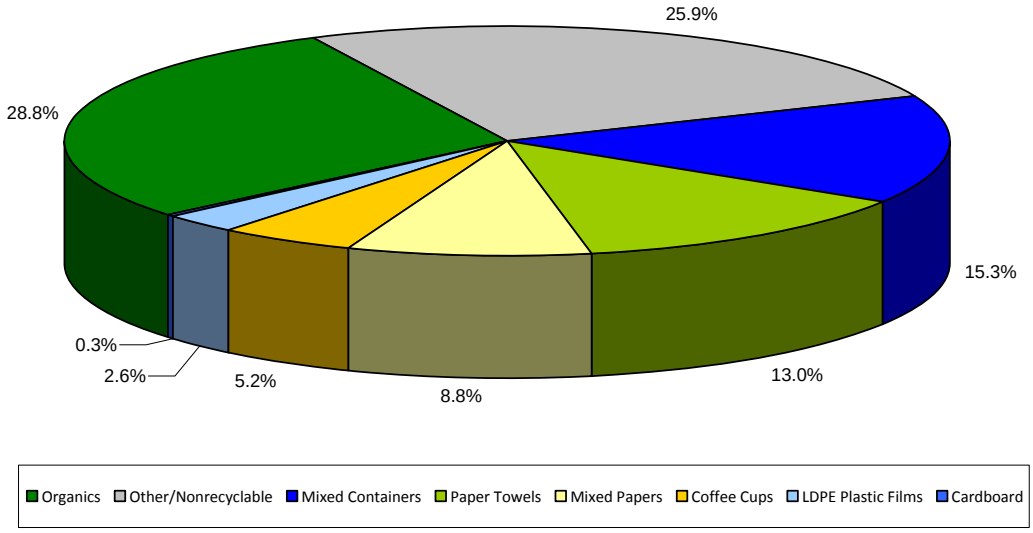
3.3 Garbage Composition per Audit Location

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

3.3.1 McMaster University Student Centre

Figure 2 summarizes the overall garbage composition determined at McMaster University Student Centre.

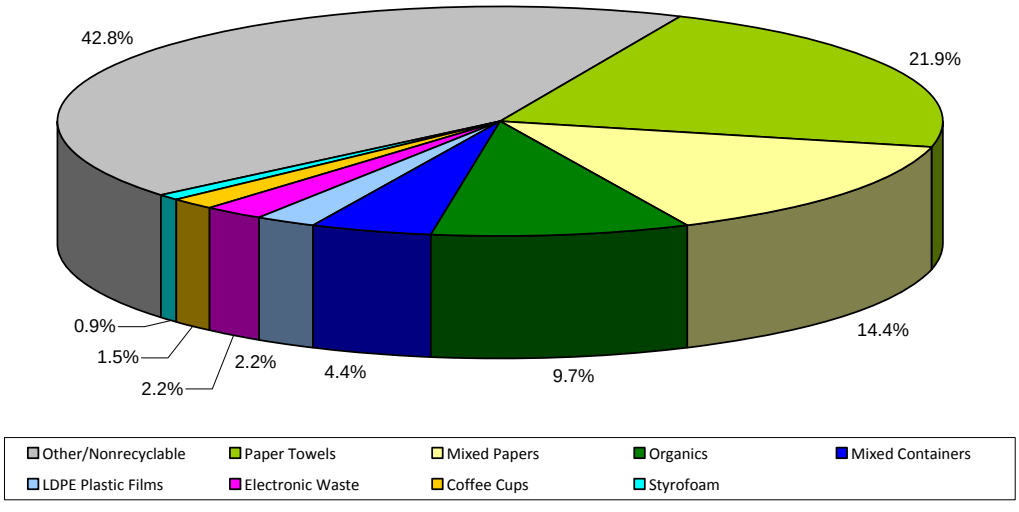
Figure 2: McMaster University Student Centre Garbage Composition



3.3.2 Mills Library

Figure 3 summarizes the overall garbage composition determined at Mills Library.

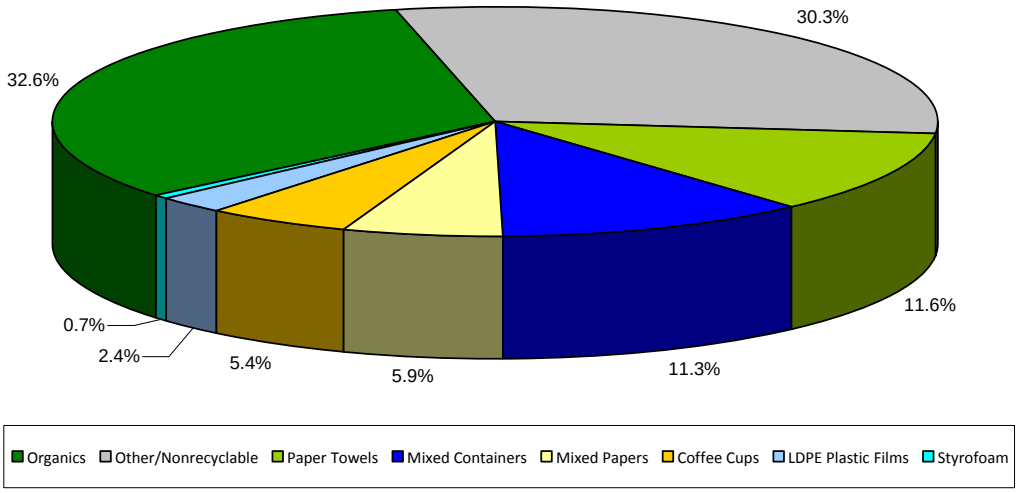
Figure 3: Mills Library Garbage Composition



3.3.3 Brandon Hall

Figure 4 summarizes the overall garbage composition determined at Brandon Hall.

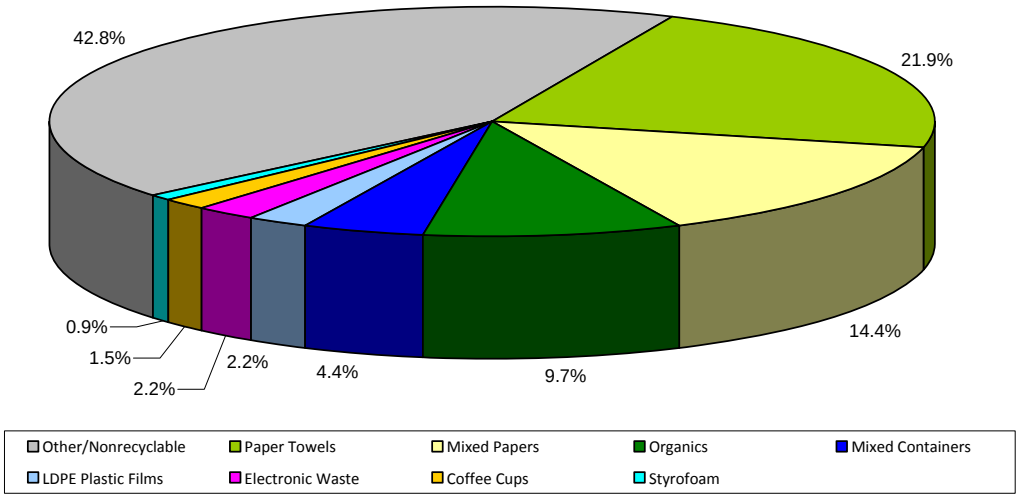
Figure 4: Brandon Hall Garbage Composition



3.3.4 Hamilton Hall

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

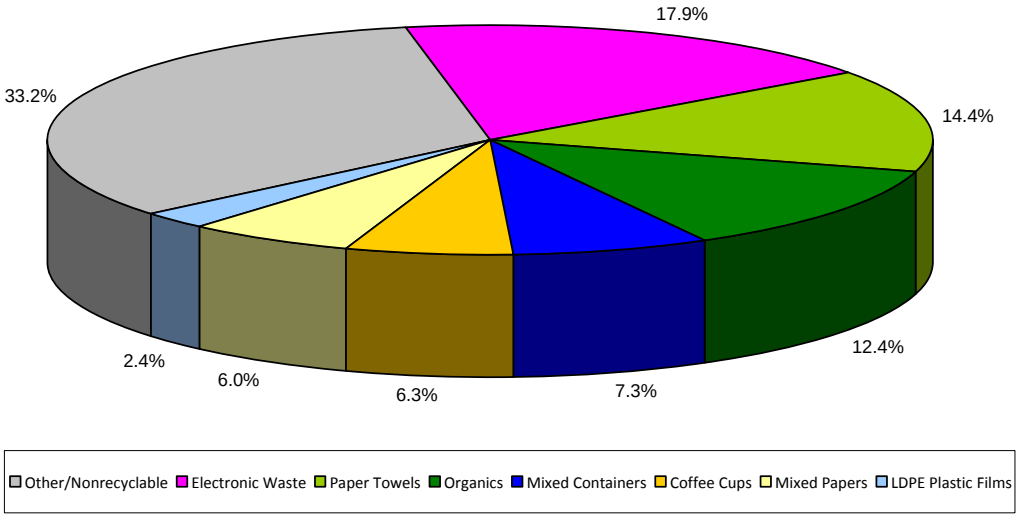
Figure 5: Hamilton Hall Garbage Composition



3.3.5 John Hodgins Engineering Building

Figure 6 summarizes the overall garbage composition determined at John Hodgins Engineering Building.

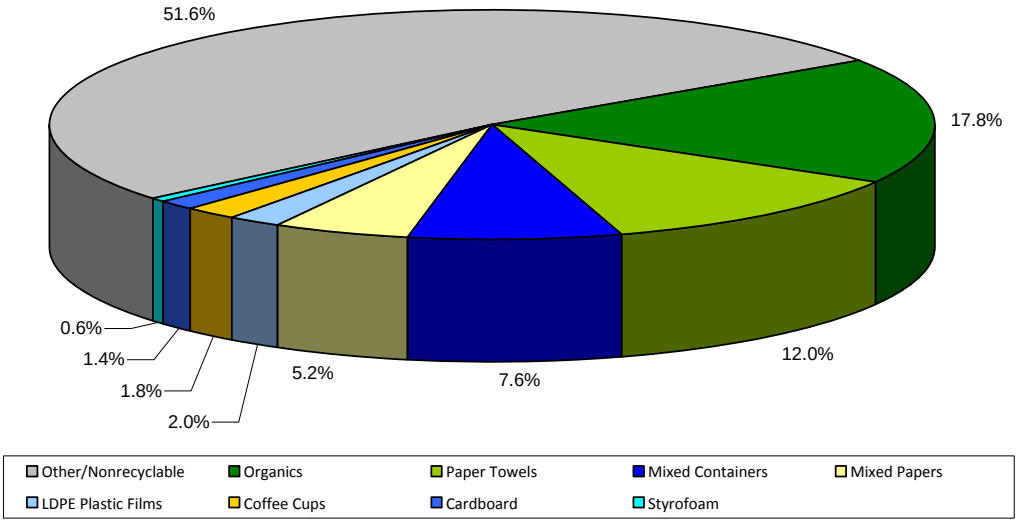
Figure 6: John Hodgins Engineering Building Garbage Composition



3.3.6 Burke Science Building

Figure 7 summarizes the overall garbage composition determined from Burke Science Building.

Figure 7: Burke Science Building Garbage Composition



3.4 Percentage of Recyclables in Garbage

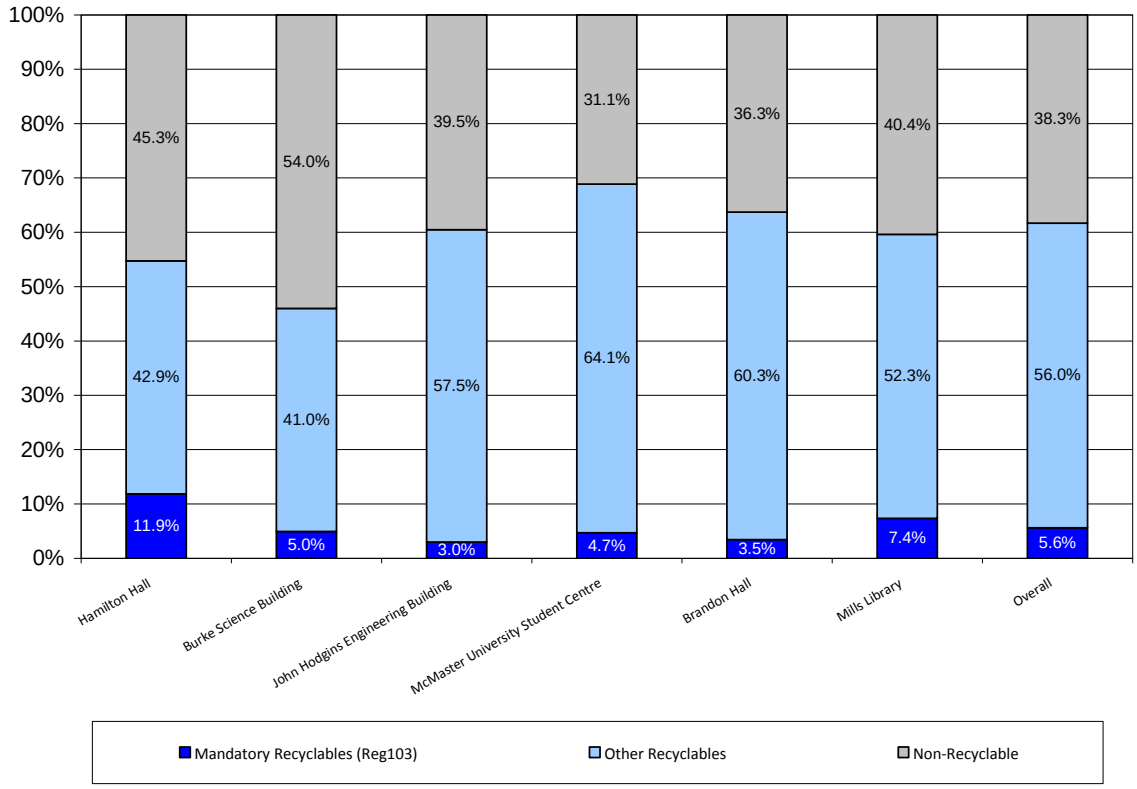
O.Reg. 103/94 requires that 'educational institutions' source separate the following materials (at a minimum):

- 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 8 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.

Figure 8: Percent Recyclables in Garbage Stream



The quantity of mandatory recyclables decreased from 16.0% in 2017 to 5.6% in 2018. The data suggests that MU has a low 'mandatory' recyclable content (i.e. 5.6%) in the combined garbage of the university. The main 'mandatory' recyclable materials were fine papers and newsprint. 'Other Recyclables' represented 56.0% of the overall sample and consisted mainly of organics, paper towels and other non-mandatory paper fibres. Non-recyclables represented approximately 38.3% of the overall sample.

3.5 Organics Stream Distribution & Composition

In total, 100.73 kg of organic materials were collected for the waste audit. Table 5 summarizes the distribution of the collected organics sample.

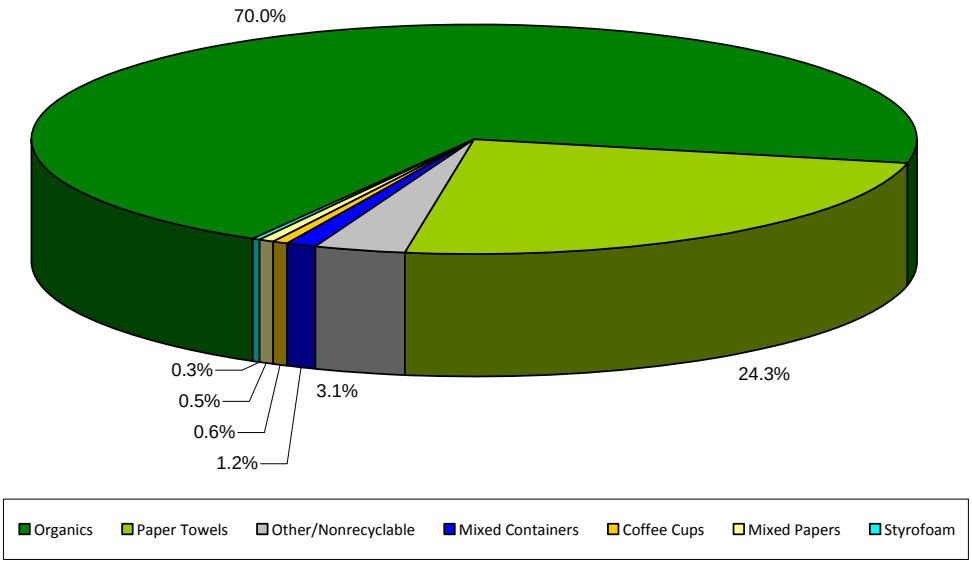
Table 5: Quantity & Distribution of Organics Sample

Building Name/Location	Waste Audit Sample	
	Sample Weight (kg)	Distribution (%)
McKay	58.33	57.9%
Whidden	25.24	25.1%
Edwards	17.16	17.0%
Total	100.73	100.0%

Therefore, McKay generated the most organics, representing approximately 58% of the waste audit sample.

Figure 9 summarizes the overall organics composition determined from the waste audit.

Figure 9: Overall Organics Composition



Analysis of the results indicates the contamination rate of the organic stream is 5.7%.

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.

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.

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

Table 6: 2018 Waste Diversion Summary

Waste Material	Diversion Program	Total Diversion	
		Metric Tonnes	Percent
Organics	Compost	461.59	42.9%
Mixed Containers	Recycle	119.19	11.1%
Cardboard	Recycle	100.09	9.3%
LCBO/Beer Store Returns	Reused	75.74	7.0%
Scrap Metals	Recycle	73.06	6.8%
Mixed Papers	Recycle	66.00	6.1%
Scrap Wood	Recycle	48.21	4.5%
Confidential Papers	Recycle	27.77	2.6%
Oil & Grease	Recycle	27.25	2.5%
Wood Pallets	Recycle	27.24	2.5%
Electronic Wastes	Recycle	24.80	2.3%
Concrete	Recycle	20.00	1.9%
Used Furniture	Recycle	4.00	0.4%
Total Waste Material Diverted		**1074.95**	**100%**

Therefore, the total amount of waste material diverted from landfill in 2018 was approximately 1075 metric tonnes. Evidence of annual quantity data obtained from MU and/or service providers is provided in Appendix A. 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 2018 was estimated to be approximately 915.93 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) initiatives versus the total amount of waste generated (i.e. 3Rs plus disposed). According to the Ontario Ministry of the Environment, Waste Diversion Rate is calculated as follows:

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

Based on the total annual amount of waste generated and materials reduced, reused and recycled, the 2018 waste diversion rate was determined to be approximately 54%. Table 7 summarizes the quantities of wastes diverted and disposed. MU's 2018 waste diversion rate is slightly less than the MECP provincial objective of 60% waste diversion. The university's waste diversion rate increased by 8.5% compared to 2017.

Table 7: Quantities of Materials Diverted & Disposed

Material	Total Waste	
	Metric Tonnes	Percent
Disposed to Landfill	915.93	46.0%
Materials Recycled/Reused	613.35	30.8%
Materials Composted	461.59	23.2%
Total Waste Generated	1990.87	100%
WASTE DIVERSION RATE		**54%**

Table 8 summarizes the change in waste diversion rate from the base year waste audit.

Table 8: 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%

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:

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

Thus, capture rate assists in determining the effectiveness of recycling programs. Table 9 summarizes the capture rate for the main divertible materials at MU.

Table 9: Capture Rate Summary

Divertible Material	Material Generated Annually Metric Tonnes	3Rs Quantity Captured Annually Metric Tonnes	Capture Rate Percent
Cardboard	105.37	100.09	95.0%
Mixed Containers	294.00	119.19	40.5%
Mixed Papers	140.55	66.00	47.0%
Confidential Papers	27.77	27.77	100.0%
Organics	684.59	461.59	67.4%
Scrap Metals	73.06	73.06	100.0%
Scrap Woods	75.45	75.45	100.0%
Ewastes	41.13	24.80	60.3%
Oil & Grease	27.25	27.25	100.0%
Used Furniture	4.00	4.00	100.0%
Concrete	20.00	20.00	100.0%
LCBO/Beer Store	75.74	75.74	100.0%
Overall Facility	1568.92	1074.95	68.5%

Capture rates ranged from approximately 40.5% for mixed containers to 100% for many materials such as confidential papers, woods, metals, oil & grease, furniture and concrete. The overall capture rate of all recyclables on campus was determined to be 68.5%.

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 10 summarizes the results for the 2018 year. A positive year-over-year change indicates waste diversion programs are improving over time.

Table 10: 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

Therefore the data indicates that the university's annual diverted quantity per FTE decreased slightly indicating the campus diversion programs were slightly less efficient in 2018.

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 11 summarizes the results for the 2018 year. A reduction in the year over year value will indicate the university is continually reducing wastes disposed to landfill.

Table 11: 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

Therefore the data indicates that the university's annual disposal quantity per FTE is reducing thus the campus garbage program is becoming more efficient over time.

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.

- In 2018, it was estimated that MU disposed of approximately 915.93 tonnes of solid waste in landfills. Approximately 1074.95 tonnes of waste materials were diverted through existing waste diversion programs. This represents a waste diversion rate of approximately 54%. 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, oil & grease, wood pallets, LCBO/Beer Store returns and used furniture. These programs exceed the minimum requirements of O.Reg.103/94 for educational institutions.
- Based on the waste audit results, McMaster University Student Centre, Mills Library and Brandon Hall generated the most garbage, representing approximately 73% 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 fairly low 'mandatory' recyclable content (i.e. 5.6%) in the combined garbage of the university. The main 'mandatory' recyclable materials were fine papers and newsprint. 'Other Recyclables' represented 56.0% of the overall sample and consisted mainly of organics, paper towels and other non-mandatory paper fibres. Non-recyclables represented approximately 38.3% of the overall sample.
- Capture rates ranged from approximately 40.5% for mixed containers to 100% for many materials such as confidential papers, woods, metals, oil & grease, furniture and concrete. The overall capture rate of all recyclables on campus was determined to be 68.5%.
- Based on the waste audit results, it was estimated that approximately 24.3% (or 223 MT annually) consisted of organics. Organic food wastes were found in high quantities in all areas of the university that were audited. An organics program is implemented in some areas on campus. Results suggest that MU may benefit from expanding the existing program, improved collection systems, improved signage and/or student/staff education programs. Organics are not a mandatory recyclable material per O.Reg.103/94.
- Based on the waste audit results, it was estimated that approximately 13.6% (or 124.5 tonnes) of solid waste disposed to landfill consisted of paper towels. MU may wish to investigate the feasibility of implementing a paper towel recycling program. Often it can be combined with an existing cardboard and/or organics program depending on hauler requirements. Alternatively, MU may wish to investigate the feasibility of replacing paper towels with automatic air dryers and/or reusable linen rolls. Paper towels are not a mandatory recyclable per O.Reg.103/94.

- Based on the waste audit results, it was estimated that approximately 10.8% (or 99.07 tonnes) of solid waste disposed to landfill consisted of mixed containers (aluminum cans, glass jars, plastic bottles, tetra packs, milk cartons, etc). A mixed container recycling program exists at MU. The data suggests that better collection systems, improved signage and/or student/staff education programs may be required to improve the capture rate of this material. Glass, aluminum and steel food and beverage containers are mandatory recyclables per O.Reg.103/94.
- Based on the waste audit results, it was estimated that approximately 8.1% (or 74.55 tonnes) of solid waste disposed to landfill consisted of mixed papers (fine papers, newsprint, boxboard, etc). A mixed paper recycling program exists at MU. This data suggests that better collection systems, improved signage and/or student/staff education programs may be required to improve the capture rate of this material. Fine papers and newsprint are mandatory recyclables 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 review operations to account for any missing 3Rs streams, such as fluorescent bulbs, batteries, yard wastes, textbook donations, clothing donations, etc.
- 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 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.

Appendix A

Supporting Documentation

Annual Financial Report

2017-2018

BRIGHTER WORLD | mcmaster.ca

McMaster University

By the Numbers

$558,400,000

Available expendable resources vs. $528,900,000 last year

$156,500,000

Capital spending vs. $113,500,000 last year

$1,109,500,000

Total revenue vs. $1,076,000,000 last year

$985,700,000

Total expenses vs. $963,900,000 last year

$123,800,000

Excess of revenues over expenses vs. $112,100,000 last year

$24,443

Endowment per FTE students vs. $24,191 last year

$37,285

Revenue per FTE students vs. $36,938 last year

$(247,700,000)

Non-pension employee future benefit unfunded obligation vs. $(220,300,000) last year

$19,100,000

Pension employee future benefit surplus vs. $(3,500,000) unfunded obligation last year

$44,200,000

Excess of revenues over expenses operating fund only vs. $25,900,000 last year

$1,209,100,000

Total net assets vs. $1,094,200,000 last year

29,758

Enrolment (full time equivalent (FTE)) vs. 29,130 last year

7,616

Staff and Faculty head count vs. 7,448 last year

Partial copy of
O.Reg.102/94

Environmental Protection Act
Loi sur la protection de l'environnement

ONTARIO REGULATION 102/94

WASTE AUDITS AND WASTE REDUCTION WORK PLANS

Consolidation Period: From March 3, 1994 to the e-Laws currency date.

No amendments.

This Regulation is made in English only.

PART I
GENERAL

1. In this Regulation,

"waste" means municipal waste as defined in Regulation 347 of the Revised Regulations of Ontario, 1990;

"waste audit" means a study relating to waste;

"waste reduction work plan" means a plan to reduce, reuse and recycle waste. O. Reg. 102/94, s. 1.

2. A waste audit required under this Regulation shall address,

(a) the amount, nature and composition of the waste;

(b) the manner by which the waste gets produced, including management decisions and policies that relate to the production of waste; and

(c) the way in which the waste is managed. O. Reg. 102/94, s. 2.

3. (1) A waste reduction work plan required under this Regulation shall include, to the extent that is reasonable, plans to reduce, reuse and recycle waste and shall set out who will implement each part of the plan, when each part will be implemented and what the expected results are.

(2) In developing the work plan, regard shall be had to the following principles:

1. Reduction is the first objective.
2. If reduction is not possible, then reuse is the next objective.
3. If reduction and reuse are not possible, then recycling is the final objective. O. Reg. 102/94, s. 3.

4. A person who is required under this Regulation to prepare a report of a waste audit or a waste reduction work plan shall prepare it on a form provided by the Ministry or in the same format as such a form. O. Reg. 102/94, s. 4.

5. (1) A person who is required under this Regulation to prepare a report of a waste audit or a waste reduction work plan shall retain a copy of the report or plan for at least five years after it was prepared.

(2) A person who is required under this Regulation to prepare a report of a waste audit or a waste reduction work plan shall submit to the Director, on request, the required report or plan, within seven days of the Director requesting them. O. Reg. 102/94, s. 5.

6. (1) A person who becomes subject to an obligation under this Regulation to prepare a report of a waste audit or a waste reduction work plan shall do so within six months of becoming subject to the obligation.

(2) This section does not apply with respect to updated reports or plans.

(3) This section does not apply with respect to obligations of a builder under Part IV or a demolisher under Part V. O. Reg. 102/94, s. 6.

7. (1) A new owner or operator to whom this Regulation applies is not required to conduct a new waste audit or prepare a new waste reduction work plan if an audit or work plan was conducted or prepared by a previous owner or operator and the new owner or operator updates the audit and work plan as required under this Regulation.

(2) This section does not apply with respect to a builder under Part IV or a demolisher under Part V. O. Reg. 102/94, s. 7.

8. (1) A person who has an obligation to conduct a waste audit and prepare a report under Part II, III, VI, VII, VIII, IX, X or XI in respect of more than one retail shopping establishment, retail shopping complex, building, restaurant, hotel or motel, hospital, location or campus of an educational institution, or site of a manufacturing establishment, may conduct a single

50. The waste reduction work plan shall include measures for communicating the plan to the operator's employees who work at the hospital and, as a minimum, those measures shall require,

(a) that the plan or a summary be posted in places where most employees will see it; and

(b) if a summary is posted, that any employee who requests to look at the plan be allowed to do so. O. Reg. 102/94, s. 50.

PART X
EDUCATIONAL INSTITUTIONS

51. (1) This Part applies to the operator of an educational institution in respect of a location or campus of the institution if, at the location or campus, at any time during the calendar year, more than 350 persons are enrolled.

(2) This Part continues to apply in respect of a location or campus for the two calendar years following the last year in which more than 350 persons were enrolled at the location or campus. O. Reg. 102/94, s. 51.

52. (1) The operator shall conduct a waste audit covering the waste generated by the operation of the institution at the location or campus. The audit shall also address the extent to which materials or products used consist of recycled or reused materials or products.

(2) After conducting the waste audit, the operator shall prepare a written report of the audit.

(3) In every year following the initial waste audit, the operator shall update the audit and prepare an updated written report. O. Reg. 102/94, s. 52.

53. (1) The operator shall prepare a written waste reduction work plan, based on the waste audit, to reduce, reuse and recycle waste generated by the operation of the institution at the location or campus.

(2) In every year following the preparation of the initial waste reduction work plan, the operator shall prepare an updated written plan. O. Reg. 102/94, s. 53.

54. The operator shall implement the waste reduction work plan as updated. O. Reg. 102/94, s. 54.

55. The waste reduction work plan shall include measures for communicating the plan to the operator's employees who work at the location or campus and, as a minimum, those measures shall require,

(a) that the plan or a summary be posted in places where most employees will see it; and

(b) if a summary is posted, that any employee who requests to look at the plan be allowed to do so. O. Reg. 102/94, s. 55.

PART XI
LARGE MANUFACTURING ESTABLISHMENTS

56. (1) This Part applies to the owner or operator of a site that is a manufacturing establishment.

(2) This Part does not apply to an owner of a site in a particular calendar year if,

(a) during the two preceding calendar years there was no calendar month in which the hours worked by the persons employed at the site exceeded 16,000 hours; and

(b) the owner is able to demonstrate this fact, within seven days of a request from the Director, through evidence satisfactory to the Director.

(3) Copies of the records related to hours of employment maintained under section 11 of the *Employment Standards Act* shall be deemed to be sufficient evidence of hours worked at a site if the copies are certified by the owner or the owner's representative as to the accuracy of the records.

(4) In this Part,

"owner" includes the operator of a manufacturing establishment but does not include a landlord;

"site" means one property and includes nearby properties owned or leased by the same person where passage from one property to another involves crossing, but not travelling along, a public highway. O. Reg. 102/94, s. 56.

57. (1) The owner shall conduct a waste audit covering the waste generated by the operation of the establishment at the site. The audit shall also address the extent to which materials or products used or sold consist of recycled or reused materials or products.

(2) After conducting the waste audit, the owner shall prepare a written report of the audit.

(3) In every year following the initial waste audit, the owner shall update the audit and prepare an updated written report. O. Reg. 102/94, s. 57.

58. (1) The owner shall prepare a written waste reduction work plan, based on the waste audit, to reduce, reuse and recycle waste generated by the operation of the establishment.

(2) In every year following the preparation of the initial waste reduction work plan, the owner shall prepare an updated written plan. O. Reg. 102/94, s. 58.

Environmental Protection Act
Loi sur la protection de l'environnement

Partial copy of O.Reg.103/94

ONTARIO REGULATION 103/94

INDUSTRIAL, COMMERCIAL AND INSTITUTIONAL SOURCE SEPARATION PROGRAMS

Consolidation Period: From March 3, 1994 to the e-Laws currency date.

No amendments.

This Regulation is made in English only.

SOURCE SEPARATION PROGRAMS

1. In this Regulation,

"Northern Ontario" means the territorial districts of Algoma, Cochrane, Kenora, Manitoulin, Nipissing, Parry Sound, Rainy River, Sudbury, Thunder Bay and Timiskaming and The Regional Municipality of Sudbury;

"source separation program" means a program to facilitate the source separation of waste for reuse or recycling. O. Reg. 103/94, s. 1.

2. (1) A source separation program required under this Regulation must include,

(a) the provision of facilities for the collection, handling and storage of source separated wastes described in subsection (2) adequate for the quantities of anticipated wastes;

(b) measures to ensure that the source separated wastes that are collected are removed;

(c) the provision of information to users and potential users of the program,

(i) describing the performance of the program,

(ii) encouraging effective source separation of waste and full use of the program;

(d) reasonable efforts to ensure that full use is made of the program and that the separated waste is reused or recycled.

(2) The source separated waste referred to in clause (1) (a) is waste that has been source separated from other kinds of waste and that consists solely of waste from one or more of the following categories:

1. The categories of waste set out in the part of the Schedule applicable to the person required to implement the source separation program.

2. The categories of waste set out in Schedule 1, 2 or 3 of Ontario Regulation 101/94 that the source separation program accepts.

(3) A source separation program required under this Regulation must provide for all the categories of waste set out in the part of the Schedule applicable to the person required to implement the program except for categories of waste that cannot be reasonably anticipated. O. Reg. 103/94, s. 2.

3. Source separation programs required by this Regulation are exempt from sections 27, 40 and 41 of the Act. O. Reg. 103/94, s. 3.

4. (1) A source separation program that is not required by this Regulation is exempt from sections 27, 40 and 41 of the Act if,

(a) the program is restricted to waste generated at a single site;

(b) the program only accepts waste that has been source separated from other kinds of waste and that consists solely of waste from one or more of the categories of waste set out in Schedule 1, 2 or 3 of Ontario Regulation 101/94;

(c) the program includes everything set out in subsection 2 (1).

(2) For the purposes of clause (1) (c), the reference to source separated waste in clause 2 (1) (a) shall be deemed to be a reference to the waste described in clause (1) (b). O. Reg. 103/94, s. 4.

RETAIL SHOPPING ESTABLISHMENTS

5. (1) This section applies to the owner of an establishment that sells goods or services at retail to persons who come to the establishment if,

(a) the establishment occupies premises with a floor area of at least 10,000 square metres; or

(b) the establishment occupies premises in a complex in respect of which section 6 applies and the owner of the establishment is solely responsible for the establishment's waste management.

(2) The owner shall implement a source separation program for the wastes generated by the establishment or shall ensure that such a program is implemented.

(3) This section applies only in respect of an establishment located within a local municipality that has a population of at least 5,000.

(4) This section takes effect with respect to an establishment in Northern Ontario on July 1, 1996. O. Reg. 103/94, s. 5.

RETAIL SHOPPING COMPLEXES

6. (1) This section applies to the owner of a complex that contains premises occupied by establishments that sell goods or services at retail to persons who come to the establishments if the total floor area of such premises is at least 10,000 square metres.

(2) The owner shall implement a source separation program for the wastes generated at the complex or shall ensure that such a program is implemented.

(3) The source separation program need not provide for the waste generated in the operation of an establishment in the complex if section 5 applies to the owner of the establishment.

(4) This section applies only in respect of a complex located in a local municipality that has a population of at least 5,000.

(5) This section takes effect with respect to a complex in Northern Ontario on July 1, 1996. O. Reg. 103/94, s. 6.

(c) a building in respect of which section 9 applies;

(d) a hotel or motel in respect of which section 12 applies;

(e) a hospital in respect of which section 13 applies;

(f) a location or campus of an educational institution in respect of which section 14 applies.

(4) This section does not apply to an owner of a restaurant in a particular calendar year if,

(a) during the two preceding calendar years there was no year in which the gross sales for all restaurants operated by the owner in Ontario equalled or exceeded $3,000,000; and

(b) the owner is able to demonstrate this fact, within seven days of a request from the Director, through evidence satisfactory to the Director.

(5) Copies of the records related to purchase and sale maintained under subsection 5 (1) of Regulation 1013 of the Revised Regulations of Ontario, 1990 shall be deemed to be sufficient evidence of the gross sales of a restaurant if the copies are certified by the owner or the owner's representative as to the accuracy of the records.

(6) This section applies only in respect of a restaurant located within a local municipality that has a population of at least 5,000.

(7) This section takes effect with respect to a restaurant in Northern Ontario on July 1, 1996. O. Reg. 103/94, s. 11.

HOTELS AND MOTELS

12. (1) The owner of a hotel or motel that has more than seventy-five units shall implement a source separation program for the wastes generated by the operation of the hotel or motel or shall ensure that such a program is implemented.

(2) This section applies only in respect of a hotel or motel located within a local municipality that has a population of at least 5,000.

(3) This section takes effect with respect to a hotel or motel in Northern Ontario on July 1, 1996. O. Reg. 103/94, s. 12.

HOSPITALS

13. (1) The operator of a public hospital classified as a class A, B or F hospital in Regulation 964 of the Revised Regulations of Ontario, 1990 shall implement a source separation program for the wastes generated by the operation of the hospital or shall ensure that such a program is implemented.

(2) This section applies only in respect of a public hospital located within a local municipality that has a population of at least 5,000.

(3) This section takes effect with respect to a public hospital in Northern Ontario on July 1, 1996. O.Reg. 103/94, s. 13.

EDUCATIONAL INSTITUTIONS

14. (1) This section applies to the operator of an educational institution in respect of a location or campus of the institution if, at the location or campus, at any time during the

calendar year, more than 350 persons are enrolled.

(2) The operator shall implement a source separation program for the waste generated by the operation of the institution at the location or campus or shall ensure that such a program is implemented.

(3) This section continues to apply in respect of a location or campus for the two calendar years following the last year in which more than 350 persons were enrolled at the location or campus.

(4) This section applies only in respect of a location or campus located within a local municipality that has a population of at least 5,000.

(5) This section takes effect with respect to a location or campus in Northern Ontario on July 1, 1996. O. Reg. 103/94, s. 14.

LARGE MANUFACTURING ESTABLISHMENTS

15. (1) This section applies to the owner or operator of a site that is a manufacturing establishment.

(2) The owner shall implement a source separation program for the waste generated by the operation of the establishment at the site or shall ensure that such a program is implemented.

(3) This section does not apply to an owner of a site in a particular calendar year if,

(a) during the two preceding calendar years there was no calendar month in which the hours worked by the persons employed at the site exceeded 16,000 hours; and

(b) the owner is able to demonstrate this fact, within seven days of a request from the Director, through evidence satisfactory to the Director.

(4) Copies of the records related to hours of employment maintained under section 11 of the *Employment Standards Act* shall be deemed to be sufficient evidence of hours worked at a site if the copies are certified by the owner or the owner's representative as to the accuracy of the records.

(5) In this section,

"owner" includes the operator of a manufacturing establishment but does not include a landlord;

"site" means one property and includes nearby properties owned or leased by the same person where passage from one property to another involves crossing, but not travelling along, a public highway. O. Reg. 103/94, s. 15.

TRANSITION

16. Except as otherwise provided, a person who, upon the coming into force of this Regulation, or at any time within twelve months after the coming into force of this Regulation, becomes subject to an obligation with respect to the implementation of a source separation program shall fulfil the obligation within twelve months after the coming into force of this Regulation. O.Reg. 103/94, s. 16.

SCHEDULE
WASTES TO BE PROVIDED FOR IN SOURCE SEPARATION PROGRAMS

2. Cardboard (corrugated).
3. Fine paper.
4. Glass bottles and jars for food or beverages.
5. Newsprint.
6. Polyethylene terephthalate bottles for food or beverages (including bottles made primarily of polyethylene terephthalate).
7. Steel food or beverage cans (including cans made primarily of steel).

PART IX
HOSPITALS

(referred to in section 13)

1. Aluminum food or beverage cans (including cans made primarily of aluminum).
2. Cardboard (corrugated).
3. Fine paper.
4. Glass bottles and jars for food or beverages.
5. Newsprint.
6. Steel food or beverage cans (including cans made primarily of steel).

PART X
EDUCATIONAL INSTITUTIONS

(referred to in section 14)

1. Aluminum food or beverage cans (including cans made primarily of aluminum).
2. Cardboard (corrugated).
3. Fine paper.
4. Glass bottles and jars for food or beverages.
5. Newsprint.
6. Steel food or beverage cans (including cans made primarily of steel).

PART XI
LARGE MANUFACTURING ESTABLISHMENTS

(referred to in section 15)

1. Aluminum.
2. Cardboard (corrugated).
3. Fine paper.
4. Glass.
5. Newsprint.

CANADIAN SCALE COMPANY LIMITED

CALIBRATION CERTIFICATE

DATE: May 11 2018 **SR No.:** 47338

CUSTOMER:
Waste Reduction Group
801 King St W Unit PH #20
Toronto ON M5V 3C9

REMARKS

This is to certify that the following scale has been tested and calibrated in relation to the Standards maintained by **CANADIAN SCALE COMPANY LIMITED**, with test weights traceable to the Legal Metrology Laboratories of, Industry Canada and National Research Council, Canada.

Anyload EWH-150
Capacity 150 kg
S/N -20161108049

Technician's Signature

Measurement Canada Authorized Service Provider – Fournisseur de services autorisé de Mesures Canada

CANADIAN SCALE COMPANY LIMITED
305 Horner Avenue, Toronto, ON M8W 1Z4
1-800-461-0634 www.canscale.com

McMaster University
Waste Audit – Photos (November 7 & 8, 2018)

	
Mixed Papers	Other Paper Fibers
	
PET (#1) Plastics	Gable Top & Aseptic Containers
	
Organics Food Wastes	Paper Towels

McMaster University
Waste Audit – Photos (November 7 & 8, 2018)

Plastic Films

Coffee Cups

Electronics/Wires

Typical recycle station

Typical recycle station

Typical signage

Appendix B

Waste Audit Data

Waste Audit Report

McMaster University

Waste Reduction Group Project P0951

Table B1: Garbage Sample Summary - By Building

Sample #	Location	Waste Audit Date	Sample	
			kg	%
1	Hamilton Hall	Nov. 15, 2018	56.06	9.8%
2	Burke Science Building	Nov. 15, 2018	46.60	8.1%
3	John Hodgins Engineering Building	Nov. 15, 2018	50.27	8.8%
4	McMaster University Student Centre	Nov. 16, 2018	170.93	29.8%
5	Brandon Hall	Nov. 16, 2018	116.19	20.2%
6	Mills Library	Nov. 16, 2018	133.99	23.3%
Total			574.04	100.0%

Table B2: Garbage Sample Summary - By Building

Waste Generating Area		Hamilton Hall		Burke Science Building		John Hodgins Engineering Building		McMaster University Student Centre		Brandon Hall		Mills Library		Total	
Sample Date		Nov. 15, 2018		Nov. 15, 2018		Nov. 15, 2018		Nov. 16, 2018		Nov. 16, 2018		Nov. 16, 2018			
Sample Size		56.06		46.60		50.27		170.93		116.19		133.99		574.04	
Percent of Sample Size		9.8%		8.1%		8.8%		29.8%		20.2%		23.3%		100.0%	
		kg	%	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Mixed Containers	PET (#1)	0.64	1.1%	1.98	4.2%	0.94	1.9%	4.21	2.5%	4.53	3.9%	3.12	2.3%	15.42	2.7%
	HDPE (#2)	0.00	0.0%	0.24	0.5%	0.00	0.0%	0.95	0.6%	0.00	0.0%	0.52	0.4%	1.71	0.3%
	PP (#5)	0.64	1.1%	0.28	0.6%	1.64	3.3%	7.44	4.4%	3.98	3.4%	5.31	4.0%	19.29	3.4%
	PS (#6)	0.44	0.8%	0.42	0.9%	0.74	1.5%	3.51	2.1%	2.27	2.0%	2.05	1.5%	9.43	1.6%
	Glass	0.00	0.0%	0.00	0.0%	0.00	0.0%	2.28	1.3%	0.00	0.0%	0.00	0.0%	2.28	0.4%
	Aluminum	0.41	0.7%	0.42	0.9%	0.33	0.7%	0.85	0.5%	0.74	0.6%	0.61	0.5%	3.36	0.6%
	Steel	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.98	0.6%	0.00	0.0%	0.00	0.0%	0.98	0.2%
	Gable Top	0.00	0.0%	0.00	0.0%	0.00	0.0%	3.28	1.9%	0.74	0.6%	0.55	0.4%	4.57	0.8%
	Aseptic	0.33	0.6%	0.22	0.5%	0.00	0.0%	2.71	1.6%	0.88	0.8%	0.91	0.7%	5.05	0.9%
Mixed Papers	Fine Paper	1.93	3.4%	0.64	1.4%	0.85	1.7%	1.95	1.1%	2.32	2.0%	4.85	3.6%	12.54	2.2%
	Newspaper	4.31	7.7%	0.61	1.3%	0.33	0.7%	1.44	0.8%	0.95	0.8%	2.29	1.7%	9.93	1.7%
	Boxboard	0.95	1.7%	0.64	1.4%	1.02	2.0%	6.29	3.7%	2.85	2.5%	2.18	1.6%	13.93	2.4%
	Other Fibres	0.88	1.6%	0.52	1.1%	0.84	1.7%	5.32	3.1%	0.75	0.6%	2.01	1.5%	10.32	1.8%
Cardboard		0.00	0.0%	0.64	1.4%	0.00	0.0%	0.55	0.3%	0.00	0.0%	2.12	1.6%	3.31	0.6%
Paper Towels		12.25	21.9%	5.59	12.0%	7.25	14.4%	22.29	13.0%	13.42	11.6%	17.23	12.9%	78.03	13.6%
Coffee Cups		0.85	1.5%	0.85	1.8%	3.18	6.3%	8.96	5.2%	6.22	5.4%	4.48	3.3%	24.54	4.3%
Organics		5.42	9.7%	8.28	17.8%	6.25	12.4%	49.21	28.8%	37.85	32.6%	32.75	24.4%	139.76	24.3%
LDPE Plastic Films		1.25	2.2%	0.95	2.0%	1.22	2.4%	4.44	2.6%	2.74	2.4%	3.38	2.5%	13.98	2.4%
Styrofoam		0.52	0.9%	0.26	0.6%	0.00	0.0%	0.00	0.0%	0.77	0.7%	0.84	0.6%	2.39	0.4%
Plastic Strapping		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Scrap Wood		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Scrap Metal		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Electronic Waste		1.24	2.2%	0.00	0.0%	9.00	17.9%	0.00	0.0%	0.00	0.0%	0.00	0.0%	10.24	1.8%
Bulbs		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Batteries		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Printer Toners		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Other/Nonrecyclable		24.00	42.8%	24.06	51.6%	16.68	33.2%	44.27	25.9%	35.18	30.3%	48.79	36.4%	192.98	33.6%
QAQC Check		56.06	100.0%	46.60	100.0%	50.27	100.0%	170.93	100.0%	116.19	100.0%	133.99	100.0%	574.04	100.0%
Mixed Containers		2.46	4.4%	3.56	7.6%	3.65	7.3%	26.21	15.3%	13.14	11.3%	13.07	9.8%	62.09	10.8%
Mixed Papers		8.07	14.4%	2.41	5.2%	3.04	6.0%	15.00	8.8%	6.87	5.9%	11.33	8.5%	46.72	8.1%
Mandatory Recyclables (Reg103)		6.65	11.9%	2.31	5.0%	1.51	3.0%	8.05	4.7%	4.01	3.5%	9.87	7.4%	32.40	5.6%
Other Recyclables		24.04	42.9%	19.12	41.0%	28.90	57.5%	109.65	64.1%	70.01	60.3%	70.01	52.3%	321.73	56.0%
Non-Recyclable		25.37	45.3%	25.17	54.0%	19.86	39.5%	53.23	31.1%	42.17	36.3%	54.11	40.4%	219.91	38.3%
QAQC Check		TRUE	100.0%	TRUE	100.0%	TRUE	100.0%	TRUE	100.0%	TRUE	100.0%	TRUE	100.0%	TRUE	100.0%

Note: Highlighted cells represent those items identified in Table 4 of report.

Table B3: Overall Garbage Composition (Ranked)

Waste Composition	%	Annual		Divert?	Est.
		915.93	MT	Y/N	Amount[1]
Other/Nonrecyclable	33.6%	307.92	MT	No	
Organics	24.3%	223.00	MT	Yes	133.80
Paper Towels	13.6%	124.50	MT	Yes	74.70
Mixed Containers	10.8%	99.07	MT	Yes	59.44
Mixed Papers	8.1%	74.55	MT	Yes	44.73
Coffee Cups	4.3%	39.16	MT	No	
LDPE Plastic Films	2.4%	22.31	MT	Yes	13.38
Electronic Waste	1.8%	16.34	MT	Yes	9.80
Cardboard	0.6%	5.28	MT	Yes	3.17
Styrofoam	0.4%	3.81	MT	No	
QAQC Check	100.0%	915.93	MT		339.03

[1] *Assumed 60% capture rate of materials in garbage stream.*

Table B4: Overall Mixed Container Summary

Material	kg	%	Disposed	Recycled
			MT	MT
			99.07	119.19
PET (#1)	15.42	24.8%	24.60	29.60
HDPE (#2)	1.71	2.8%	2.73	3.28
PP (#5)	19.29	31.1%	30.78	37.03
PS (#6)	9.43	15.2%	15.05	18.10
Glass	2.28	3.7%	3.64	4.38
Aluminum	3.36	5.4%	5.36	6.45
Steel	0.98	1.6%	1.56	1.88
Gable Top	4.57	7.4%	7.29	8.77
Aseptic	5.05	8.1%	8.06	9.69
Total	62.09	100.0%	99.07	119.19

Table B5: Overall Mixed Paper Summary

Material	kg	%	Disposed	Recycled
			MT	MT
			74.55	66.00
Fine	12.54	26.8%	20.01	17.71
Newsprint	9.93	21.3%	15.84	14.03
BoxBoard	13.93	29.8%	22.23	19.68
Other	10.32	22.1%	16.47	14.58
Total	46.72	100.0%	74.55	66.00

Table B6: Organics Sample Summary - By Building

Sample #	Location	Waste Audit Date	Sample	
			kg	%
1	McKay	Nov. 16, 2018	58.33	57.9%
2	Edwards	Nov. 16, 2018	17.16	17.0%
3	Whidden	Nov. 16, 2018	25.24	25.1%
Total			100.73	100.0%

Table B7: Organics Sample Summary - By Building

Waste Generating Area		McKay		Edwards		Whidden		Total	
Sample Date		Nov. 16, 2018		Nov. 16, 2018		Nov. 16, 2018			
Sample Size		58.33		17.16		25.24		100.73	
Percent of Sample Size		57.9%		17.0%		25.1%		100.0%	
		kg	%	kg	%	kg	%	kg	%
Mixed Containers	PET (#1)	0.15	0.3%	0.00	0.0%	0.10	0.4%	0.25	0.2%
	HDPE (#2)	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
	PP (#5)	0.24	0.4%	0.00	0.0%	0.00	0.0%	0.24	0.2%
	PS (#6)	0.55	0.9%	0.21	1.2%	0.00	0.0%	0.76	0.8%
	Glass	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
	Aluminum	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
	Steel	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
	Gable Top	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
	Aseptic	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Mixed Papers	Fine Paper	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
	Newspaper	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
	Boxboard	0.55	0.9%	0.00	0.0%	0.00	0.0%	0.55	0.5%
	Other Fibres	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Cardboard		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Paper Towels		12.25	21.0%	5.59	32.6%	6.63	26.3%	24.47	24.3%
Coffee Cups		0.25	0.4%	0.33	1.9%	0.00	0.0%	0.58	0.6%
Organics		42.75	73.3%	10.23	59.6%	17.53	69.5%	70.51	70.0%
LDPE Plastic Films		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Styrofoam		0.00	0.0%	0.26	1.5%	0.00	0.0%	0.26	0.3%
Plastic Strapping		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Scrap Wood		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Scrap Metal		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Electronic Waste		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Bulbs		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Batteries		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Printer Toners		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Other/Nonrecyclable		1.59	2.7%	0.54	3.1%	0.98	3.9%	3.11	3.1%
QAQC Check		58.33	100.0%	17.16	100.0%	25.24	100.0%	100.73	100.0%
Mixed Containers		0.94	1.6%	0.21	1.2%	0.10	0.4%	1.25	1.2%
Mixed Papers		0.55	0.9%	0.00	0.0%	0.00	0.0%	0.55	0.5%
Contamination Rate		3.33	5.7%	1.34	7.8%	1.08	4.3%	5.75	5.7%

Table B8: Overall Organics Composition (Ranked)

Waste Composition	%	Annual		Contam?	Est.
		461.59	MT	Y/N	Amount[1]
Organics	70.0%	323.11	MT	No	
Paper Towels	24.3%	112.13	MT	No	
Other/Nonrecyclable	3.1%	14.25	MT	Yes	14.25
Mixed Containers	1.2%	5.73	MT	Yes	5.73
Coffee Cups	0.6%	2.66	MT	Yes	2.66
Mixed Papers	0.5%	2.52	MT	Yes	2.52
Styrofoam	0.3%	1.19	MT	Yes	1.19
QAQC Check	100.0%	461.59	MT		26.35
				Contamination Rate	*5.7%*

Waste Audit Report

McMaster University

Waste Reduction Group Project P0951

Table B9: Annual Waste Management & Diversion Summary

Material Stream	3Rs or Disposed	2016 Total[1]			2017 Total[2]			2018 Total[2]		
		kg	MT	%	kg	MT	%	kg	MT	%
Garbage - Disposed to Landfill	Disposed	1,256,560	1256.56	100.0%	1,182,530	1182.53	100.0%		915.93	100.0%
Sub-Total			***1256.56***	64.0%		***1182.53***	50.3%		***915.93***	46.0%
Cardboard	Recycled	135,460	135.46	19.2%	106,550	106.55	9.1%		100.09	9.3%
Mixed Containers	Recycled	68,274	68.27	9.7%	125,610	125.61	10.7%		119.19	11.1%
Mixed Papers	Recycled	14,958	14.96	2.1%	1,820	1.82	0.2%		66.00	6.1%
Confidential Papers	Recycled	109,240	109.24	15.5%	254,205	254.21	21.7%		27.77	2.6%
Scrap Metals	Recycled	81,290	81.29	11.5%	81,030	81.03	6.9%		73.06	6.8%
Scrap Wood	Recycled	53,880	53.88	7.6%	82,080	82.08	7.0%		48.21	4.5%
Electronic Wastes	Recycled	900	0.90	0.1%	24,796	24.80	2.1%	24,796	24.80	2.3%
Concrete	Recycled	8,000	8.00	1.1%	30,000	30.00	2.6%		20.00	1.9%
Bulbs & Ballasts	Recycled		0.00	0.0%		0.00	0.0%		0.00	0.0%
Batteries	Recycled		0.00	0.0%		0.00	0.0%		0.00	0.0%
Oil & Grease	Recycled		0.00	0.0%	27,254	27.25	2.3%	27,254	27.25	2.5%
Organics	Composted	234,840	234.84	33.2%	330,160	330.16	28.2%		461.59	42.9%
Yard Wastes	Composted		0.00	0.0%		0.00	0.0%		0.00	0.0%
LCBO/Beer Store Returns	Reused		0.00	0.0%	75,744	75.74	6.5%	75,744	75.74	7.0%
Textbook Donations	Reused		0.00	0.0%		0.00	0.0%		0.00	0.0%
Wood Pallets	Reused		0.00	0.0%	27,240	27.24	2.3%	27,240	27.24	2.5%
Used Furniture/Equipment	Reused		0.00	0.0%	4,000	4.00	0.3%	4,000	4.00	0.4%
Printer Toners	Reused		0.00	0.0%		0.00	0.0%		0.00	0.0%
Clothing Donations	Reused		0.00	0.0%		0.00	0.0%		0.00	0.0%
Water Bottle Filling Stations	Reduced		0.00	0.0%		0.00	0.0%		0.00	0.0%
Double sided printing	Reduced		0.00	0.0%		0.00	0.0%		0.00	0.0%
Refillable coffee/Lug-a-Mug programs	Reduced		0.00	0.0%		0.00	0.0%		0.00	0.0%
Sub-Total			***706.84***	***36.0%***		***1170.49***	***49.7%***		***1074.95***	***54.0%***
Total Generated			1963.4	100.0%		2353.02	100.0%		1990.87	100.0%
Total Recycled			472.0	24.0%		733.35	31.2%		506.37	25.4%
Total Reused			0.0	0.00%		106.98	4.55%		106.98	5.37%
Total Reduced			0.0	--		0.00	0.00%		0.00	0.00%
Total Composted			234.8	12.0%		330.16	14.0%		461.59	23.2%
Total Disposed			1256.6	64.0%		1182.53	50.3%		915.93	46.0%
			TRUE							
Achieved Waste Diversion Rate			***36.0%***			***49.7%***			***54.0%***	
Additioanl Recyclable Materials in Wastes Disposed to Landfill (MT)						*612.3*			*339.0*	
Potential Waste Diversion Rate						***75.8%***			***71.0%***	

Notes:

1: Annual values taken from McMaster 2016 Waste Audit Report.

2: Annual Values provided by Client.

Volume Report

McMaster University Diversion & Volume Report
2018 Annual Summary

	January	February	March	April	May	June	July	August	September	October	Novemer	December	Total MT
Waste													
2018 Volume	76.03	63.19	67.54	82.43	102.51	71.52	53.70	95.11	102.46	90.15	65.34	45.94	915.93
Cardboard													
2018 Volume	5.02	9.01	8.97	12.20	6.23	4.65	6.42	5.97	7.64	13.54	9.16	11.28	100.09
Paper													
2018 Volume	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	66.00
Comingle													
2018 Volume	9.89	8.36	12.37	13.77	10.41	8.57	8.02	9.22	8.42	12.09	10.64	7.43	119.19
Shreddding													
2018 Volume	4.45	1.76	1.81	2.92	2.06	1.91	1.97	3.00	0.93	2.99	2.01	1.96	27.77
Organics													
2018 Volume	22.64	19.16	24.82	29.55	21.27	18.78	21.18	24.30	62.39	80.90	76.01	60.61	461.59
Paper Towel													
2018 Volume	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood													
2018 Volume	2.28	3.15	0.00	4.58	4.44	11.15	6.44	0.00	2.21	6.69	2.93	4.34	48.21
Metal													
2018 Volume	4.46	8.47	3.63	7.14	6.77	9.06	6.66	8.38	6.57	2.25	6.75	2.92	73.06
Concrete													
2018 Volume	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	10.00	20.00
													1,831.84

Appendix C

Waste Audit Summary

Ministry of the Environment Waste Form

Report of a Waste Audit

Industrial, Commercial and Institutional Establishments

As required by O. Reg. 102/94

- ***This report must be prepared 6 months after becoming subject to O. Reg. 102/94 and a copy retained on file for at least five years after it is prepared, and be made available to the ministry upon request.***
- ***For large construction and demolition projects, please refer to the forms included with "A Guide to Waste Audits and Waste Reduction Work Plans for Construction and Demolition Projects as Required Under Ontario Regulation 102/94"* (revised July 2008)**

I. GENERAL INFORMATION

Name of Owner and/or Operator of Entity(ies) and Company Name: McMaster University		
Name of Contact Person:	**Telephone #:**	**Email address:**
Street Address(es) of Entity(ies): 1280 Main Street West		
Municipality: Hamilton, Ontario, L8S 4L8		

		Type of Entity (check one)	
Retail Shopping Establishments		Hotels and Motels	
Retail Shopping Complexes		Hospitals	
Office Buildings		Educational Institutions	X
Restaurants		Large Manufacturing Establishments	

Note: O. Reg. 102/94 does not apply to multi-unit residential buildings.

II. DESCRIPTION OF ENTITY

Provide a brief overview of the entity(ties):

McMaster University is an educational institution with approximately 29,758 FTE students which satisfies Part X of Ontario Regulation 102/94 & 103/94. O.Reg. 102/94 requires operators of educational institutions with more than 350 full- or part-time students enrolled during the calendar year to conduct an annual waste audit and implement a waste reduction work plan. O.Reg. 103/94 requires that source separation programs be implemented and maintained for fine papers, newsprint, aluminum cans, steel cans, glass beverage containers and corrugated cardboard. McMaster University undertook this audit in order to assist them in reducing wastes generated on campus and/or disposed to landfill, while being in compliance with the required Regulations.

III. HOW WASTE IS PRODUCED AND DECISIONS AFFECTING THE PRODUCTION OF WASTE

For each category of waste that is produced at the entity(ies), explain how the waste will be produced and how management decisions and policies will affect the production of waste.	
Categories of Waste	**How Is the Waste Produced and What Management Decisions/Policies Affect Its Production?**
PET (#1) plastic food and beverage bottles	*Brought onto campus or generated on campus by staff/students.*
HDPE (#2) Containers	*Brought onto campus/generated on campus by staff/students.*
Polypropylene (#5) Containers	*Brought onto campus or generated on campus by staff/students.*
Polystyrene (#6) Containers	*Brought onto campus/generated on campus by staff/students.*
Glass food and beverage bottles/jars	*Brought onto campus or generated on campus by staff/students.*
Aluminum food and beverage cans	*Brought onto campus or generated on campus by staff/students.*
Steel food and beverage cans	*Brought onto campus or generated on campus by staff/students.*
Gable Top Containers	*Brought onto campus or generated on campus by staff/students.*
Aseptic Containers	*Brought onto campus or generated on campus by staff/students.*
Fine paper	*Brought onto campus or generated on campus by staff/students.*
Newsprint	*Brought onto campus or generated on campus by staff/students.*
Boxboard shoe boxes, cereal boxes, etc.	*Brought onto campus or generated on campus by staff/students.*
Glossy magazines, catalogues, flyers	*Brought onto campus or generated on campus by staff/students.*
Cardboard	*Brought onto campus, shipping/generated on campus by staff/students.*
Paper towels	*Generated by staff/students on campus*
Coffee cups	*Brought onto campus/generated on campus by staff/students.*
Organics / Food Waste	*Brought onto campus/generated on campus by staff/students.*
LDPE (#4) plastic film	*Brought onto campus/generated on campus by staff/students.*
Styrofoam	*Brought onto campus/generated on campus by staff/students.*
Plastics Strapping	*Brought onto campus/generated on campus by staff/students.*
Scrap Woods/Pallets	*Generated by staff/students on campus*
Scrap Metals	*Generated by staff/students on campus*
Electronic Wastes (incl. toners)	*Generated by staff/students on campus*
Bulbs & Ballasts	*Generated by staff/students on campus*
Batteries	*Generated by staff/students on campus*
Concrete	*Generated by staff/operations on campus*
Oil & Grease	*Generated by staff/operations on campus*
Used Furniture	*Generated by staff/operations on campus*
Other / Non-Recyclable	*Generated by staff/students on campus*

Note: When completing this form, write "n/a" in the columns where the entity will not produce any waste for a category of waste.

…/2

IV. MANAGEMENT OF WASTE

For each category of waste listed below, indicate which waste items will be disposed or reused/recycled and how each item will be managed at the entity(ies).		
Category	**Waste to be Disposed**	**Reused or Recycled Waste**
PET (#1) plastic food and beverage bottles	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
HDPE (#2) Containers	*Staff/students may place in garbage*	*Staff/Students may place in recycling containers.*
Polypropylene (#5) Containers	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Polystyrene (#6) Containers	*Staff/students may place in garbage*	*Staff/Students may place in recycling containers.*
Glass food and beverage bottles/jars	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Aluminum food and beverage cans	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Steel food and beverage cans	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Gable Top Containers	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Aseptic Containers	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Fine paper	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Newsprint	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Boxboard shoe boxes, cereal boxes, etc.	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Glossy magazines, catalogues, flyers	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Cardboard	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Paper towels	*Staff/Students place in garbage*	*No recycling program implemented.*
Coffee cups	*Staff/Students may place in garbage*	*No recycling program implemented.*
Organics / Food Waste	*Staff/Students may place in garbage*	*Staff/Students may place in organics containers.*
LDPE (#4) Plastic Film	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Styrofoam (#6)	*Staff/Students place in garbage*	*No recycling program implemented.*
Plastic Strapping	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Scrap Woods/Pallets	*Staff/students may place in garbage*	*Staff may place in recycling containers.*
Scrap Metals	*Staff/students may place in garbage*	*Staff may place in recycling containers.*
Electronic Wastes (incl. toners)	*Staff/Students may place in garbage*	*Staff/Students may place in recycling containers.*
Bulbs & Ballasts	*Staff/Students place in garbage*	*No recycling program implemented.*
Batteries	*Staff/Students place in garbage*	*No recycling program implemented.*
Concrete	*Staff may place in garbage*	*Staff may place in recycling containers.*
Oil & Grease	*Staff may place in garbage*	*Staff may place in recycling containers.*
Used Furniture	*Staff may place in garbage*	*Staff may place in recycling containers.*
Other / Non-Recyclable	*Staff/students place in garbage*	*Not applicable.*

Note: When completing this form, write "n/a" in the columns where the entity will not produce any waste for a category of waste.

V. ESTIMATED QUANTITY OF WASTE PRODUCED

Categories of Waste	Estimated Amount of Waste											
	Generated			Reduced/Reused			Recycled			Disposed		
	"A" Base Year	"B" Current Year	"C" * Change (A - B)	"A" Base Year	"B" Current Year	"C" * Change (A - B)	"A" Base Year	"B" Current Year	"C" * Change (A - B)	"A" Base Year	"B" Current Year	"C" * Change (A - B)
	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
PET (#1) plastic food and beverage bottles	36.60	54.20	-17.60	0.00	0.00	0.00	1.77	29.60	-27.83	34.84	24.60	10.23
HDPE (#2) Containers	15.24	6.01	9.23	0.00	0.00	0.00	2.17	3.28	-1.12	13.07	2.73	10.34
Polypropylene (#5) Containers	10.20	67.81	-57.61	0.00	0.00	0.00	0.11	37.03	-36.92	10.08	30.78	-20.69
Polystyrene (#6) Containers	38.83	33.15	5.68	0.00	0.00	0.00	0.27	18.10	-17.83	38.56	15.05	23.51
Glass food and beverage bottles/jars	84.55	83.76	0.79	0.00	75.74	-75.74	5.35	4.38	0.98	79.20	3.64	75.56
Aluminum food and beverage cans	12.70	11.81	0.88	0.00	0.00	0.00	0.58	6.45	-5.87	12.11	5.36	6.75
Steel food and beverage cans	2.02	3.44	-1.42	0.00	0.00	0.00	0.74	1.88	-1.14	1.28	1.56	-0.28
Gable Top/Milk Containers	15.34	16.06	-0.72	0.00	0.00	0.00	0.22	8.77	-8.55	15.12	7.29	7.83
Aseptic Containers	6.94	17.75	-10.82	0.00	0.00	0.00	0.09	9.69	-9.61	6.85	8.06	-1.21
Fine paper	179.31	65.49	113.82	0.00	0.00	0.00	132.22	45.48	86.73	47.09	20.01	27.08
Newsprint	16.23	29.87	-13.64	0.00	0.00	0.00	6.98	14.03	-7.05	9.25	15.84	-6.59
Boxboard shoe boxes, cereal boxes, etc.	25.75	41.90	-16.15	0.00	0.00	0.00	0.62	19.68	-19.06	25.13	22.23	2.90
Glossy magazines, catalogues, flyers	12.49	31.05	-18.56	0.00	0.00	0.00	0.02	14.58	-14.56	12.47	16.47	-4.00
Corrugated Cardboard	278.75	105.37	173.38	0.00	0.00	0.00	256.93	100.09	156.84	21.82	5.28	16.54
Paper Towels	130.35	124.50	5.85	0.00	0.00	0.00	0.00	0.00	0.00	130.35	124.50	5.85
Coffee Cups	0.00	39.16	-39.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39.16	-39.16
Organics	699.73	684.59	15.13	0.00	0.00	0.00	259.71	461.59	-201.88	440.01	223.00	217.01
LDPE (#4) Plastic Films	17.76	22.31	-4.55	0.00	0.00	0.00	0.09	0.00	0.09	17.67	22.31	-4.64
Styrofoam (#6) Plastic	3.31	3.81	-0.51	0.00	0.00	0.00	0.00	0.00	0.00	3.31	3.81	-0.51
Plastic Strapping	3.91	0.00	3.91	0.00	0.00	0.00	0.00	0.00	0.00	3.91	0.00	3.91
Scrap Wood/Pallets	137.14	75.45	61.69	0.00	27.24	-27.24	135.29	48.21	87.08	1.85	0.00	1.85
Scrap Metal	83.45	73.06	10.39	0.00	0.00	0.00	79.68	73.06	6.62	3.77	0.00	3.77
Electronic Wastes	3.68	41.13	-37.45	0.00	0.00	0.00	0.00	24.80	-24.80	3.68	16.34	-12.66
Fluorescent Bulbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Batteries	0.21	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.21
Concrete	0.00	20.00	-20.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00
Oil & Grease	0.00	27.25	-27.25	0.00	0.00	0.00	0.00	27.25	0.00	0.00	0.00	0.00
Used Furniture	0.00	4.00	-4.00	0.00	4.00	-4.00	0.00	0.00	0.00	0.00	0.00	0.00
Other/Nonrecyclable	616.53	307.92	308.61	0.00	0.00	0.00	0.00	0.00	0.00	616.53	307.92	308.61
Total	2431.01	1990.87	440.14	0.00	106.98	-106.98	882.84	967.96	-37.87	1548.17	915.93	632.24
Percent Change (C ÷A x 100)			18.1%			--			-4.3%			40.8%

Note: When completing this form, write “n/a” in the “Estimated Amount of Waste Produced” column where the entity will not produce any waste for a category of waste

* Fill out these columns each year following the initial waste audit or baseline year to determine the progress that is being made by your waste reduction program

Base year taken as 2012

VI. EXTENT TO WHICH MATERIALS OR PRODUCTS USED OR SOLD BY THE ENTITY CONSIST OF RECYCLED OR REUSED MATERIALS OR PRODUCTS

Please answer the following questions:

1. Do you have a management policy in place that promotes the purchasing and/or use of materials or products that consist of recycled and/or reused materials or products? If yes, please describe.

   No formal "green" purchasing policy is in place at McMaster University. However, the different purchasing departments at the University do consider environmental impacts of their purchases whenever options are available and feasible.

2. Do you have plans to increase the extent to which materials or products used or sold* consist of recycled or reused materials or products? If yes, please describe.

   Not applicable.

   ***** Information regarding materials or products "sold" that consist of recycled or reused materials or products is only required from owner(s) of retail shopping establishments and the owner(s) or operator(s) of large manufacturing establishments.
   Please attach any additional page(s) as required to answer the above questions.

I hereby certify that the information provided in this Report of Waste Audit is complete and correct.		
Signature of authorized official:	**Title:**	**Date:**

…/5

Appendix D

Waste Reduction Work Plan

Ministry of the Environment Waste Form

Report of a Waste Reduction Work Plan

Industrial, Commercial and Institutional Establishments

As required by O. Reg. 102/94

This report must be prepared 6 months after becoming subject to O. Reg. 102/94 and a copy retained on file for at least five years after it is prepared, and be made available to the ministry upon request.

I. GENERAL INFORMATION

Name of Owner and/or Operator of Entity(ies) and Company Name: McMaster University		
Name of Contact Person:	**Telephone #:**	**Email address:**
Street Address(es) of Entity(ies): 1280 Main Street West		
Municipality: Hamilton, Ontario, L8S 4L8		

Type of Entity (check one)			
Retail Shopping Establishments		Hotels and Motels	
Retail Shopping Complexes		Hospitals	
Office Buildings		Educational Institutions	X
Restaurants		Large Manufacturing Establishments	

Note: O. Reg. 102/94 does not apply to multi-unit residential buildings.

II. DESCRIPTION OF THE ENTITY

Provide a brief overview of the entity(ties):

McMaster University is an educational institution with approximately 29,758 FTE students which satisfies Part X of Ontario Regulation 102/94 & 103/94. O.Reg. 102/94 requires operators of educational institutions with more than 350 full- or part-time students enrolled during the calendar year to conduct an annual waste audit and implement a waste reduction work plan. O.Reg. 103/94 requires that source separation programs be implemented and maintained for fine papers, newsprint, aluminum cans, steel cans, glass beverage containers and corrugated cardboard. McMaster University undertook this audit in order to assist them in reducing wastes generated on campus and/or disposed to landfill, while being in compliance with the required Regulations.

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III. PLANS TO REDUCE, REUSE AND RECYCLE WASTE

For each category of waste described in Part V of "Report of a Waste Audit" (on which this plan is based), explain what your plans are to Reduce, Reuse and Recycle the waste, including: 1) how the waste will be source separated at the establishment, and 2) the programs to reduce, reuse and recycle all source separated waste.

Waste Category (as stated in Part V of your "Report of a Waste Audit")	**Source Separation and 3Rs Program**
Comingled Containers (PET, HDPE, LDPE, PP, PS, Aluminum, Steel, Glass, Aseptic)	*"Comingled 3Rs Program"* *Reduce: Staff/Students will be encouraged to bring reusable containers food/beverage containers for lunch and breaks. McMaster University will encourage suppliers to reduce the amount of polystyrene used to transport supplies. McMaster University will encourage suppliers to reduce the amount of plastic film and wrapping materials used to transport supplies.* *Reuse: Staff/Students will be encouraged to reuse plastic crates and totes wherever possible.* *Recycle: Staff/Students will be provided with recycling bins in high waste generating areas and food service areas for mixed containers/plastics. Staff/Students will be encouraged to place mixed containers/plastics in appropriate recycling bins with appropriate signage affixed to the receptacle. Receptacles will be emptied on a regular basis before they become full into large roll away bins for collection as required.*
Mixed Papers (Fine Paper, newsprint, boxboard, magazines, molded papers, kraft, catalogues, flyers, etc)	*"Mixed Paper 3Rs Program"* *Reduce: Staff/Students will be encouraged to print on both sides of each piece of paper as well as not print when it is unnecessary. Staff/Students will be encouraged to take reading materials home with them after they are finished with them. Staff and students will be sent, via email, news sources that are available online opposed to purchasing paper copies of news.* *Reuse: Discarded paper with print only on one side will be used for note pads/scrap paper. Staff/Students will be encouraged to leave newspapers they are finished reading in common areas for others to read.* *Recycle: Staff/Students will be provided with instructions via email. Receptacles will be provided in each office, classroom and high waste generating areas. Staff/Students will be encouraged to place newsprint, fine paper, boxboard, magazines, molded papers, etc in appropriate recycling receptacles. Staff/Students will empty receptacles into centralized containers. Custodial Staff/Students will empty centralized containers into bulk container in designated area for collection as required.*
Confidential Papers	*"Confidential Paper 3Rs Program"* *Reduce: None.* *Reuse: None.* *Recycle: Staff/Students will be reminded of the existing program. Receptacles will be provided in each designated office area as required. Staff/Students will be encouraged to place all confidential paper in the designated consoles. Contactor will empty consoles appropriately for shredding and recycling as required.*
Cardboard	*"Cardboard 3Rs Program"* *Reduce: Suppliers will be encouraged to make use of reusable containers for the shipment of supplies to the University.* *Reuse: Cardboard boxes will be reused for shipments when appropriate.* *Recycle: Staff/Students will be reminded of the existing program. Cleaners will be trained on where to dispose of waste correctly.*
Paper Towels	*No 3Rs Program*
Organics	*"Organics 3Rs Program"* *Reduce: Students will be encouraged to bring uneaten food items home after lunch breaks or uneaten. Non-perishable food items can be donated to a local food drive.* *Reuse: Staff/Students provided with reusable china in some food service areas.* *Recycle: Staff/Students will be continually reminded of the existing program. Kitchen staff & cleaners trained on where to dispose of waste correctly. Additional bins added to the university food service areas to capture organic materials. Signs improved relating to organics program to assist staff/students in sorting organic stream correctly. Selling of disposable food containers*

	discouraged on campus, and if sold, containers should be compostable. Updated organics handouts for staff/student education/training program. Training of food service staff regarding improvements to organics program.
Coffee Cups, LDPE (#4) films, Plastic Strapping	*"Mixed Container 3Rs Program" – Refer above for description*
Styrofoam	*No 3Rs Program*
Wood Pallets/Scrap Woods	*"Scrap Woods & Wood Pallets 3Rs Program"* *Reduce: Staff to monitor use of Pallet to eliminate/reduce broken pallets.* *Reuse: Staff will be reminded of the existing program. Staff/Students will be encouraged to use scrap wood before new wood is purchased for use at the University.* *Recycle: Staff will be reminded of scrap wood recycling program.*
Scrap Metals	*"Scrap Metals 3Rs Program"* *Reduce: McMaster University will investigate through metal optimization study to insure steel is used with as little scrap generated as possible.* *Reuse: None.* *Recycle: Staff will be reminded of the existing program.*
Electronic Wastes (incl. printer toners)	*"Electronic Wastes 3Rs Program"* *Reduce: None.* *Reuse: Staff/students will be encouraged to reuse/donate electronic wastes if possible. .* *Recycle: Staff/Students will be reminded of the existing program, continue collecting for proper recycling of waste materials.*
Bulbs & Ballasts	*No 3Rs Program*
Batteries	*No 3Rs Program*
Concrete	*"Concrete 3Rs Program"* *Reduce: None.* *Reuse: None.* *Recycle: Staff will be reminded of the existing program.*
Oil & Grease	*"Oil & Grease 3Rs Program"* *Reduce: None.* *Reuse: None.* *Recycle: Staff will be reminded of the existing program.*
Used Furniture	*"Used Furniture 3Rs Program"* *Reduce: None.* *Reuse: Staff will be reminded of the existing program.* *Recycle: Staff will be reminded of the existing program.*

IV. RESPONSIBILITY FOR IMPLEMENTING THE WASTE REDUCTION WORK PLAN

Identify who is responsible for implementing the Waste Reduction Work Plan at your entity(ies). If more than one person is responsible for implementation, identify each person who is responsible and indicate the part of the Waste Reduction Work Plan that each person is responsible for implementing.

Name of Person	Responsibility	Telephone #
	Cardboard	
	Comingled (PET, HDPE, LDPE, PP, PS, Aluminum, Steel, Glass, Aseptic)	
	Mixed Papers (Fine Paper, newsprint, boxboard, magazines, molded papers, kraft, catalogues, flyers, etc)	
	Confidential Papers	
	Organics	
	Wood Pallets/Scrap Woods	
	Scrap Metals	
	Electronic Wastes	
	Concrete	
	Oil & Grease	
	Used Furniture	
	Garbage Disposal	

.../2

V. TIMETABLE FOR IMPLEMENTING WASTE REDUCTION WORK PLAN

Provide a timetable indicating when each Source Separation and 3Rs program of the Waste Reduction Work Plan will be implemented.

Source Separation and 3Rs Program	Schedule for Completion
Cardboard	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*
Comingled	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*
Mixed Papers	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*
Confidential Papers	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*
Organics	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*
Scrap Wood/ Wood Pallets	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*
Scrap Metals	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*
Electronic Waste	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*
Concrete	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*
Oil & Grease	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*
Used Furniture	*3Rs Program currently in place. Continual improvement to signage and additional promotional campaigns to be considered.*

VI. COMMUNICATION TO STAFF, CUSTOMERS, GUESTS AND VISITORS

Explain how the Waste Reduction Work Plan will be communicated to employees, customers, tenants, guests/visitors and students:
Explain how the Waste Reduction Work Plan will be communicated to employees, customers, tenants, guests/visitors and students. Sustainability committee will review and develop a work plan to be posted on campus for staff and students. Additional promotional campaigns will also be considered to target specific audiences for specific programs. Continue to improve educational materials (hand-outs, flyers) and signage across campus as required.

…/3

VII. ESTIMATED WASTE PRODUCED BY MATERIAL TYPE AND THE PROJECTED AMOUNT

Material Categories *(as stated in Part III)*	**Estimated Annual Waste Produced *** *(tonnes)*	**Name of Proposed 3Rs Program** *(as stated in Part III)*	**Projections to Reduce, Reuse or Recycle Waste** *(tonnes)*			**Estimated Annual Amount to be Diverted **** (%)
			Reduce	**Reuse**	**Recycle**	
PET (#1) plastic food and beverage bottles	54.20	Comingled 3Rs Program			35.23	65%
HDPE (#2) Containers	6.01	Comingled 3Rs Program			3.91	65%
Polypropylene (#5) Containers	67.81	Comingled 3Rs Program			44.08	65%
Polystyrene (#6) Containers	33.15	Comingled 3Rs Program			21.55	65%
Glass food and beverage bottles/jars	83.76	Comingled 3Rs Program			54.44	65%
Aluminum food and beverage cans	11.81	Comingled 3Rs Program			7.68	65%
Steel food and beverage cans	3.44	Comingled 3Rs Program			2.24	65%
Gable Top Containers	16.06	Comingled 3Rs Program			10.44	65%
Aseptic Containers	17.75	Comingled 3Rs Program			11.54	65%
Fine paper	65.49	Mixed Papers & Confidential Paper 3Rs Program			49.12	75%
Newsprint	29.87	Mixed Papers 3Rs Program			19.42	65%
Boxboard shoe boxes, cereal boxes, etc.	41.90	Mixed Papers 3Rs Program			27.24	65%
Glossy magazines, catalogues, flyers	31.05	Mixed Papers 3Rs Program			20.18	65%
Cardboard	105.37	Cardboard 3Rs Program			94.83	90%
Paper towels	124.50	No 3Rs Program				NA

Coffee cups	39.16	No 3Rs Program				NA
Organics / Food Waste	684.59	Organics 3Rs Program			410.76	60%
LDPE (#4) Plastic Film	22.31	Comingled 3Rs Program			14.50	65%
Styrofoam (#6)	3.81	No 3Rs Program				NA
Plastic Strapping	0.00	Comingled 3Rs Program				NA
Scrap Woods/Pallets	75.45	Scrap Woods/Pallets 3Rs Program			75.45	100%
Scrap Metals	73.06	Scrap Metals 3Rs Program			73.06	100%
Electronic Wastes	41.13	Electronic Wastes 3Rs Program			41.13	100%
Bulbs & Ballasts	0.00	No 3Rs Program				NA
Batteries	0.00	No 3Rs Program				NA
Concrete	20.00	No 3Rs Program			20.00	100%
Oil & Grease	27.25	No 3Rs Program			27.25	100%
Used Furniture	4.00	No 3Rs Program			4.00	100%
Other / Non-Recyclable	307.92	No 3Rs Program				NA

* *Estimated Waste Produced = Waste Diverted (3Rs) + Waste Disposed*

** *Estimated Waste Diversion Rate = Amount of Waste Diverted (3Rs) ÷ Estimated Waste Produced x 100%*

I hereby certify that the information provided in this Waste Reduction Work Plan is complete and correct.		
Signature of authorized official:	**Title:**	**Date:**