Waste Characterization Analysis and Opportunity Assessment Report

Missouri State University

November 2021

Missouri State University

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About the Illinois Sustainable Technology Center Technical Assistance Program

The Illinois Sustainable Technology Center's (ISTC) mission is to encourage and assist citizens, businesses and government agencies to prevent pollution, conserve natural resources, and reduce waste to protect human health and the environment in Illinois and beyond. ISTC's applied research lab and technical assistance team work together to advance best practices in pollution prevention, water conservation, energy efficiency, renewable energy and waste reduction.

ISTC's Technical Assistance Program (TAP) makes companies and communities more competitive and resilient with sustainable business practices, technologies, and solutions. TAP works at the intersection of industry, science, and government to help organizations achieve profitable, sustainable results.

TAP's Zero Waste Program aims to reduce or eliminate loss and waste by conducting waste audits, supporting materials management planning and engaging stakeholders.

Questions about this report and project may be directed to: ISTC Zero Waste Program, istc-zerowaste@illinois.edu.

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Executive Summary

Campuswide Waste Characterization Study Results

Based on the 2021 Campuswide Waste Characterization Study at Missouri State University (MSU),

- **Divertable**: Approximately **78%** of materials in the current campus landfill stream can potentially be diverted from landfill.
- **Compostable**: Over **42%** of the campus landfill stream is comprised of compostable material, such as food scraps and paper towels.
- **Recyclable**: Over **25%** of the campus landfill stream is composed of recyclable materials, such as paper and cardboard.
- **Avoidable**: Nearly **8%** of the campus landfill stream on campus consists of avoidable materials, such as paper and plastic disposable beverage cups.
- **Potentially Recyclable**: Over **3%** of the campus landfill stream is made up of potentially recyclable material, such as plastic film and gloves that could be diverted through source-separated streams.
- **Landfill:** The remaining **22%** of the waste stream consists of materials that are currently non-recoverable, i.e. items for which recovery end markets do not yet exist, or for which solutions are not yet available at MSU, such as composite materials.

Potential Campuswide Waste Diversion & Emissions Impact

MSU's FY2019 waste diversion rate is 24.06%. Application of the waste characterization study results to campuswide waste generation, displayed in table FY2019 MSU Generation, results in a Potential Diversion Rate of **83.6%.** Respective tonnage and percentage representation of the FY19 landfill stream is displayed in the Potential Waste Diversion table.

FY2019 MSU Generation

Fate	Tonnage	Percentage
Diverted	595.92	24.06%
Landfilled	1,881.31	75.94%
Total	**2,477.23**	**100.00%**

Potential Waste Diversion Based on Waste Characterization Study Utilizing FY19 Generation

Potential Material Fate	Tonnage	Percentage
FY19 Diverted	595.92	24.06%
Avoidable	149.60	6.04%
Compostable	792.30	31.98%
Landfill	406.36	16.40%
Potentially Recyclable	57.58	2.32%
Recyclable	475.48	19.19%
Total	**2,477.24**	**100.00%**
Potential Waste Diversion Rate		**83.60%**

According to EPA's Waste Reduction Model (WARM), FY19 landfill generation had a greenhouse gas emissions footprint of 581.75 metric tons of carbon dioxide equivalent, or $MTCO_2E$. Information on the emissions impact of waste diversion and reduction on this campuswide landfill stream can be found in section Waste Generation & Diversion Rate Scenarios on pages 16-17.

Waste Characterization Study Introduction

Acknowledging the waste and recycling challenges and opportunities at Missouri State University (MSU), the Green Student Alliance, Student Government Association, and numerous departments partnered to seeks solutions by first sourcing an Integrated Waste Management Plan and Waste Characterization Study from the Zero Waste Unit of the Illinois Sustainable Technology Center (ISTC).

Existing Conditions: ISTC began the project by conducting walkthroughs of facilities and meeting with department stakeholders to learn about current waste management practices and existing conditions. Presently, collection bins of all shapes and sizes can be found on campus. Some are consistent within buildings, some are unique, while other styles are found in buildings across campus. Accompanying signage on public-facing bins varies from abundant to non-existent. Landfill bins are serviced by Custodial Services teams, recycling bins are serviced by Student Service Workers, and Grounds services "on the go"/outdoor landfill bins. Dumpsters range from 95-gallon totes to 40-yard compactors, with 8-yard dumpsters being the most prevalent. Primary recycling efforts consist of paper only totes in academic and administrative buildings, designated corrugated cardboard collection spaces, infrequent "bottles & cans" bins, glass recycling in Residence Halls only, yard waste composting by Grounds, and back-of-house food scrap and vegetable oil recycling by Dining.

Waste Audit Planning: A waste audit is conducted in order to first identify waste composition and key materials streams within the broader landfill and recycling streams on campus and in various spaces, and second, identify opportunities for waste reduction and best practices for management of those landfill and recycling materials generated on campus. Like any large university campus, MSU has significant material generation and complex material flow, with each campus building producing distinctive waste streams at varied volumes, ending up in dedicated or shared dumpsters and compactors.

- **Activity Zones:** To better provide building level generation data to guide change, as well as the ability to extrapolate to campuswide generation, ISTC adopts an "Activity Zone" approach to waste characterization. An Activity Zone is a classification of a building according to its main function and services, while acknowledging there may be other services housed within buildings that differ from its main function. Working together, MSU and ISTC identified 10 activity zones on campus and selected 1 to 3 representative buildings or spaces per Activity Zone to include in the audit. Further, each campus building was classified into an Activity Zone. These 10 Activity Zones include: Academic Buildings, Academic Buildings with Kitchen, Academic Buildings with Labs, Academic Buildings with Studios, Administrative Buildings, Event Spaces, Dining Spaces, Multi-Use Spaces, Residence Halls, and "On the Go" Outdoor Bins. Activity Zone definitions, respective buildings audited and waste composition and tonnage by Activity Zone, are included in the Waste & Recycling Characterization by Activity Zone section beginning on page 17.
- **Material Categories:** Together staff defined over 30 material categories into which waste audit samples would be hand sorted. These were identified based on materials currently accepted by MSU's waste, recycling and organics haulers, specific material streams MSU wanted to explore, and waste audit best practices. A detailed list of these categories can be found in Appendix A.
- **Potential Material Fates:** To fully identify reduction and diversion opportunities, landfill material categories were sorted into five potential fates:
  - Avoidable: Items that can be eliminated from the material stream through policy, procurement, or behavioral change.
  - Recyclable: Items that can be recycled through the existing mixed recycling collection infrastructure and end markets.
  - Compostable: Items that can be recycled through the implementation of composting programs.

- Potentially Recyclable: Items that could be recycled through the introduction of new source-separated recycling programs.
- Landfill: Items that cannot be recycled due to logistical limitations or lack of current end market.

- **Material Fates for Recycling**: Likewise, recycling material categories were sorted into five representative categories:
  - Fiber: Any fiber-based recyclable material, such as corrugated cardboard, office paper, etc.
  - Metal: Any metal-based recyclable material, such as aluminum cans, metal containers, etc.
  - Plastic: Any plastic-based recyclable material, such as plastic beverage bottles, laundry detergent bottles, etc.
  - Glass: Any glass-based recyclable material, such as glass beverage bottles, glass salsa jars, etc.
  - Contamination: Any material not accepted in a recycling category listed above.

Waste Audit: In Fall 2021, ISTC, along with over 40 student, staff and faculty volunteers, completed a waste characterization study of the University's landfill and recycling. Over 10 days, samples were collected from the 18 buildings selected. A total of 4,742 pounds of material was sorted into more than 30 categories. Each material category was weighed, and data recorded. ISTC adheres to the ASTM D5231-92 (2016) Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste.

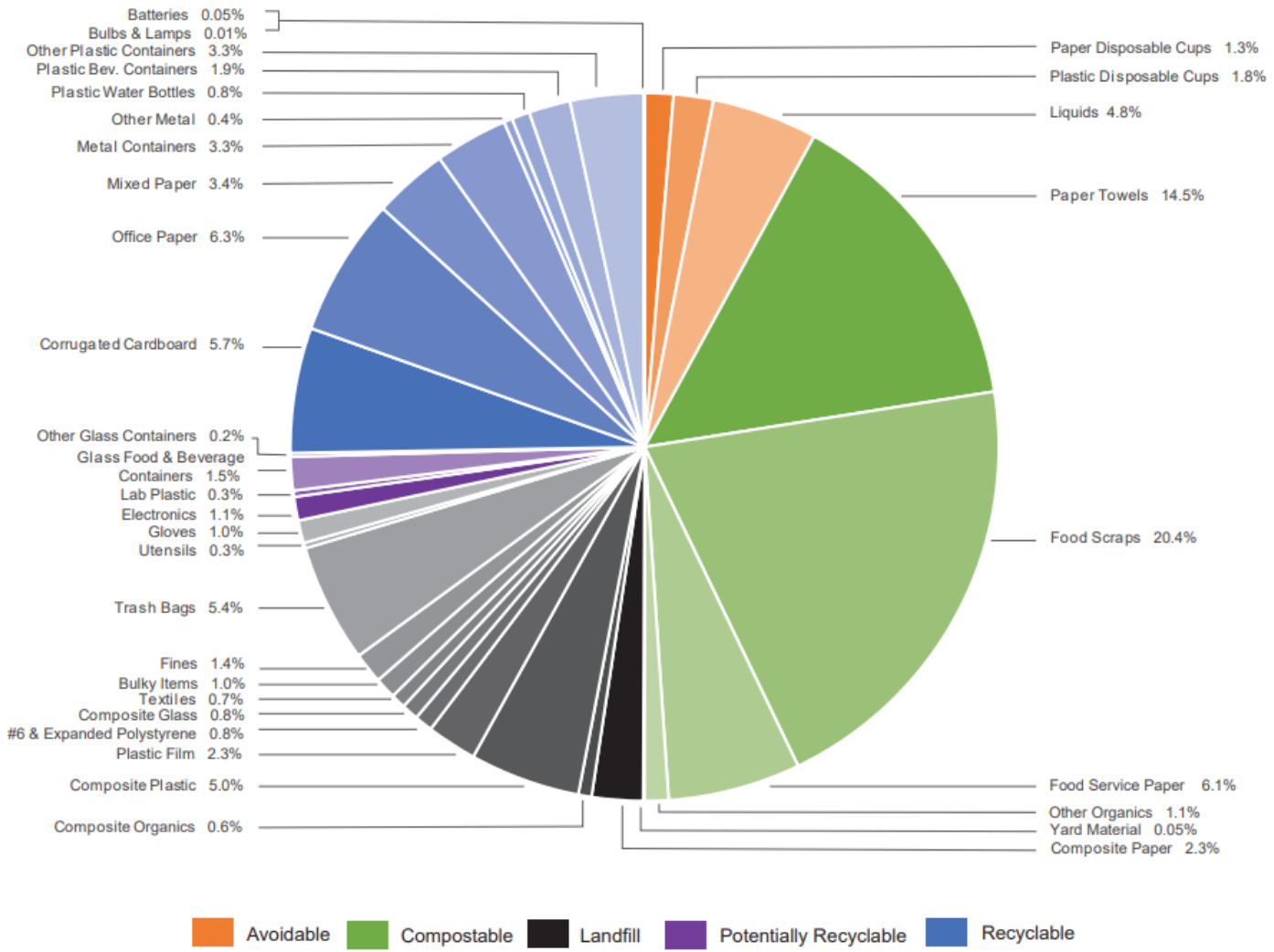
Data Processing: After performing internal QA/QC on field-gathered data, ISTC extrapolated estimated mean weights and percentages of each material within each sample. These extrapolations were then converted to produce estimates of pounds and percentages for each material component sorted. The analysis of each sample composition was normalized by converting the sample data from weight to percentage. Mean compositions for each building type were normalized using square footage and 2019 tonnage data. In some cases, buildings shared dumpsters and compactors, which required tonnage allocation using building square footage.

2019 Waste Generation Data: MSU and ISTC chose to use 2019 waste generation data as baseline data for this project due to potential anomalies in 2020 and 2021 data caused by the COVID-19 pandemic. This baseline data was sourced from both material reporting and material generation estimates relayed by hauling partners and respective department staff, such as Dining and Environmental Health & Safety. In some cases, ISTC estimated tonnage data for residence hall move-in, move-out, and tailgating dumpsters, since actual tonnage was not reported by the hauler for these dumpsters that were sourced, invoiced, and reported on specifically for those events. About 900 tons of reported landfill tonnage is estimated based on dumpster capacity (2-yard, 8-yard, etc.), whereas about 1,000 tons of reported landfill tonnage is actual because MSU is billed for each ton of material processed from compactors (4) and open-top dumpster (about 25). Total tonnage does not include material generated at the Mountain Grove Campus or that reported one-time for Fire Training and Office of Planning and Design as material categorized as Construction and Demolition waste is out of scope.

Waste Characterization Analysis and Opportunity Assessment Report: Data gathered during the 2021 Missouri State University Waste Characterization Study was categorized and analyzed to create the graphs and charts in this report. Additional methods and approach details are briefly described below next to initial charts, graphs and tables. Campuswide results are highlighted first, followed by that of Activity Zones to illustrate the differing distributions of materials found in each. All reported tonnage is for a one-year timeframe.

Next Steps: MSU and ISTC will conduct focus groups to both engage the campus community on waste audit results and source recommendations for the creation of the Solid Waste Management Plan to be delivered Spring 2022.

Campuswide Landfill Waste Composition

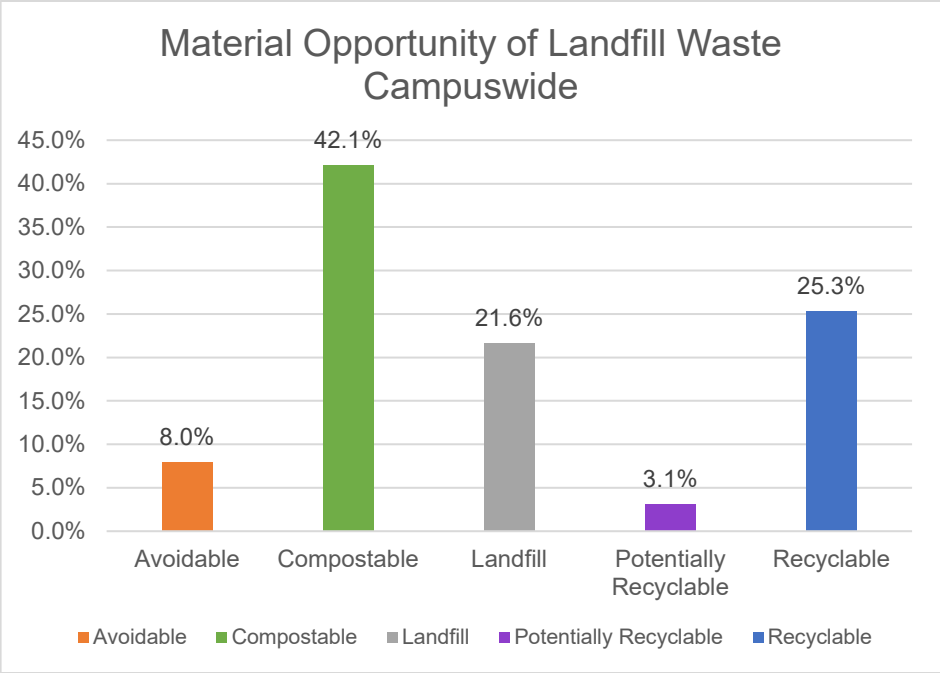


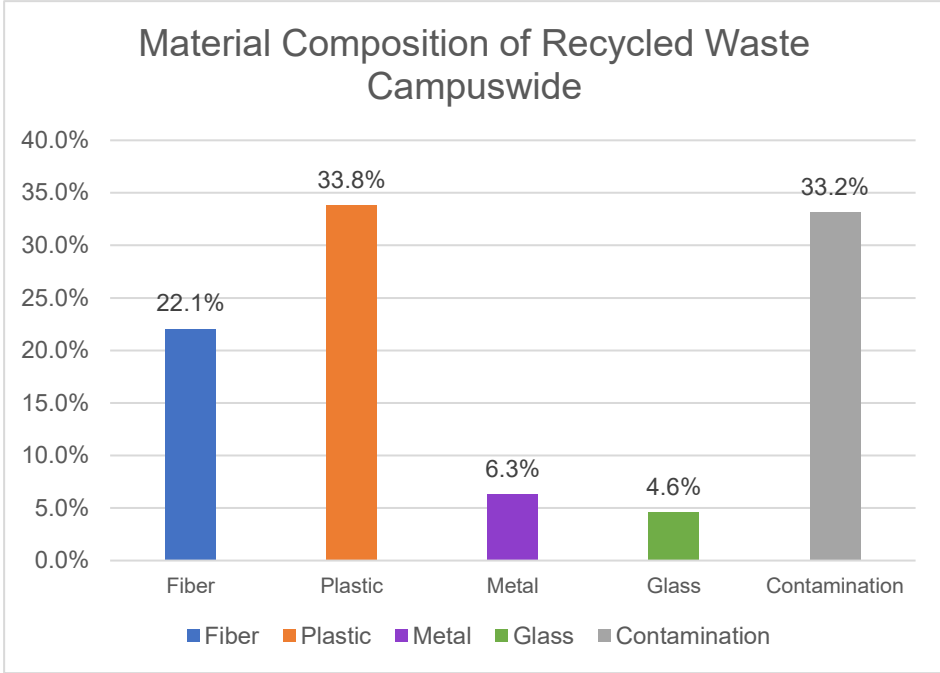
Estimated Landfill Waste Composition Campuswide

Material	Potential Material Fate	Tonnage
Food Scraps	Compostable	383.21
Paper Towels	Compostable	273.59
Office Printer Paper	Recyclable	118.89
Food Service Paper	Compostable	113.85
Corrugated Cardboard	Recyclable	107.57
Trash Bags	Landfill	101.89
Composite Plastic	Landfill	94.80
Liquids	Avoidable	90.79
Mixed Paper	Recyclable	64.07
Metals & Aluminum	Recyclable	62.80
Other Plastic Containers	Recyclable	62.55
Composite Paper	Landfill	43.86
Plastic Film	Landfill	42.98
Plastic Beverage Containers	Recyclable	35.74
Plastic Disposable Cups	Avoidable	34.24
Glass Food & Bev. Containers	Potentially Recyclable	28.76
Fines	Landfill	26.38
Paper Disposable Cups	Avoidable	24.58
Other Organics	Compostable	20.75
Non- Regulated Electronics	Potentially Recyclable	20.32
Gloves	Landfill	19.51
Bulky Items	Landfill	18.29
#6 & Expanded Poly	Landfill	15.56
Plastic Water Bottles	Recyclable	15.53
Composite Glass	Landfill	14.45
Textiles	Landfill	12.55
Composite Organics	Landfill	11.37
Other Metal	Recyclable	7.30
Lab Plastic	Potentially Recyclable	5.31
Utensils	Landfill	4.72
Other Glass Containers	Potentially Recyclable	3.18
Yard Material	Compostable	0.90
Batteries	Recyclable	0.85
Bulbs/ Lamps	Recyclable	0.18
Total		**1,881.31**

Estimated Landfill Waste Composition Tables: Throughout this report Estimated Landfill Waste Composition Tables display the potential material fate (color-coded opportune destination) and tonnage (number) of the waste stream in respective spaces based on the Waste Audit and 2019 Campuswide Waste Generation data. The estimated qualifier is utilized because the tonnage reporting Republic Services provides MSU are estimates for 1,000 tons of the waste generated.

Campuswide Waste Distribution





Campuswide Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	149.60
Compostable	792.30
Landfill	406.35
Potentially Recyclable	57.58
Recyclable	475.48
Total	**1,881.31**

Material Opportunity of Landfill Waste and Estimated Landfill Tonnage: Throughout this report Material Opportunity of Landfill Waste bar graphs display the potential material fate (color-coded, opportune destination) and representation (percent of total) of the waste stream in respective spaces based on the Waste Audit. The paired Estimated Landfill Tonnage table represents the tonnage associated with the graph.

Material Composition of Recycled Waste: Throughout this report Material Composition of Recycled Waste bar graphs display the composition (color-coded, recycling material category) and representation (percent of total) of the recycled waste of respective spaces based on the Waste Audit.

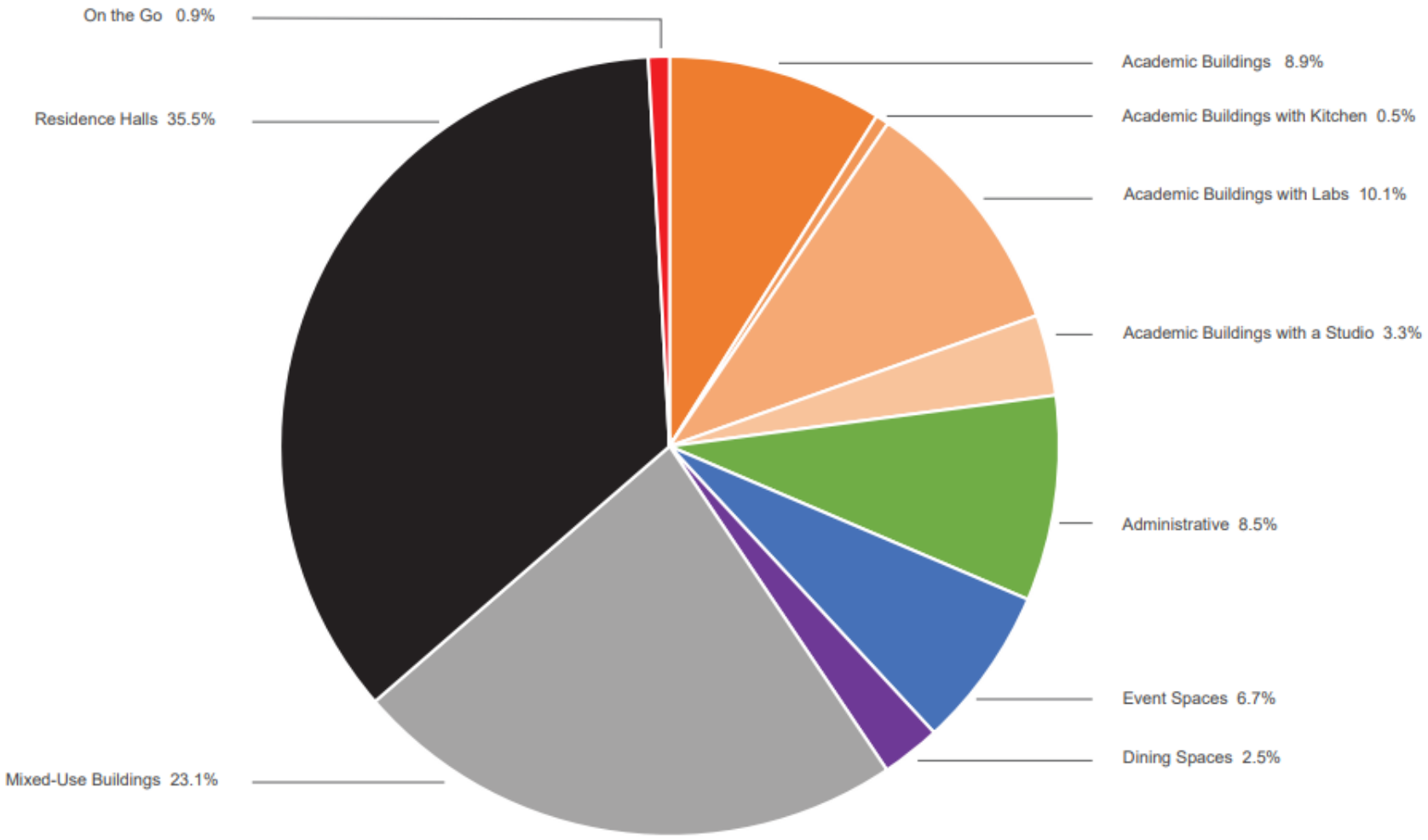
Campuswide Landfill Generation by Activity Zone

Activity Zone	Tons of Landfill Generation	Percentage
Residence Halls	667.53	35.5%
Mixed-Use Spaces	433.85	23.1%
Academic with Labs	189.85	10.1%
Academic Buildings	167.90	8.9%
Administrative Buildings	160.22	8.5%
Event Spaces	126.05	6.7%
Academic with Studios	62.94	3.3%
Dining Spaces	46.30	2.5%
On the Go / Outdoor	16.40	0.9%
Academic with Kitchen	10.25	0.5%
Total	***1,881.31**	**100.0%**

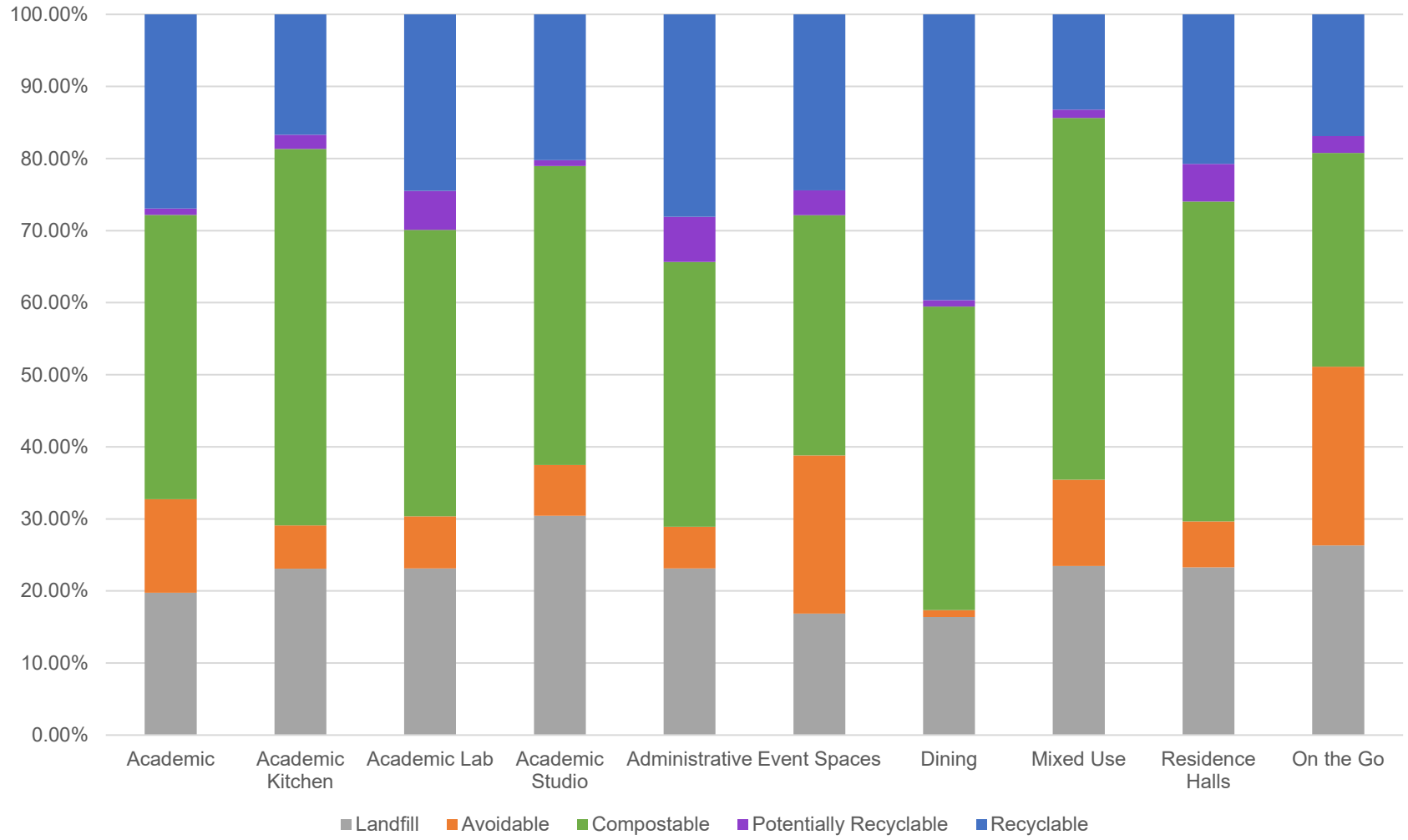
The Campuswide Landfill Generation by Activity Zone table (above) and chart (below) breakdown the tonnage and percentage of campuswide landfill generation for each respective Activity Zone. In the table Activity Zones are ranked, highest to lowest generator, whereas in the chart they are listed alphabetically. These representations are based on 2019 Campuswide Waste Generation data, and further, allocation of tonnage based on dedicated and shared dumpsters. This information could help MSU prioritize efforts and engagement at the Activity Zones with the highest generation, as these spaces offer greater waste reduction and diversion impact.

***Rounding Differences**: Throughout this report there are minor difference between the Total tonnage presented and the total one would yield if adding up the fields. These hundredth differences are due to rounding. For example, in the table presented above the Total tonnage is 1,881.31. If adding the column, one will yield 1,881.29.

Campuswide Landfill Generation by Activity Zone

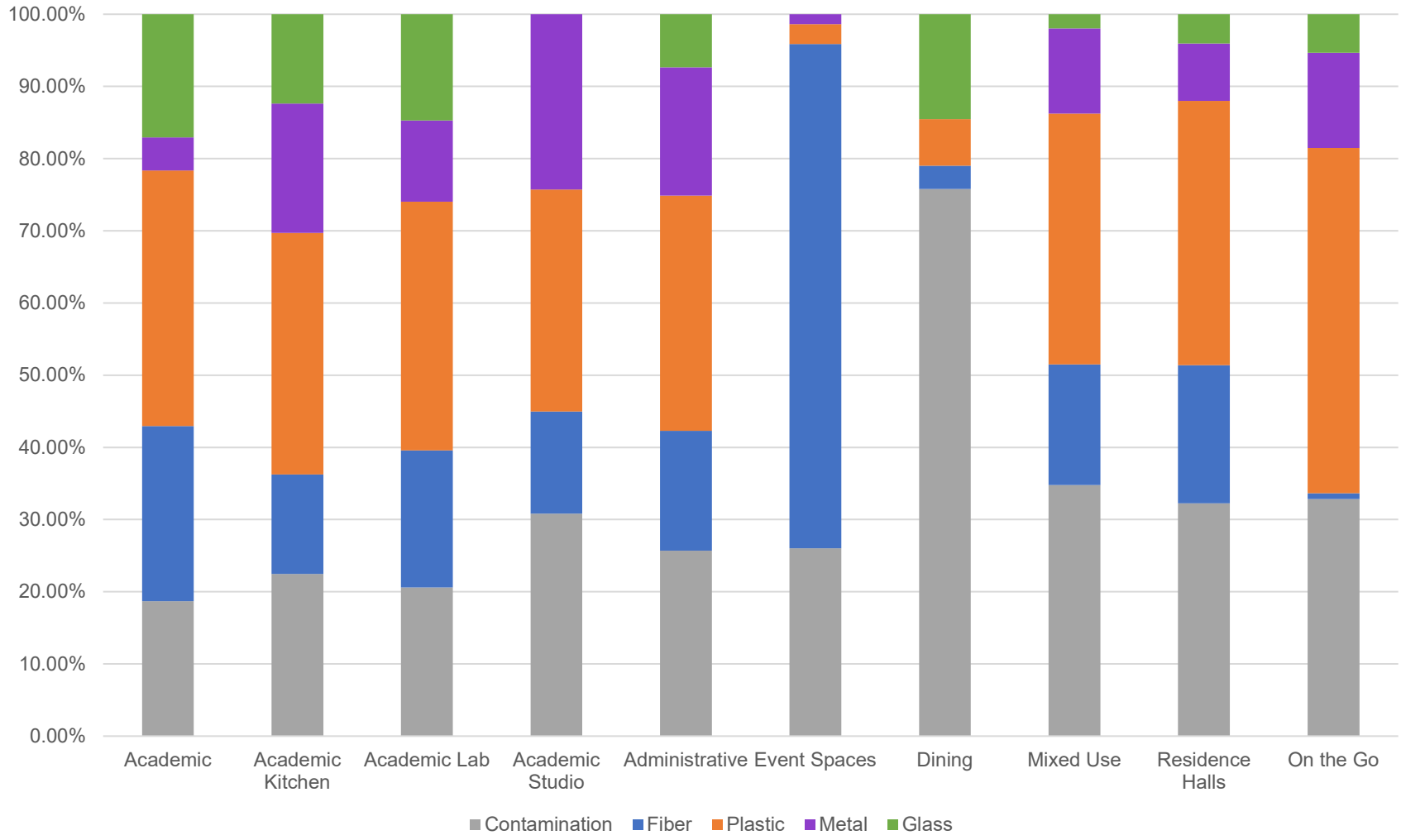


Campuswide Potential Material Fates for Landfill Waste by Activity Zone



This chart represents the percentages of potential material fates for the landfill waste analyzed by Activity Zone. Detailed results for each Activity Zone can be found beginning on page 17 of this report.

Campuswide Material Composition for Recycled Waste by Activity Zone



This chart represents the percentages of material categories found within waste destined for recycling by Activity Zone. Detailed results for each Activity Zone can be found beginning on page 17 of this report.

Estimated Potential Material Fate Tonnage of Landfill by Building

Organized by Activity Zones, analysis presents the Potential Material Fate of Landfilled Waste at the building level.

Activity Zone	Avoidable (Tons)	Compostable (Tons)	Recyclable (Tons)	Potentially Recyclable (Tons)	Total Landfill Generation (Tons)
Academic Buildings					
Cheek Hall	5.06	15.42	10.52	0.35	39.07
Ellis Hall	1.50	4.57	3.12	0.10	11.58
Glass Hall	4.74	14.44	9.85	0.33	36.60
Hill Hall	1.97	6.01	4.10	0.14	15.23
King Street Annex	0.95	2.90	1.98	0.07	7.34
Sicelluf Hall	3.71	11.30	7.71	0.25	28.65
Strong Hall	3.82	11.62	7.92	0.26	29.44
Academic Buildings with Kitchen					
Pummill Hall	0.62	5.36	1.71	0.20	10.25
Academic Buildings with Labs					
Karls Hall	0.81	4.47	2.75	0.61	11.24
Kemper Hall	4.74	26.04	16.05	3.54	65.52
McQueary	0.81	4.48	2.76	0.61	11.26
O'Reilly	1.08	5.95	3.67	0.81	14.97
Professional Building	3.39	18.62	11.48	2.53	46.86
Temple Hall	2.89	15.90	9.80	2.16	40.00
Academic Buildings with Studios					
Brick City 1	1.19	7.01	3.42	0.14	16.90
Brick City 3 & 4	0.83	4.85	2.37	0.09	11.70
Brick City 5	0.07	0.38	0.19	0.01	0.92
Craig Hall	1.49	8.73	4.26	0.17	21.05
Wehr Band Hall	0.87	5.13	2.50	0.1	12.37
Administrative Buildings					
Alumni Center	2.19	13.95	10.66	2.38	37.95
Art Annex	0.28	1.76	1.34	0.30	4.79
Burgess House	0.09	0.60	0.46	0.10	1.64
Carrington Hall	1.54	9.77	7.46	1.66	26.57
Clay Hall	0.04	0.28	0.21	0.05	0.75

Estimated Potential Material Fate Tonnage of Landfill by Building, Continued

Activity Zone	Avoidable (Tons)	Compostable (Tons)	Recyclable (Tons)	Potentially Recyclable (Tons)	Total Landfill Generation (Tons)
Administrative Buildings, Continued					
Jim D. Morris Center	1.60	10.17	7.77	1.73	27.66
Police Officer's Substation	0.07	0.47	0.36	0.08	1.28
Power Plant	0.25	1.57	1.20	0.27	4.27
Central Stores & Maintenance	2.84	18.09	13.82	3.08	49.21
Transit Operations Facility	0.06	0.39	0.30	0.07	1.07
University Hall	0.29	1.85	1.41	0.31	5.02
Dining Spaces					
Blair-Shannon Dining	0.34	15.02	14.13	0.32	35.65
Garst Dining	0.10	4.49	4.22	0.09	10.65
Event Spaces					
Hammons Hall Performing Arts	1.08	1.64	1.20	0.17	4.92
JQH Arena	22.58	34.34	25.14	3.56	103.00
Plaster Stadium East Grandstand	3.98	6.05	4.43	0.63	18.14
Mixed Use					
Baker Book Store	2.78	11.62	3.06	0.26	23.15
Bill R. Foster Recreation Center	0.79	3.29	0.87	0.07	6.55
Bond Learning Center	1.57	6.59	1.74	0.15	13.13
Duane Meyer Library	7.87	32.94	8.67	0.74	65.62
Forsythe Athletic Center	1.33	5.59	1.47	0.13	11.13
Hammons Student Center	0.85	3.55	0.93	0.08	7.07
Jordan Valley Innovation Center	3.15	13.17	3.47	0.30	26.24
Magers Health & Wellness Center	5.09	21.32	5.61	0.48	42.47
McDonald Arena	3.69	15.43	4.06	0.35	30.74
Plaster Stadium	9.44	39.53	10.41	0.89	78.74
Plaster Student Union	11.63	48.67	12.82	1.10	96.96
Robert W. Plaster Center Free Enterprise	3.15	13.17	3.47	0.30	26.24
The Welcome Center	0.70	2.92	0.77	0.07	5.82

Estimated Potential Material Fate Tonnage of Landfill by Building, Continued

Activity Zone	Avoidable (Tons)	Compostable (Tons)	Recyclable (Tons)	Potentially Recyclable (Tons)	Total Landfill Generation (Tons)
Residence Halls					
Blair House	3.85	26.76	12.50	3.15	60.28
Freudenberger Hall	8.95	62.20	29.04	7.33	140.09
Hammons House	4.55	31.65	14.78	3.73	71.28
Hutchens House	4.58	31.82	14.86	3.75	71.67
Kentwood Hall	2.53	17.56	8.20	2.07	39.55
Scholars House	0.96	6.64	3.10	0.78	14.96
Shannon House	3.38	23.48	10.96	2.77	52.89
Sunvilla Tower	4.22	29.32	13.69	3.45	66.05
The Monroe	1.84	12.76	5.96	1.50	28.74
Wells House	3.43	23.80	11.11	2.80	53.61
Woods House	4.37	30.38	14.19	3.58	68.43
On the Go					
Grounds	4.07	4.87	2.77	0.38	16.40

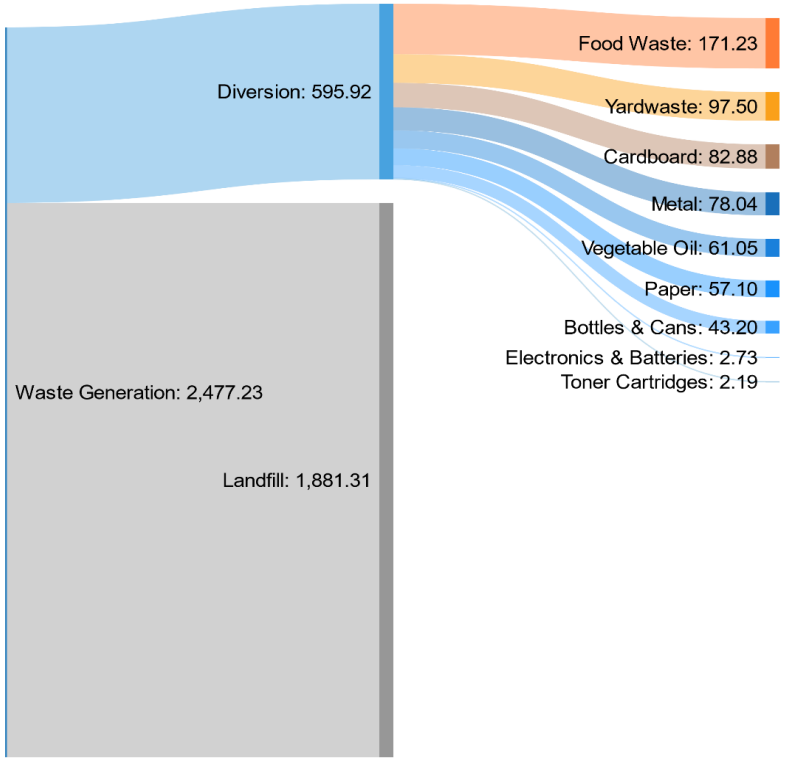
Waste Generation & Diversion Rate Scenarios

In 2019, a total of 2,477.23 tons of waste was generated at Missouri State University. Of that, 1,881.31 tons of waste, or 75.94%, was landfilled and 595.92 tons of waste[1], or 24.06%, was diverted from the landfill by recycling or composting processes. This means, **Missouri State University had a 24.1% Diversion Rate in 2019**.

An entity's diversion rate represents the percentage of solid waste channeled away from (or diverted) from the landfill. This waste is instead eliminated from the landfill stream through source reduction, reuse, recycling, or composting. To calculate a Diversion Rate, one adds up the total of each waste stream diverted from the landfill – in this case we have food waste, yard waste, cardboard, etc. One would then add up the total weight of all waste generated within scope (i.e. primary campus only, no C&D) at an entity – typically this is the landfill total plus each of the streams diverted from the landfill. The total weight of waste streams diverted is then divided by the total weight of all waste streams generated. This percentage represents the waste diverted from landfill, or the Diversion Rate.

$$\text{Diversion Rate} = \frac{\text{Total Tonnage Waste Diverted}}{\text{Total Tonnage Waste Generated}} \times 100$$

2019 Campuswide Waste Generation in Tons



Entities of all types and sizes use Diversion Rate as a solid waste key performance indicator. This metric is often used as a baseline when first calculated. After initial calculation, it is utilized to support waste diversion goal setting, to track waste diversion progress, and to compare oneself to peers or within an industry. This metric is often paired with per-capita waste generation, which better tracks progress in waste reduction and reuse, key components of the mantra, "Reduce, Reuse and Recycle."

[1] Diverted tonnage is assumed to be under-estimated as Residence Life's glass recycling efforts are not represented. In residence halls, glass is collected and stored separately, enabling recycling. Residence Life staff transport collected glass to a Springfield recycling drop-off site. Tonnage and/or volume estimates of this waste are unknown.

Waste Generation & Diversion Rate Scenarios

The following table correlates the additional tonnage MSU would need to either divert from landfill, reduce from landfill or both divert and reduce, in order to achieve listed diversion rates. **These numbers should be kept in mind when reviewing tonnage generation, acknowledging material stream composition and considering opportunities to improve.**

Diversion Rate Scenarios Based on 2019 Material Generation Baseline

Projection	Diversion Rate (%)	Diversion Increase (tons)	Landfill Reduction (tons)	Waste Generation			Landfill Generation Reduction Impact		
				Diversion (tons)	Landfill (tons)	Total (tons)	GHG Emissions* (MTCO2E)	Collection Volume^ (cy)	8-Yard Dumpsters Serviced Weekly+
2019 Baseline	**24.06%**	**0**	**0**	**595.92**	**1,881.31**	**2,477.23**	**581.75**	**-**	**-**
Diversion from Landfill	25.0%	24	0	619.92	1,857.31	2,477.23	(7.43)	-	-
	30.0%	148	0	743.92	1,733.31	2,477.23	(45.77)	-	-
	35.0%	271	0	866.92	1,610.31	2,477.23	(83.80)	-	-
	40.0%	395	0	990.92	1,486.31	2,477.23	(122.15)	-	-
Reduction of Landfill	25.0%	0	94	595.92	1,787.31	2,383.23	(29.07)	752	1.81
	30.0%	0	491	595.92	1,390.31	1,986.23	(151.83)	3,928	9.44
	35.0%	0	775	595.92	1,106.31	1,702.23	(239.65)	6,200	14.90
	40.0%	0	988	595.92	893.31	1,489.23	(305.52)	7,904	19.00
Landfill Diversion and Reduction	25.0%	19	19	614.92	1,843.31	2,458.23	(11.75)	152	0.37
	30.0%	113	113	708.92	1,655.31	2,364.23	(69.89)	904	2.17
	35.0%	201	201	796.92	1,479.31	2,276.23	(124.31)	1,608	3.87
	40.0%	282	282	877.92	1,317.31	2,195.23	(174.41)	2,256	5.42

* EPA's Waste Reduction Model (WARM) tool was utilized to calculate the Greenhouse Gas (GHG) Emissions Footprint reduction of the Landfill Reduction from baseline. This material is categorized on the tool as Mixed Municipal Solid Waste (MSW). The resulting emissions footprint is measured and reported in metric tons of carbon dioxide equivalent ($MTCO_2E$). https://www.epa.gov/warm

^ EPA's Volume-to-Weight Conversion Factors were utilized to calculate the Collection Volume equivalent of the Landfill Reduction, utilizing report categorization of Mixed MSW - Residential, Institutional, Commercial at 250 pounds per cubic yard of Uncompacted waste. https://www.epa.gov/sites/default/files/2016-04/documents/volume_to_weight_conversion_factors_memorandum_04192016_508fnl.pdf

+ This field calculates the Collection Volume equivalent of weekly service of 8-yard dumpsters (52 weeks in a year). This can be viewed in terms of dumpster quantity or service reduction. On MSU's campus 8-yard dumpsters are the most common size.

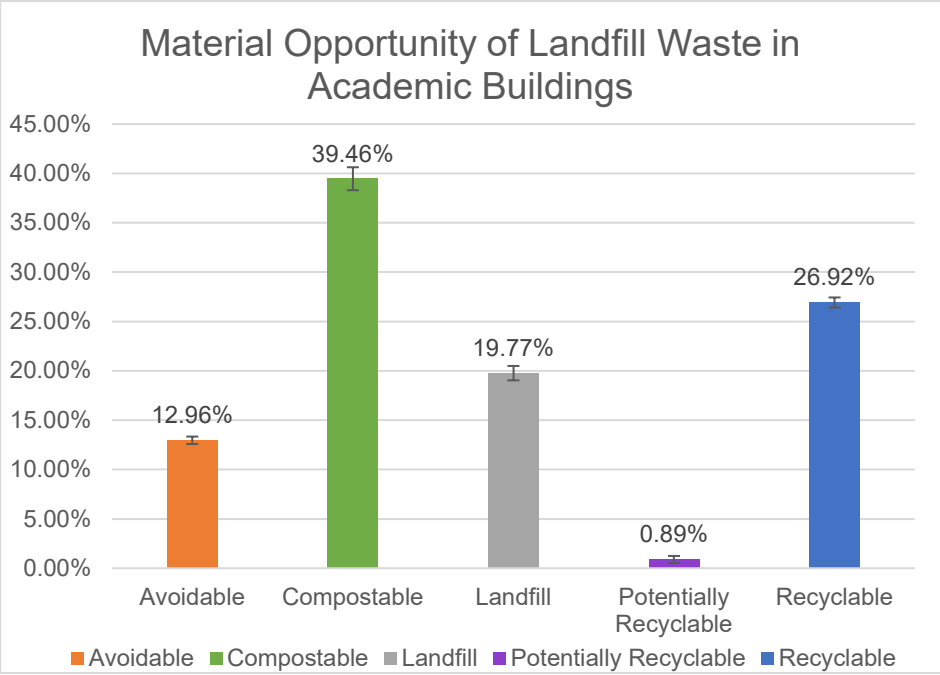
Waste & Recycling Characterization by Activity Zone

Academic Buildings

Description: Buildings that primarily serve as spaces for student classrooms and instruction. These buildings also may have offices, conference rooms, lounges, and computer labs.

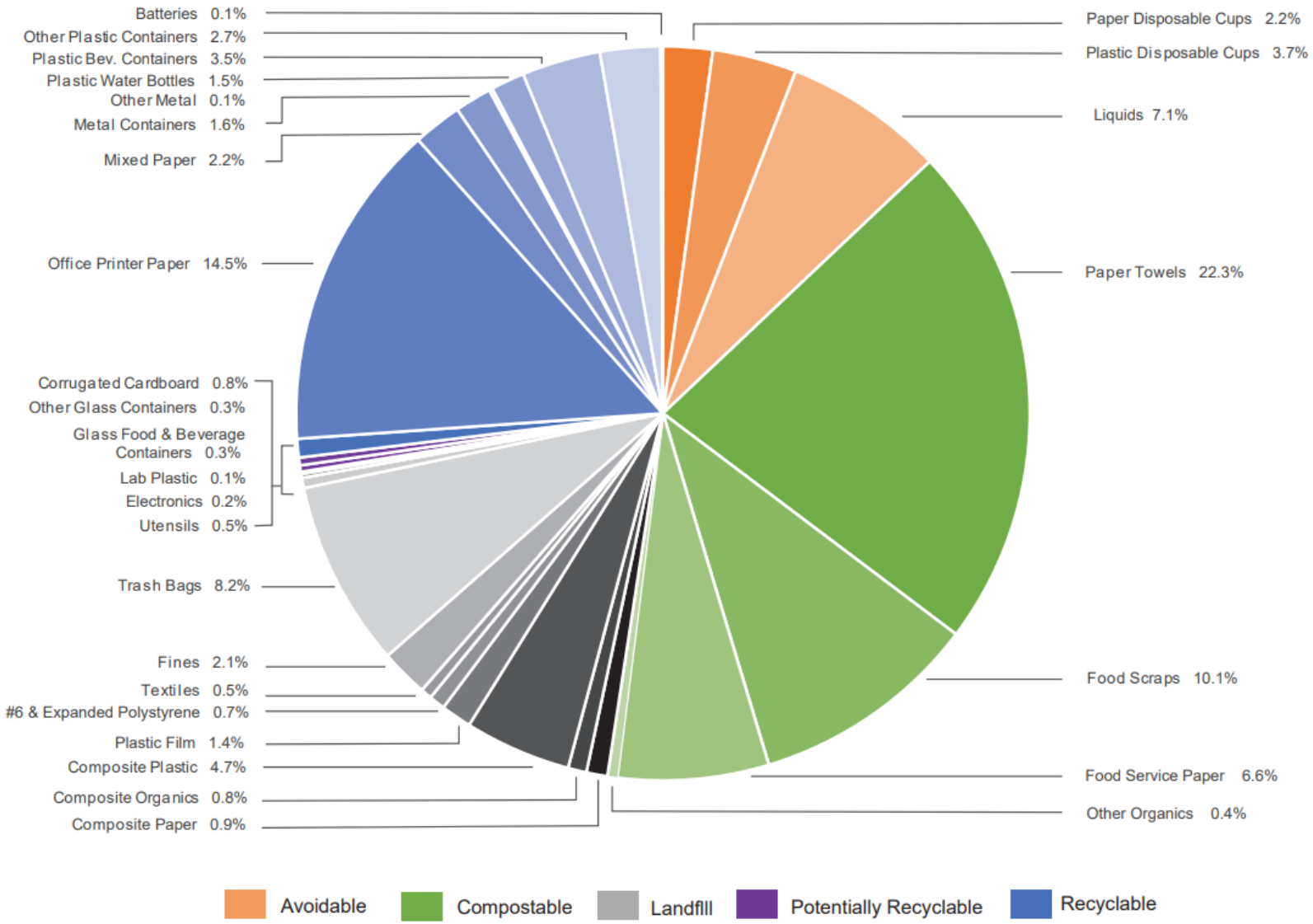
Buildings Audited: Cheek Hall, Glass Hall and Strong Hall.

What is in the Waste?
According to the 2021 MSU waste characterization study, over **80% (134.7 tons)** of materials in the landfill waste stream for academic buildings can potentially be diverted into other channels. The top five materials contributing to the overall amount of landfill waste generated in academic buildings include: paper towels (**22.3% or 37.4 tons**), office printer paper (**14.5% or 24.3 tons**), food scraps (**10.1% or 16.9 tons**), trash bags (**8.2% or 13.8 tons**), and liquids (**7.1% or 11.9 tons**). Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream.



Academic Buildings Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	21.76
Compostable	66.26
Landfill	33.19
Potentially Recyclable	1.49
Recyclable	45.20
Total	**167.90**

Composition of Landfill Waste from Academic Buildings



Estimated Landfill Waste Composition in Academic Buildings Campuswide

Material	Potential Material Fate	Tonnage
Paper Towels	Compostable	37.46
Office Printer Paper	Recyclable	24.31
Food Scraps	Compostable	16.91
Trash Bags	Landfill	13.79
Liquids	Avoidable	11.87
Food Service Paper	Compostable	11.16
Composite Plastic	Landfill	7.89
Plastic Disposable Cups	Avoidable	6.24
Plastic Beverage Containers	Recyclable	5.82
Other Plastic Containers	Recyclable	4.46
Paper Disposable Cups	Avoidable	3.66
Mixed Paper	Recyclable	3.61
Fines	Landfill	3.53
Metals & Aluminum	Recyclable	2.72
Plastic Water Bottles	Recyclable	2.49
Plastic Film	Landfill	2.27
Composite Paper	Landfill	1.56
Corrugated Cardboard	Recyclable	1.38
Composite Organics	Landfill	1.37
#6 & Expanded Poly	Landfill	1.19
Textiles	Landfill	0.83
Utensils	Landfill	0.76
Other Organics	Compostable	0.73
Other Glass Containers	Potentially Recyclable	0.57
Glass Food & Bev Containers	Potentially Recyclable	0.47
Non-Regulated Electronics	Potentially Recyclable	0.29
Other Metal	Recyclable	0.24
Batteries	Recyclable	0.17
Lab Plastic	Potentially Recyclable	0.15
		167.90

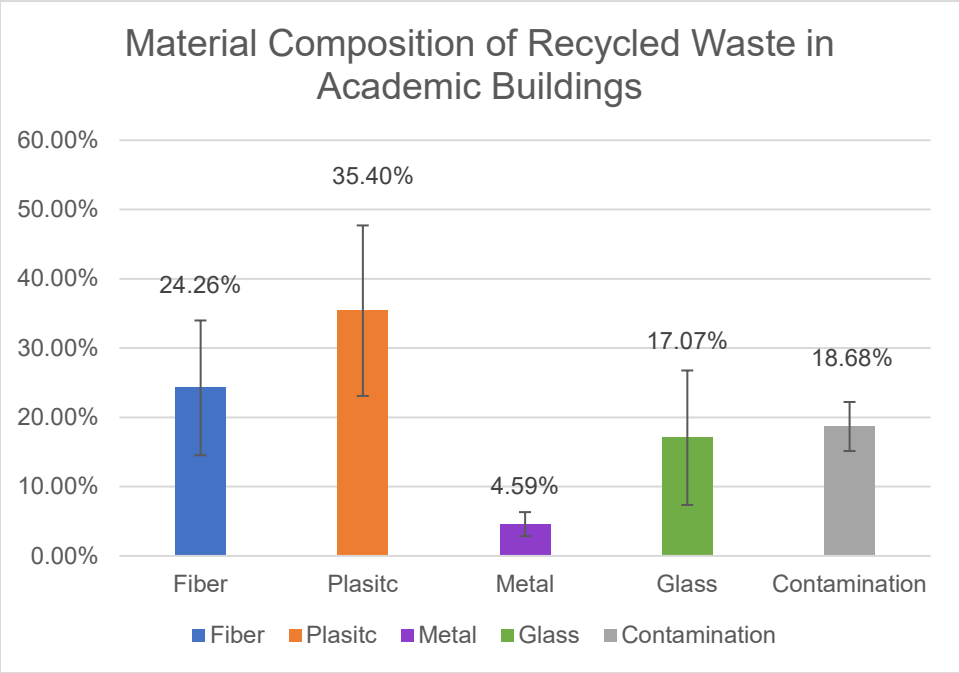
Estimated Landfill Waste Composition Tables: Throughout this report Estimated Landfill Waste Composition Tables display the potential material fate (color-coded opportune destination) and tonnage (number) of the waste stream in respective spaces based on the Waste Audit and 2019 Campus Waste Generation data. The estimated qualifier is utilized because over half of the tonnage reporting Republic Services provides MSU are estimates. In this example, total tonnage generated by Academic Buildings was calculated by adding generation at dedicated dumpsters and at shared dumpsters, where allocation was based on building square footage. Waste audit material composition results from 3 Academic Buildings was then applied to total annual tonnage waste generation to represent the composition of landfill waste at academic buildings across campus.

Any unlisted materials were not found in the sample summarized.

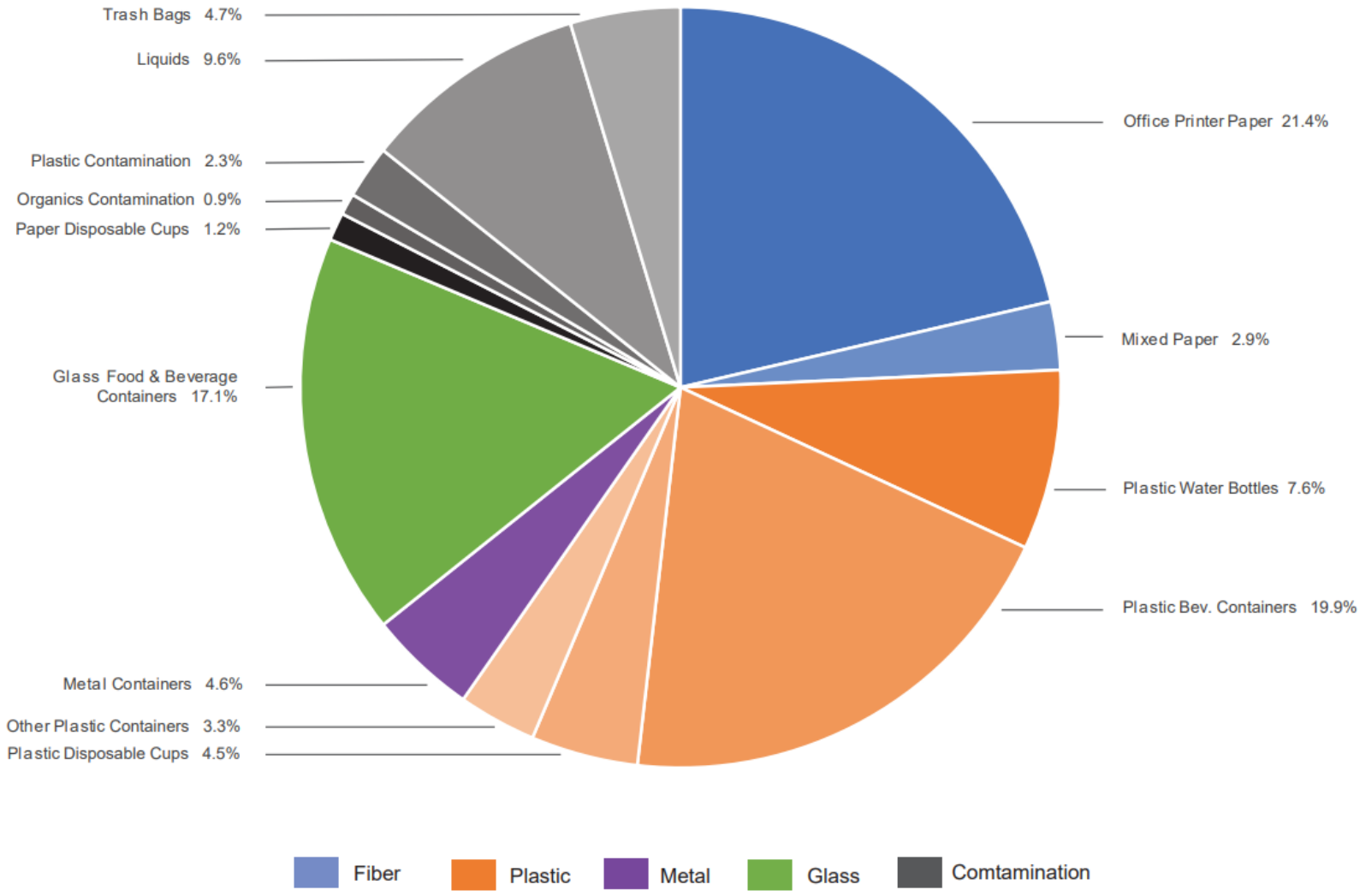
Academic Buildings

What is in the Recycling?

In the recycling waste stream from academic buildings **64.25%** of material was currently accepted recyclables. Aside from correctly recycled materials, **18.7%** of the recycling waste stream from academic buildings consists of materials considered to be mixed contamination and **17%** was glass contamination. Top materials contributing to the overall amount of contamination within the recycling stream for academic buildings include: liquids (**9.6%**), trash bags (**4.7%**), plastic contamination (**2.3%**), and paper disposable cups (**1.2%**).



Composition of Recycled Waste from Academic Buildings

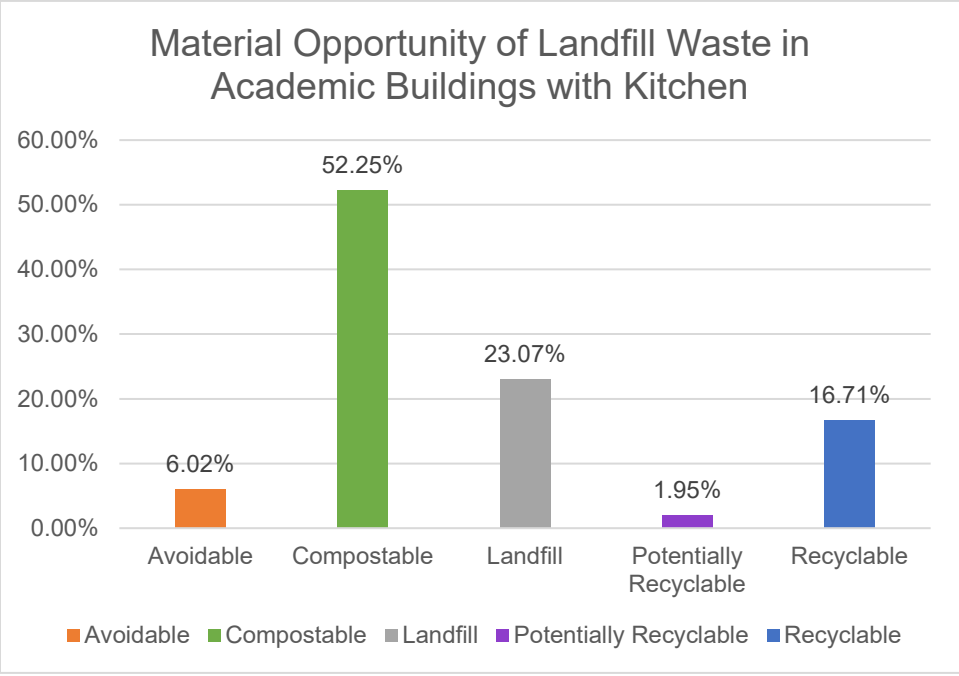


Academic Buildings with Kitchen

Description: Buildings that primarily serve as spaces for student classrooms and instruction and have kitchen where instruction, cooking and food preparation take place.

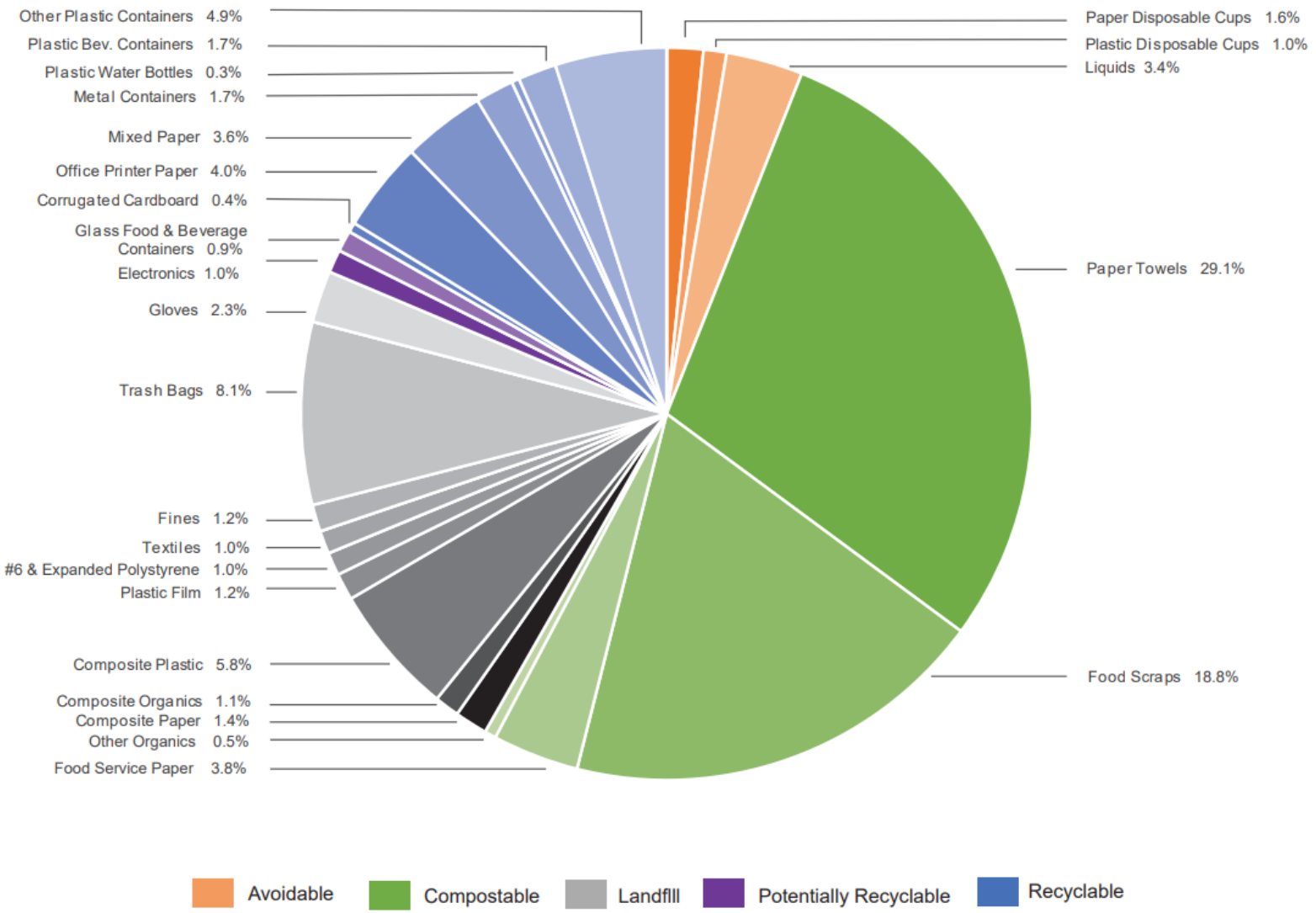
Buildings Audited: Pummill Hall

What is in the Waste?
Almost **77% (7.88 tons)** of materials in the landfill waste stream for academic buildings with kitchen can potentially be diverted. The top five materials contributing to the overall amount of landfill waste generated in academic buildings with kitchen include: paper towels (**29.1% or 2.9 tons**), food scraps (**18.8% or 1.9 tons**), trash bags (**8.1% or 0.8 tons**), composite plastics (**5.8% or 0.6 tons**) and other plastic containers (**4.9% or 0.5 tons**). Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream except trash bags and composite plastics.



Academic Buildings with Kitchen Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	0.62
Compostable	5.35
Landfill	2.36
Potentially Recyclable	0.20
Recyclable	1.71
Total	**10.25**

Composition of Landfill Waste from Academic Buildings with a Kitchen



Estimated Landfill Waste Composition in Academic Buildings with Kitchen

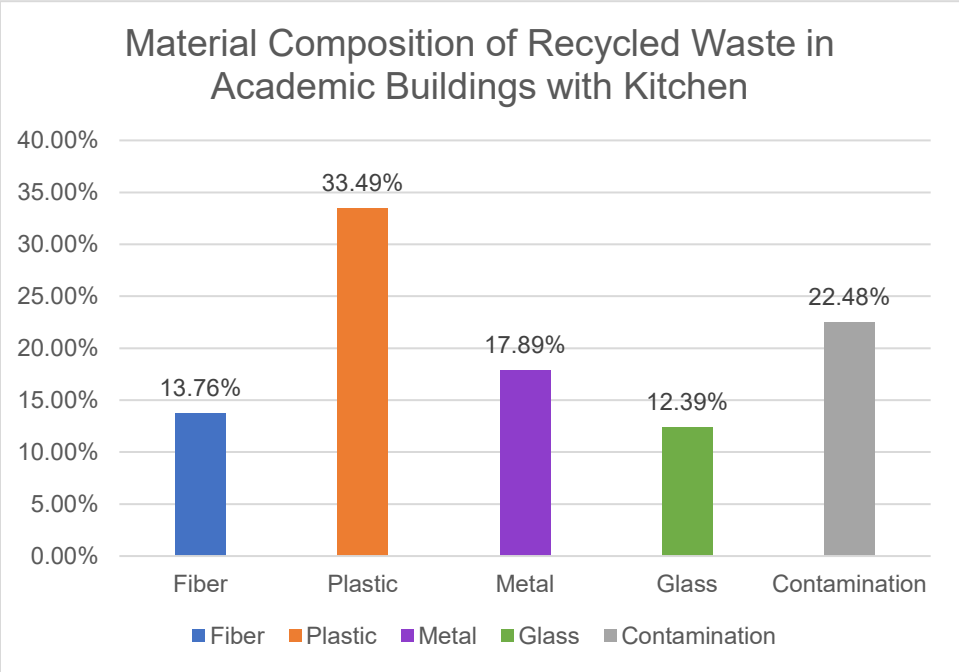
Material	Potential Material Fate	Tonnage
Paper Towels	Compostable	2.98
Food Scraps	Compostable	1.93
Trash Bags	Landfill	0.83
Composite Plastic	Landfill	0.59
Other Plastic Containers	Recyclable	0.50
Office Printer Paper	Recyclable	0.41
Food Service Paper	Compostable	0.39
Mixed Paper	Recyclable	0.37
Liquids	Avoidable	0.35
Gloves	Landfill	0.23
Plastic Beverage Containers	Recyclable	0.17
Metals & Aluminum	Recyclable	0.17
Paper Disposable Cups	Avoidable	0.17
Composite Paper	Landfill	0.15
Plastic Film	Landfill	0.12
Fines	Landfill	0.12
Composite Organics	Landfill	0.11
Textiles	Landfill	0.10
#6 & Expanded Poly	Landfill	0.10
Non- Regulated Electronics	Potentially Recyclable	0.10
Plastic Disposable Cups	Avoidable	0.10
Glass Food & Bev Containers	Potentially Recyclable	0.10
Other Organics	Compostable	0.05
Corrugated Cardboard	Recyclable	0.04
Plastic Water Bottles	Recyclable	0.03
		10.25

Any unlisted materials were not found in the sample summarized.

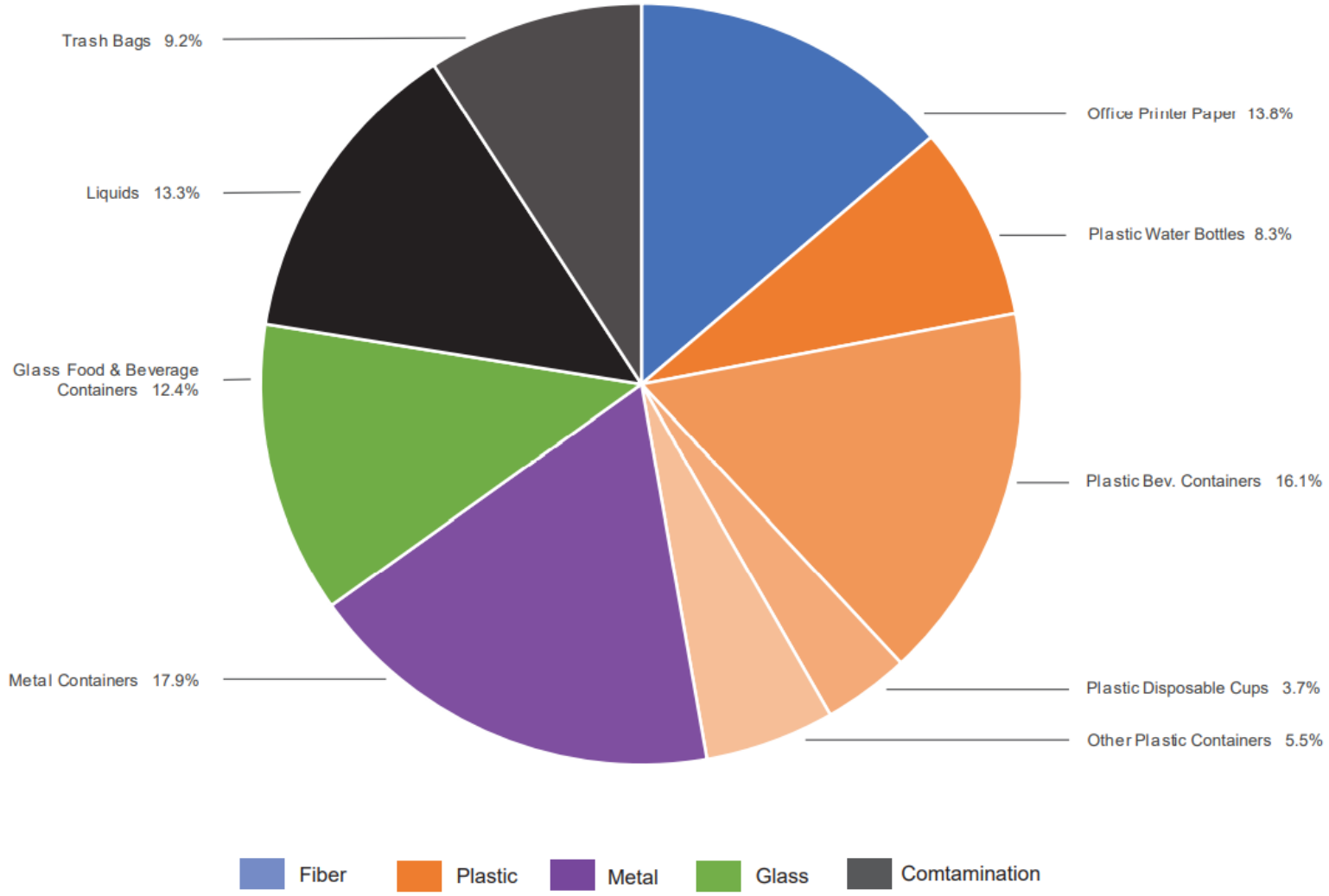
Academic Buildings with Kitchen

What is in the Recycling?

In the recycling waste stream from academic buildings with kitchen, **65.13%** of material was currently accepted recyclables**.** Aside from correctly recycled materials, **22.5%** of the recycling waste stream from academic buildings with kitchen consists of materials considered to be mixed contamination and **12.39%** was glass contamination. Top materials contributing to the overall amount of contamination within the recycling stream for academic buildings with kitchen include: liquids (**13.3%**) and trash bags (**9.2%**).



Composition of Recycled Waste from Academic Buildings with Kitchen

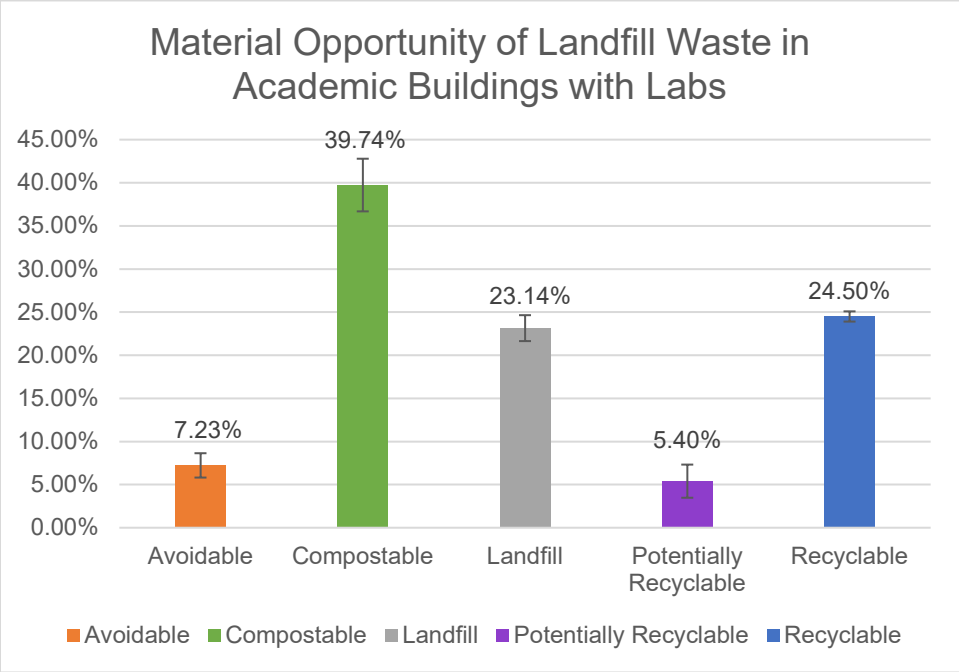


Academic Buildings with Labs

Description: These buildings house research and/or instructional laboratories. They may also house laboratories, offices, conference rooms, and lounges.

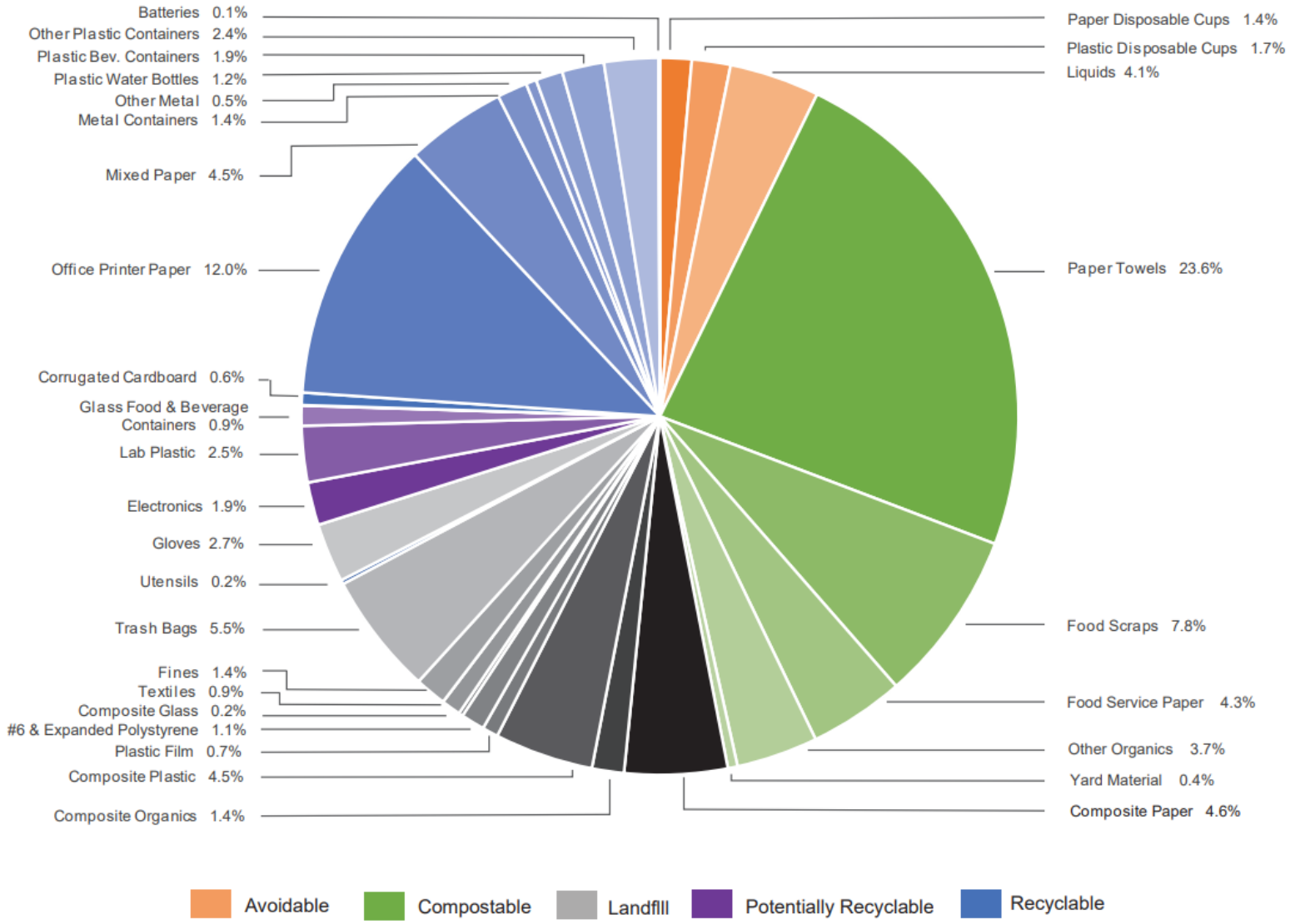
Buildings Audited: Professional Building, Karl Hall and Temple Hall.

What is in the Waste?
Nearly **77% (145.9 tons)** of materials in the landfill waste stream for academic buildings with labs can potentially be diverted into other channels. The top five materials contributing to the overall amount of landfill waste generated in academic buildings with labs include: paper towels (**23.6% or 44.7 tons**), office printer paper (**12.0% or 22.7 tons**), food scraps (**7.8% or 14.7 tons**), trash bags (**5.5% or 10.4 tons**), and composite paper (**4.6% or 8.8 tons)**. Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream with the exception of composite paper.



Academic Buildings with Labs Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	13.72
Compostable	75.44
Landfill	43.94
Potentially Recyclable	10.25
Recyclable	46.50
Total	**189.85**

Composition of Landfill Waste from Academic Buildings with Labs



Estimated Landfill Waste Composition in Academic Buildings with Labs Campuswide

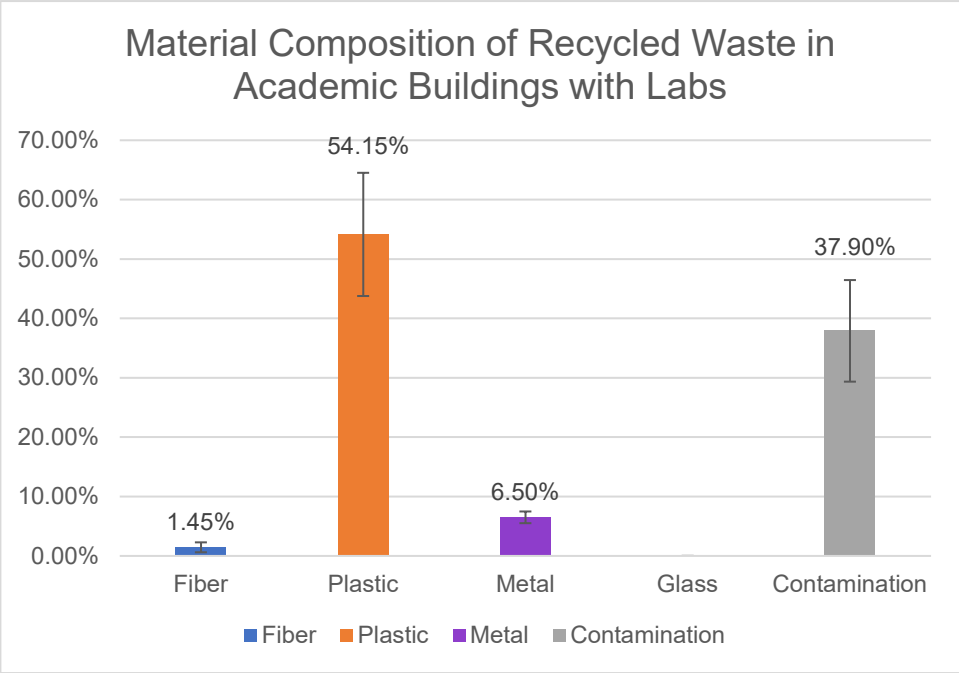
Material	Potential Material Fate	Tonnage
Paper Towels	Compostable	44.73
Office Printer Paper	Recyclable	22.70
Food Scraps	Compostable	14.74
Trash Bags	Landfill	10.44
Composite Paper	Landfill	8.81
Mixed Paper	Recyclable	8.61
Composite Plastic	Landfill	8.46
Food Service Paper	Compostable	8.16
Liquids	Avoidable	7.71
Other Organics	Compostable	6.98
Gloves	Landfill	5.05
Lab Plastic	Potentially Recyclable	4.81
Other Plastic Containers	Recyclable	4.64
Non- Regulated Electronics	Potentially Recyclable	3.68
Plastic Beverage Containers	Recyclable	3.60
Plastic Disposable Cups	Avoidable	3.31
Composite Organics	Landfill	2.74
Paper Disposable Cups	Avoidable	2.70
Fines	Landfill	2.68
Metals & Aluminum	Recyclable	2.57
Plastic Water Bottles	Recyclable	2.31
#6 & Expanded Poly	Landfill	2.03
Glass Food & Bev Containers	Potentially Recyclable	1.72
Textiles	Landfill	1.66
Plastic Film	Landfill	1.36
Corrugated Cardboard	Recyclable	1.06
Other Metal	Recyclable	0.90
Yard Material	Compostable	0.83
Composite Glass	Landfill	0.36
Utensils	Landfill	0.35
Batteries	Recyclable	0.12
Other Glass Containers	Potentially Recyclable	0.04
		189.85

Any unlisted materials were not found in the sample summarized.

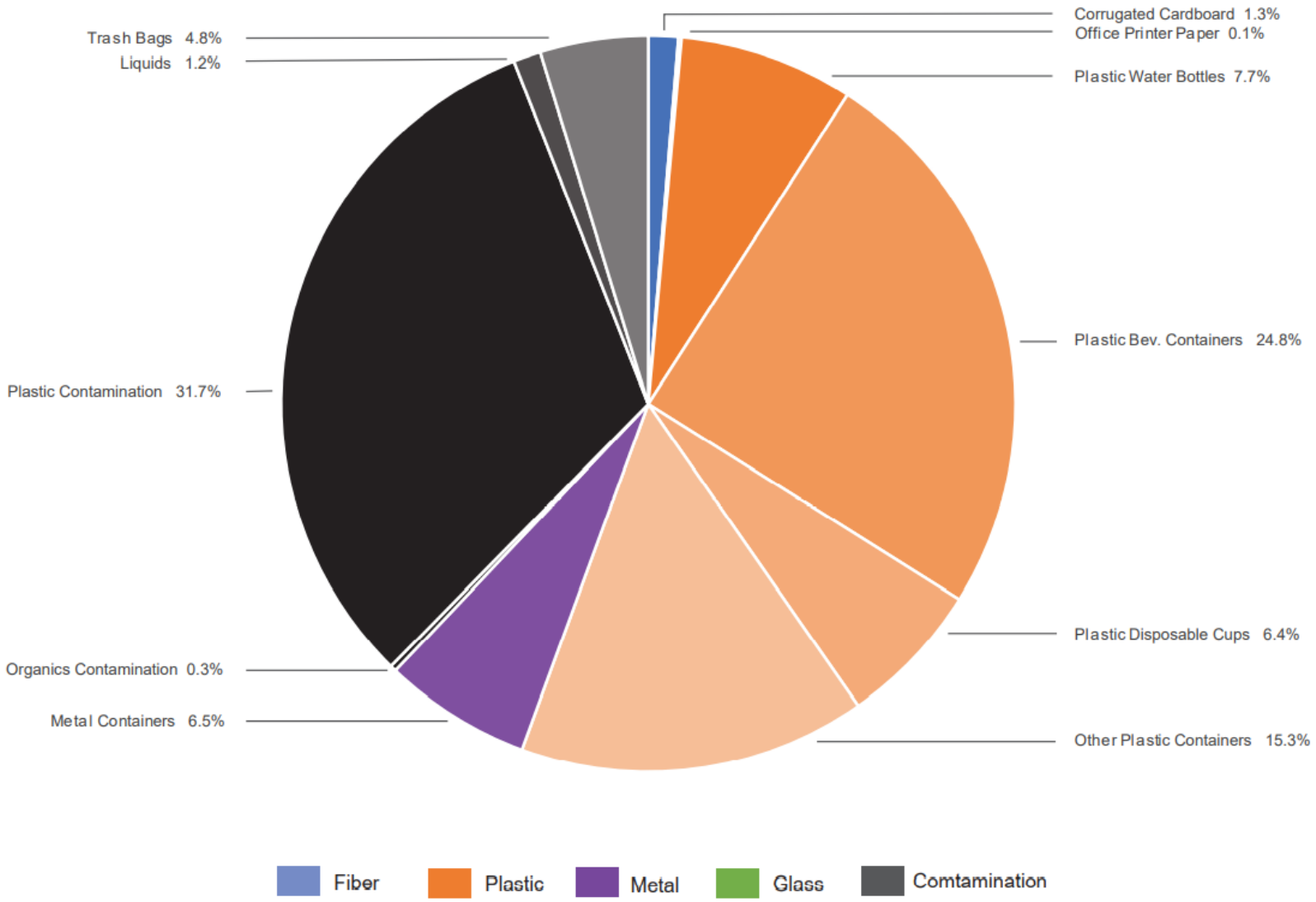
Academic Buildings with Labs

What is in the Recycling?

In the recycling waste stream from academic buildings with labs, **62.1%** of material was currently accepted recyclables. Aside from correctly recycled materials, **37.9%** of the recycling waste stream from academic buildings with labs consists of materials considered to be mixed contamination. Top materials contributing to the overall amount of contamination within the recycling stream for academic buildings with labs include: plastic contamination (**31.7%**), trash bags (**4.8%**), and liquids (**1.2%**).



Composition of Recycled Waste from Academic Buildings with Labs

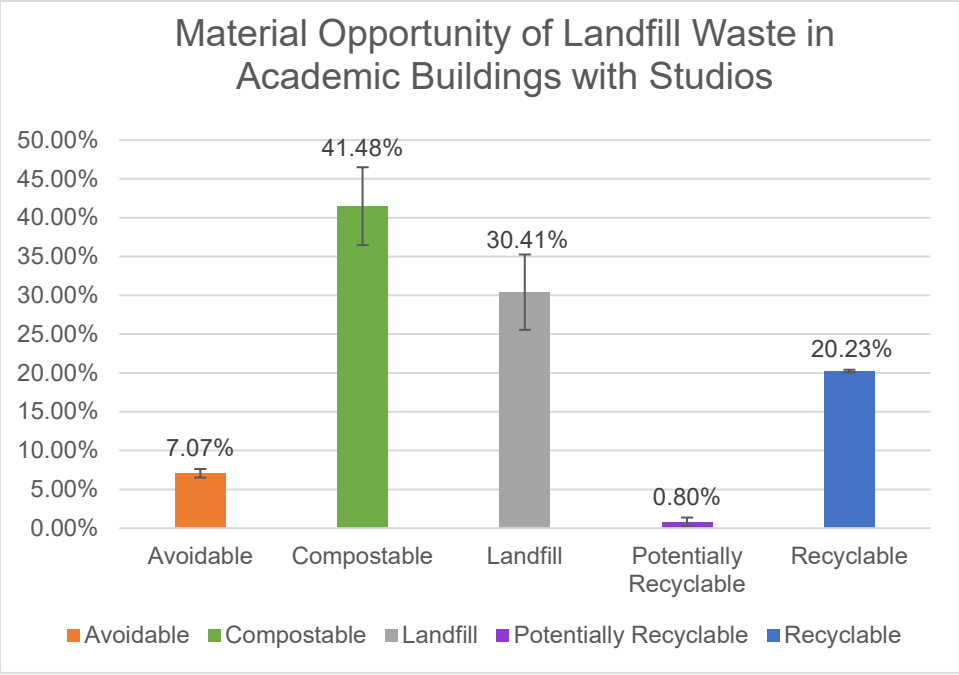


Academic Buildings with Studios

Description: These buildings house artistic studios and/or creative development spaces. They may also house classrooms, offices, conference rooms, and lounges.

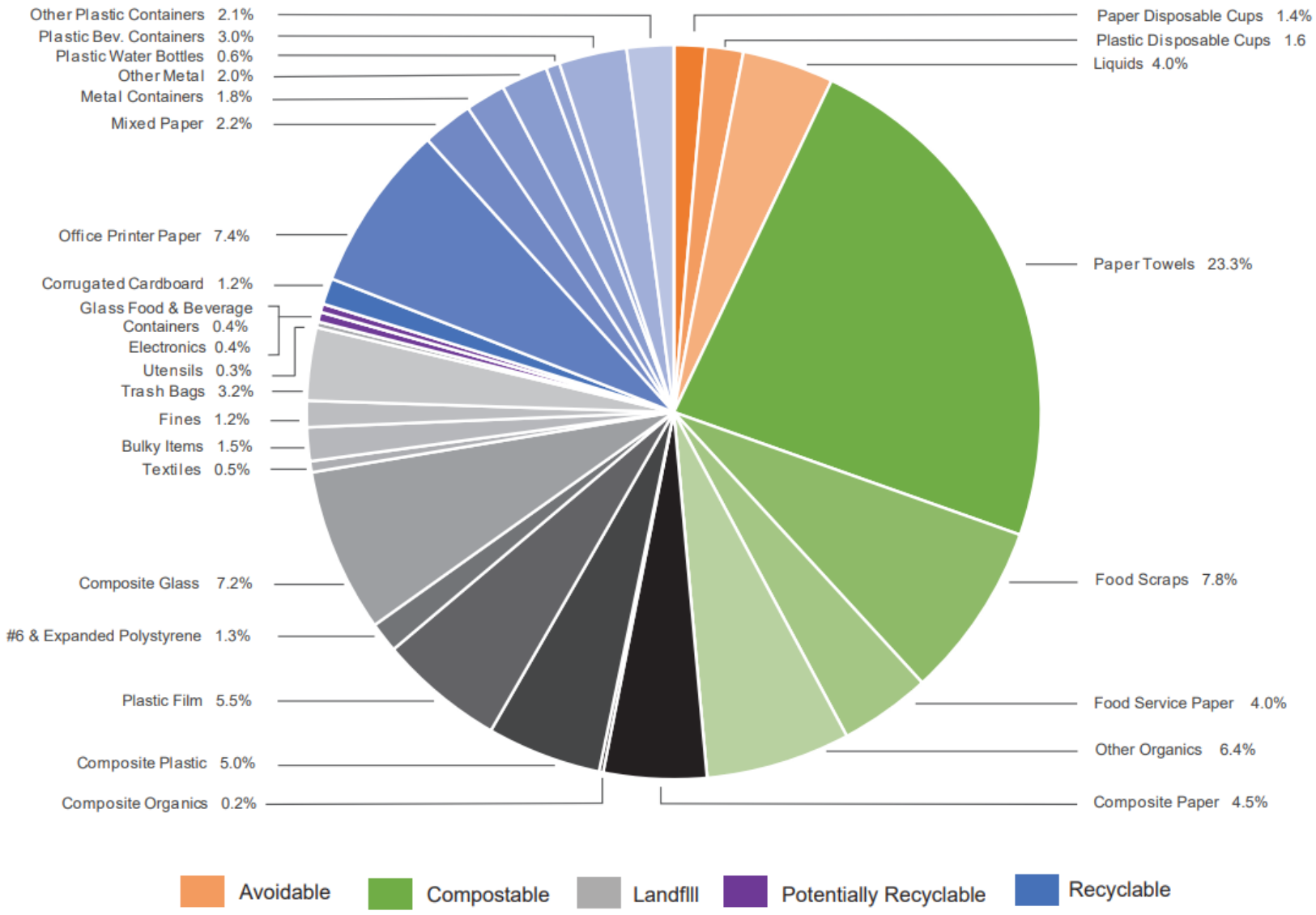
Buildings Audited: Brick City 1 and Craig Hall.

What is in the Waste?
Almost **70% (43.8 tons)** of materials in the landfill waste stream for academic buildings with studios can potentially be diverted into other channels. The top five materials contributing to the overall amount of landfill waste generated in academic buildings with studios include: paper towels (**23.3% or 14.7 tons**), food scraps (**7.8% or 4.9 tons**), office printer paper (**7.4% or 4.7 tons**), composite glass (**7.2% or 4.5 tons**), and other organics (**6.4% or 4.0 tons**). Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream with the exception of composite glass.



Academic Buildings with Studios Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	4.45
Compostable	26.11
Landfill	19.14
Potentially Recyclable	0.50
Recyclable	12.73
Total	**62.94**

Composition of Landfill Waste from Academic Buildings with Studio



Estimated Landfill Waste Composition in Academic Buildings with Studios Campuswide

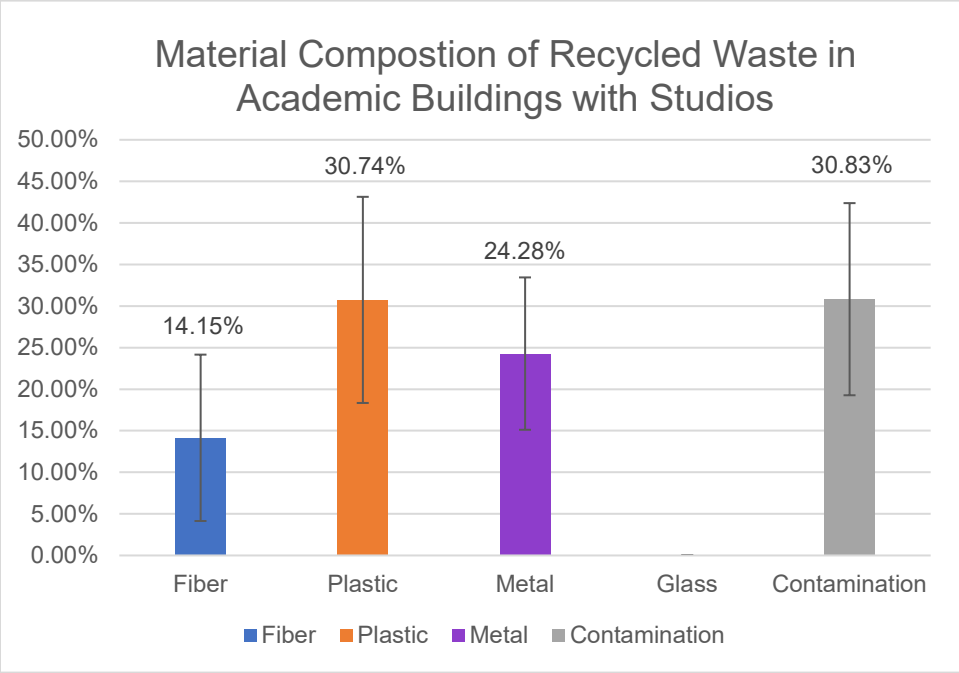
Material	Potential Material Fate	Tonnage
Paper Towels	Compostable	14.70
Food Scraps	Compostable	4.88
Office Printer Paper	Recyclable	4.65
Composite Glass	Landfill	4.54
Other Organics	Compostable	4.00
Plastic Film	Landfill	3.48
Composite Plastic	Landfill	3.17
Composite Paper	Landfill	2.85
Liquids	Avoidable	2.54
Food Service Paper	Compostable	2.53
Trash Bags	Landfill	2.02
Plastic Beverage Containers	Recyclable	1.88
Mixed Paper	Recyclable	1.41
Other Plastic Containers	Recyclable	1.30
Other Metal	Recyclable	1.29
Metals & Aluminum	Recyclable	1.11
Plastic Disposable Cups	Avoidable	1.04
Bulky Items	Landfill	0.93
Paper Disposable Cups	Avoidable	0.88
#6 & Expanded Poly	Landfill	0.84
Fines	Landfill	0.73
Corrugated Cardboard	Recyclable	0.72
Plastic Water Bottles	Recyclable	0.38
Textiles	Landfill	0.30
Non- Regulated Electronics	Potentially Recyclable	0.27
Glass Food & Bev Containers	Potentially Recyclable	0.23
Utensils	Landfill	0.16
Composite Organics	Landfill	0.11
		62.94

Any unlisted materials were not found in the sample summarized.

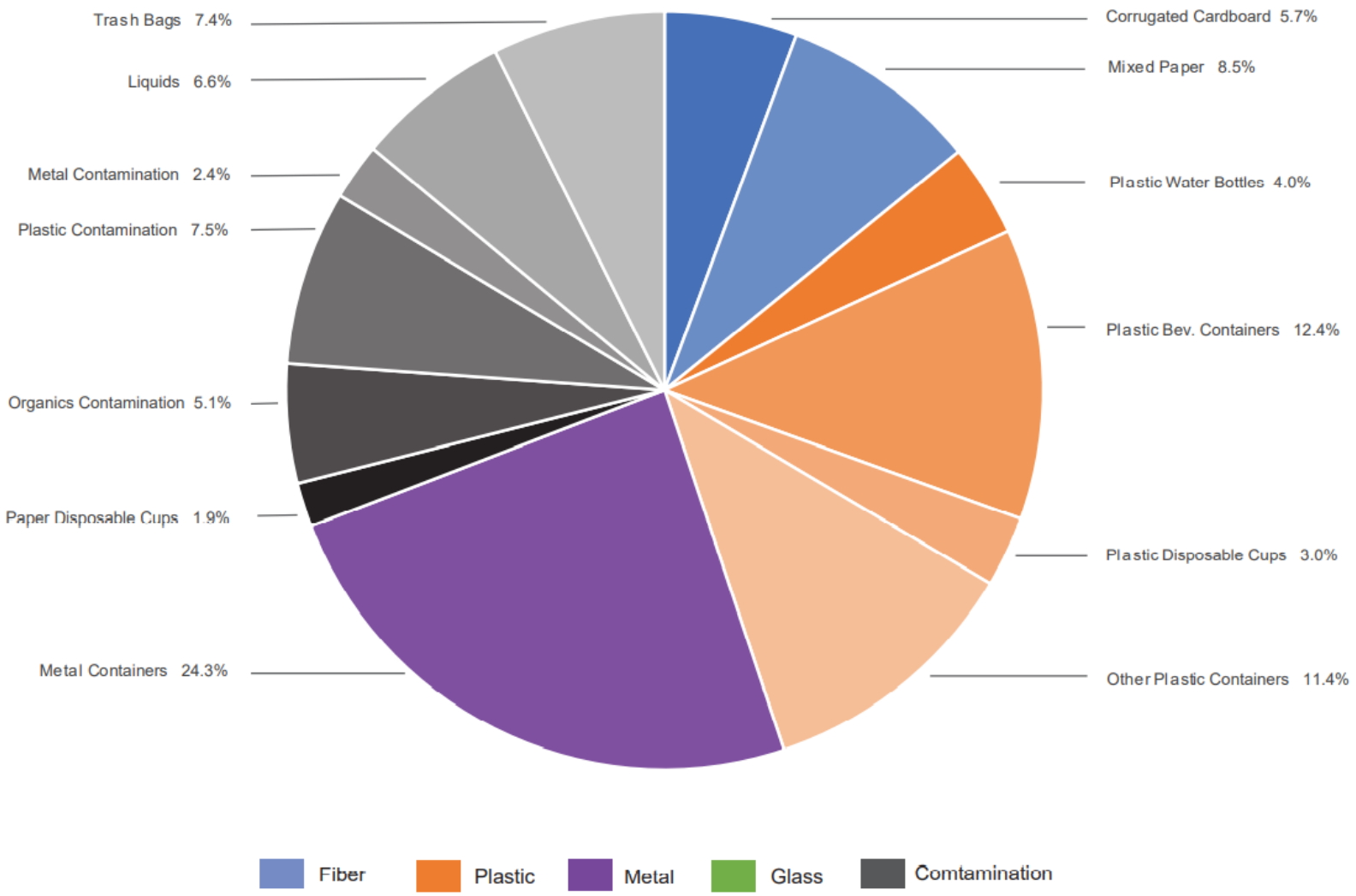
Academic Buildings with Studios

What is in the Recycling?

In the recycling waste stream from academic buildings with studios **64.25%** of material was accepted recyclables. Aside from correctly recycled materials, **30.83%** of the recycling waste stream from academic buildings with studios consists of materials considered to be mixed contamination. Top materials contributing to the overall amount of contamination within the recycling stream for academic buildings with studios include: trash bags (**7.4%**), plastic contamination (**7.5%**), liquids (**6.6%**), metal contamination (**2.4%**), and paper disposable cups (**1.9%**).



Composition of Recycled Waste from Academic Buildings with Studios

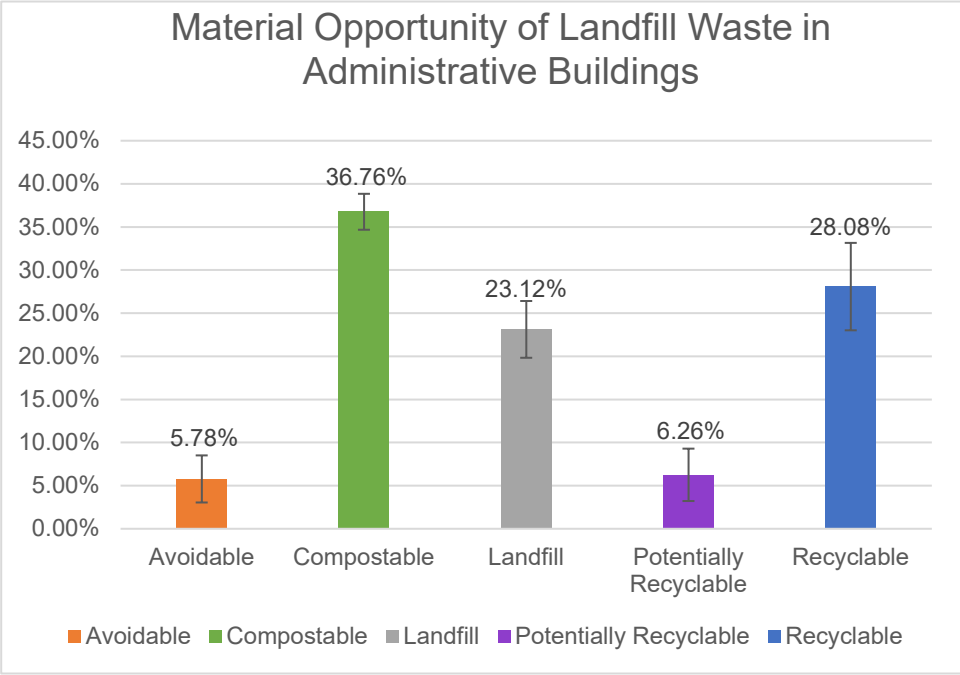


Administrative Buildings

Description: Buildings that primarily serve administrative functions and/or house office space for staff and faculty on campus.

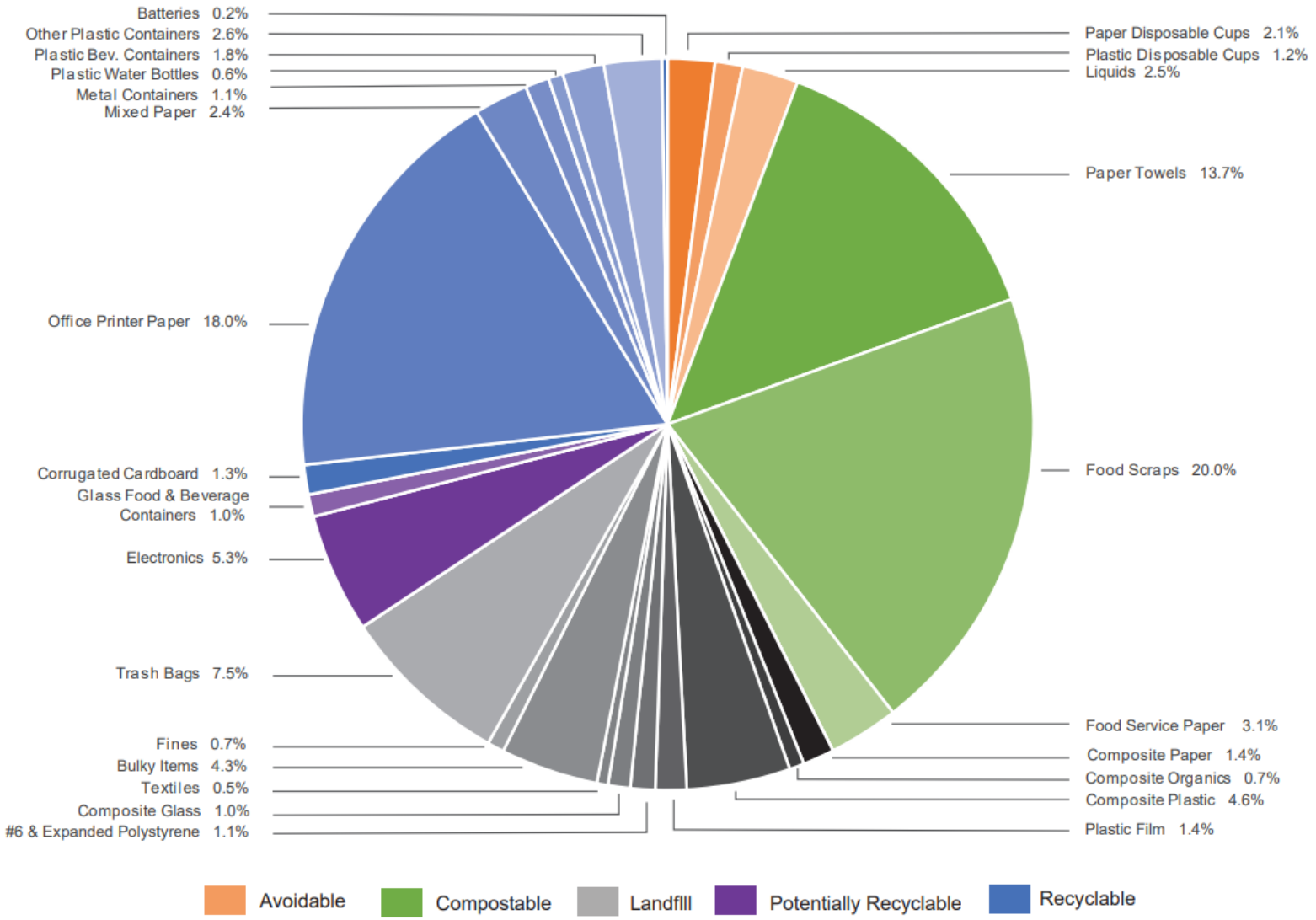
Buildings Audited: University Hall and Carrington Hall.

What is in the Waste?
Almost **77%** (**123.18 tons)** of materials in the landfill waste stream for administrative buildings can potentially be diverted. The top 5 materials contributing to the overall amount of landfill waste generated in administrative buildings include: food scraps (**20% or 32.0 tons**), office printer paper (**18% or 28.9 tons**), paper towels (**13.7% or 21.9 tons**), trash bags (**7.5% or 12.0 tons**), and electronics (**5.3% or 8.5 tons**). Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream with the exception of trash bags.



Administrative Buildings Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	9.26
Compostable	58.90
Landfill	37.05
Potentially Recyclable	10.02
Recyclable	45.00
Total	**160.22**

Composition of Landfill Waste from Administrative Buildings



Estimated Landfill Waste Composition in Administrative Buildings Campuswide

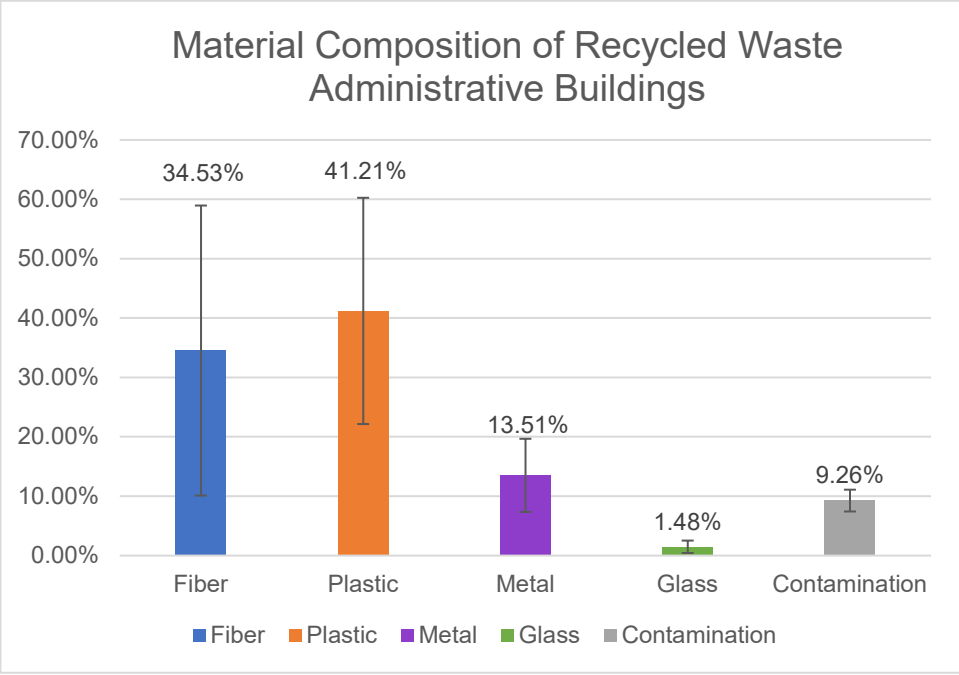
Material	Potential Material Fate	Tonnage
Food Scraps	Compostable	32.02
Office Printer Paper	Recyclable	28.91
Paper Towels	Compostable	21.91
Trash Bags	Landfill	12.03
Non- Regulated Electronics	Potentially Recyclable	8.45
Composite Plastic	Landfill	7.34
Bulky Items	Landfill	6.92
Food Service Paper	Compostable	4.97
Other Plastic Containers	Recyclable	4.09
Liquids	Avoidable	3.97
Mixed Paper	Recyclable	3.85
Paper Disposable Cups	Avoidable	3.33
Plastic Beverage Containers	Recyclable	2.93
Composite Paper	Landfill	2.23
Plastic Film	Landfill	2.20
Corrugated Cardboard	Recyclable	2.09
Plastic Disposable Cups	Avoidable	1.96
#6 & Expanded Poly	Landfill	1.75
Metals & Aluminum	Recyclable	1.69
Composite Glass	Landfill	1.57
Glass Food & Bev Containers	Potentially Recyclable	1.57
Fines	Landfill	1.18
Composite Organics	Landfill	1.05
Plastic Water Bottles	Recyclable	1.04
Textiles	Landfill	0.79
Batteries	Recyclable	0.38
		160.22

Any unlisted materials were not found in the sample summarized.

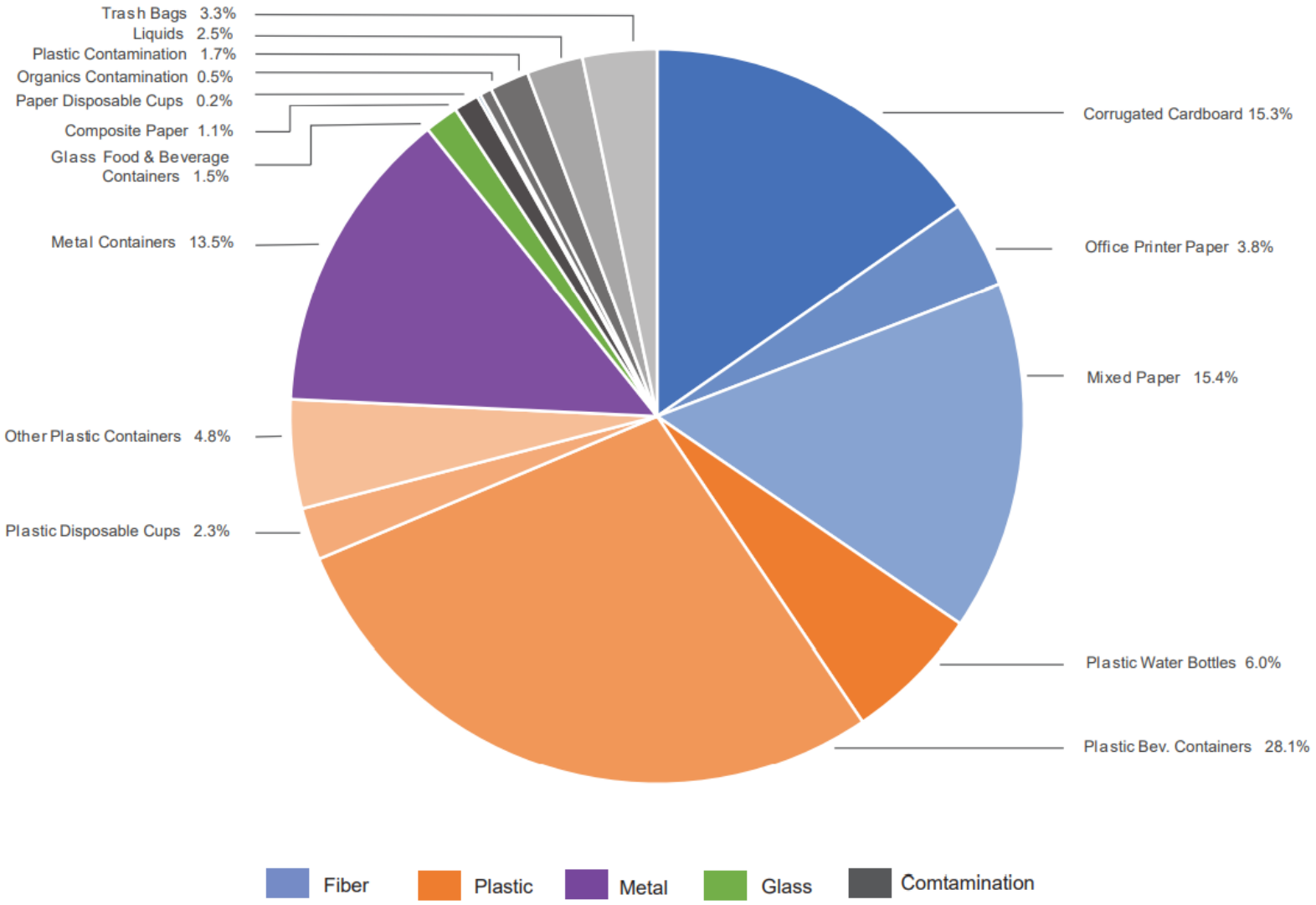
Administrative Buildings

What is in the Recycling?

In the recycling waste stream from administrative buildings **89.26%** of material was accepted recyclables. Aside from correctly recycled materials, **9.26%** of the recycling waste stream from administrative buildings consists of materials considered to be mixed contamination and **1.48%** was glass contamination. Top materials contributing to the overall amount of contamination within the recycling stream for administrative buildings include: trash bags (**3.3%**), liquids (**2.5%**), plastic contamination (**1.7%**), and composite paper (**1.1%**).



Composition of Recycled Waste from Administrative Buildings

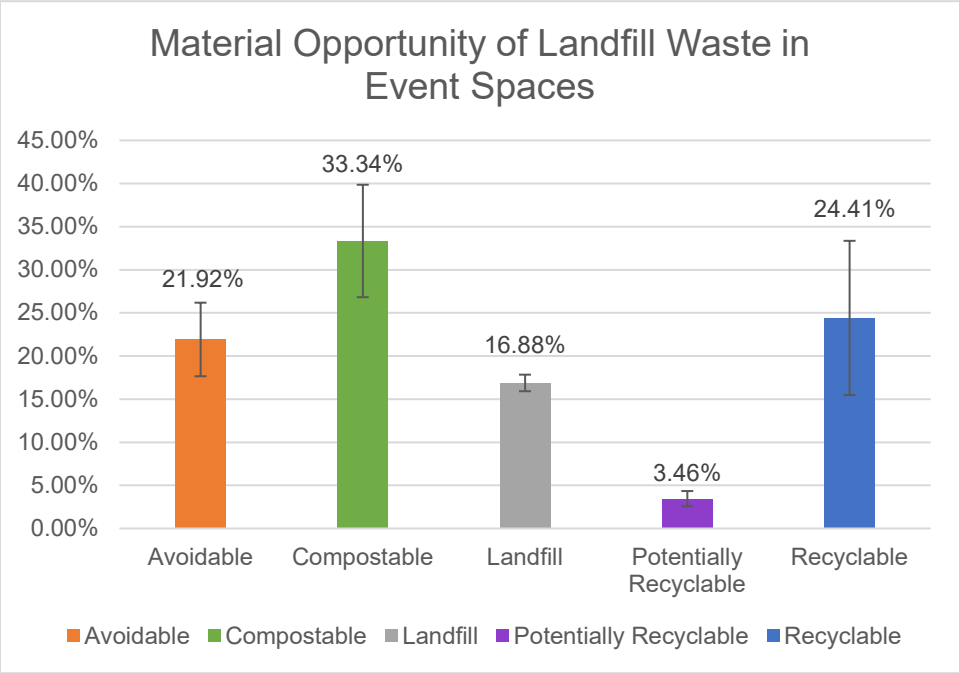


Event Spaces

Description: Buildings that serve the purpose of hosting both campus and public facing events.

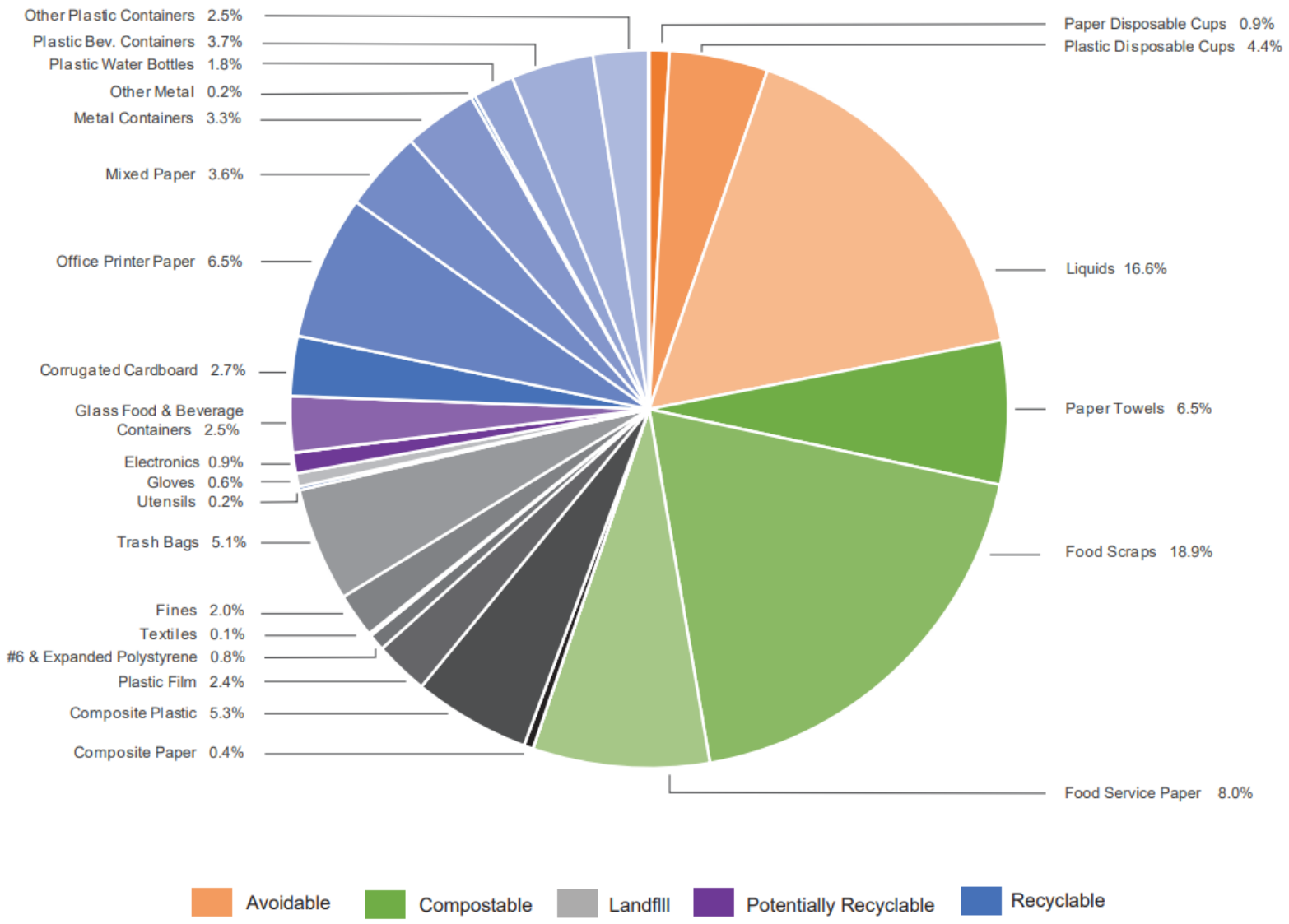
Buildings Audited: The Arena and a production at Craig Theater. Note: Audited recycling only represents materials from Craig Theater. There is no co-mingled recycling at The Arena. There is only cardboard recycling at The Arena, which was not audited.

What is in the Waste?
Over **83% (104.8 tons)** of materials in the landfill waste stream for event spaces can potentially be diverted into other channels. The top 5 materials contributing to the overall amount of landfill waste generated in event spaces include: food scraps (**18.9% or 23.8 tons**), liquids (**16.6% or 20.9 tons**), food service paper (**8% or 10.0 tons),** paper towels (**6.5% or 8.2 tons**), and office printer paper (**6.5% or 8.2 tons**). Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream.



Event Spaces Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	27.63
Compostable	42.02
Landfill	21.27
Potentially Recyclable	4.36
Recyclable	30.77
Total	**126.05**

Composition of Landfill Waste from Event Spaces



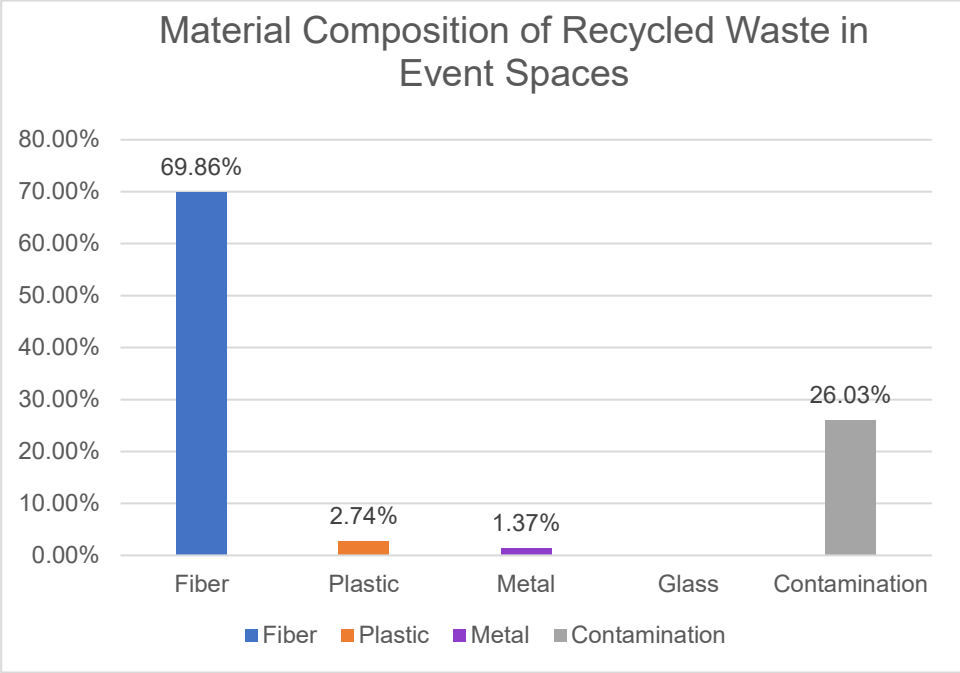
Estimated Landfill Waste Composition in Event Spaces Campuswide

Material	Potential Material Fate	Tonnage
Food Scraps	Compostable	23.83
Liquids	Avoidable	20.88
Food Service Paper	Compostable	10.04
Office Printer Paper	Recyclable	8.21
Paper Towels	Compostable	8.15
Composite Plastic	Landfill	6.64
Trash Bags	Landfill	6.47
Plastic Disposable Cups	Avoidable	5.60
Plastic Beverage Containers	Recyclable	4.69
Mixed Paper	Recyclable	4.60
Metals & Aluminum	Recyclable	4.17
Corrugated Cardboard	Recyclable	3.39
Glass Food & Bev Containers	Potentially Recyclable	3.19
Other Plastic Containers	Recyclable	3.12
Plastic Film	Landfill	3.07
Fines	Landfill	2.51
Plastic Water Bottles	Recyclable	2.33
Non- Regulated Electronics	Potentially Recyclable	1.17
Paper Disposable Cups	Avoidable	1.14
#6 & Expanded Poly	Landfill	0.95
Gloves	Landfill	0.75
Composite Paper	Landfill	0.53
Other Metal	Recyclable	0.22
Utensils	Landfill	0.20
Textiles	Landfill	0.15
Bulbs/ Lamps	Recyclable	0.04
		126.05

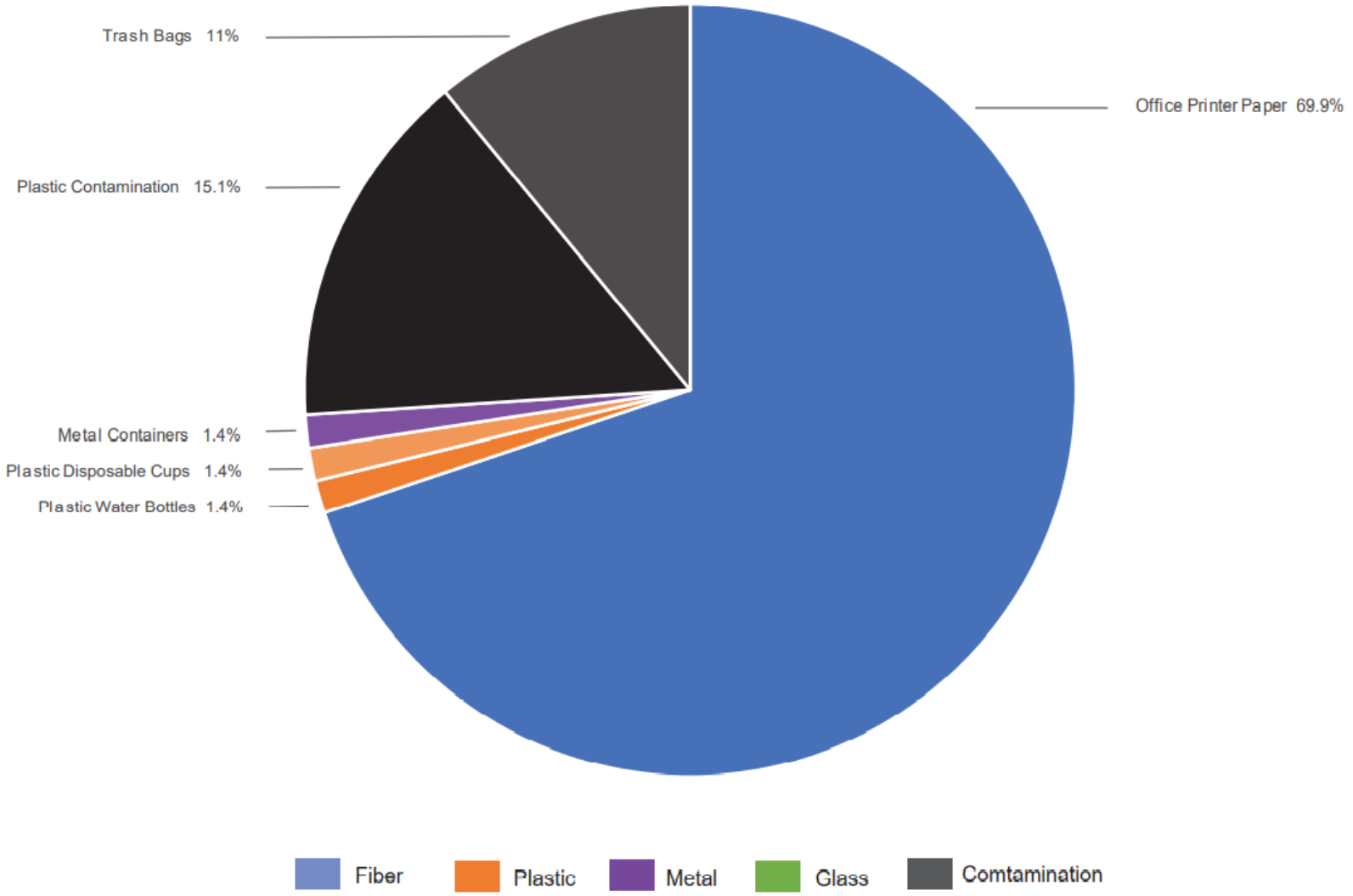
Any unlisted materials were not found in the sample summarized.

Event Spaces

What is in the Recycling?
In the recycling waste stream from event spaces **73.97%** of material was accepted recyclables. Aside from correctly recycled materials, over **26%** of the recycling waste stream from event spaces consists of materials considered to be mixed contamination. Top materials contributing to the overall amount of contamination within the recycling stream for event spaces include: plastic contamination (**15.1%**) and trash bags (**11%**).



Composition of Recycled Waste from Event Spaces

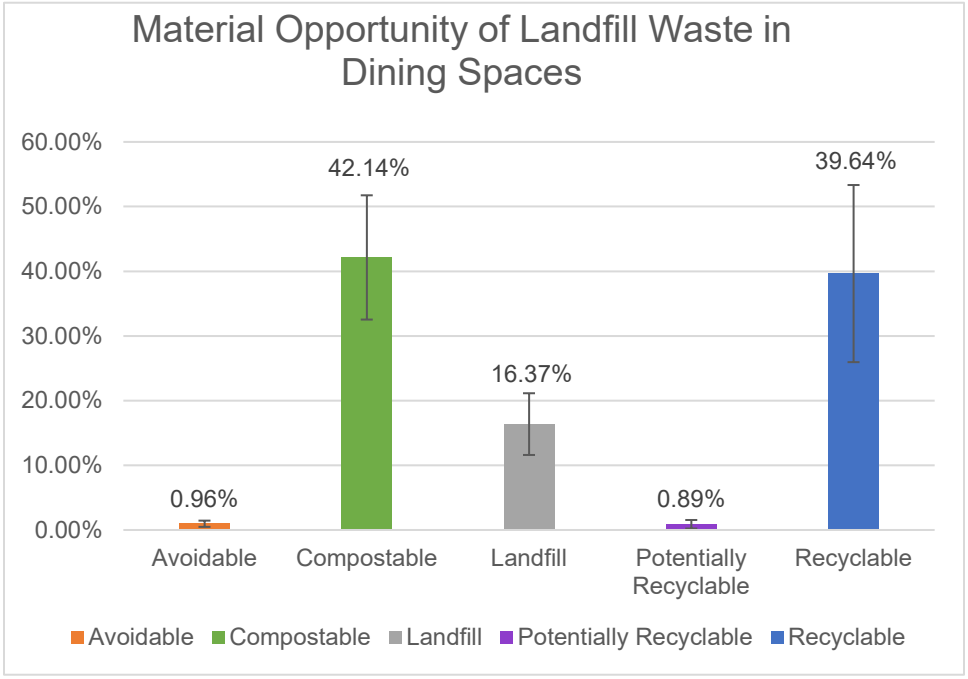


Dining Spaces

Description: This includes facilities where the primary functions are to prepare and consume food.

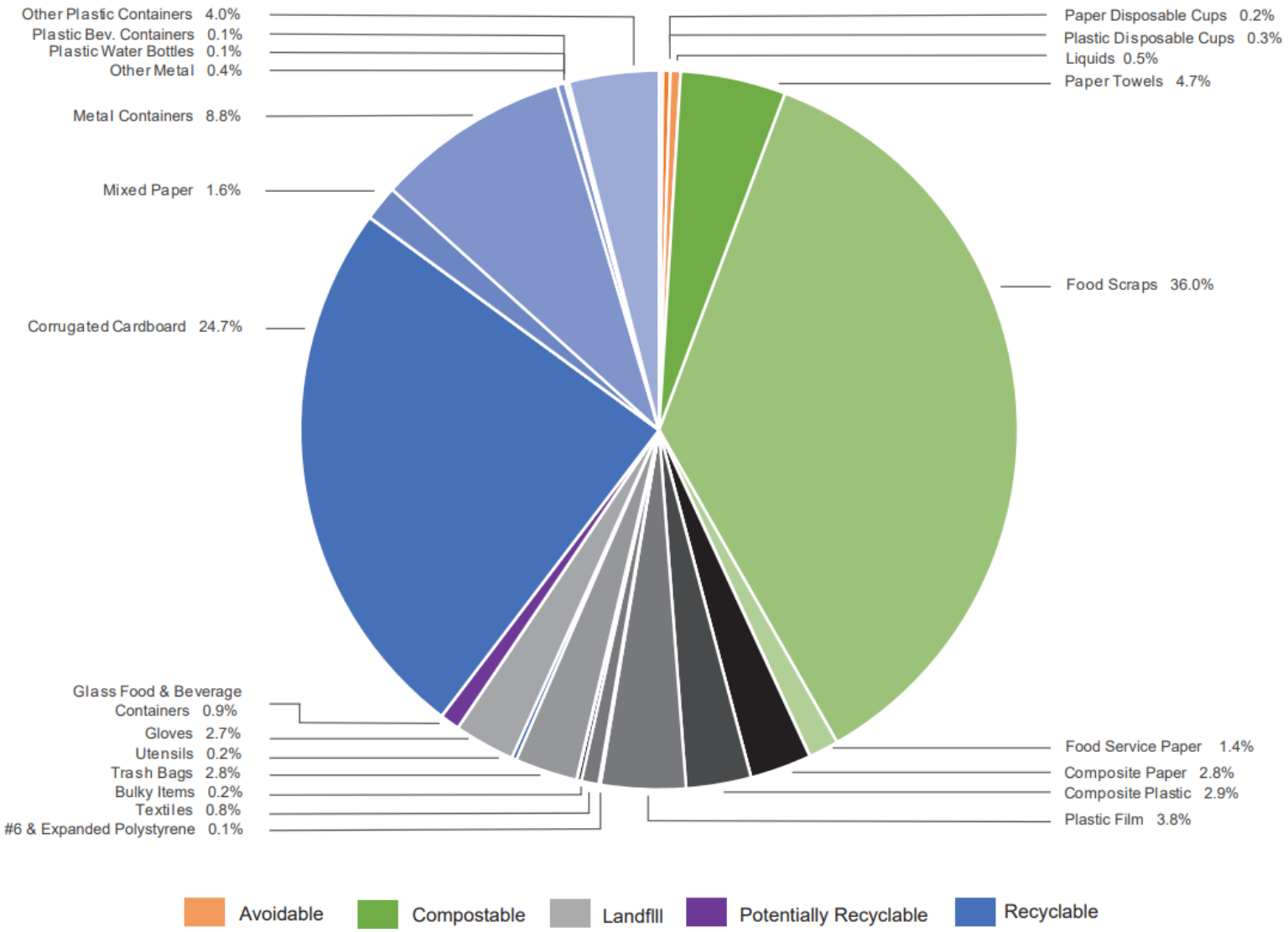
Buildings Audited: Plaster Student Union dining vendors, Blair Shannon Dining and Einstein's Bagels in Glass Hall.

What is in the Waste?
Nearly **84% (38.7 tons)** of materials in the landfill waste stream for dining spaces can potentially be diverted into other channels. The top 5 materials contributing to the overall amount of landfill waste generated in dining spaces include: food scraps (**36% or 16.7 tons**), corrugated cardboard (**24.7% or 11.4 tons**), metal containers (**8.8% or 4.1 tons)**, paper towels (**4.7% or 2.2 tons**), and other plastic containers (**4% or 1.9 tons** Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream.



Dining Spaces Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	0.45
Compostable	19.51
Landfill	7.58
Potentially Recyclable	0.41
Recyclable	18.36
Total	**46.30**

Composition of Landfill Waste from Dining Spaces



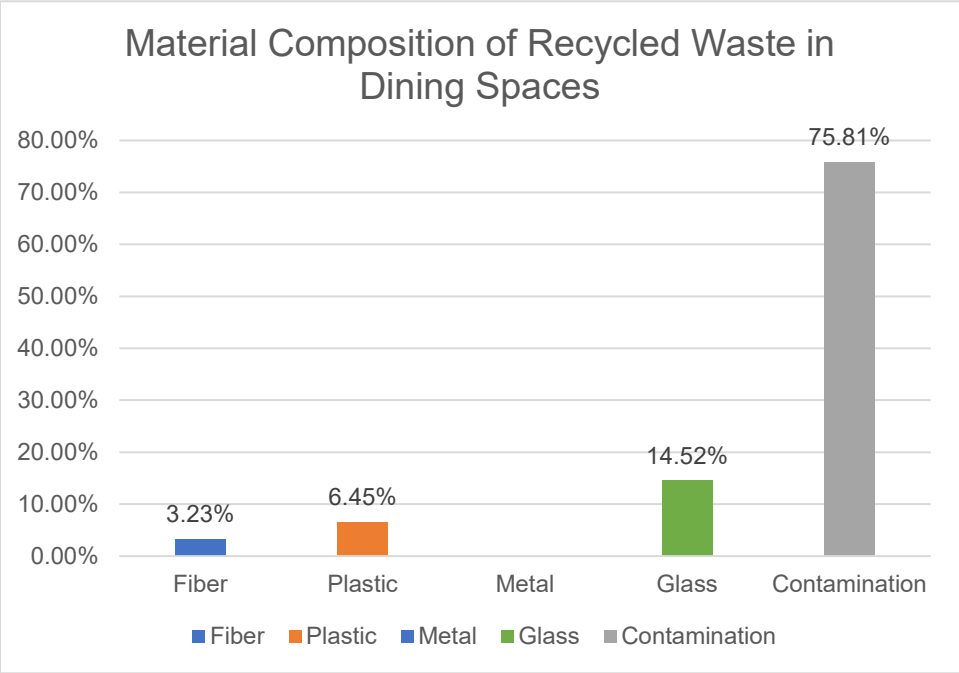
Estimated Landfill Waste Composition in Dining Spaces Campuswide

Material	Potential Material Fate	Tonnage
Food Scraps	Compostable	16.68
Corrugated Cardboard	Recyclable	11.44
Metals & Aluminum	Recyclable	4.05
Paper Towels	Compostable	2.20
Other Plastic Containers	Recyclable	1.87
Plastic Film	Landfill	1.77
Composite Plastic	Landfill	1.35
Trash Bags	Landfill	1.30
Composite Paper	Landfill	1.28
Gloves	Landfill	1.27
Mixed Paper	Recyclable	0.73
Food Service Paper	Compostable	0.63
Glass Food & Bev Containers	Potentially Recyclable	0.41
Textiles	Landfill	0.36
Liquids	Avoidable	0.21
Other Metal	Recyclable	0.17
Plastic Disposable Cups	Avoidable	0.15
Utensils	Landfill	0.10
Bulky Items	Landfill	0.09
Paper Disposable Cups	Avoidable	0.08
Plastic Beverage Containers	Recyclable	0.06
#6 & Expanded Poly	Landfill	0.04
Plastic Water Bottles	Recyclable	0.02
Fines	Landfill	0.01
Other Organics	Compostable	0.01
		46.28

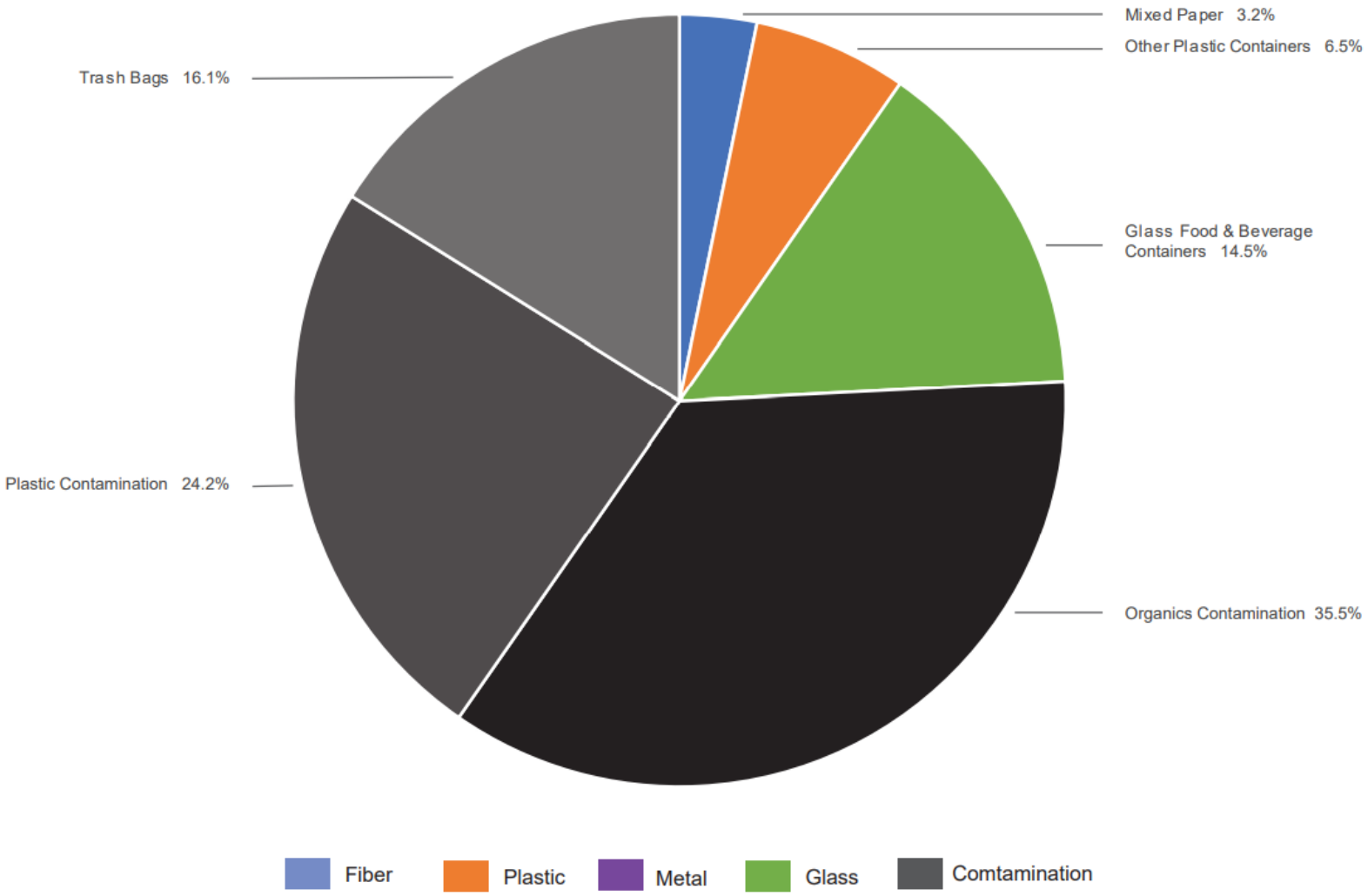
Any unlisted materials were not found in the sample summarized.

Dining Spaces

What is in the Recycling?
In the recycling waste stream from dining spaces **9.67%** of material was accepted recyclables. Aside from correctly recycled materials, **75.81%** of the recycling waste stream from dining spaces consists of materials considered to be mixed contamination and **14.52%** was glass contamination. Top materials contributing to the overall amount of contamination within the recycling stream for dining spaces include: organics (**35.5%**), plastic contamination (**24.2%**), and trash bags (**16.1%**).



Composition of Recycled Waste from Dining Spaces

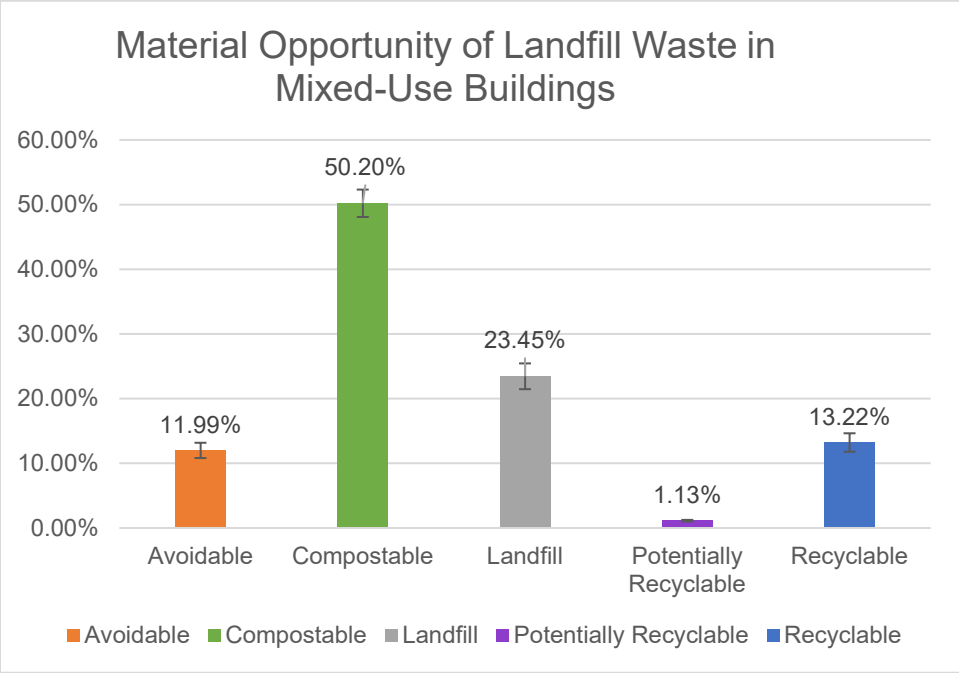


Mixed-Use Spaces

Description: Buildings that serve more than one substantial functional. This could be a combination of athletic facilities, study space, food services, etc.

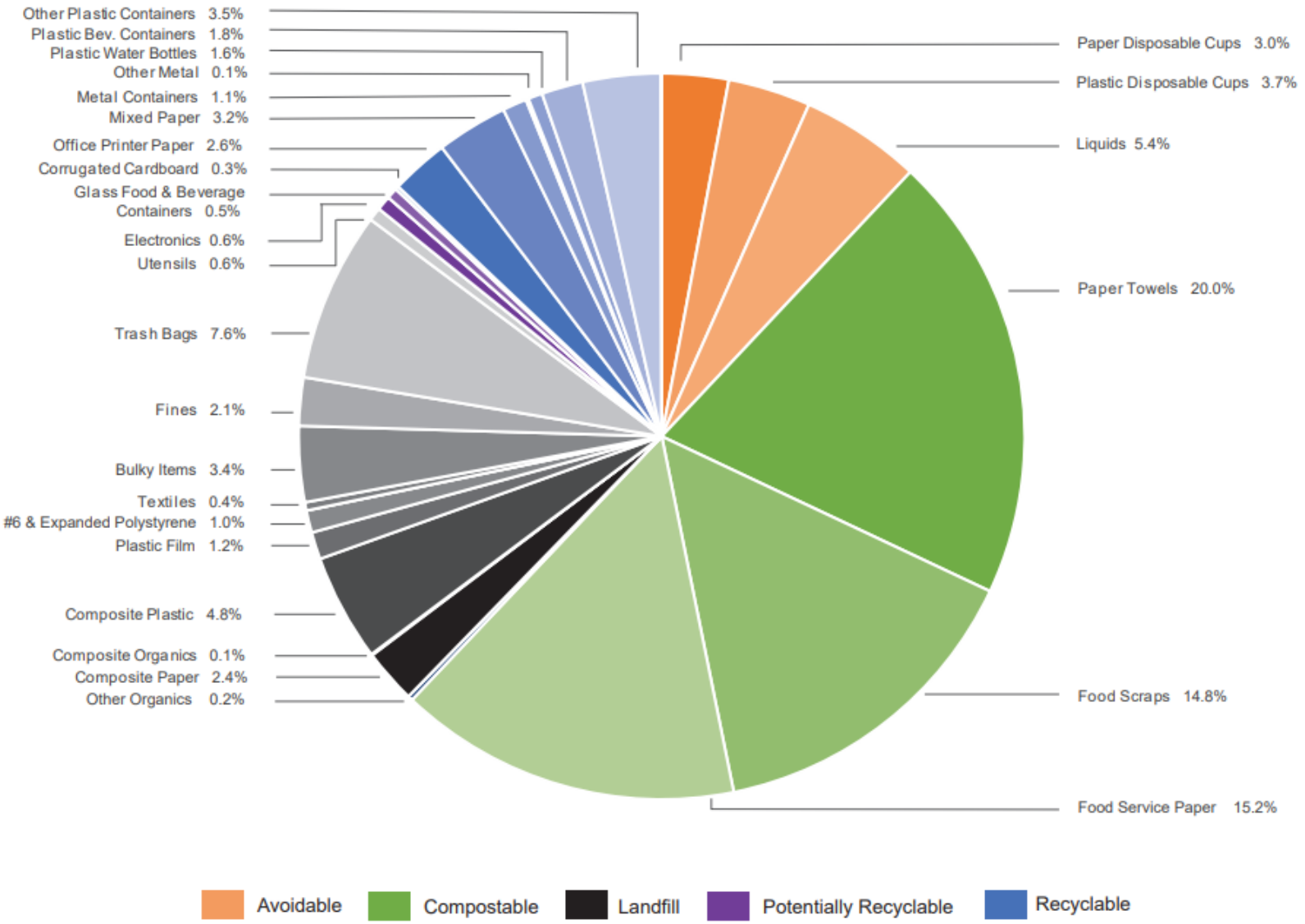
Buildings Audited: Plaster Student Union and Meyer Library.

What is in the Waste?
Nearly **77% (332.1 tons)** of materials in the landfill waste stream for mixed-use spaces can potentially be diverted into other channels. The top 5 materials contributing to the overall amount of landfill waste generated in mixed-use spaces include: paper towels (**20% or 86.6 tons**), food service paper (**15.2% or 66.1 tons**), food scraps (**14.8% or 64.1 tons**), trash bags (**7.6% or 32.8 tons**), and liquids (**5.4% or 23.2 tons**). Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream.



Mixed-Use Spaces Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	52.04
Compostable	217.80
Landfill	101.75
Potentially Recyclable	4.92
Recyclable	57.34
Total	**433.85**

Composition of Landfill Waste from Mixed-Use Spaces



Estimated Landfill Waste Composition in Mixed-Use Spaces Campuswide

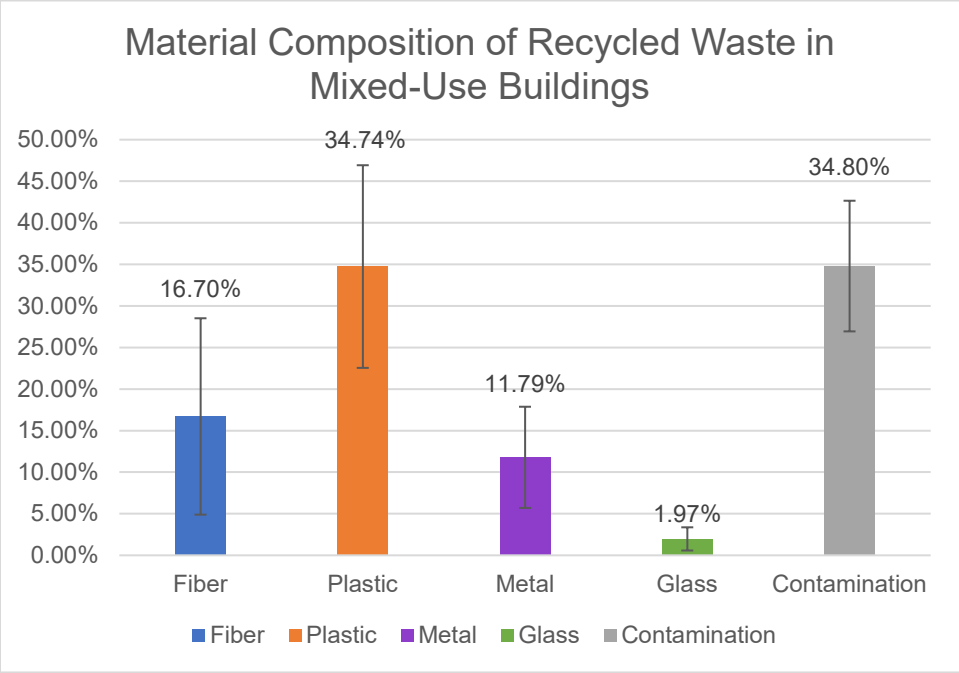
Material	Potential Material Fate	Tonnage
Paper Towels	Compostable	86.64
Food Service Paper	Compostable	66.09
Food Scraps	Compostable	64.13
Trash Bags	Landfill	32.82
Liquids	Avoidable	23.23
Composite Plastic	Landfill	20.65
Plastic Disposable Cups	Avoidable	15.96
Other Plastic Containers	Recyclable	15.05
Bulky Items	Landfill	14.62
Mixed Paper	Recyclable	13.75
Paper Disposable Cups	Avoidable	12.85
Office Printer Paper	Recyclable	11.14
Composite Paper	Landfill	10.43
Fines	Landfill	9.29
Plastic Beverage Containers	Recyclable	8.00
Plastic Film	Landfill	5.25
Metals & Aluminum	Recyclable	4.66
#6 & Expanded Poly	Landfill	4.28
Non- Regulated Electronics	Potentially Recyclable	2.80
Plastic Water Bottles	Recyclable	2.75
Utensils	Landfill	2.58
Glass Food & Bev Containers	Potentially Recyclable	2.12
Textiles	Landfill	1.59
Corrugated Cardboard	Recyclable	1.35
Other Organics	Compostable	0.94
Other Metal	Recyclable	0.53
Composite Organics	Landfill	0.23
Batteries	Recyclable	0.12
		433.85

Any unlisted materials were not found in the sample summarized.

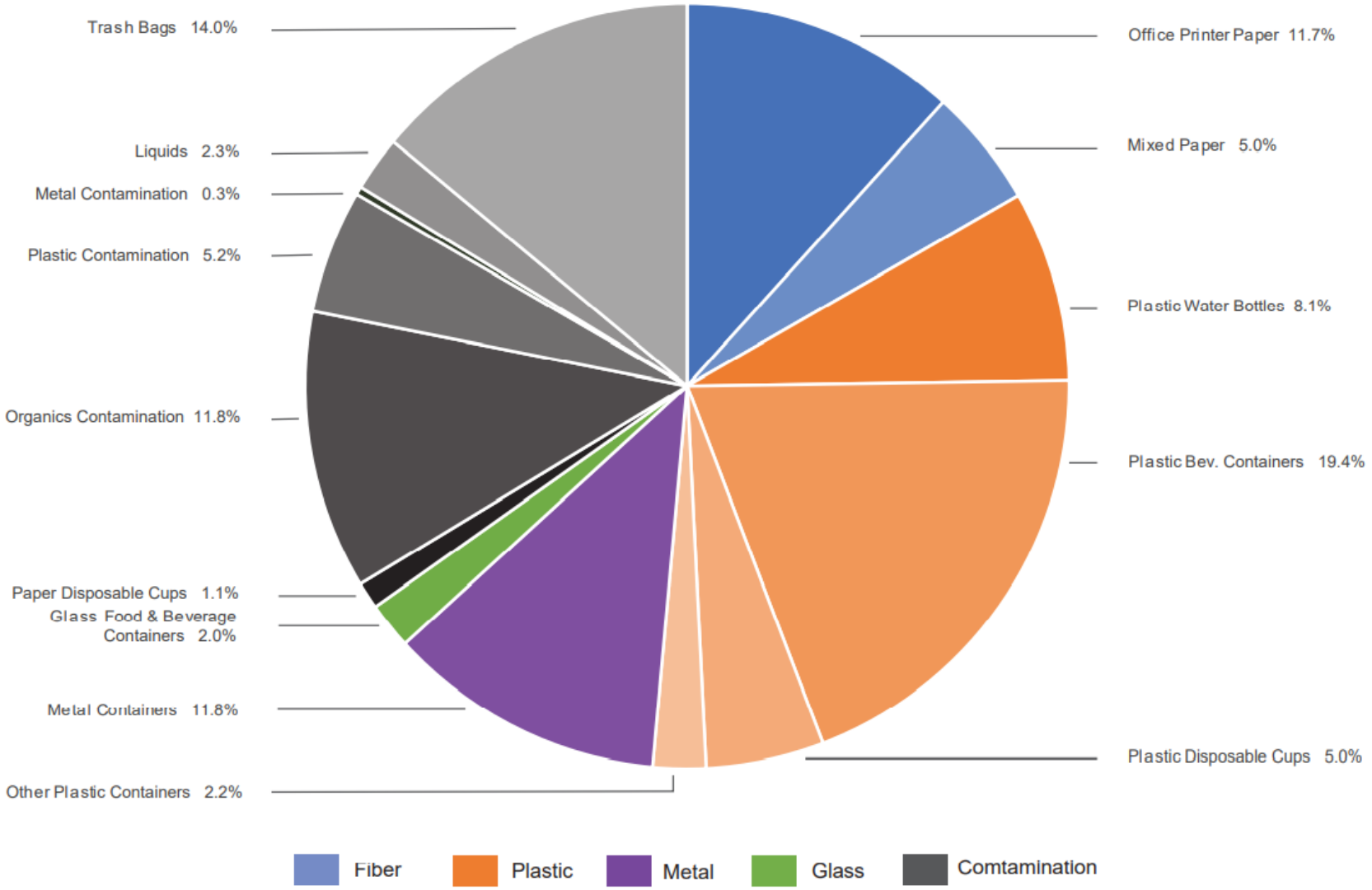
Mixed-Use Spaces

What is in the Recycling?

In the recycling waste stream from mixed use buildings **63.23%** of material was accepted recyclables. Aside from correctly recycled materials, almost **35%** of the recycling waste stream from mixed-use spaces consists of materials considered to be mixed contamination and **1.97%** was glass contamination. Top materials contributing to the overall amount of contamination within the recycling stream for mixed-use spaces include: trash bags (**14%**), organics (**11.8%**), plastic contamination (**5.2%**), liquids (**2.3%**), and paper disposable cups (**1.1%**).



Composition of Recycled Waste from Mixed-Use Spaces

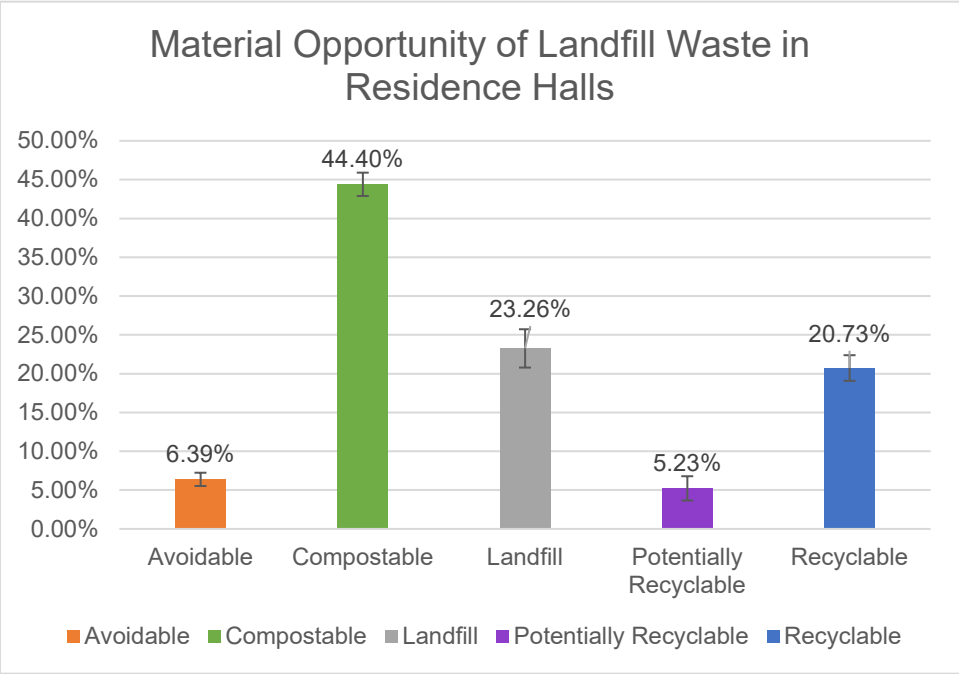


Residence Halls

Description: Buildings that serve as on-campus student housing. These spaces are not co-located with campus food service operations.

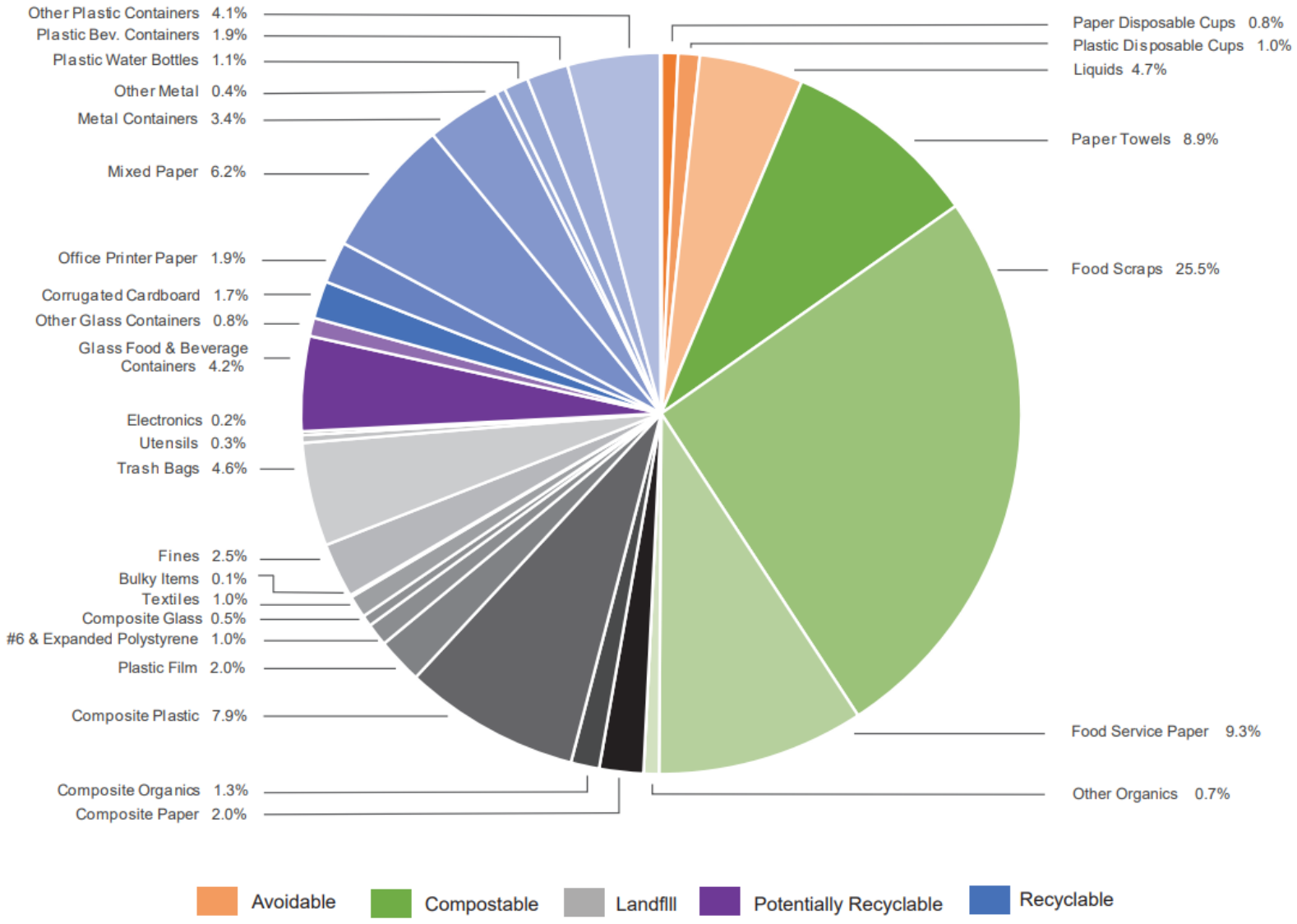
Buildings Audited: Blair Shannon, Sunvilla and Freudenberger Halls.

What is in the Waste?
Almost **77% (512.3 tons)** of materials in the landfill waste stream for residence halls can potentially be diverted into other channels. The top 5 materials contributing to the overall amount of landfill waste generated in residence halls include: food scraps (**25.5% or 170.6 tons**), food service paper (**9.3% or 62.1 tons**), paper towels (**8.9% or 59.1 tons**), composite plastic (**7.9% or 52.8 tons**), and mixed paper (**6.2% or 41.7 tons)**. Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream with the exception of composite plastic.



Residence Halls Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	42.63
Compostable	296.39
Landfill	155.25
Potentially Recyclable	34.88
Recyclable	138.38
Total	**667.53**

Composition of Landfill Waste from Residence Halls



Estimated Landfill Waste Composition in Residence Halls Campuswide

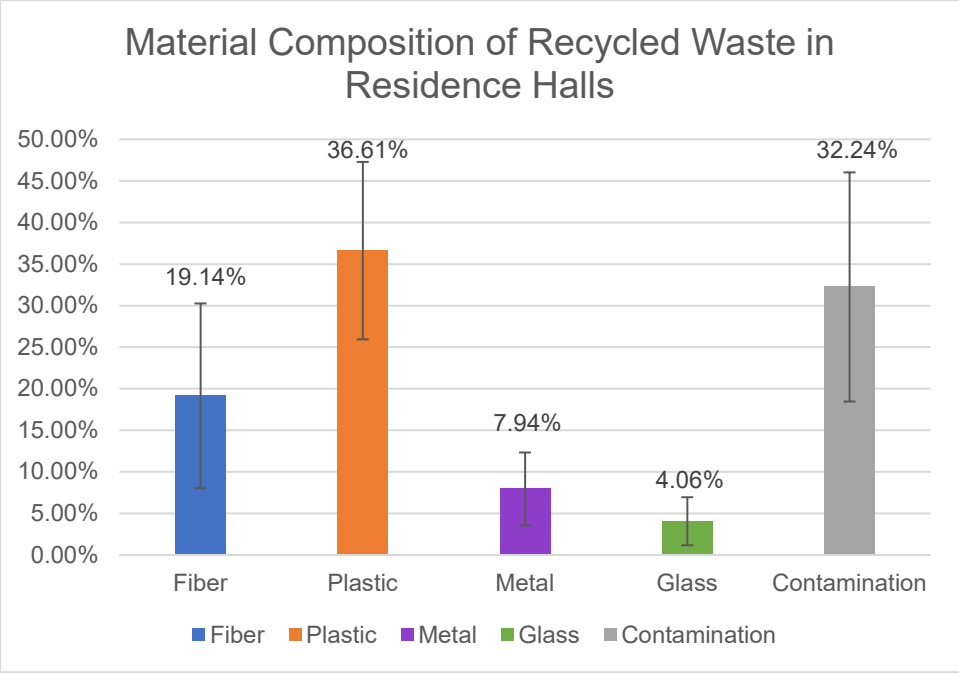
Material	Potential Material Fate	Tonnage
Food Scraps	Compostable	170.55
Food Service Paper	Compostable	62.10
Paper Towels	Compostable	59.15
Composite Plastic	Landfill	52.76
Mixed Paper	Recyclable	41.67
Liquids	Avoidable	31.15
Trash Bags	Landfill	30.98
Glass Food & Bev Containers	Potentially Recyclable	28.32
Other Plastic Containers	Recyclable	27.64
Metals & Aluminum	Recyclable	22.52
Fines	Landfill	16.45
Plastic Film	Landfill	13.66
Composite Paper	Landfill	13.19
Plastic Beverage Containers	Recyclable	12.48
Office Printer Paper	Recyclable	12.45
Corrugated Cardboard	Recyclable	11.23
Composite Organics	Landfill	8.50
Plastic Water Bottles	Recyclable	7.33
#6 & Expanded Poly	Landfill	6.76
Textiles	Landfill	6.68
Plastic Disposable Cups	Avoidable	6.46
Other Glass Containers	Potentially Recyclable	5.48
Paper Disposable Cups	Avoidable	5.01
Other Organics	Compostable	4.60
Composite Glass	Landfill	3.33
Other Metal	Recyclable	2.71
Utensils	Landfill	2.32
Non- Regulated Electronics	Potentially Recyclable	1.08
Bulky Items	Landfill	0.62
Bulbs/ Lamps	Recyclable	0.23
Batteries	Recyclable	0.12
		667.53

Any unlisted materials were not found in the sample summarized.

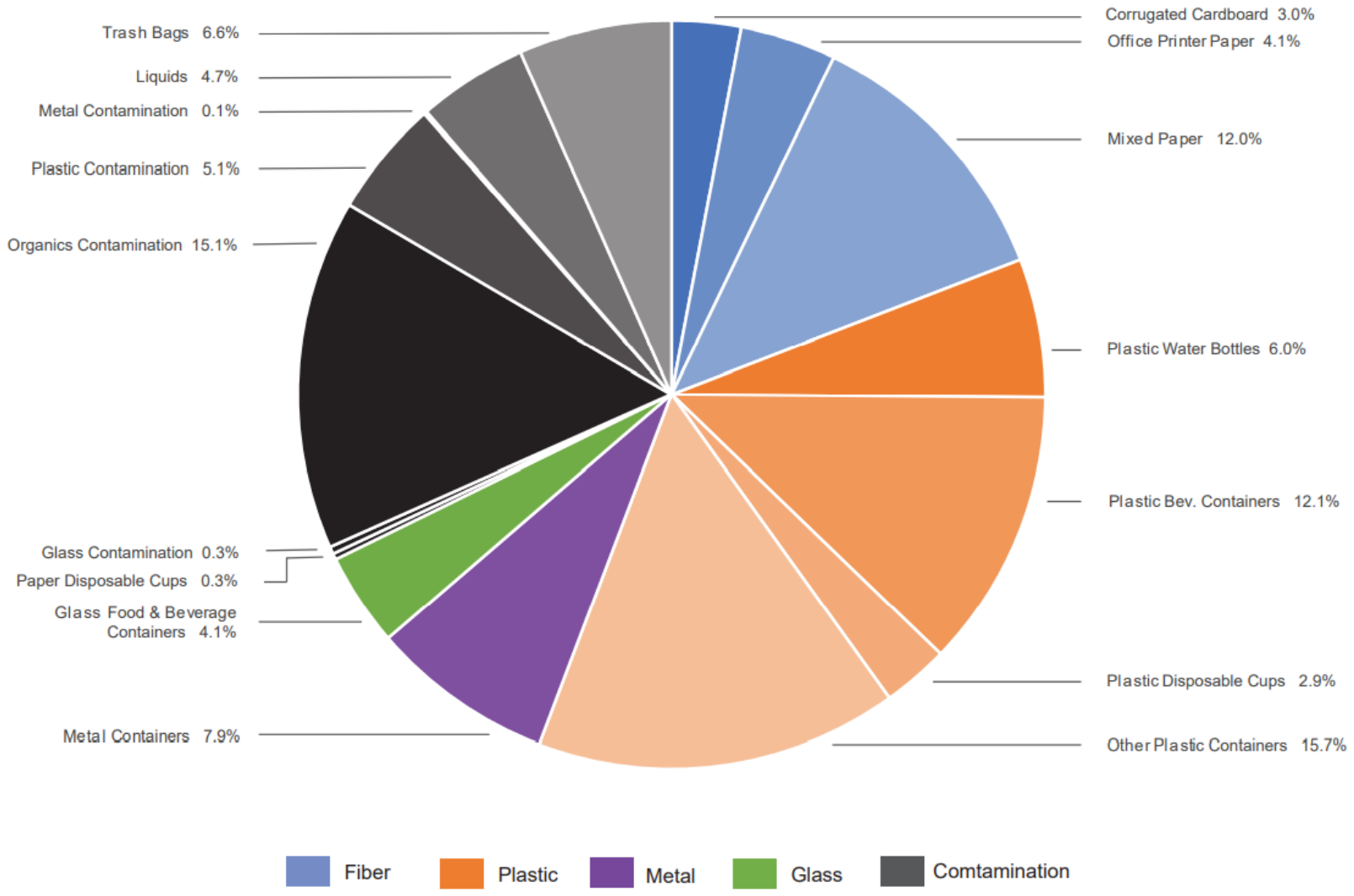
Residence Halls

What is in the Recycling?

In the recycling waste stream from residence halls **63.7%** of material was accepted recyclables. Aside from correctly recycled materials, **32.24%** of the recycling waste stream from residence halls consists of materials considered to be mixed contamination and **4.06%** was glass contamination. Top materials contributing to the overall amount of contamination within the recycling stream for residence halls include: organics contamination (**15.1%**), trash bags (**6.6%**), plastic contamination (**5.1%**), and liquids (**4.7%**).



Composition of Recycled Waste from Residence Halls

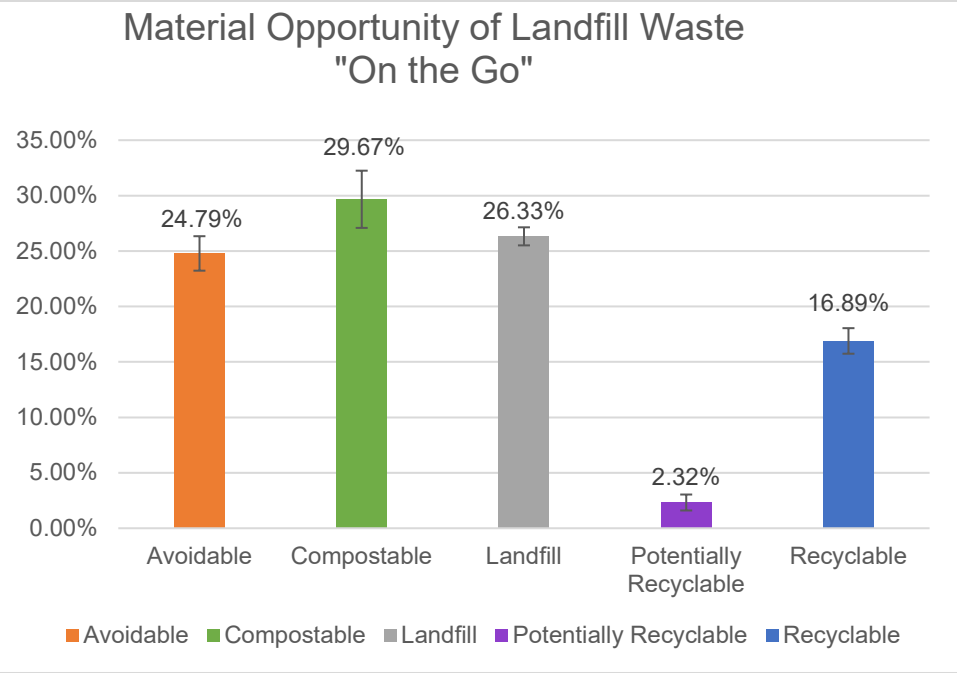


“On the Go” Outdoor Bins

Description: This includes landfill and recycle bins from across campus that are outdoors in publicly accessible spaces along walking paths, near building entry/exit, and in parking lots and structures.

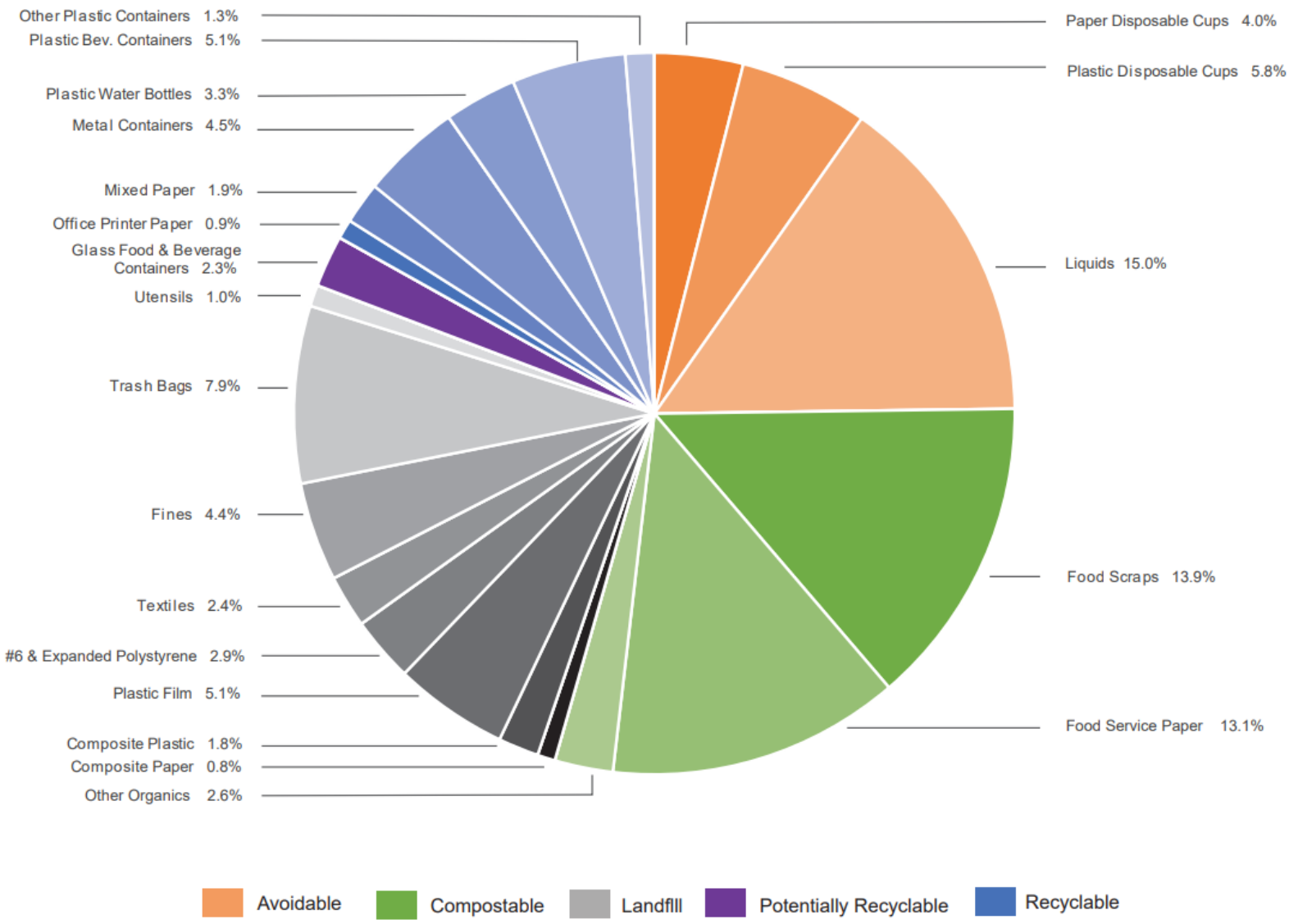
Locations Audited: North Campus, Central Campus, South Campus and Parking Structures

What is in the Waste?
Almost **74% (12.1 tons)** of materials in the landfill waste stream for outdoor bins can potentially be diverted into other channels. The top 5 materials contributing to the overall amount of landfill waste generated outdoor bins include: liquids (**15% or 2.5 tons**), food scraps (**13.9% or 2.3 tons**), food service paper (**13.1% or 2.2 tons**), trash bags (**7.9% or 1.3 tons**), and plastic disposable cups (**5.8% or 0.9 tons)**. Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream.



"On the Go" Estimated Landfill Tonnage	
Potential Material Fate	**Tonnage**
Avoidable	4.07
Compostable	4.87
Landfill	4.32
Potentially Recyclable	0.38
Recyclable	2.77
Total	**16.40**

Composition of Landfill Waste from “On the Go” Outdoor Bins



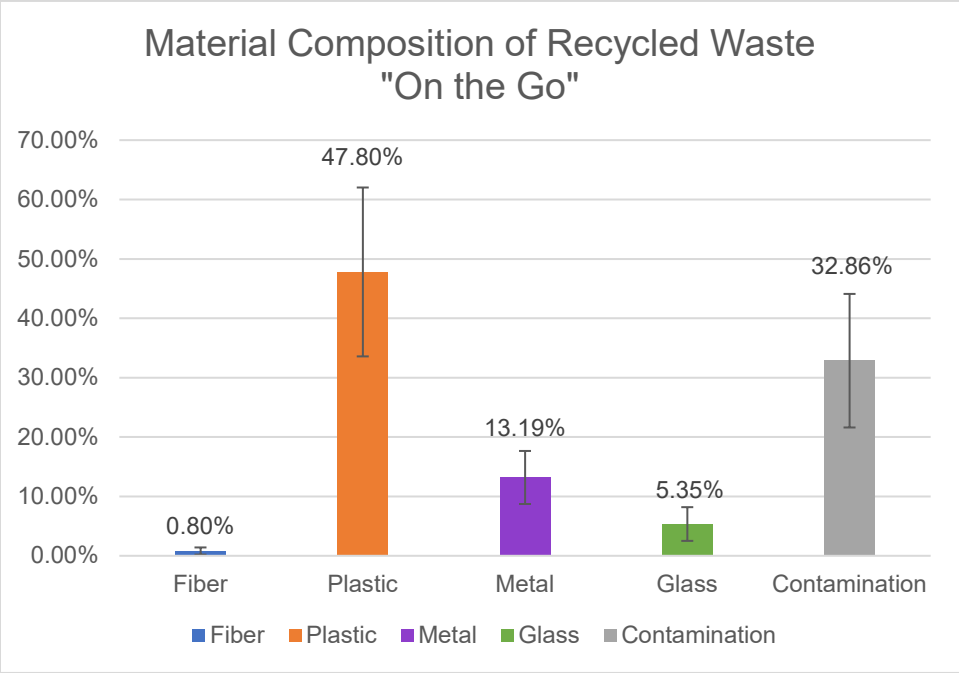
Estimated Landfill Waste Composition in "On the Go" Outdoor Bins Campuswide

Material	Potential Material Fate	Tonnage
Liquids	Avoidable	2.47
Food Scraps	Compostable	2.29
Food Service Paper	Compostable	2.15
Trash Bags	Landfill	1.30
Plastic Disposable Cups	Avoidable	0.95
Plastic Film	Landfill	0.84
Plastic Beverage Containers	Recyclable	0.84
Metals & Aluminum	Recyclable	0.74
Fines	Landfill	0.73
Paper Disposable Cups	Avoidable	0.65
Plastic Water Bottles	Recyclable	0.53
#6 & Expanded Poly	Landfill	0.48
Other Organics	Compostable	0.43
Textiles	Landfill	0.39
Glass Food & Bev Containers	Potentially Recyclable	0.38
Mixed Paper	Recyclable	0.31
Composite Plastic	Landfill	0.30
Other Plastic Containers	Recyclable	0.21
Utensils	Landfill	0.16
Office Printer Paper	Recyclable	0.14
Composite Paper	Landfill	0.13
		16.40

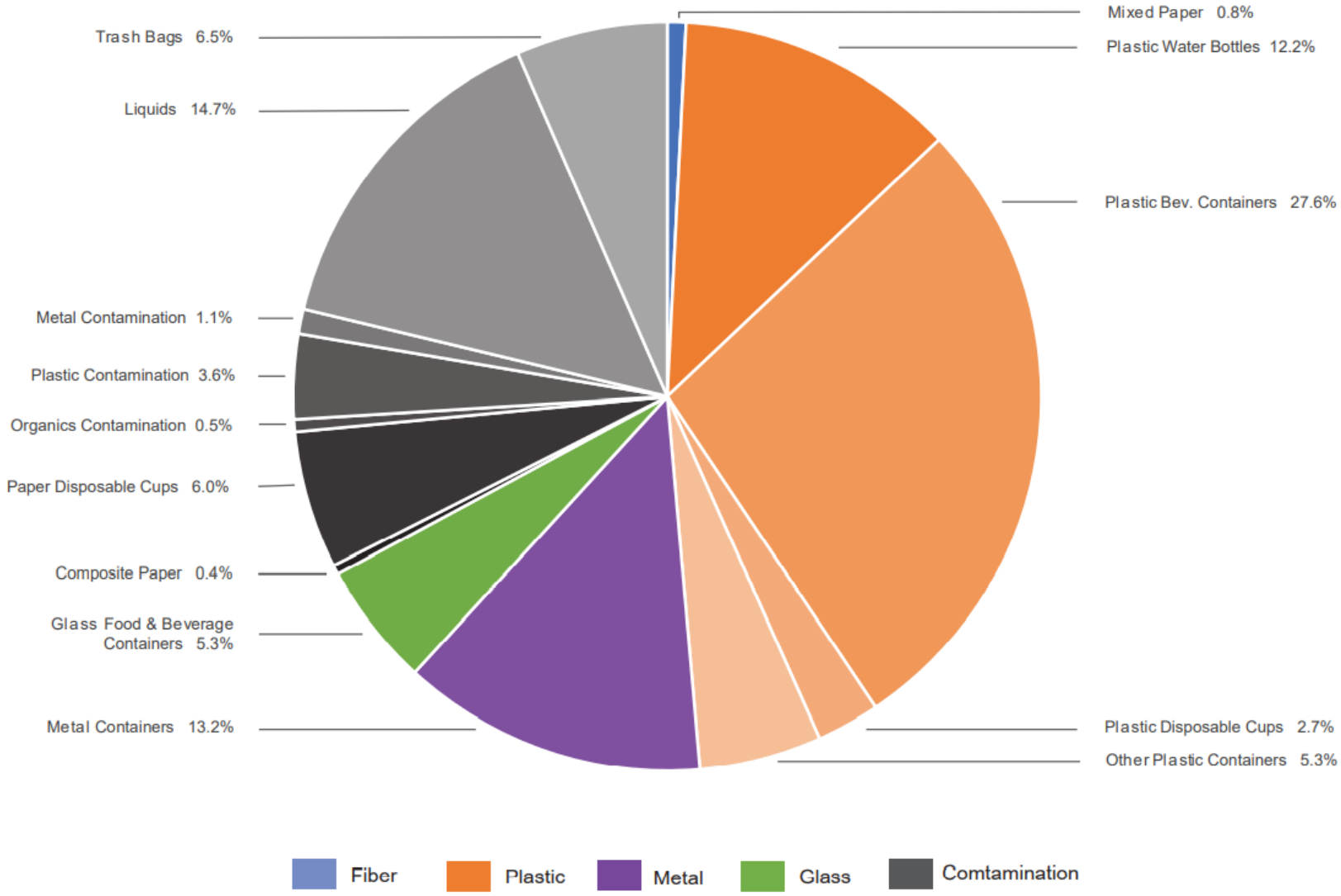
Any unlisted materials were not found in the sample summarized.

“On the Go” Outdoor Bins

What is in the Recycling?
In the recycling waste stream from outdoor bins **61.79%** of material was accepted recyclables. Aside from currently accepted recyclables, **32.86%** of the recycling waste stream from outdoor bins consists of materials considered to be mixed contamination and **5.35%** was glass contamination. Top materials contributing to the overall amount of contamination within the recycling stream for outdoor bins include: liquids (**14.7%**), trash bags (**6.5%**), paper disposable cups (**6%**), and plastic contamination (**3.6%**).



Composition of Recycled Waste from “On the Go” Outdoor Bins



Waste Reduction & Diversion Opportunities

Based on current practices and Activity Zone analysis the following higher-level opportunities could be considered in order to reduce waste generation and increase waste diversion. Many more detailed recommendations will be presented in this project's culminating report, the Solid Waste Management Plan.

Collection Improvements

- Provide consistent collection bins signage and labelling across campus.
- Examine the landfill bin inventory and service frequency. Consider a bin audit.
- Ensure that trash and recycling bins are co-located.
- Work with the waste hauler to ensure adequate service and recycling dumpster capacity at high generation locations.

Collection Expansion

- Introduce food scrap composting beyond dining halls, plus front-of-house composting in dining halls.
- Consider collection of paper towels for composting—especially in restrooms. Alternatively, or in some cases, consider hand dryers.
- Consider requiring glass collection in future recycling contracts. If not possible, increase the number of collection locations.
- Begin expanded polystyrene recycling.

Waste Avoidance

- Examine and/or enact policies to reduce waste generation. E.g. set double-sided printing as default on all campus printers.
- Examine hauler contracts and consider requirements to expand materials accepted and/or data provided by haulers.
- Consider policies related to source reduction and recycled content. E.g. Ban the Bottle.
- Work with Dining and create an education campaign to enable use of reusable cups for hot beverages and use of reusable bottles for fountain drinks.

Engagement Improvement

- Develop and implement a campuswide recycling awareness campaign to ensure campus community members know what items are and are not recyclable on campus, increasing recycling literacy.
- Since all plastic resins are accepted (except for plastic bags/film and #6), make that apparent on bin labels (i.e. don't simply say "bottles and cans" as this implies only bottles #1 and #2 are acceptable).
- Where sinks exist, include signage encouraging people to pour out liquids prior to beverage container disposal. In break/kitchen areas, consider trash bin signage that reminds people to pour out liquids prior to container disposal.

Appendix A: Waste Characterization Study Material Categories - Landfill

Corrugated Cardboard	Examples include entire cardboard containers, such as shipping and moving boxes, computer packaging cartons, sheets and pieces of cardboard and unbleached paperboard, the flat, pressed, stiff paper used in cereal boxes. Only clean/clean portion of pizza boxes.
Office Printer Paper	Examples include standard office paper / SOP such as white paper used in photocopiers and laser printers, letter paper, and receipts.
Mixed Paper	Examples include colored paper, manila folders and envelopes, file folders, index cards, junk mail, white envelopes, white window envelopes, white or colored notebook paper, greeting cards, shredded paper, magazines, catalogs, brochures, newspapers and inserts, phone books, and carbonless forms.
Composite Paper	Examples include waxed corrugated cardboard, paper cups, tetra pack/aseptic/gable top cartons, paper/hardback books, and photo paper.
Disposable Beverage Cups – Paper	Examples include paper plastic-lined coffee-cups, sleeves and lids, and fountain drink cold-cups, lids and straws.
Paper Towels	Paper or bathroom towels, tissues, and napkins.
Food Scraps	Food prep, peels, shells, scraps and uneaten food portions.
Food Service Paper & Compostables	Fast food paper wrappers, food-soiled paper, all pizza boxes, compostable bowls, plates, and cups.
Other Organics	Cork, hemp rope, chopsticks, hair, cotton balls, tea bags, pet waste.
Yard Material	Landscaping debris such as grass clippings, leaves, garden waste, brush, plants and trees.
Composite Organics	Examples include leather items, rubber items, carpet padding, cigarette butts, diapers, feminine hygiene products, small wood products, K-Cups, vacuum bags.
Metals & Aluminum Containers	Examples include aluminum beverage cans, tin and steel canned food, beverages, meat and pet food, clean balled aluminum foil, pie pans, loose metal jar lids and steel bottle caps.
Other Metal	Coat hangers, empty spray paint and other aerosol containers (no caps), metal scraps and other metal.
Plastic Water Bottles	Plastic water bottles and caps.
Plastic Beverage Containers	Examples include fruit juice, milk, sports drink, tea, or liquor containers. Caps are fine.
Plastic Containers #1-5	Examples include detergent, bleach, yogurt, shampoo, cleaning supply, takeout containers.
Disposable Beverage Cups - Plastic	Examples include plastic cold drink cups, lids and straws.

Appendix A: Waste Characterization Study Material Categories - Landfill

Composite Plastic	Examples include parts made of plastic attached to metal, plastic drinking straws, utensils, chip bags, granola bar and candy bar wrappers, plastic strapping, plastic lids, handles and knobs.
Plastic Film	Examples include grocery bags, dry cleaning bags, Ziploc bags, stretch wrap and other soft plastic.
Polystyrene #6 and Styrofoam	#6 plastic such as cookie trays and other rigid plastic containers. Foam meat, produce and pastry trays, foam packing blocks, packing peanuts, foam plates/bowls and other expanded polystyrene products.
Lab Plastic	Pipette boxes, gloves, petri dishes and other lab items.
Glass Beverage & Food Containers	Examples include whole or broken soda bottles, fruit juice bottles, wine cooler or beer bottles, and wine bottles, pickle jars, jam/jelly jars, peanut butter jars, salsa jars, olive jars.
Other Glass Containers	Drinking vessels (pint, wine, mason jars), candle jars, cosmetic bottles, jars, windows, shower door, tabletop (no frames)
Composite Glass	Examples include Pyrex, Corningware, and milkglass tableware, mirrors, auto windshields, laminated glass, china/leaded glass.
Bulbs/Lamps	All kinds of bulbs and lamps.
Regulated Electronic Goods	Examples include Computers (desktop, laptop, netbook, notebook, tablet – anything with 4’ diagonal screen), electronic keyboards, monitors and mice.
Non-Regulated Electronics	Printers, faxes, televisions, DVD players, VHS players, and game consoles, cords, headphones, small appliances, and other non-regulated items that operate using either a battery or power cord.
Textiles	Examples include clothes, towels, bedding and bed sheets, fabric trimmings, draperies, bandanas and all natural and synthetic cloth fibers.
Bulky Items	Bulky Items means large hard-to-handle items that are not defined elsewhere in the material types list, including furniture, mattresses, couches, tires, garden hose, binders, umbrellas and other large items.
Liquids	All kinds of liquids.
Fines	Remnants left after sorting is complete, typically consisting of dirt, sawdust, small food scraps, etc.
Trash Bag Waste	Bags used to contain waste materials.
Batteries	All kinds of batteries

Appendix A: Waste Characterization Study Material Categories - Recycle

Office Printer Paper	Examples include standard office paper / SOP such as white paper used in photocopiers and laser printers, letter paper, and receipts.
Mixed Paper	Examples include colored paper, manila folders and envelopes, file folders, index cards, junk mail, white envelopes, white window envelopes, white or colored notebook paper, greeting cards, shredded paper, magazines, catalogs, brochures, newspapers and inserts, phone books, and carbonless forms.
Composite Paper	Examples include waxed corrugated cardboard, paper cups, tetra pack/aseptic/gable top cartons, paper/hardback books, and photo paper.
Metal Containers	Examples include aluminum beverage cans, canned food, beverages, meat and pet food, clean balled aluminum foil, pie pans, loose metal jar lids and steel bottle caps, and art chemical containers.
Plastic Water Bottles	Plastic water bottles and caps.
Plastic Beverage Containers	Examples include fruit juice, milk, sports drink, tea, or liquor containers. Caps are fine.
Plastic Containers #1-5	Examples include detergent, bleach, yogurt, shampoo, cleaning supply, takeout containers.
Disposable Beverage Cups – Paper Contamination	Examples include paper plastic-lined coffee-cups, sleeves and lids, and fountain drink cold-cups, lids and straws.
Disposable Beverage Cups – Plastic Contamination	Examples include plastic cold drink cups, lids and straws.
Plastic Art Chemical Containers	Art chemicals / supplies plastic containers.
Glass Beverage & Food Containers	Examples include whole or broken soda bottles, fruit juice bottles, wine cooler or beer bottles, and wine bottles, pickle jars, jam/jelly jars, peanut butter jars, salsa jars, olive jars.
Other Glass Containers	Drinking vessels (pint, wine, mason jars), candle jars, cosmetic bottles, jars, windows, shower door, tabletop (no frames).
Glass Contamination	Glass of items that are not conventionally recyclable such as: Pyrex, Corningware, and milkglass tableware, mirrors, auto windshields, laminated glass and china/leaded glass.
Organics Contamination	Organic material found in recycling stream that is not recyclable such as: Food prep, peels, shells, scraps and uneaten food portions, fast food wrappers, food-soiled paper, all pizza boxes, compostable bowls, plates, and cups, cork, hemp rope, chopsticks, hair, flowers, landscaping debris.
Plastic Contamination	Plastic items that are not recyclable such as: lab plastics, #6 plastics, Styrofoam of any kind, shrink wrap and plastic bags, parts made of plastic attached to metal, plastic drinking straws, utensils, chip bags, granola bar and candy bar wrappers, plastic 6-pack holders, plastic strapping, plastic lids, handles and knobs.
Metal Contamination	Coat hangers, empty spray paint, other aerosol containers (no caps), metal scraps and other metal discards.