FOUR-SEASON WASTE COMPOSITION STUDY
BROWN STATION ROAD SANITARY LANDFILL

Prepared for

PRINCE GEORGE'S COUNTY MARYLAND

MARYLAND ENVIRONMENTAL SERVICE

FINAL REPORT

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- Maryland Environmental Service (MES) staff
- Brown Station Road Sanitary Landfill staff

This study would not have been successful without their ongoing cooperation.

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E. EXECUTIVE SUMMARY

E.1 INTRODUCTION

Prince George's County, Maryland (County) commissioned a waste characterization study of residential and commercial waste disposed at the Brown Station Road Sanitary Landfill (BSRSL). The study contains a wealth of data about the composition of wastes originating from different generator sectors. Selected County-wide results are shown in this Executive Summary.

Figure E-1 shows the composition of the aggregate waste stream, which totals over 297,000 combined tons of residential and commercial wastes, self-haul wastes, and bulky wastes direct hauled to the landfill. As shown, Organics is the most prevalent fraction of the waste stream, followed by Paper and Other miscellaneous wastes.

Figure E-1 BSRSL Disposed Waste Composition by Material Group (Tons & Percent)

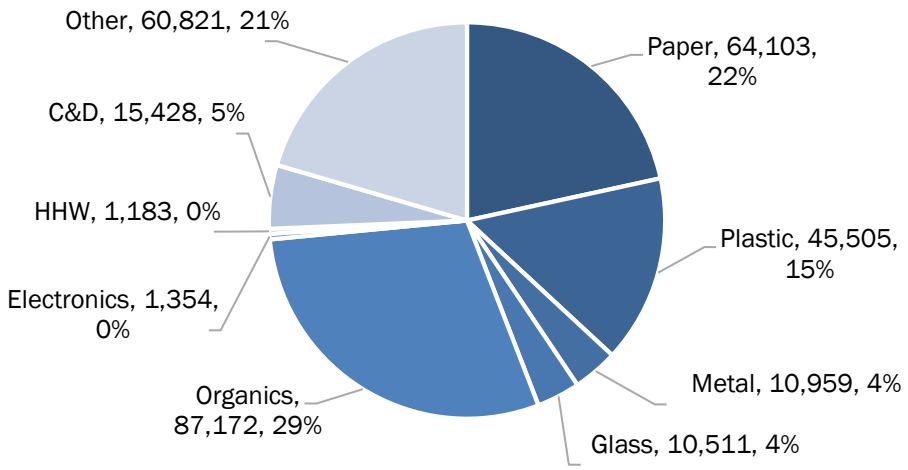
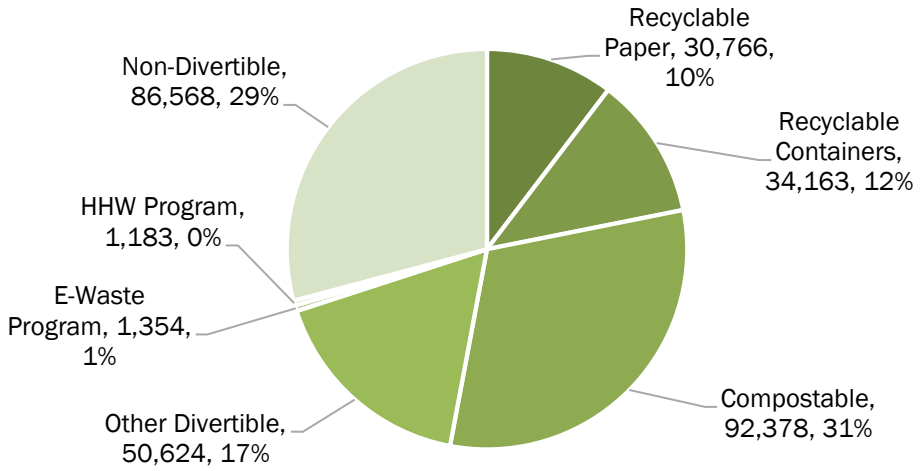


Figure E-2 presents the divertibility potential of waste currently disposed at BSRSL by all generators. This pie chart indicates that a substantial majority of the individual constituents in the disposed waste stream could be diverted through various existing recycling programs and recovery methods.

Figure E-2 BSRSL Disposed Waste Composition by Divertibility (Tons & Percent)



The top ten constituents of the 2022 disposed waste stream at BSRSL are show in Figure E-3. Consistent with studies across the U.S., food waste is the most prevalent single constituent in the disposed waste stream. When separated and free of contaminants, food wastes can be easily composted and digested for recovery of nutrients and energy. The top ten list also includes corrugated cardboard and mixed recyclable paper, which are targeted in residential curbside recycling and in many commercial recycling programs. However, this list also includes a number of difficult-to-divert materials that likely will continue needing landfill disposal for the foreseeable future.

Figure E-3 Top Ten Materials in BSRSL Waste (by Percent)

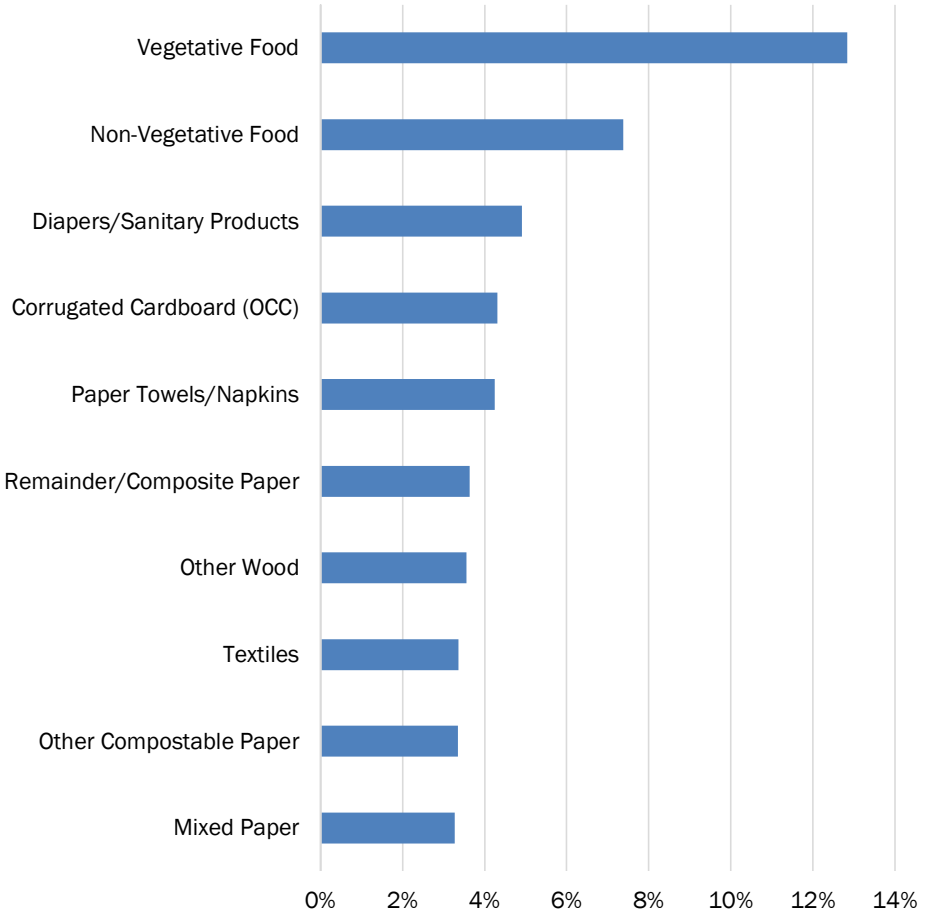
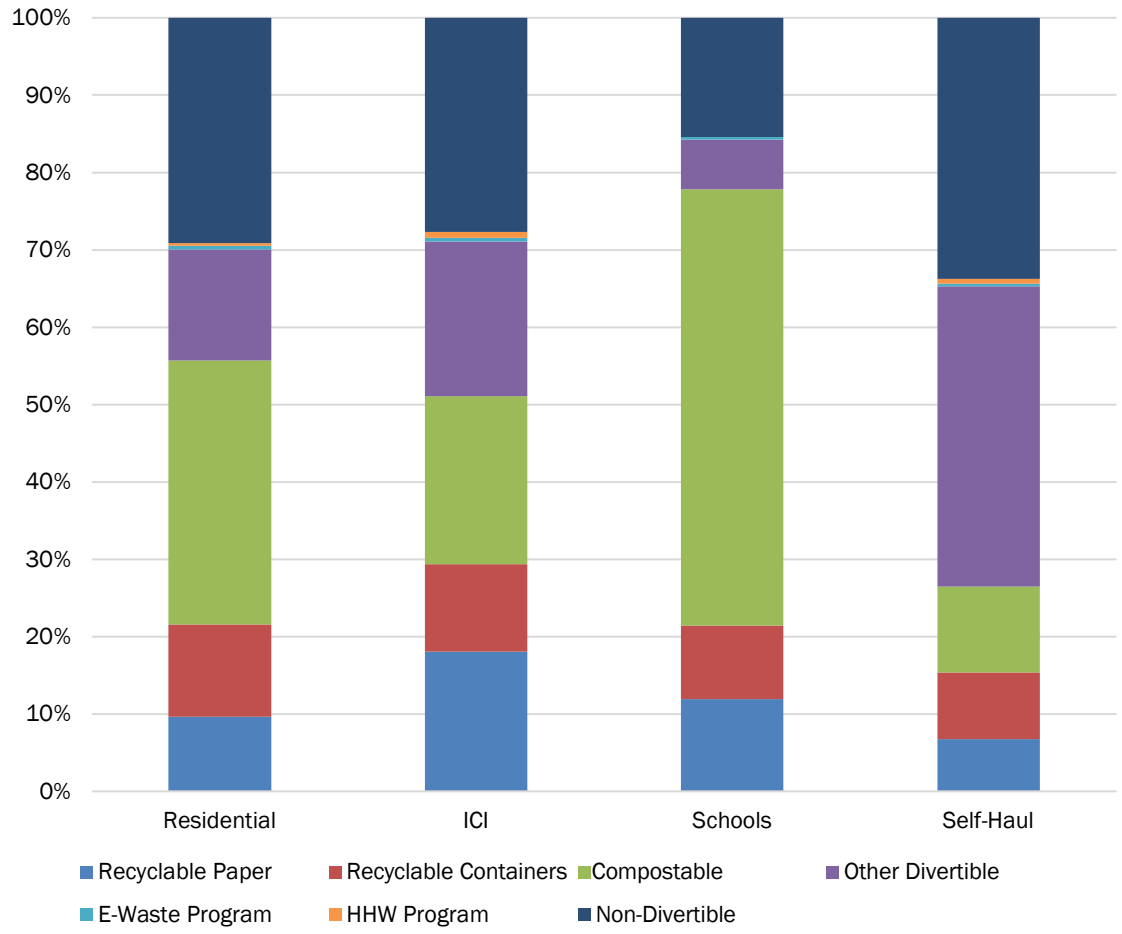


Figure E-4 compares the divertibility of various wastes for each of the generator sectors evaluated in the 2022 Study. The following observations can be made from this figure:

- Residential wastes were found to have relatively low fractions of targeted recyclable paper and containers, which suggests that curbside recycling programs are effectively diverting these materials.
- Residential wastes contained a significant fraction of compostable organic materials, including food scraps, yard wastes, and low grade compostable papers such as tissues and paper towels that are not otherwise recyclable.
- Commercial wastes had the highest fraction of paper, led by the prevalence of corrugated cardboard in this waste stream. While large businesses routinely divert cardboard, small businesses may not have an economically viable outlet to divert cardboard.

- School wastes contained by far the highest fraction of compostable organic materials, which could represent an opportunity to increase diversion (albeit, at just over 5,300 tons, from a small fraction of the overall County waste stream).
- Self-haul wastes, which are a combined subset of the residential and commercial waste streams delivered by residents and small businesses rather than by commercial garbage trucks, were found to be a significant part of the waste stream and contained wastes that are generally more difficult to divert. This waste stream contains a high fraction of bulky items such as furniture and home renovation debris, as well as bags of trash and other miscellaneous items.

Figure E-4 Material Composition by Divertibility by Stream



The body of this report provides extensive data about the composition of wastes from individual generators, as well as comparisons of these results with the previous study performed in 2015. The data in this report should serve to inform County recycling program and solid waste infrastructure planning for the next three to five years. Given the speed of change in the composition of the waste stream, this study should continue to be updated at five to seven year intervals.

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1. INTRODUCTION

1.1 BACKGROUND

In 2021, Maryland Environmental Service (MES) and Prince George's County (County) issued a Request for Proposal (RFP) and Scope of Work (SOW) to complete a four-season waste characterization study at the County's Brown Station Road Sanitary Landfill (BSRSL) located at 3500 Brown Station Road in Upper Marlboro, Maryland. MES and the County retained the team of Geosyntec Consultants, Inc., MSW Consultants and McElroy Enterprises (Project Team) to perform the study. The field work took place from November 2021 through August 2022. This report summarizes the results of the 2021-2022 Waste Characterization Study (2022 Study).

The 2022 Study was designed to serve as an update to the County's previous 2014-2015 waste characterization study (2015 Study)[1] and provide insight into the County's landfill capacity needs and functionality of existing waste diversion efforts and programs. Understanding the types and quantities of the inbound material stream at BSRSL is the first step in analyzing the County's existing waste management strategies and identifying long-term program needs.

1.2 OBJECTIVES

The project objectives for the 2022 Study include:

- Provide information about the types and quantities of the materials present in the waste stream over four seasons through the implementation of a detailed manual and visual sort sampling plan.
- Update the County-wide composition profile for the various County waste generators.
- Apply the waste composition results to the appropriate underlying annual tonnage received at the BSRSL by individual generator and in the aggregate.
- Compare the 2022 Study and 2015 Study findings.
- Provide insights on how the County can improve long-term waste management strategies and evaluate overall effectiveness of the County's existing waste management programs.

1.3 COMPARISONS WITH 2015 STUDY

The 2015 Study created a baseline waste composition profile. Many of the elements of the 2015 were necessarily retained to enable comparisons with this 2022 Study update. However, the 2022 Study incorporated some updated approach elements to enhance the value of the data. Similarities and differences are described below.

1.3.1 SIMILARITIES

Both the 2015 and 2022 studies relied on the general framework for waste composition analysis as provided in ASTM Designation: D5231-92 (Reapproved 2016), "Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste." Common elements to the studies include:

- **Seasonality:** Both studies were performed over four seasons in Winter, Spring, Summer and Fall and captured seasonal representation.
- **Manual Sort Generator Sectors:** The 2022 Study retained the primary generator sectors for the manual sort of Residential-Contract, Residential-Municipal, Commercial and Public Schools.
- **Recyclable Material and Divertibility Categories:** The 2022 Study retained the material categories from the 2015 Study, which were focused primarily on recyclable and divertible constituents. The

[1] Waste Characterization Study Summary of Results 2014/2015, Prince George's County, June 7, 2016.

2022 Study also retained the divertibility categories of Recyclable Paper, Recyclable Containers, Compostable and Other Divertible.

- **Grab Sampling Protocol**: The protocol for obtaining samples of wastes remained unchanged as both studies used standard grab sampling techniques for municipal solid waste (MSW).
- **Manual Sorting Protocol**: The sorting protocol was largely unchanged from the 2015 Study. Samples were pre-weighed, loaded on a sort table, and processed into labeled bins so they could be weighed for analysis.
- **Statistical Methods**: Comparable statistical methods were used in both the 2015 and 2022 Studies to calculate the composition of manually sorted municipal solid wastes.

1.3.2 DIFFERENCES

- **Expansion of Manual Sort Categories to Enable Analysis by Material Group:** Most waste characterization studies sort materials such that all paper, plastic, metal, glass, organics and inorganics are segregated in the resulting composition estimates. The 2015 Study differentiated recyclable and compostable categories, but omitted non-recyclable/non-compostable paper, certain non-recoverable plastics, and various non-recoverable constituents which are known to be a significant portion of the waste stream. The material category list was expanded in the 2022 Study to provide these more conventional results.
- **Comparison of Residential-Contract and Residential-Municipal Waste Composition**: The 2015 Study provided the aggregate residential waste composition, combining the two residential sub-generators. The 2022 Study provides the aggregate residential composition, but also compares the Residential-Contract with the Residential-Municipal waste composition.
- **Addition of Bulky Waste Visual Characterization:** A significant add-on to the 2015 Study was to incorporate visual, volumetric composition surveys on bulky loads generated by the Commercial, Self-Haul and Residential-Bulky (County curbside bulky program) sectors. These loads are not conducive to manual sorting due to the many oversize items included in the waste stream, and were not included in a representative fashion in the 2015 Study.
- **Addition of Cash/Self-Haul Generator Sector**: The 2022 Study also captured a significant number of residential and commercial self-haul loads, which were either manually sorted if they contained regular household or commercial MSW, or visually surveyed if they contained bulky items and renovation debris. These loads were not representatively analyzed in the 2015 Study.
- **Sample Distribution**: The 2015 Study allocated samples in proportion to the weight of inbound wastes by generator sector. This resulted in many samples of residential waste, which is relatively homogeneous, and fewer samples of commercial and public school waste. The 2022 Study increased the sampling of commercial and public school waste because these waste streams exhibit greater sampling variability, meaning that more samples are needed to obtain similarly accurate results to the residential waste stream. The allocation of samples to the residential waste streams was commensurately decreased.
- **Aggregation of BSRSL Waste Composition**: The 2022 Study provides a statistical analysis of the results of the aggregate composition of wastes entering the BSRSL from all generator sectors and waste streams. The 2015 Study included a summary tonnage table with this information, but did not include a full statistical presentation of the aggregate composition

1.4 REPORT ORGANIZATION

The remainder of this report contains the following chapters:

- **Section 2 – Methodology**, describes the sampling, sorting, and data aggregation methods used. This section also provides an overview of the County's waste generation and the sampling targets.

- **Section 3 – Results**, provides graphical and tabular composition data from the 2022 Study, as well as selected comparisons with the 2015 Study.
- **Section 4 – Conclusions and Recommendations**, offers noteworthy observations about the County's waste stream and makes several recommendations for future consideration.

There are also appendices containing supplementary information.

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2. METHODOLOGY

2.1 INTRODUCTION

The general approach to this study was carried over from the 2015 Study, which served as a baseline. Details associated with this 2022 Study update approach are described in this section. First and foremost, this 2022 Study continued to differentiate the generator sectors from the 2015 Study. However, based on a more detailed review of the inbound tonnage, County collection programs, and operations at BSRSL, two additional generator types were defined for this update. The resulting generator sectors are listed below:

- **Residential-Contract:** Residential household refuse collected from the County's unincorporated area by contracted private haulers.
- **Residential-Municipal:** Residential wastes collected from the incorporated municipalities by municipal crews or municipal contract.
- **Commercial:** Wastes collected by private haulers from non-residential generators throughout the County.
- **Public Schools:** Wastes collected by the County Board of Education from the public school system.
- **Self-Haul**: Includes wastes delivered by residents and businesses in passenger cars, pick-up trucks, vans, and other small, non-compacting vehicles. Note that some of these loads are typically recorded as Commercial wastes, but it was possible to segregate these loads from conventional commercial compactor trucks and roll-offs based on detailed scale records.
- **Residential-Bulky:** Residential bulky items collected from the County's unincorporated area on County-operated on-call routes that exclusively collect such items.

Prince George's County maintains detailed scale records of its inbound waste stream. Based on input from the County, this report relies on calendar year (CY) 2021 tonnage as the basis to which composition estimates are applied. Table 2-1 shows the annual tonnage data by generator sector provided by the County for CY21. As shown, almost 300,000 tons were disposed at the BSRSL during 2021, with the majority originating from residential sources.

Table 2-1 Prince George's County Waste Generation Summary (2021 Tons)

Generator Sector	Refuse
Residential-Contract	184,512
Residential-Municipal	42,160
Commercial	32,958
Public Schools	5,334
Self-Haul	26,480
Residential-Bulky	5,592
Total MSW	**297,036**

Source: Prince George's County

2.2 STUDY DESIGN ELEMENTS

2.2.1 STUDY LOCATION

Same as in the 2015 Study, all four-seasons of the 2022 Study took place at BSRSL located at 3500 Brown Station Road near Upper Marlboro, Maryland. Sample collection and sorting took place adjacent to the

active tip face. Each season, landfill staff prepared a pad for the sort crew to work on and an area where selected trucks could tip at a safe proximity from the sort crew while limiting the disruption to normal landfill operations, as shown in Figure 2-1 from Season 2. .

Figure 2-1 Brown Station Road Sanitary Landfill Tip Face (Far) and Sampling Area (Near)

2.2.2 SEASONALITY

Similar to the 2015 Study, one week data collection events took place each season. Table 2-2 summarizes the dates on which sampling, sorting and visual surveying took place for the 2022 Study.

Table 2-2 Seasonal Data Collection Schedule

Season	Manual Sort Dates	Visual Survey Dates
Fall Season (Season 1)	November 15-19, 2021	November 18-19, 2021
Winter Season (Season 2)	February 14-18, 2022	February 16-17, 2022
Spring Season (Season 3)	June 6-10, 2022	June 13-14, 2022
Summer Season (Season 4)	August 15-19, 2022	August 16-17, 2022

2.2.3 SAMPLE ALLOCATION

Table 2-3 summarizes the sample number and distribution by generating sectors from the 2015 Study. As shown, the sample distribution in the 2015 Study was based on the actual distribution of landfill tonnage by generator sector.

Table 2-3 Sampling Plan from 2015 Study

Generator Sector	Annual Tonnage	% of Tons	Sample Targets	% of Samples
Commercial	90,000	30.2%	60	30%
Public Schools	10,000	3.4%	8	4%
Residential – Contract	156,400	52.4%	104	52%
Residential – Municipal	41,800	14.0%	28	14%
Total	**298,200**	**100%**	**200**	**100%**

For the 2022 Study the Project Team proposed two different sampling options to MES and the County. One options was to replicate the 2015 study allocations based purely on tonnages. However, with the Project Team's guidance the County and MES opted for an alternative that involved allocating samples more evenly across generator sectors to ensure representative sampling and to provide increased sampling of generator sectors that tend to have more variability (e.g. Commercial).

This option further reduces the margin of error across all generator sectors by allocating samples more proportionally across each sector. Additionally, though the Residential-Contract generator sector is the largest inbound tonnage, MES and the County were equally interested in understanding the inbound material types and quantities of the Residential-Municipal generator sector; therefore samples were evenly allocated for these generators. The Commercial generator sector was given a higher sample target to better capture the variability of these loads.

Table 2-4 shows the targeted sample allocation and actual samples acquired for the 2022 Study. As shown, samples were allocated more evenly, and all sampling targets were exceeded.

Table 2-4 2022 Sampling Targets for Manual Sorts

	Sample Targets	Pct of Samples	Actual Samples
Residential-Contract	46	23%	52
Residential-Municipal	46	23%	49
Commercial	84	42%	86
Public Schools	12	6%	15
Self-Haul	12	6%	13
Total	**200**	**100%**	**215**

As an update to the 2015 Study, bulky visual surveys were added to the 2022 Study to capture data for bulky loads of MSW that are not conducive to physical sampling and sorting. These loads are primarily sourced from the self-haul generator sector; however, some Commercial and Residential-Bulky loads collected by the County are regularly delivered to BSRSL and were included in the visual surveys.

During Season 1 of the 2022 Study, bulky waste was collected County-wide from curbside residential via the County's Recycle Right trucks, shown in Figure 2-2. Following Season 1 of sample collection, the County transitioned its collection system to have its Residential-Contract haulers collect bulky waste concurrently with regular household trash for most households, although approximately 3,000 households continued to receive separate bulky waste collection provided by the County.

Figure 2-2 County Residential-Bulky Truck

Although bulky wastes were transitioned into the regular curbside collection service in Seasons 2 through 4, visual surveys were not performed on Residential-Contract or Residential-Municipal loads as these loads were too mixed. Rather, efforts were made to note and observe bulky waste in these loads including those selected for manual sampling as the manual sampling and sorting protocol allows bulky items to be characterized to the extent they fall (whether partially or fully) into a random grab sample.

Self-haul surveys were taken from a mix of private haulers/vehicles (e.g., box trucks, cargo vans, pickup trucks) and the County's onsite self-haul drop boxes at BSRSL. Residential-Bulky samples were exclusively collected from the County's rear load trucks for the curbside bulky program. Commercial bulky samples were taken from roll-off compactors and open tops from large private haulers (such as Waste Management, Republic Services and Apple Valley). As much of the Commercial inbound waste observed throughout each season was mixed, non-bulky MSW waste, fewer samples of this generator sector were available to survey visually. However, many of the self-haul samples originated from commercial businesses (e.g., offices, warehouses).

Each season, visual surveys took place over a minimum of two days with a dedicated visual surveyor. Visual surveyors targeted 40 to 60 surveys per season (160-240 samples total). Table 2-5 shows the total number of bulky visual surveys completed during the 2022 Study.

Table 2-5 2022 Bulky Visual Survey Count

	Fall Season 1	Winter Season 2	Spring Season 3	Summer Season 4	Total Samples
Residential-Bulky	7	3	3	3	16
Commercial	7	2	6	6	21
Self-Haul	31	57	64	51	203
Total	**45**	**62**	**73**	**60**	**240**

Figure 2-3 shows examples of vehicles surveyed as bulky visuals.

Figure 2-3 Bulky Visual Surveys

2.2.4 SAMPLE WEIGHTS

The quantity of each sample is based on the homogeneity of the sampled material and the particle size. Consistent with industry literature and the 2015 Study, the sample weights for all manual refuse samples were 200-250 pounds.

Conversely, visually surveyed samples consisted of the entire contents of the tipped load of material. This enables the surveyor to reconcile resulting weight-based composition estimates against a known scale weight (discussed below in more detail).

2.2.5 MATERIAL CATEGORIES AND DIVERTIBILITY

Each manual sample of refuse was sorted into 57 material categories, including all of the original categories from the 2015 Study. However, the 2015 Study simplified the categories into primarily the recyclable, divertible and compostable fractions of the waste stream. Consistent with waste characterization best practices, the 2022 Study included a number of additional categories to enable better roll-up reporting on material groups (paper, plastic, metal, etc,) as well to provide insight on certain constituents that are not currently diverted but represent a significant fraction of the disposed waste stream.

Consistent with the 2015 Study, all material categories were identified as one of several divertibility classes. These are shown in Table 2-6. As shown, these classes are intended to group the material categories to show how materials might be diverted from landfill. Most of these divertibility classes are retained from the 2015 Study, although the 2022 Study added a class for household hazardous waste (HHW) and electronic wastes (E-Waste), which are targeted for separate collection at the County's HHW acceptance site.

Table 2-7 shows the breakdown of the material categories within their respective material groups as well as the divertibility class for each constituent. This table also italicizes new material categories added to the 2022 Study. Detailed definitions for each of these categories is shown in Appendix A.

Table 2-6 Divertibility Classes

#	Divertibility Class	Description
1	Recyclable Paper	Materials in this category are collected through residential curbside collection programs in the County and municipalities. These materials are also accepted at the County's Material Recovery Facility (MRF).
2	Recyclable Containers	Materials in this category are collected through residential curbside collection programs in the County and municipalities. These materials are also accepted at the County's Material Recovery Facility (MRF).
3	Compostable	Materials in this category can be included in the County's composting program.
4	*E-Waste Program*	*Materials in this category can be included in the County's e-waste program.*
5	*HHW Program*	*Materials in this category can be included in the County's HHW program.*
6	Other Divertible	Materials in this category can be diverted from landfill disposal through special programs.
7	Non-Divertible	Materials in this category do not generally have markets established for their recycling or recovery nor can they be included or composted.

**Divertibility classes in italics denote new classes in the 2022 study*

Table 2-7 Manual Sort Material Categories

Material Group and Category	Divertibility Class	Material Group and Category	Divertibility Class
Paper		**Organics**	
Corrugated Cardboard (OCC)	1	Vegetative Food	3
Newspaper/Print (ONP)	1	Non-Vegetative Food	3
Magazines/Catalogs/Other Books	1	Leaves	3
Kraft Paper/Boxboard	1	Grass	3
Mixed Paper	1	Brush	3
Aseptic/Gable Top Cartons	1	Pallets/Lumber	6
Paper Towels/Napkins	*3*	Other Wood	6
Other Compostable Paper	3	*Remainder/Composite Organics*	*7*
Remainder/Composite Paper	*7*	**C&D**	
Plastic		Concrete/Brick/Rock	6
PET (#1) Bottles	2	Sheet Rock	6
HDPE (#2) Bottles	2	Shingles	6
Other (#3-#7) Bottles	2	Carpet/Carpet Padding	6
Jars, Jugs, Tubs, Trays	2	Dirt	6
Flower Pots	2	*Remainder/Composite C&D*	*7*
Other Rigid Plastic	2	**HHW**	
Plastic Shopping Bags	6	Paint	5
Other Plastic Film	7	*Remainder/Composite HHW*	*5*
Garbage Bags	7	**Other**	
Multiple Layered Packaging	*7*	Textiles	6
Polystyrene	7	*Shoes*	*6*
Remainder/Composite Plastic	*7*	*Rags*	*6*
Metal		*Diapers/Sanitary Products*	*7*
Ferrous Cans	2	*Animal Bi-Products*	*7*
Aluminum Cans/Foil	2	*Mattresses*	*6*
Other Ferrous Metals	*6*	*Box Springs*	*6*
Non-Ferrous Metals	*6*	Furniture	7
Glass		*Fines*	*7*
Glass Bottles/Jars	2	Other MSW	7
Remainder/Composite Glass	*7*	*PPE*	*7*
Electronics		*Other Bulky*	*7*
Electronics	4		
CRTs	4		

**Material categories in italics denote new categories in the 2022 study*

Visual, volumetric surveying is designed to estimate the volume and weight of larger constituents in a bulky waste (or construction and demolition, or C&D) stream. Accordingly, this method relies on its own specialized list of material category definitions. Table 2-8 lists the 32 categories used for the visual surveying. These categories are generally self-explanatory, although the Mixed MSW category warrants explanation. Specifically, many bulky waste loads contain a small fraction of bagged trash that has been tossed into the bulky waste pile by the generator, under the assumption that all of the material is suitable for discard. Mixed MSW captures the fraction of bagged wastes that likely contain household and commercial refuse which has been mixed into the bulky load. Definitions for these categories are included in Appendix B.

Table 2-8 Bulky Waste Material Categories for Visual Surveys

Material Category	Material Category
Paper	**Glass**
Uncoated OCC - Recyclable	Non-Recyclable Glass
Other Paper	**Wood**
Plastics	Pallets/Crates
Durable Plastic Items	Wood - Clean
Film Plastic (Comm./Indus.)	Wood - Painted/Treated
Other Plastic	**Furniture**
Metal	Predominantly Wood
Appliances	Predominantly Plastic
Ferrous Metal	Predominantly Metal
Non-Ferrous Metal	Predominantly Mixed
General C&D	Matresses
Dirt/Sand	Box Springs
Rock/Gravel	**Other**
Gypsum/Dry Wall	Other Bulky
Concrete/Brick	E-Waste
Asphalt Roofing	Yard Waste - Brush/Prunings
Asphalt Paving	Textiles
Carpet/Carpet Padding	Tires
Other C&D	Mixed MSW

2.3 FIELD DATA COLLECTION PROTOCOLS

2.3.1 GRAB SAMPLING

Selected loads of waste designated for manual sorting were tipped in the designated area at BSRSL, as shown in Figure 2-4. From each selected load, one sample of material was selected based on systematic "grabs" from the perimeter of the load. For example, if the tipped pile is viewed from the top as a clock face with 12:00 being the part of the load closest to the front of the truck, the first samples was taken from 3 o'clock, 6 o'clock, 9 o'clock, 12 o'clock, and then from 1, 4, 7, and 10 o'clock, and so-on.

Once the area of the tipped load was selected, the Field Supervisor coordinated with a facility-provided loader operator to take a "grab" sample of wastes from that point in the tipped load. The loader operator

removed a sample of waste that exceeded the targeted sample weight and placed the grab sample in a secure area to await sorting.

Figure 2-4 Tipped Loads

Samples were collected in barrels to contain the sample and to enable the sampling team to pre-weigh the sample according to sample mass targets. Each sample was labeled by its identifying number using a placard and photographed, as shown in Figure 2-5. The placard for sample identification stayed with the sample until sorting and weigh out was completed.

Figure 2-5 Selected Loads

2.3.2 MANUAL SORTING

Once each sample had been acquired, the material was manually sorted into the prescribed component categories. Plastic 5-gallon, 18-gallon and 35-gallon bins were used to contain the separated components. Sorters were asked to specialize in certain material groups, with someone handling the paper categories, another the plastics, another the glass and metals, and so on. In this way, sorters were able become highly knowledgeable in a short period of time as to the definitions of individual material categories. Figure 2-6 shows photographs of the work area, sort table and bins.

Figure 2-6 Sorting Work Area

After the entire sample had been sorted into the correct bins, each bin containing sorted materials would be carried over to a digital scale. Sorting laborers assisted with carrying and weighing the bins of sorted material and a professional Crew Chief recorded all data. The Crew Chief used a rugged tablet computer synched to the cloud to record composition weights. Each sample was cross-referenced against the Field Supervisor's sample sheet to assure accurate tracking of the samples each day. The electronic tablet provided real-time quality control calculations to assure each sample was completed in its entirety. The weigh-out process is shown in Figure 2-7, and a schematic showing the data management system is shown in Figure 2-8.

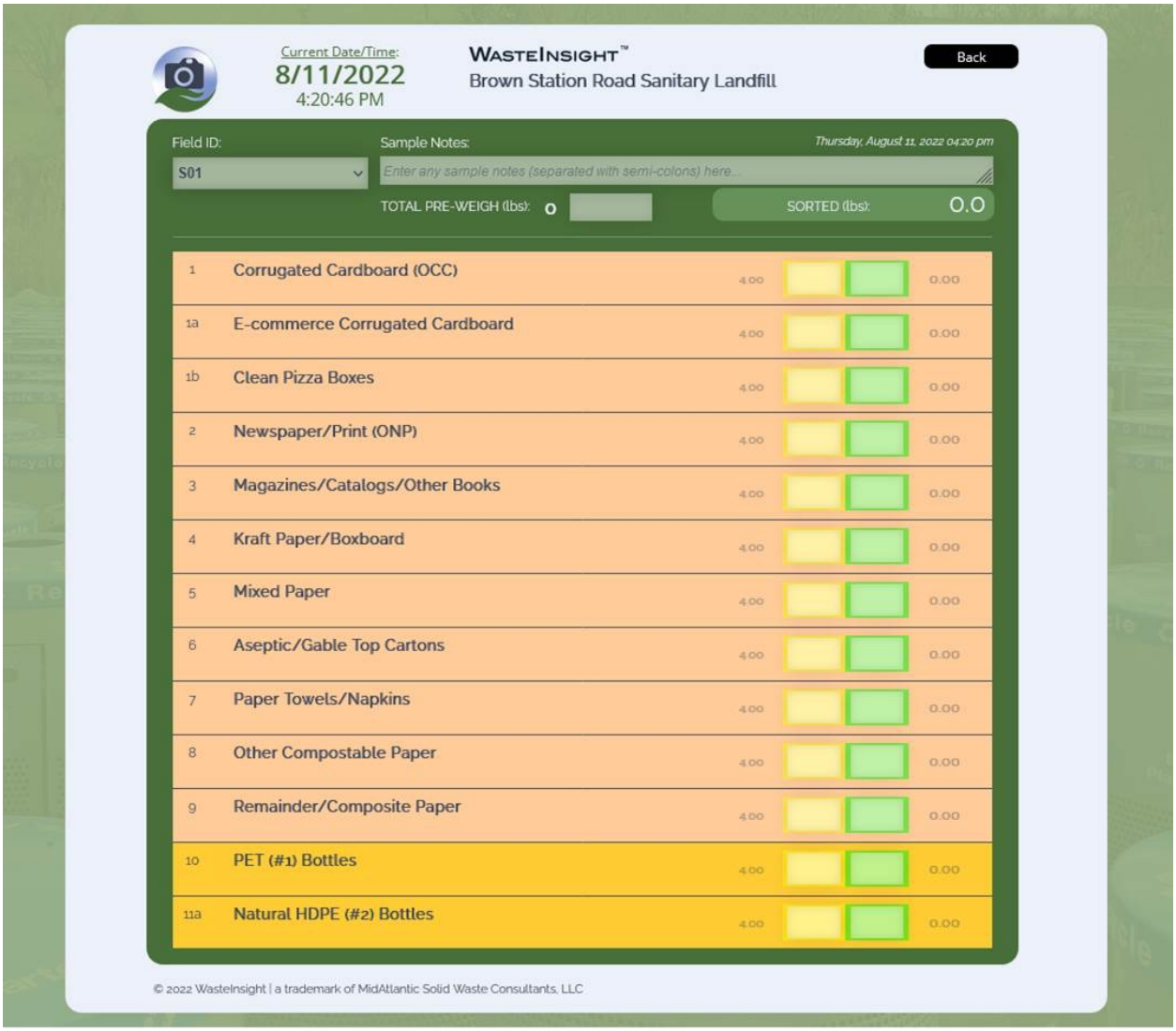
Figure 2-7 Weigh-out

Figure 2-8 Data Management Technology: App-based Data Entry Synced to Cloud Platform

The tablet synchronizes with the cloud via internet, providing excellent data security. Figure 2-9 shows a screenshot of the tablet-based app. Each sample was cross-referenced against the Field Supervisor's sample sheet to assure accurate tracking of the samples each day. The real-time data entry offered several important advantages:

- The template contains built-in logic and error checking to prevent erroneous entries.
- The template sums sample weights in real time so the Crew Chief can confirm achievement of weight targets for each and every sample.

Figure 2-9 Screenshot of Weight Data Recording App



2.3.3 Bulky Waste Visual Surveying

Visual surveying of a load of bulky waste involved detailed volumetric measurements of the truck and load dimensions, followed by the systematic observation of the major material components in the tipped load.

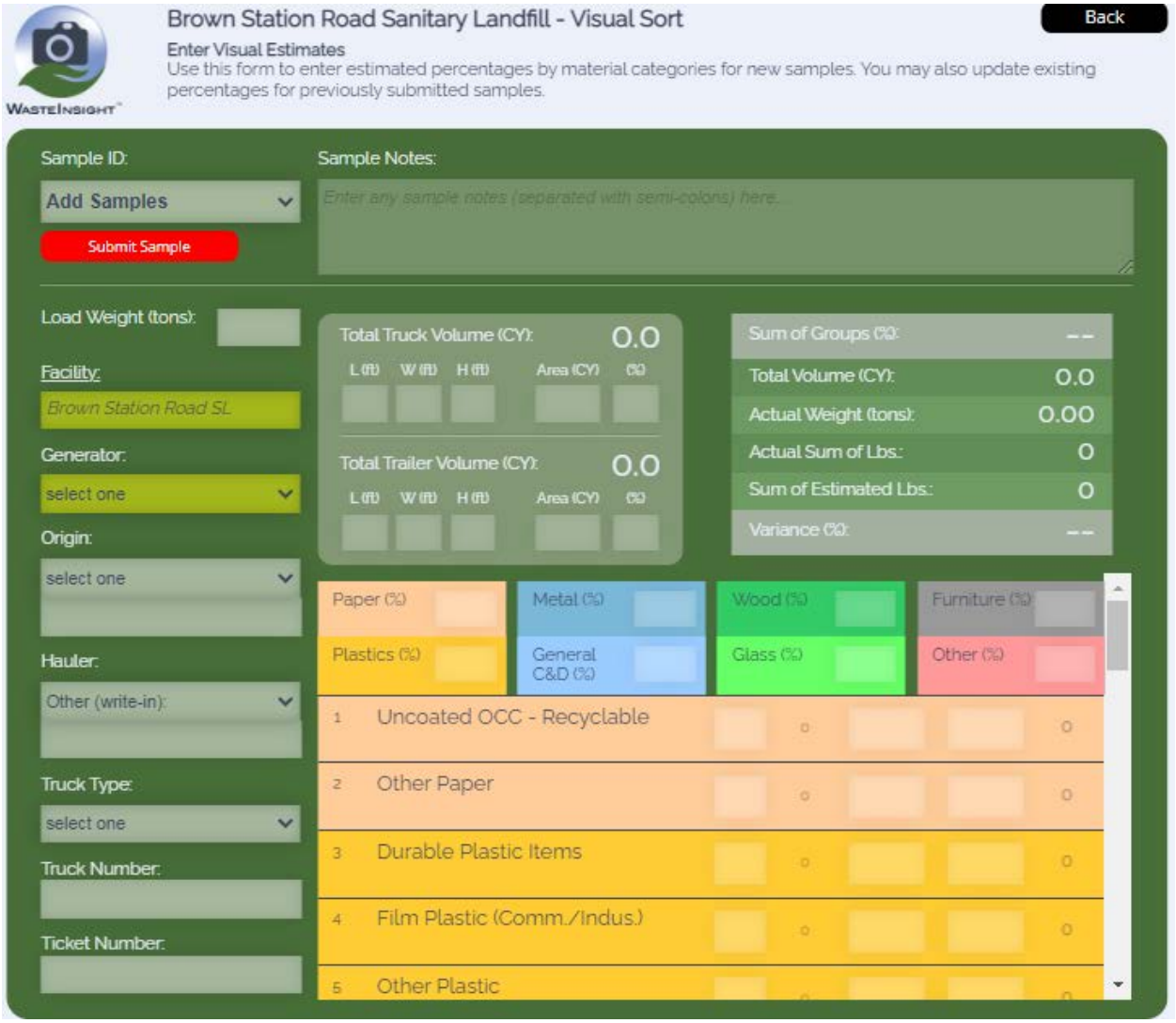
The basic steps used to visually survey these loads were:

- Dimensions of the incoming load were measured and (if possible) the percent full of the vehicle was estimated and recorded.
- A first pass was made around the bulky load marking the major material categories present in the load—Fibers, Metals, Wood, C & D materials, Furniture, etc., estimating the percentage of the load made up of these major materials.
- A second pass was made around the load, noting the secondary material categories contained in the load, estimating, and recording the percentage of the load made up of these materials.

- The estimated percentages were verified to sum up to 100 percent, and that the estimated major material categories were realistic given the overall truck dimensions and volume.

Usage of the MSW Consultants' visual surveying app provides real-time QA/QC on the accuracy of the volumetric estimates, and also compares the estimated weight with the actual weight of the load based on the scale ticket. The visual surveyor thereby has immediate feedback to adjust the weight-based estimate to accurately reflect the weight of the loads. Figure 2-10 shows the interface for visual volumetric surveys.

Figure 2-10 Screenshot of Visual Volumetric Survey Interface



2.4 DATA ANALYSIS

A statistical analysis was performed to calculate the mean composition for each of the material categories and for each material stream in this study. However, the calculations are slightly different for manually sorted samples compared to visually surveyed samples.

Manually sorted samples are first normalized by converting the sample data from weight to percentage. Then, the sample mean has been determined by averaging the percent composition of each material across all samples.

Conversely, the visual volumetric survey data is analyzed with a more elaborate approach. First, volumetric estimates of each surveyed load are converted to weight based on density factors. The density factors have been accumulated by MSW Consultants from industry resources and supplemented with real-world densities obtained in other waste characterization studies. The density factors (and other inputs to the calculation) can also be adjusted in real time through use of the MSW Consultants data collection app. The calculated load weights were then compared against the actual reported weights as presented on the ticketing information obtained for each load.

Once visual sample data were converted to estimated weights, the sample mean composition was determined for each material category by (i) summing the weight of each material in each sample; (ii) summing the total weight of all samples, and (iii) dividing the first value by the second value to determine the percent-by-weight composition.

For both manually sorted and visually surveyed samples, the margin of error (MOE) is provided for each material category as well as for major material groups (e.g., "paper", "plastic", etc.). The MOE has been calculated at a 90 percent level of confidence. In general, as the number of samples increases, the size of the MOE decreases, although the more variable the underlying waste stream composition, the less noticeable the improvement for adding incremental samples.

3. RESULTS

3.1 AGGREGATE DISPOSED WASTE COMPOSITION

The material streams and generator sectors that were analyzed during the 2022 Study have been aggregated to show the composition of discarded wastes at the BSRSL. Table 3-1 shows the combined composition of the 297,000 tons of residential, commercial, public school, self-haul, and bulky wastes that were disposed in CY21. In particular, this table includes the mean composition percentage and the margin of error (MOE) at a 90 percent level of confidence. The MOE value is shown in the column labeled "+/-". The lower bound of a 90 percent confidence interval can be calculated by subtracting the MOE from the mean; and the upper bound by adding the MOE to the mean. This table further applies the mean composition estimate to the overall tonnage received at the landfill. As shown, these estimates are based on all 455 manually sorted and visually surveyed samples.

Table 3-1 Detailed Composition of BSRSL Waste, CY21

Material Category	Mean	+/-	Annual Tons	Material Category	Mean	+/-	Annual Tons
Paper	**21.6%**	**2.5%**	**64,103**	**Organics**	**29.3%**	**3.5%**	**87,172**
Corrugated Cardboard (OCC)	4.3%	0.7%	12,790	Vegetative Food	12.8%	3.2%	38,149
Newspaper/Print (ONP)	0.5%	0.2%	1,449	Non-Vegetative Food	7.4%	2.0%	21,920
Magazines/Catalogs/Other Books	0.6%	0.3%	1,811	Leaves	1.4%	1.3%	4,026
Kraft Paper/Boxboard	1.5%	0.4%	4,367	Grass	0.6%	0.5%	1,688
Mixed Paper	3.3%	1.1%	9,710	Brush	1.4%	1.0%	4,047
Aseptic/Gable Top Cartons	0.2%	0.1%	640	Pallets/Lumber	1.5%	1.3%	4,472
Paper Towels/Napkins	4.2%	1.0%	12,607	Other Wood	3.6%	1.9%	10,553
Other Compostable Paper	3.3%	1.7%	9,942	Remainder/Composite Organi	0.8%	0.5%	2,318
Remainder/Composite Paper	3.6%	0.7%	10,788	**C&D**	**5.2%**	**3.0%**	**15,428**
Plastic	**15.3%**	**1.5%**	**45,505**	Concrete/Brick/Rock	0.1%	0.1%	284
PET (#1) Bottles	1.9%	0.4%	5,685	Sheet Rock	0.7%	1.3%	2,183
HDPE (#2) Bottles	0.6%	0.2%	1,850	Shingles	0.1%	0.1%	418
Other (#3-#7) Bottles	0.1%	0.0%	211	Carpet/Carpet Padding	1.6%	1.4%	4,879
Jars, Jugs, Tubs, Trays	2.0%	0.5%	5,879	Dirt	0.2%	0.2%	478
Flower Pots	0.0%	0.0%	42	Remainder/Composite C&D	2.4%	2.0%	7,186
Other Rigid Plastic	2.2%	0.7%	6,555	**HHW**	**0.4%**	**0.2%**	**1,183**
Plastic Shopping Bags	0.6%	0.2%	1,876	Paint	0.0%	0.2%	141
Other Plastic Film	2.9%	0.5%	8,711	Remainder/Composite HHW	0.4%	0.2%	1,042
Garbage Bags	2.4%	0.4%	7,068	**Other**	**20.5%**	**3.1%**	**60,821**
Multiple Layered Packaging	0.2%	0.1%	663	Textiles	3.4%	1.2%	9,972
Polystyrene	0.8%	0.2%	2,331	Shoes	0.6%	0.4%	1,712
Remainder/Composite Plastic	1.6%	0.3%	4,634	Rags	0.0%	0.0%	51
Metal	**3.7%**	**0.8%**	**10,959**	Diapers/Sanitary Products	4.9%	2.3%	14,592
Ferrous Cans	0.6%	0.2%	1,850	Animal Bi-Products	2.1%	1.5%	6,232
Aluminum Cans/Foil	1.0%	0.3%	3,071	Mattresses	2.4%	2.4%	7,203
Other Ferrous Metals	1.5%	0.7%	4,362	Box Springs	0.2%	0.2%	505
Non-Ferrous Metals	0.6%	0.3%	1,676	Furniture	3.2%	1.6%	9,652
Glass	**3.5%**	**0.9%**	**10,511**	Fines	0.7%	0.2%	1,941
Glass Bottles/Jars	3.0%	1.0%	9,021	Other MSW	0.9%	0.4%	2,634
Remainder/Composite Glass	0.5%	0.2%	1,490	PPE	0.2%	0.1%	506
Electronics	**0.5%**	**0.3%**	**1,354**	Other Bulky	2.0%	0.8%	5,821
Electronics	0.4%	0.3%	1,294	**Total**	**100.0%**		**297,036**
CRTs	0.0%	0.0%	60	**No. of Samples**	**455**		

3. RESULTS

Figure 3-1 provides a visual breakdown of the aggregate disposed waste stream by material group. Organics were found to make up the largest fraction of landfilled wastes, followed by Paper. Note that the 2015 Study did not sort constituents entirely into material group (e.g., non-recyclable, non-compostable papers were sorted as "Other") and so there is no way to compare these findings with the 2015 Study.

Figure 3-1 Aggregate Disposed Waste Composition by Material Group

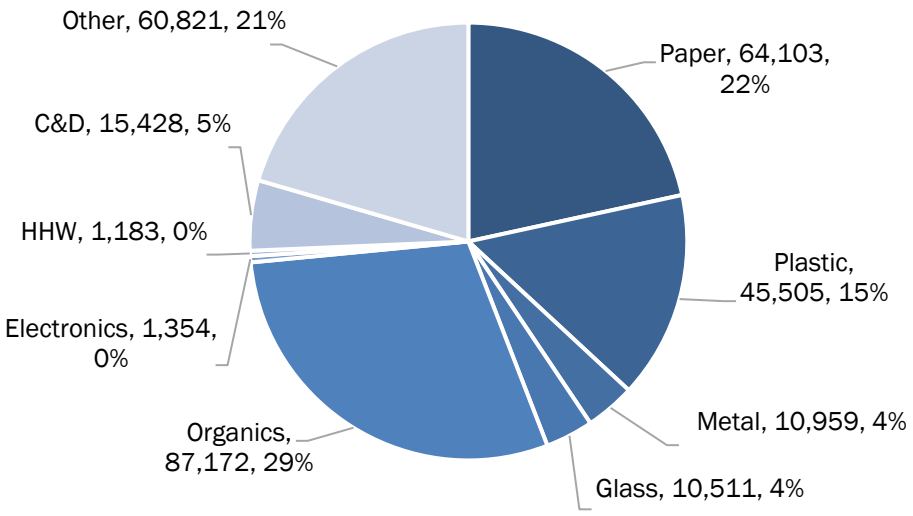


Figure 3-2 compares the divertibility of landfilled MSW from the 2022 and 2015 studies on a percent basis. This figure highlights some noteworthy changes from the 2015 results. First, the fraction of targeted paper in the disposed waste stream has declined significantly. This finding tracks the macroeconomic trend of the migration from paper to digital media. The other noteworthy change shown in this figure is the apparent growth in the Other waste category. However, it is hypothesized that the 2022 Study methodology, which more exhaustively characterized the entire landfilled waste steam vis a vis the self-haul and bulky waste tonnages, may have captured additional waste materials that would have been missed via an entirely manual sort as was performed in 2015.

Figure 3-2 Comparison of Divertibility in Landfilled MSW, 2022 v 2015 (Percent)

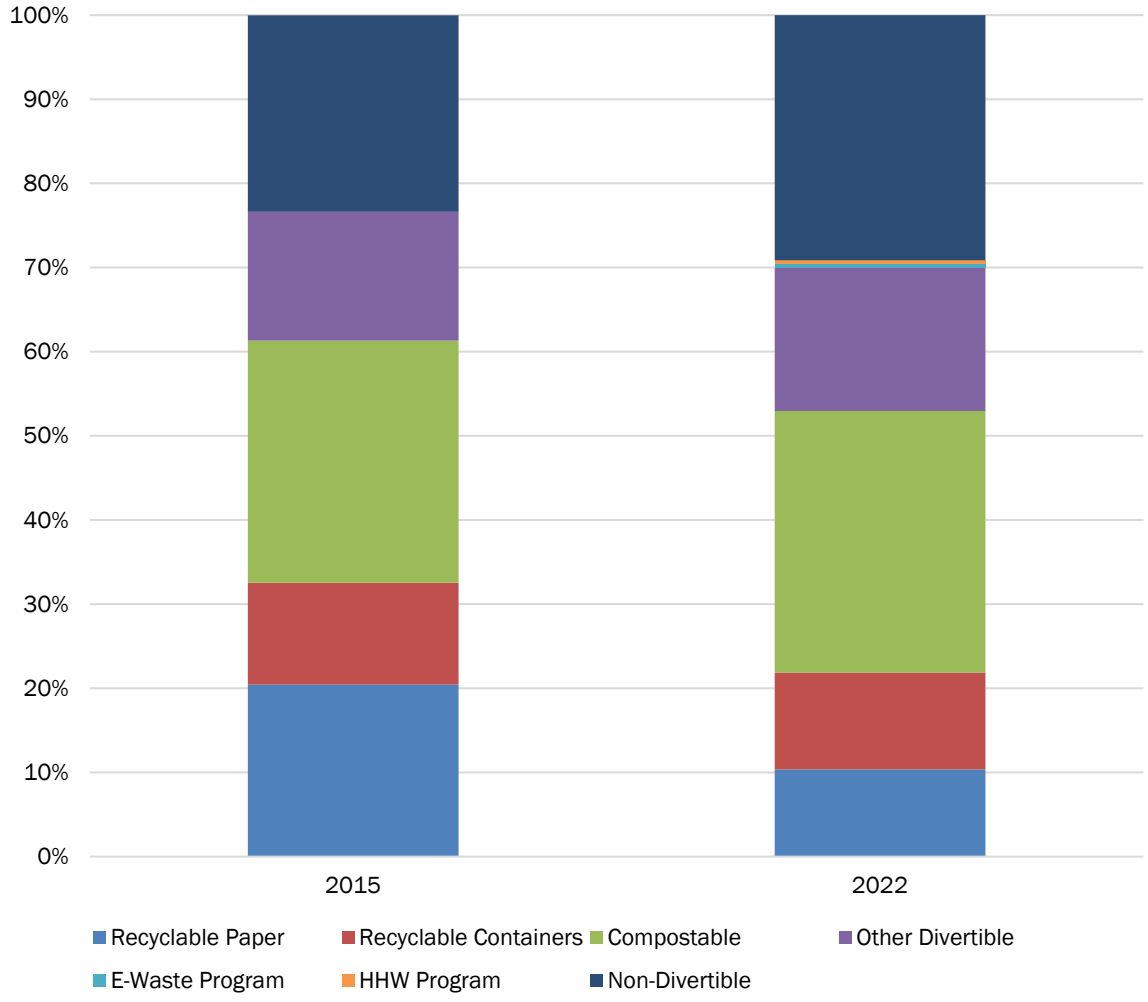


Figure 3-3 shows the same comparison of 2022 and 2015 material divertibility, but on a tonnage basis. Overall, tonnage has remained relatively level since 2015, and the changes in absolute quantities track the percentage changes since 2015.

Figure 3-3 Comparison of Divertibility in Landfilled MSW, 2022 v 2015 (Tons)

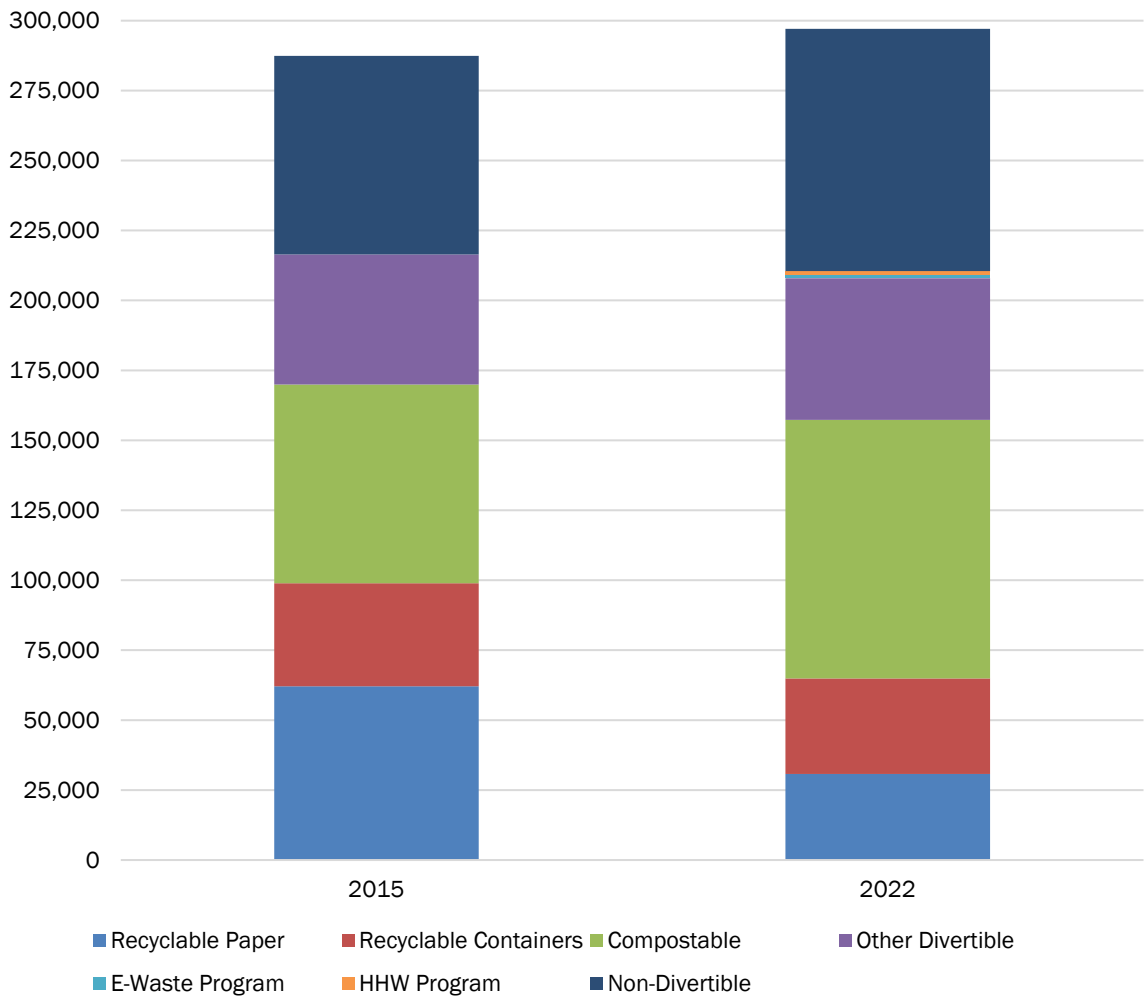


Table 3-2 provides a detailed numerical comparison of material divertibility in 2022 and 2015. These data underlie the preceding figures and are provided for easy reference.

Table 3-2 Detailed Comparison of Divertible Materials, 2022 v 2015

	2015		2022	
Materials	**Percent**	**Tons**	**Percent**	**Tons**
Recyclable Paper	**20.4%**	**62,114**	**10.4%**	**30,766**
Recyclable Containers	**12.1%**	**36,832**	**11.5%**	**34,163**
Compostable	**28.8%**	**87,472**	**31.1%**	**92,378**
Divertible	**15.3%**	**46,526**	**17.9%**	**53,161**
Electronics	0.8%	2,287	0.4%	1,294
CRTs	0.2%	745	0.0%	60
Paint	0.1%	295	0.0%	141
Other Ferrous Metals	0.5%	1,580	1.5%	4,362
Non-Ferrous Metals	0.5%	1,580	0.6%	1,676
Pallets/Lumber	1.5%	4,627	1.5%	4,472
Other Wood	2.2%	6,554	3.6%	10,553
Concrete/Brick/Rock	0.3%	793	0.1%	284
Dirt	0.6%	1,789	0.2%	478
Sheet Rock	0.6%	1,813	0.7%	2,183
Carpet/Carpet Padding	1.6%	4,838	1.6%	4,879
Shingles	0.3%	1,063	0.1%	418
Textiles	4.8%	14,722	3.4%	9,972
Plastic Shopping Bags	1.3%	3,840	0.6%	1,876
Shoes	0.0%	0	0.6%	1,712
Rags	0.0%	0	0.0%	51
Mattresses	0.0%	0	2.4%	7,203
Box Springs	0.0%	0	0.2%	505
Remainder/Composite HHW	0.0%	0	0.4%	1,042
Other MSW	**23.3%**	**70,974**	**29.1%**	**86,568**
Total	**100.0%**	**303,918**	**100.0%**	**297,036**

3.2 RESIDENTIAL WASTE COMPOSITION

Residential waste is comprised of Residential-Contract, Residential-Municipal, and Residential-Bulky wastes. Table 3-3 shows the aggregated composition of residential waste. These estimates are based on the 117 combined manual samples and visual surveys of these inbound loads.

Table 3-3 Detailed Composition of Residential Waste

Material Categories	Mean	+/-	Annual Tons	Material Categories	Mean	+/-	Annual Tons
Paper	**22.0%**	**1.4%**	**51,134**	**Organics**	**29.6%**	**1.6%**	**68,807**
Corrugated Cardboard (OCC)	3.1%	0.5%	7,201	Vegetative Food	14.3%	2.2%	33,120
Newspaper/Print (ONP)	0.6%	0.2%	1,300	Non-Vegetative Food	8.0%	1.6%	18,615
Magazines/Catalogs/Other Books	0.7%	0.2%	1,526	Leaves	1.5%	0.6%	3,471
Kraft Paper/Boxboard	1.6%	0.3%	3,719	Grass	0.6%	0.5%	1,499
Mixed Paper	3.5%	0.7%	8,148	Brush	1.4%	0.5%	3,166
Aseptic/Gable Top Cartons	0.2%	0.1%	505	Pallets/Lumber	0.4%	0.4%	1,015
Paper Towels/Napkins	4.8%	0.9%	11,158	Other Wood	2.5%	0.8%	5,859
Other Compostable Paper	3.6%	1.8%	8,259	Remainder/Composite Organics	0.9%	0.5%	2,062
Remainder/Composite Paper	4.0%	0.5%	9,319	**C&D**	**2.6%**	**1.0%**	**6,030**
Plastic	**15.8%**	**0.9%**	**36,656**	Concrete/Brick/Rock	0.0%	0.0%	60
PET (#1) Bottles	2.0%	0.2%	4,742	Sheet Rock	0.4%	0.3%	816
HDPE (#2) Bottles	0.6%	0.2%	1,415	Shingles	0.2%	0.2%	401
Other (#3-#7) Bottles	0.1%	0.0%	188	Carpet/Carpet Padding	1.0%	0.6%	2,386
Jars, Jugs, Tubs, Trays	2.2%	0.3%	5,180	Dirt	0.1%	0.1%	286
Flower Pots	0.0%	0.0%	38	Remainder/Composite C&D	0.9%	0.6%	2,080
Other Rigid Plastic	1.9%	0.5%	4,459	**HHW**	**0.3%**	**0.2%**	**771**
Plastic Shopping Bags	0.7%	0.2%	1,685	Paint	0.0%	0.0%	74
Other Plastic Film	3.0%	0.3%	6,948	Remainder/Composite HHW	0.3%	0.2%	697
Garbage Bags	2.4%	0.4%	5,659	**Other**	**21.9%**	**1.9%**	**50,959**
Multiple Layered Packaging	0.2%	0.1%	572	Textiles	3.5%	0.7%	8,232
Polystyrene	0.8%	0.2%	1,972	Shoes	0.7%	0.4%	1,581
Remainder/Composite Plastic	1.6%	0.3%	3,798	Rags	0.0%	0.0%	22
Metal	**3.6%**	**0.6%**	**8,289**	Diapers/Sanitary Products	5.9%	2.1%	13,792
Ferrous Cans	0.7%	0.2%	1,562	Animal Bi-Products	2.6%	0.8%	5,935
Aluminum Cans/Foil	1.1%	0.2%	2,656	Mattresses	2.8%	1.4%	6,587
Other Ferrous Metals	1.3%	0.5%	3,014	Box Springs	0.2%	0.3%	412
Non-Ferrous Metals	0.5%	0.2%	1,057	Furniture	2.6%	1.1%	6,149
Glass	**3.7%**	**0.5%**	**8,543**	Fines	0.7%	0.2%	1,678
Glass Bottles/Jars	3.2%	0.6%	7,392	Other MSW	1.0%	0.3%	2,234
Remainder/Composite Glass	0.5%	0.1%	1,151	PPE	0.2%	0.0%	355
Electronics	**0.5%**	**0.2%**	**1,074**	Other Bulky	1.7%	0.6%	3,981
Electronics	0.4%	0.2%	1,014	**Total**	**100.0%**		**232,264**
CRTs	0.0%	0.0%	60	**No. of Samples**	**117**		

Figure 3-4 shows the composition of aggregated residential waste by material groups. It is not surprising that the composition of residential wastes is quite similar to the aggregate composition of all disposed

wastes, given that the majority of waste materials originate from the residential sector. C&D debris was found in lower concentrations in the residential waste stream.

Figure 3-4 Residential Waste Composition by Material Group

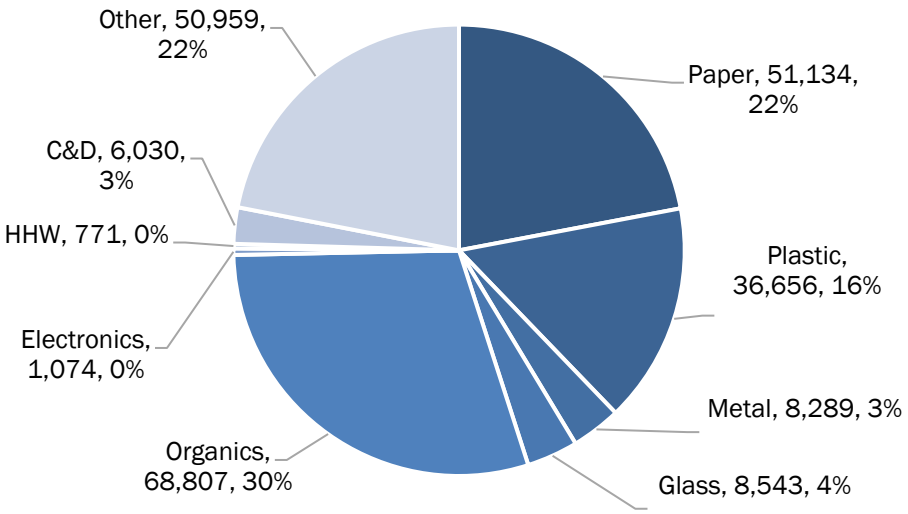


Figure 3-5 compares the composition of Residential-Contract, Residential-Municipal and Residential-Bulky wastes. A number of interesting observations can be made from this figure:

- As expected, residential waste collected by municipal haulers and private haulers is largely similar in composition.
- However, the residential wastes collected by private haulers from the County unincorporated areas appears to have slightly higher incidence of divertible materials compared to the municipal wastes.
- Finally, the residential bulky stream is vastly different in its make-up, with far higher proportions being non-divertible and/or C&D-type debris. This finding is not surprising as these bulky and C&D materials are difficult to recycle when generated in the residential sector, and potentially difficult to collection with manual collection systems.

Figure 3-5 Comparison of Residential Waste Composition by Stream

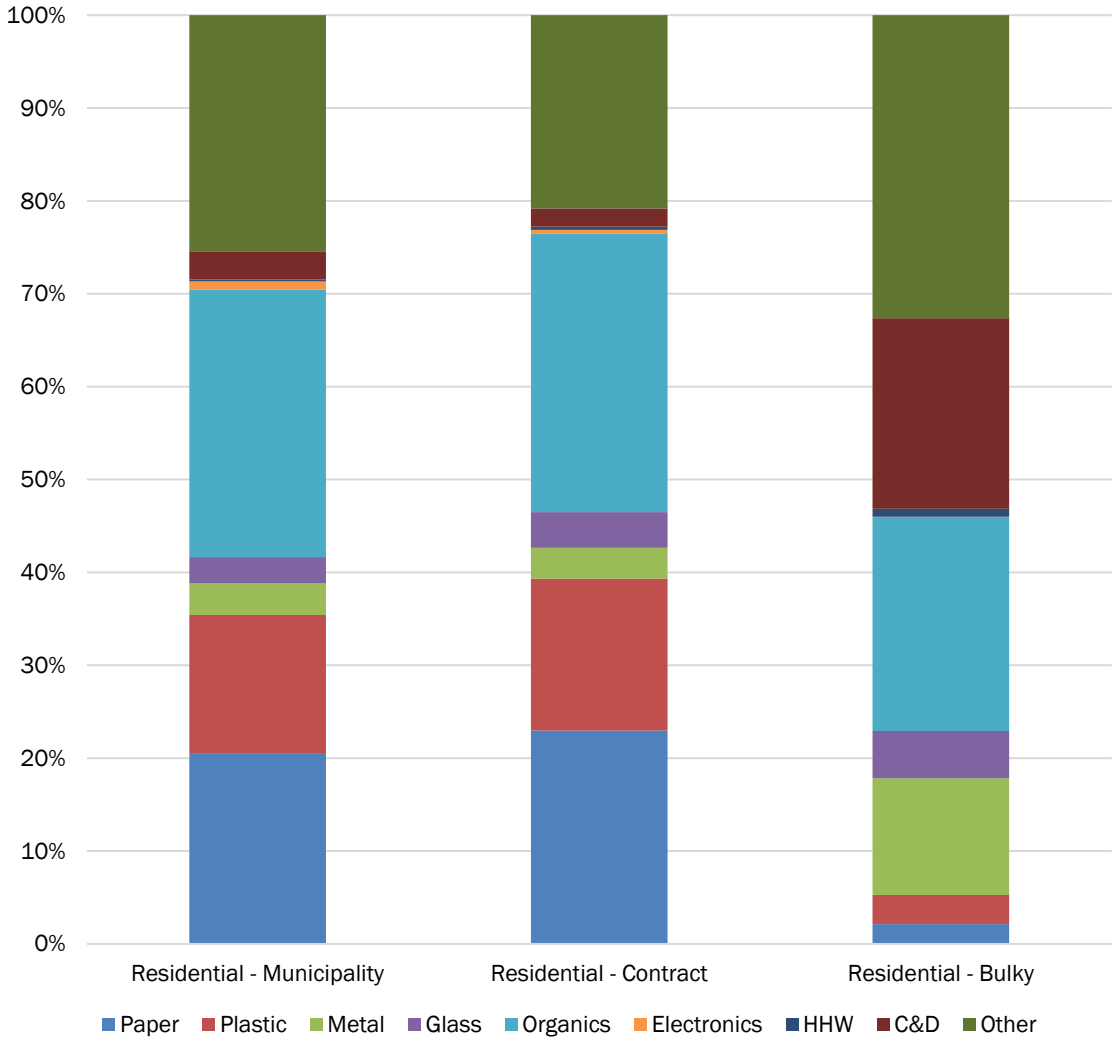
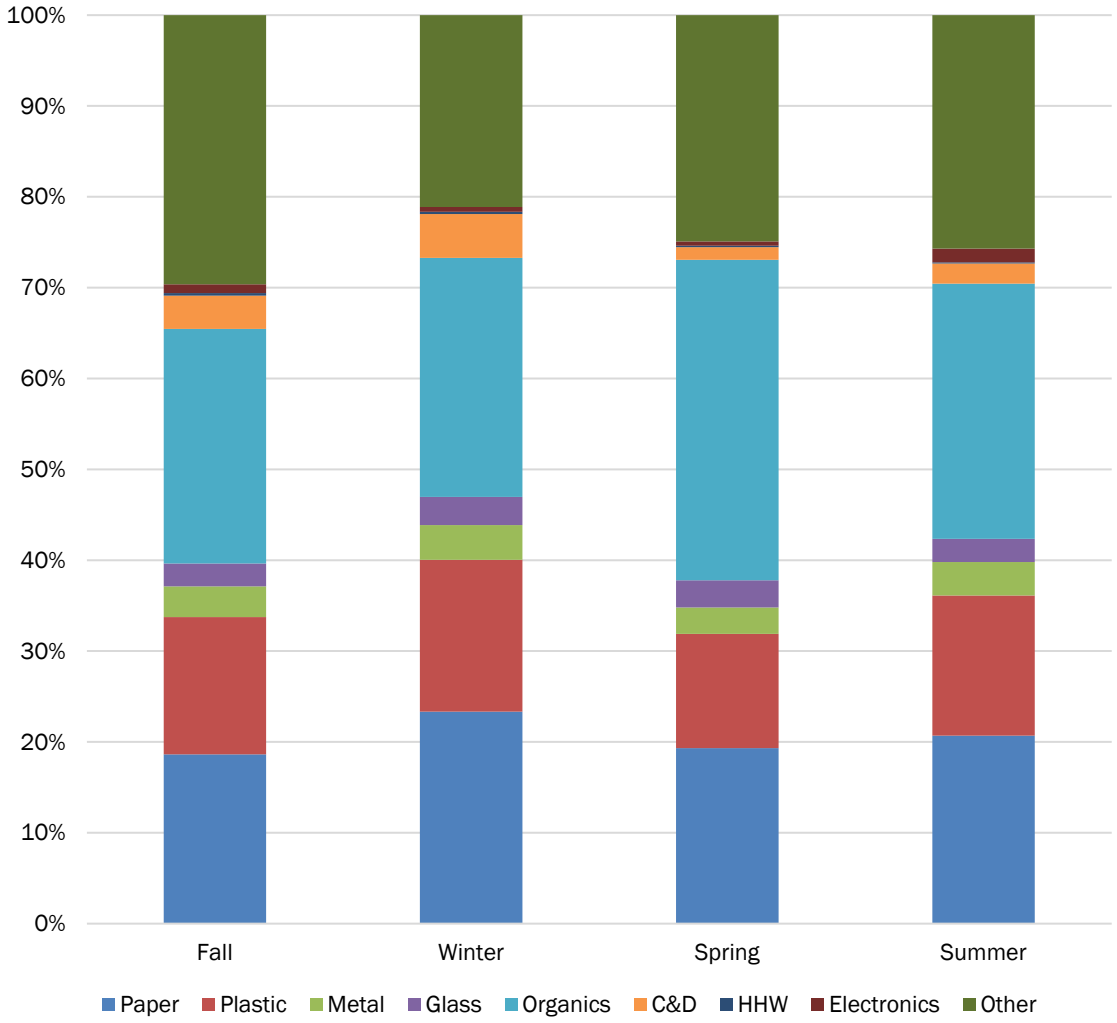


Figure 3-6 presents the 2022 four-season comparison for the Residential-Municipal sector. As shown, seasonal composition was found to be relatively range-bound by material group, although slight variation within some material groups was noted in each season.

Figure 3-6 Seasonal Differences in Residential-Municipal Waste by Material Group



The seasonal comparison for the Residential-Contract generator sector is shown in Figure 3-7.

Figure 3-7 Seasonal Differences in Residential-Contract Waste by Material Group

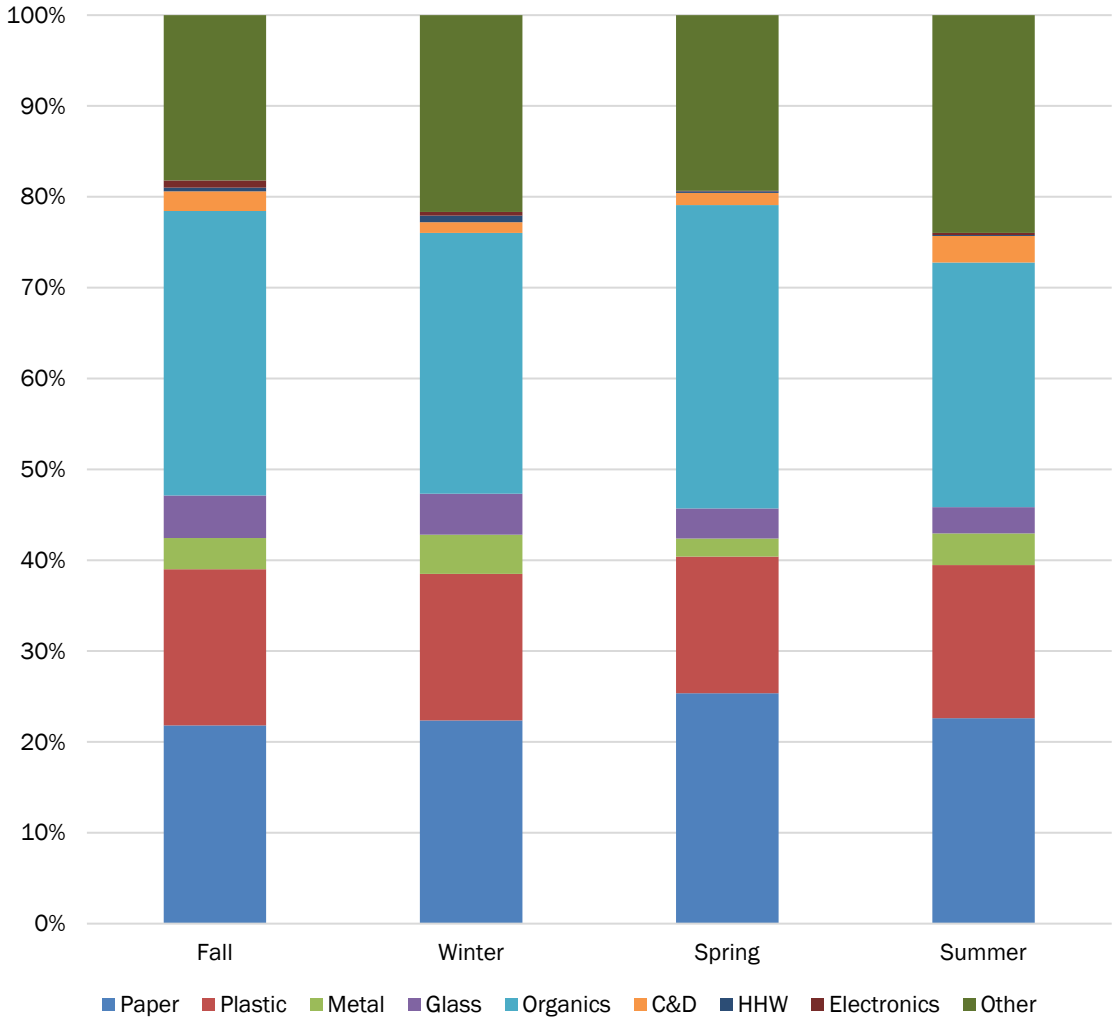


Figure 3-8 compares the divertibility of the three subsets of residential waste. Again, residential contract and municipal wastes are quite similar in make-up, while bulky wastes are very different. The larger Divertible category in the bulky stream is driven by comparatively larger amounts of other ferrous metals, other non-ferrous metals, mattresses, box Springs, and various C&D material categories.

Figure 3-8 Comparison of Residential Waste Divertibility by Stream, 2022

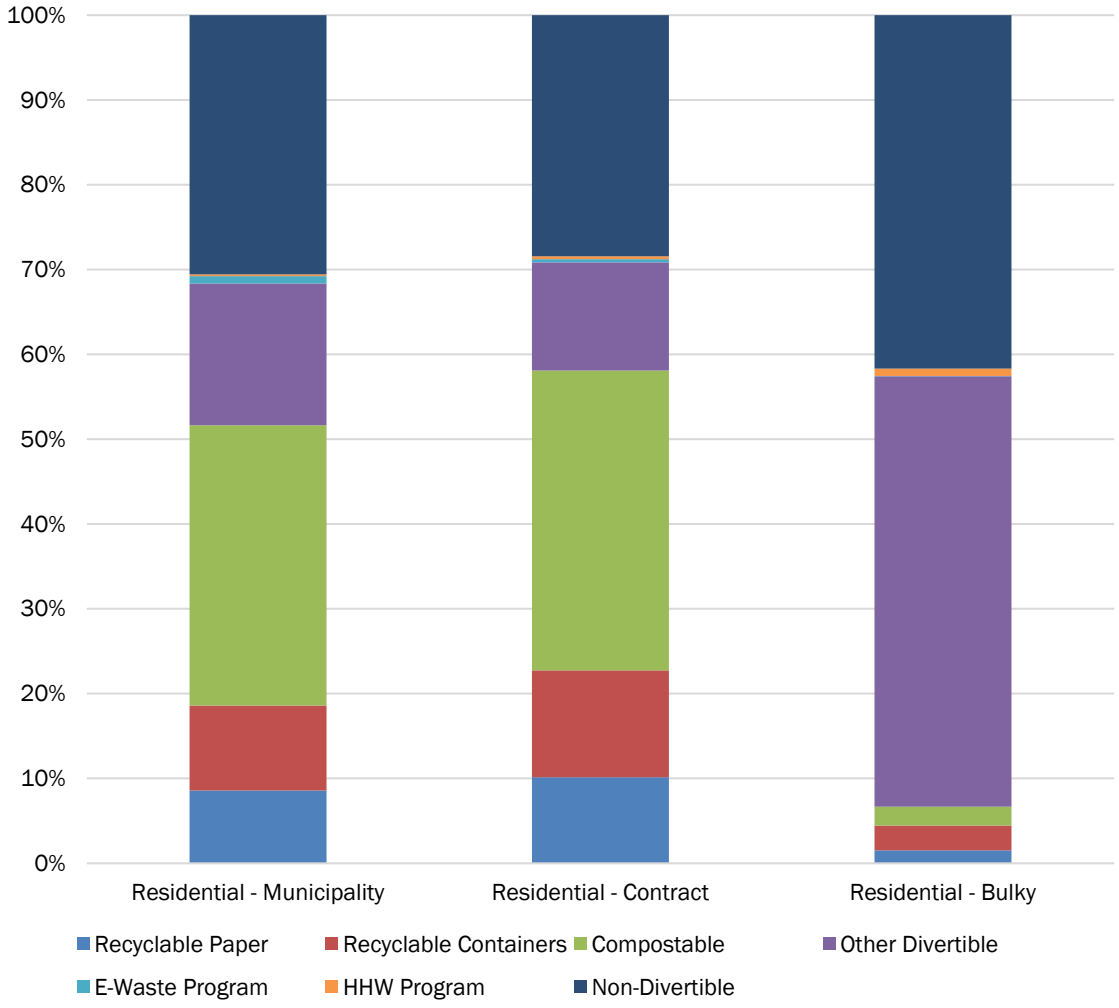


Figure 3-9 compares the divertibility of residential waste in the 2022 and 2015 studies. These results track closely with the aggregate results in the preceding section.

Figure 3-9 Comparison of Divertibility in Residential Waste, 2022 v 2015 (Percent)

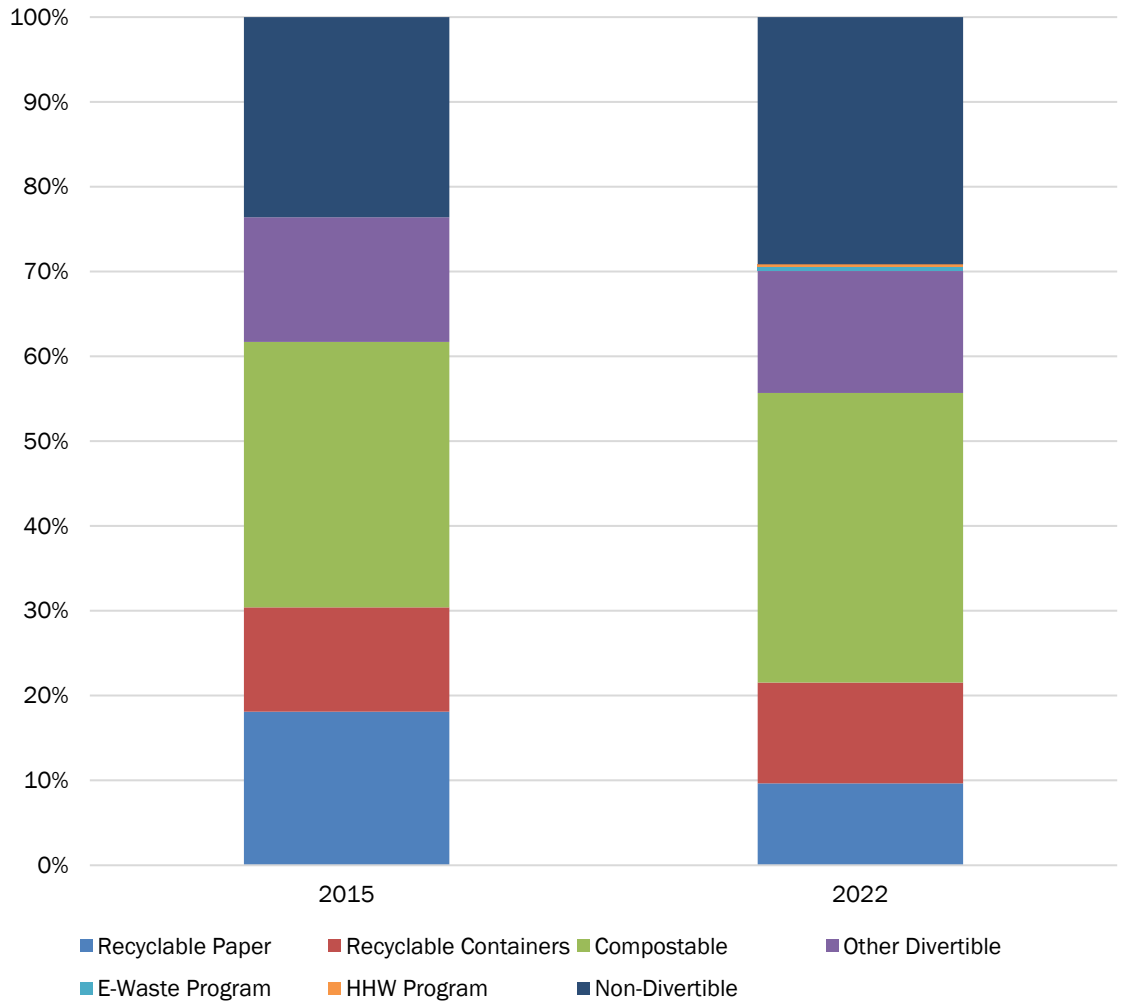


Table 3-4 provides a detailed comparison of material divertibility between the study periods by class and then further showing the individual Divertible material categories.

Table 3-4 Detailed Comparison of Divertible Residential Materials, 2022 v 2015

	2015		2022	
Materials	Percent	Tons	Percent	Tons
Recyclable Paper	**18.1%**	**36,924**	**9.6%**	**22,399**
Recyclable Containers	**12.3%**	**25,092**	**11.9%**	**27,633**
Compostable	**31.3%**	**63,852**	**34.1%**	**79,288**
Divertible	**14.7%**	**29,988**	**15.2%**	**35,259**
Electronics	0.9%	1,836	0.4%	1,014
CRTs	0.1%	204	0.0%	60
Paint	0.1%	204	0.0%	74
Other Ferrous Metals	0.5%	1,020	1.3%	3,014
Non-Ferrous Metals	0.5%	1,020	0.5%	1,057
Pallets/Lumber	0.9%	1,836	0.4%	1,015
Other Wood	2.1%	4,284	2.5%	5,859
Concrete/Brick/Rock	0.3%	612	0.0%	60
Dirt	0.7%	1,428	0.1%	286
Sheet Rock	0.8%	1,632	0.4%	816
Carpet/Carpet Padding	0.7%	1,428	1.0%	2,386
Shingles	0.3%	612	0.2%	401
Textiles	5.3%	10,812	3.5%	8,232
Plastic Shopping Bags	1.5%	3,060	0.7%	1,685
Shoes	0.0%	0	0.7%	1,581
Rags	0.0%	0	0.0%	22
Mattresses	0.0%	0	2.8%	6,587
Box Springs	0.0%	0	0.2%	412
Remainder/Composite HHW	0.0%	0	0.3%	697
Other MSW	**23.6%**	**48,144**	**29.1%**	**67,685**
Total	**100.0%**	**204,000**	**100.0%**	**232,264**

Table 3-5, Table 3-6 and Table 3-8 provide the detailed statistical analysis of the composition of Residential-Contract, Residential-Municipal, and Residential-Bulky wastes for reference. Note that Table 3-8 shows the unadjusted composition of Residential-Bulky wastes, using the specific visually surveyed material categories. For consistency, Table 3-8 shows the adjusted composition of Residential-Bulky. This adjusted table allocates the Mixed MSW into all of the manual sort categories in proportion to the composition of aggregate residential wastes, and maps other visual categories into the appropriate manually sorted category.

Table 3-5 Detailed Composition of Residential-Contract Waste

Material Category	Mean	+/-	Annual Tons	Material Category	Mean	+/-	Annual Tons
Paper	**23.0%**	**1.1%**	**42,391**	**Organics**	**30.0%**	**1.6%**	**55,372**
Corrugated Cardboard (OCC)	3.2%	0.4%	5,905	Vegetative Food	14.8%	1.3%	27,307
Newspaper/Print (ONP)	0.6%	0.1%	1,074	Non-Vegetative Food	8.6%	1.0%	15,780
Magazines/Catalogs/Other Books	0.7%	0.2%	1,214	Leaves	1.6%	0.6%	2,922
Kraft Paper/Boxboard	1.7%	0.2%	3,169	Grass	0.5%	0.3%	869
Mixed Paper	3.8%	0.5%	6,923	Brush	1.3%	0.5%	2,426
Aseptic/Gable Top Cartons	0.2%	0.0%	414	Pallets/Lumber	0.3%	0.3%	482
Paper Towels/Napkins	4.9%	0.5%	9,014	Other Wood	2.1%	0.7%	3,957
Other Compostable Paper	3.7%	0.9%	6,908	Remainder/Composite Organics	0.9%	0.3%	1,629
Remainder/Composite Paper	4.2%	0.4%	7,770	**C&D**	**2.0%**	**0.8%**	**3,603**
Plastic	**16.4%**	**0.8%**	**30,176**	Concrete/Brick/Rock	0.0%	0.0%	11
PET (#1) Bottles	2.2%	0.2%	4,064	Sheet Rock	0.3%	0.3%	493
HDPE (#2) Bottles	0.6%	0.1%	1,177	Shingles	0.2%	0.2%	358
Other (#3-#7) Bottles	0.1%	0.0%	149	Carpet/Carpet Padding	0.8%	0.5%	1,462
Jars, Jugs, Tubs, Trays	2.3%	0.2%	4,311	Dirt	0.1%	0.1%	156
Flower Pots	0.0%	0.0%	32	Remainder/Composite C&D	0.6%	0.4%	1,123
Other Rigid Plastic	2.0%	0.5%	3,718	**HHW**	**0.3%**	**0.2%**	**638**
Plastic Shopping Bags	0.8%	0.1%	1,401	Paint	0.0%	0.0%	69
Other Plastic Film	3.0%	0.2%	5,522	Remainder/Composite HHW	0.3%	0.2%	569
Garbage Bags	2.5%	0.3%	4,615	**Other**	**20.8%**	**1.8%**	**38,414**
Multiple Layered Packaging	0.2%	0.0%	456	Textiles	3.5%	0.7%	6,418
Polystyrene	0.9%	0.1%	1,643	Shoes	0.8%	0.3%	1,453
Remainder/Composite Plastic	1.7%	0.2%	3,087	Rags	0.0%	0.0%	20
Metal	**3.3%**	**0.5%**	**6,132**	Diapers/Sanitary Products	6.2%	0.9%	11,440
Ferrous Cans	0.7%	0.1%	1,242	Animal Bi-Products	2.7%	0.5%	4,917
Aluminum Cans/Foil	1.2%	0.1%	2,181	Mattresses	2.4%	1.3%	4,404
Other Ferrous Metals	1.2%	0.5%	2,220	Box Springs	0.1%	0.2%	206
Non-Ferrous Metals	0.3%	0.1%	489	Furniture	1.9%	0.8%	3,454
Glass	**3.8%**	**0.5%**	**7,085**	Fines	0.7%	0.1%	1,333
Glass Bottles/Jars	3.5%	0.5%	6,378	Other MSW	0.9%	0.2%	1,733
Remainder/Composite Glass	0.4%	0.1%	707	PPE	0.1%	0.0%	272
Electronics	**0.4%**	**0.2%**	**702**	Other Bulky	1.5%	0.5%	2,762
Electronics	0.4%	0.2%	702	**Total**	**100.0%**		**184,512**
CRTs	0.0%	0.0%	0	**No. of Samples**	**52**		

Table 3-6 Detailed Composition of Residential-Municipal Waste

Material Category	Mean	+/-	Annual Tons	Material Category	Mean	+/-	Annual Tons
Paper	**20.5%**	**1.3%**	**8,624**	**Organics**	**28.8%**	**1.9%**	**12,147**
Corrugated Cardboard (OCC)	2.9%	0.5%	1,236	Vegetative Food	13.7%	1.3%	5,790
Newspaper/Print (ONP)	0.5%	0.2%	225	Non-Vegetative Food	6.7%	1.0%	2,819
Magazines/Catalogs/Other Books	0.7%	0.2%	310	Leaves	1.3%	0.5%	537
Kraft Paper/Boxboard	1.3%	0.2%	544	Grass	1.5%	0.6%	629
Mixed Paper	2.9%	0.4%	1,211	Brush	1.6%	0.6%	681
Aseptic/Gable Top Cartons	0.2%	0.1%	90	Pallets/Lumber	0.6%	0.3%	254
Paper Towels/Napkins	5.1%	0.6%	2,136	Other Wood	2.4%	1.2%	1,006
Other Compostable Paper	3.2%	0.6%	1,346	Remainder/Composite Organics	1.0%	0.3%	432
Remainder/Composite Paper	3.6%	0.4%	1,526	**C&D**	**3.0%**	**1.1%**	**1,280**
Plastic	**15.0%**	**0.9%**	**6,306**	Concrete/Brick/Rock	0.0%	0.0%	5
PET (#1) Bottles	1.6%	0.2%	670	Sheet Rock	0.5%	0.5%	203
HDPE (#2) Bottles	0.6%	0.1%	237	Shingles	0.0%	0.0%	11
Other (#3-#7) Bottles	0.1%	0.1%	39	Carpet/Carpet Padding	1.9%	0.9%	790
Jars, Jugs, Tubs, Trays	2.1%	0.2%	865	Dirt	0.1%	0.2%	48
Flower Pots	0.0%	0.0%	6	Remainder/Composite C&D	0.5%	0.3%	223
Other Rigid Plastic	1.5%	0.4%	618	**HHW**	**0.2%**	**0.1%**	**85**
Plastic Shopping Bags	0.7%	0.1%	282	Paint	0.0%	0.0%	3
Other Plastic Film	3.3%	0.3%	1,409	Remainder/Composite HHW	0.2%	0.1%	82
Garbage Bags	2.4%	0.2%	1,032	**Other**	**25.4%**	**2.5%**	**10,720**
Multiple Layered Packaging	0.3%	0.0%	115	Textiles	3.9%	0.6%	1,664
Polystyrene	0.8%	0.1%	328	Shoes	0.3%	0.2%	125
Remainder/Composite Plastic	1.7%	0.2%	703	Rags	0.0%	0.0%	2
Metal	**3.4%**	**0.5%**	**1,454**	Diapers/Sanitary Products	5.6%	0.8%	2,346
Ferrous Cans	0.8%	0.2%	317	Animal Bi-Products	2.4%	0.6%	1,012
Aluminum Cans/Foil	1.1%	0.1%	471	Mattresses	4.5%	1.6%	1,896
Other Ferrous Metals	1.1%	0.4%	455	Box Springs	0.2%	0.3%	94
Non-Ferrous Metals	0.5%	0.2%	210	Furniture	4.0%	1.6%	1,669
Glass	**2.8%**	**0.5%**	**1,175**	Fines	0.8%	0.1%	343
Glass Bottles/Jars	2.4%	0.5%	994	Other MSW	1.2%	0.3%	497
Remainder/Composite Glass	0.4%	0.1%	180	PPE	0.2%	0.1%	83
Electronics	**0.9%**	**0.4%**	**369**	Other Bulky	2.3%	0.8%	989
Electronics	0.7%	0.3%	309	**Total**	**100.0%**		**42,160**
CRTs	0.1%	0.2%	60	**No. of Samples**	**49**		

Table 3-7 Detailed Composition of Residential-Bulky Waste, Unadjusted

Material Category	Mean	+/-	Annual Tons	Material Category	Mean	+/-	Annual Tons
Paper	**0.9%**	**0.5%**	**49**	**Wood**	**18.8%**	**3.4%**	**1,051**
Uncoated OCC - Recyclable	0.7%	0.4%	38	Pallets/Crates	2.5%	3.1%	140
Other Paper	0.2%	0.2%	11	Wood - Clean	1.8%	0.7%	102
Plastics	**2.0%**	**0.8%**	**113**	Wood - Painted/Treated	14.5%	2.7%	809
Durable Plastic Items	1.1%	0.5%	63	**Glass**	**4.7%**	**3.2%**	**263**
Film Plastic (Comm./Indus.)	0.2%	0.1%	11	Non-Recyclable Glass	4.7%	3.2%	263
Other Plastic	0.7%	0.4%	38	**Furniture**	**24.8%**	**8.7%**	**1,386**
Metal	**14.1%**	**4.4%**	**790**	Predominantly Wood	10.7%	3.8%	598
Appliances	2.0%	1.9%	114	Predominantly Plastic	0.8%	0.6%	47
Ferrous Metal	5.8%	2.1%	323	Predominantly Metal	3.6%	2.8%	199
Non-Ferrous Metal	6.3%	2.9%	353	Predominantly Mixed	2.7%	2.0%	152
General C&D	**17.6%**	**8.7%**	**982**	Matresses	5.0%	2.5%	277
Dirt/Sand	1.4%	2.3%	81	Box Springs	2.0%	1.4%	113
Rock/Gravel	0.0%	0.0%	0	**Other**	**17.1%**	**5.5%**	**958**
Gypsum/Dry Wall	1.6%	1.7%	90	Other Bulky	1.7%	1.4%	94
Concrete/Brick	0.8%	1.2%	43	E-Waste	0.0%	0.0%	0
Asphalt Roofing	0.6%	0.9%	32	Yard Waste - Brush/Prunings	0.8%	1.4%	44
Asphalt Paving	0.0%	0.0%	0	Textiles	2.3%	1.7%	131
Carpet/Carpet Padding	1.7%	1.1%	93	Tires	0.8%	1.3%	44
Other C&D	11.5%	4.8%	643	Mixed MSW	11.5%	4.1%	646
				Total	**100%**		**5,592**
				No. of Samples	**16**		

Table 3-8 Detailed Composition of Residential-Bulky Waste, Adjusted

Material Categories	Mean	+/-	Annual Tons	Material Categories	Mean	+/-	Annual Tons
Paper	**2.1%**	**1.1%**	**63**	**Organics**	**23.0%**	**1.6%**	**88**
Corrugated Cardboard (OCC)	1.1%	0.4%	24	Vegetative Food	0.4%	1.3%	70
Newspaper/Print (ONP)	0.0%	0.1%	7	Non-Vegetative Food	0.3%	1.0%	55
Magazines/Catalogs/Other Books	0.0%	0.2%	9	Leaves	0.2%	0.6%	31
Kraft Paper/Boxboard	0.1%	0.2%	12	Grass	0.0%	0.3%	16
Mixed Paper	0.3%	0.5%	30	Brush	1.1%	0.5%	26
Aseptic/Gable Top Cartons	0.0%	0.0%	2	Pallets/Lumber	5.0%	0.3%	15
Paper Towels/Napkins	0.2%	0.5%	27	Other Wood	16.0%	0.7%	37
Other Compostable Paper	0.1%	0.9%	48	Remainder/Composite Organics	0.0%	0.3%	15
Remainder/Composite Paper	0.4%	0.4%	23	**C&D**	**20.5%**	**0.8%**	**43**
Plastic	**3.1%**	**0.8%**	**47**	Concrete/Brick/Rock	0.8%	0.0%	1
PET (#1) Bottles	0.1%	0.2%	10	Sheet Rock	2.2%	0.3%	15
HDPE (#2) Bottles	0.0%	0.1%	5	Shingles	0.6%	0.2%	13
Other (#3-#7) Bottles	0.0%	0.0%	1	Carpet/Carpet Padding	2.4%	0.5%	27
Jars, Jugs, Tubs, Trays	0.1%	0.2%	11	Dirt	1.5%	0.1%	5
Flower Pots	0.0%	0.0%	1	Remainder/Composite C&D	13.1%	0.4%	24
Other Rigid Plastic	2.2%	0.5%	25	**HHW**	**0.9%**	**0.2%**	**10**
Plastic Shopping Bags	0.0%	0.1%	5	Paint	0.0%	0.0%	3
Other Plastic Film	0.3%	0.2%	12	Remainder/Composite HHW	0.8%	0.2%	10
Garbage Bags	0.2%	0.3%	16	**Other**	**32.6%**	**1.8%**	**101**
Multiple Layered Packaging	0.0%	0.0%	2	Textiles	2.7%	0.7%	37
Polystyrene	0.0%	0.1%	6	Shoes	0.0%	0.3%	17
Remainder/Composite Plastic	0.1%	0.2%	11	Rags	0.0%	0.0%	0
Metal	**12.6%**	**0.5%**	**31**	Diapers/Sanitary Products	0.1%	0.9%	52
Ferrous Cans	0.0%	0.1%	7	Animal Bi-Products	0.1%	0.5%	29
Aluminum Cans/Foil	0.1%	0.1%	7	Mattresses	5.1%	1.3%	70
Other Ferrous Metals	6.1%	0.5%	28	Box Springs	2.0%	0.2%	10
Non-Ferrous Metals	6.4%	0.1%	8	Furniture	18.4%	0.8%	44
Glass	**5.1%**	**0.5%**	**28**	Fines	0.0%	0.1%	7
Glass Bottles/Jars	0.4%	0.5%	26	Other MSW	0.1%	0.2%	12
Remainder/Composite Glass	4.7%	0.1%	6	PPE	0.0%	0.0%	1
Electronics	**0.0%**	**0.2%**	**9**	Other Bulky	4.1%	0.5%	29
Electronics	0.0%	0.2%	9	**Total**	**100.0%**		**5,592**
CRTs	0.0%	0.0%	0	**No. of Samples**	**16**		

3.3 COMMERCIAL AND PUBLIC SCHOOL WASTE COMPOSITION

This section details the composition results of the Commercial sector that includes industrial, commercial, and institutional buildings. This section also includes the results for Public Schools, which fall within the definition of Commercial, but which were evaluated separately in this study. Table 3-9 shows the composition of waste from Commercial generators, excluding Public Schools.

Table 3-9 Detailed Composition of Commercial Waste

Material Categories	Mean	+/-	Annual Tons	Material Categories	Mean	+/-	Annual Tons
Paper	**26.5%**	**4.9%**	**8,745**	**Organics**	**25.6%**	**9.5%**	**8,432**
Corrugated Cardboard (OCC)	13.3%	1.3%	4,380	Vegetative Food	9.1%	3.1%	2,990
Newspaper/Print (ONP)	0.3%	0.2%	101	Non-Vegetative Food	5.5%	1.6%	1,809
Magazines/Catalogs/Other Books	0.5%	0.3%	179	Leaves	0.4%	1.7%	121
Kraft Paper/Boxboard	1.2%	0.7%	402	Grass	0.4%	0.4%	139
Mixed Paper	2.5%	1.9%	819	Brush	0.7%	2.3%	240
Aseptic/Gable Top Cartons	0.2%	0.1%	72	Pallets/Lumber	5.3%	3.9%	1,757
Paper Towels/Napkins	2.9%	0.9%	960	Other Wood	3.5%	6.4%	1,166
Other Compostable Paper	2.7%	0.6%	893	Remainder/Composite Organics	0.6%	0.1%	207
Remainder/Composite Paper	2.9%	0.9%	941	**C&D**	**8.6%**	**15.0%**	**2,843**
Plastic	**17.2%**	**3.0%**	**5,674**	Concrete/Brick/Rock	0.5%	0.3%	172
PET (#1) Bottles	1.6%	0.7%	543	Sheet Rock	0.6%	4.4%	187
HDPE (#2) Bottles	0.9%	0.1%	282	Shingles	0.0%	0.0%	3
Other (#3-#7) Bottles	0.0%	0.0%	16	Carpet/Carpet Padding	2.5%	5.5%	815
Jars, Jugs, Tubs, Trays	1.4%	0.5%	475	Dirt	0.5%	0.2%	155
Flower Pots	0.0%	0.0%	3	Remainder/Composite C&D	4.6%	9.1%	1,511
Other Rigid Plastic	3.4%	1.6%	1,115	**HHW**	**0.8%**	**0.7%**	**249**
Plastic Shopping Bags	0.4%	0.2%	121	Paint	0.0%	0.3%	3
Other Plastic Film	4.3%	0.7%	1,407	Remainder/Composite HHW	0.7%	0.6%	246
Garbage Bags	2.5%	0.5%	830	**Other**	**13.2%**	**5.6%**	**4,336**
Multiple Layered Packaging	0.1%	0.1%	47	Textiles	3.0%	3.0%	977
Polystyrene	0.9%	0.1%	311	Shoes	0.2%	0.3%	61
Remainder/Composite Plastic	1.6%	0.5%	523	Rags	0.0%	0.0%	16
Metal	**4.3%**	**1.6%**	**1,431**	Diapers/Sanitary Products	1.7%	1.0%	568
Ferrous Cans	0.5%	0.3%	165	Animal Bi-Products	0.3%	0.9%	110
Aluminum Cans/Foil	0.8%	0.5%	251	Mattresses	0.4%	1.7%	119
Other Ferrous Metals	2.0%	1.3%	657	Box Springs	0.0%	0.0%	14
Non-Ferrous Metals	1.1%	0.7%	358	Furniture	3.1%	3.1%	1,038
Glass	**3.3%**	**2.1%**	**1,084**	Fines	0.4%	0.2%	142
Glass Bottles/Jars	2.7%	2.1%	880	Other MSW	0.6%	0.5%	207
Remainder/Composite Glass	0.6%	0.2%	204	PPE	0.4%	0.0%	128
Electronics	**0.5%**	**0.6%**	**165**	Other Bulky	2.9%	1.7%	956
Electronics	0.5%	0.6%	165	**Total**	**100.0%**		**32,958**
CRTs	0.0%	0.0%	0	**No. of Samples**	**107**		

Figure 3-10 shows the material composition of Commercial waste by the material groups. Paper was found to make up a relatively larger portion of Commercial wastes compared to the residential waste stream.

Figure 3-10 Commercial Waste Composition by Material Group

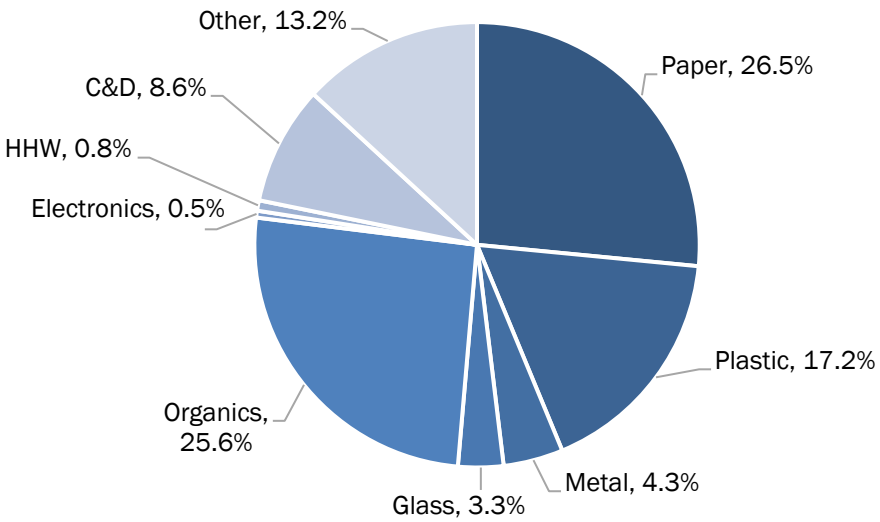


Figure 3-11 shows the seasonal comparison for the Commercial waste stream. While some variation occurs on a seasonal basis, the general composition of Commercial waste is reasonably consistent and range-bound.

Figure 3-11 Seasonal Differences in Commercial Waste by Material Group

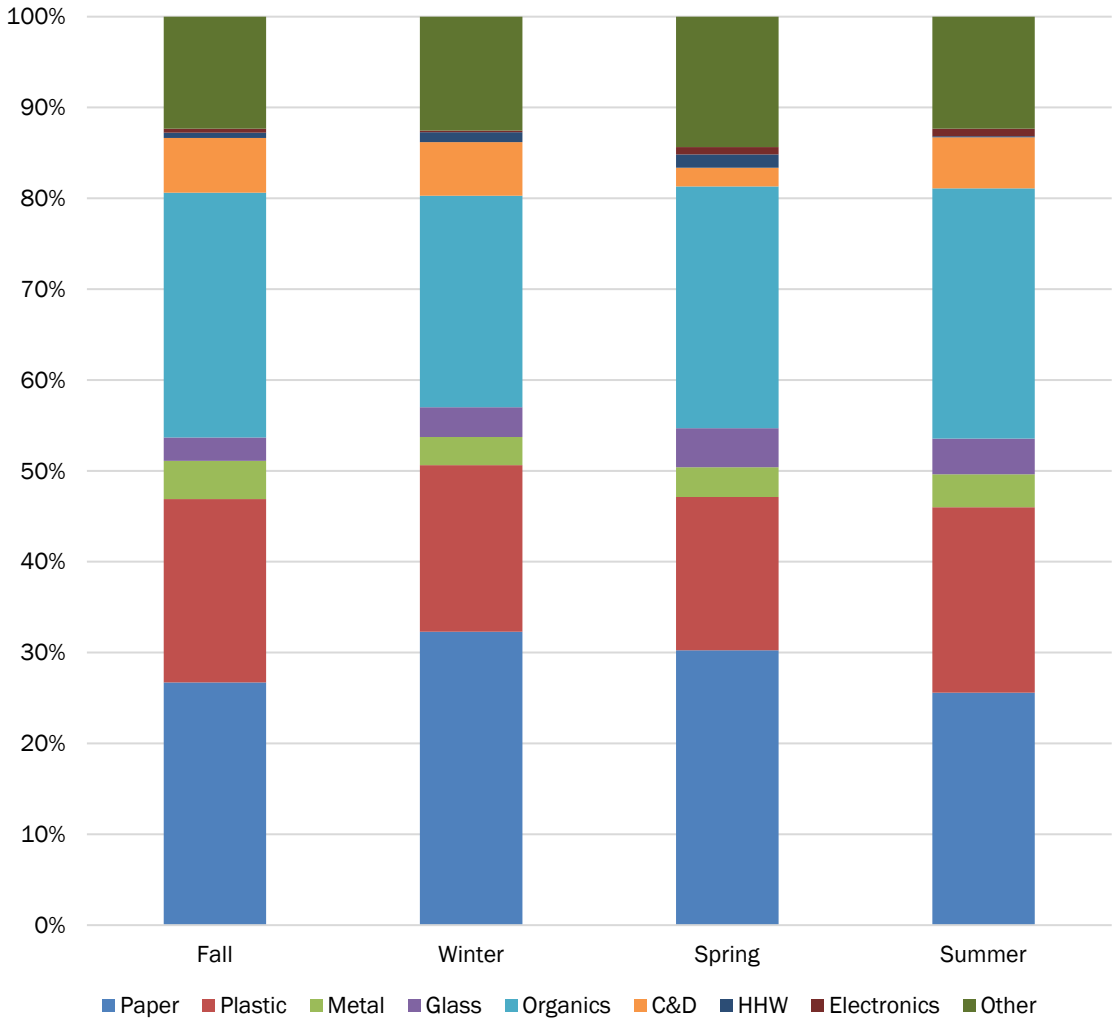


Figure 3-12 compares the divertibility of Commercial waste from the 2022 and 2015 studies. Changes since the 2015 Study track the same as in the residential sector.

Figure 3-12 Comparison of Divertibility in Commercial Waste, 2022 v 2015 (Percent)

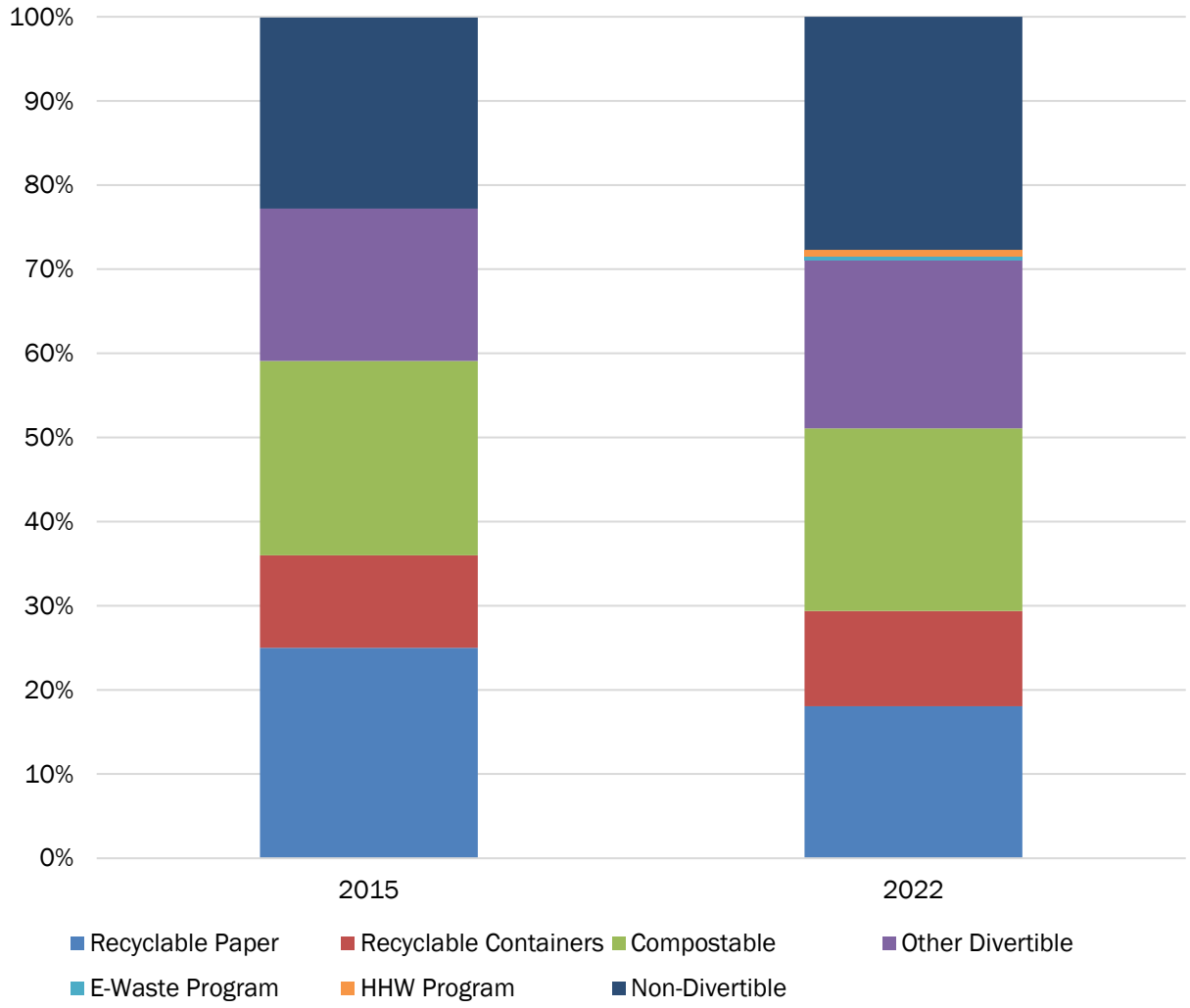


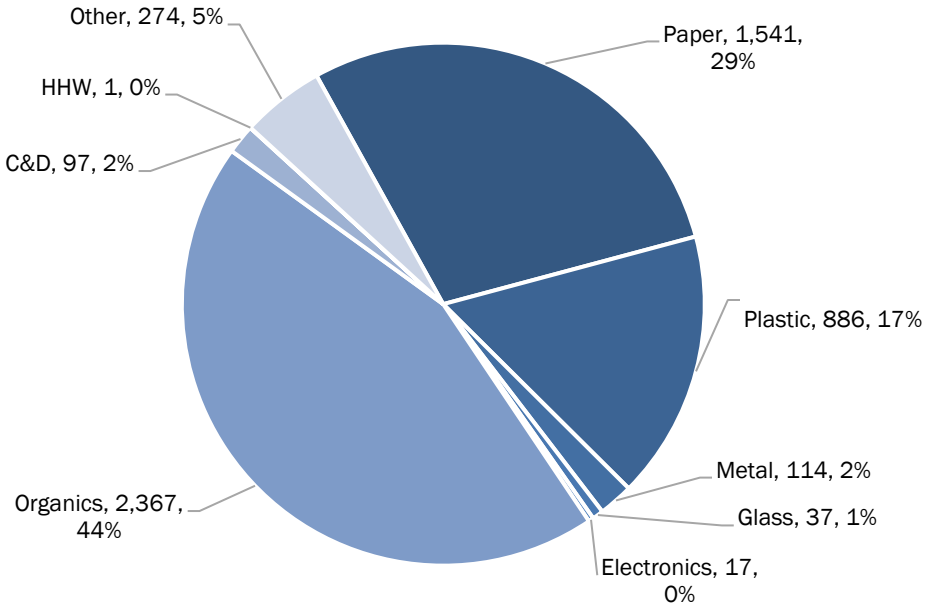
Table 3-10 shows the detailed composition of Public School waste. Note that there was a relatively small sample size, and consequently the margins of error are somewhat larger in these results. However, major differences are still able to be statistically verified in this stream, especially the prevalence of food wastes.

Table 3-10 Detailed Composition of Public School Waste

Material Category	Mean	+/-	Annual Tons	Material Category	Mean	+/-	Annual Tons
Paper	**28.9%**	**3.4%**	**1,541**	**Organics**	**44.4%**	**7.4%**	**2,367**
Corrugated Cardboard (OCC)	5.5%	1.5%	296	Vegetative Food	22.6%	5.3%	1,208
Newspaper/Print (ONP)	0.1%	0.1%	3	Non-Vegetative Food	17.9%	4.7%	956
Magazines/Catalogs/Other Books	0.6%	0.4%	32	Leaves	0.1%	0.2%	5
Kraft Paper/Boxboard	0.7%	0.3%	38	Grass	0.0%	0.0%	0
Mixed Paper	4.2%	1.5%	222	Brush	0.3%	0.4%	14
Aseptic/Gable Top Cartons	0.8%	0.4%	45	Pallets/Lumber	2.7%	1.5%	146
Paper Towels/Napkins	3.4%	0.8%	182	Other Wood	0.5%	1.1%	26
Other Compostable Paper	12.0%	2.5%	640	Remainder/Composite Organics	0.2%	0.1%	11
Remainder/Composite Paper	1.6%	0.5%	83	**C&D**	**1.8%**	**2.9%**	**97**
Plastic	**16.6%**	**1.5%**	**886**	Concrete/Brick/Rock	0.0%	0.0%	0
PET (#1) Bottles	2.3%	0.6%	121	Sheet Rock	0.5%	1.2%	26
HDPE (#2) Bottles	2.1%	0.4%	110	Shingles	0.0%	0.0%	0
Other (#3-#7) Bottles	0.0%	0.0%	1	Carpet/Carpet Padding	0.5%	1.7%	26
Jars, Jugs, Tubs, Trays	1.2%	0.4%	64	Dirt	0.0%	0.0%	0
Flower Pots	0.0%	0.0%	0	Remainder/Composite C&D	0.8%	1.1%	44
Other Rigid Plastic	2.5%	1.4%	131	**HHW**	**0.0%**	**0.0%**	**1**
Plastic Shopping Bags	0.2%	0.1%	10	Paint	0.0%	0.0%	0
Other Plastic Film	2.9%	0.6%	155	Remainder/Composite HHW	0.0%	0.0%	1
Garbage Bags	3.5%	0.7%	187	**Other**	**5.1%**	**2.9%**	**274**
Multiple Layered Packaging	0.5%	0.2%	25	Textiles	0.8%	0.5%	42
Polystyrene	0.2%	0.1%	12	Shoes	0.0%	0.0%	0
Remainder/Composite Plastic	1.3%	0.3%	71	Rags	0.0%	0.1%	2
Metal	**2.1%**	**1.5%**	**114**	Diapers/Sanitary Products	0.3%	0.2%	16
Ferrous Cans	0.5%	0.3%	26	Animal Bi-Products	0.0%	0.0%	0
Aluminum Cans/Foil	0.4%	0.2%	22	Mattresses	0.0%	0.0%	0
Other Ferrous Metals	1.0%	0.8%	51	Box Springs	0.0%	0.0%	0
Non-Ferrous Metals	0.3%	0.8%	15	Furniture	1.8%	2.1%	98
Glass	**0.7%**	**0.7%**	**37**	Fines	0.5%	0.1%	29
Glass Bottles/Jars	0.6%	0.6%	33	Other MSW	0.8%	0.4%	41
Remainder/Composite Glass	0.1%	0.2%	3	PPE	0.2%	0.1%	12
Electronics	**0.3%**	**0.7%**	**17**	Other Bulky	0.6%	1.2%	33
Electronics	0.3%	0.7%	17	**Total**	**100.0%**		**5,334**
CRTs	0.0%	0.0%	0	**No. of Samples**	**15**		

Figure 3-13 shows a visual depiction of Public School waste composition by material group. The prevalence of organics is clear in this view.

Figure 3-13 School Waste Composition by Material Group



In any four-season waste composition study, the waste generation level in schools would be expected to dip in the summer. The County stated an interest in comparing the composition of school wastes in the summer against the remaining seasons when school is in session. Figure 3-14 shows the composition by material group across the four seasons of the study. As expected, the summer season was significantly different from the other three seasons when school was in session. Summer wastes exhibited a far lower incidence of organics, and a wider variety of other wastes when compared to the other three seasons. It is important to note that these seasonal comparisons are not statistically verifiable based on the small sample sizes. However, the findings appear to corroborate hypothetical expectations about school waste composition.

Figure 3-14 Seasonal Differences in Public School Waste Composition

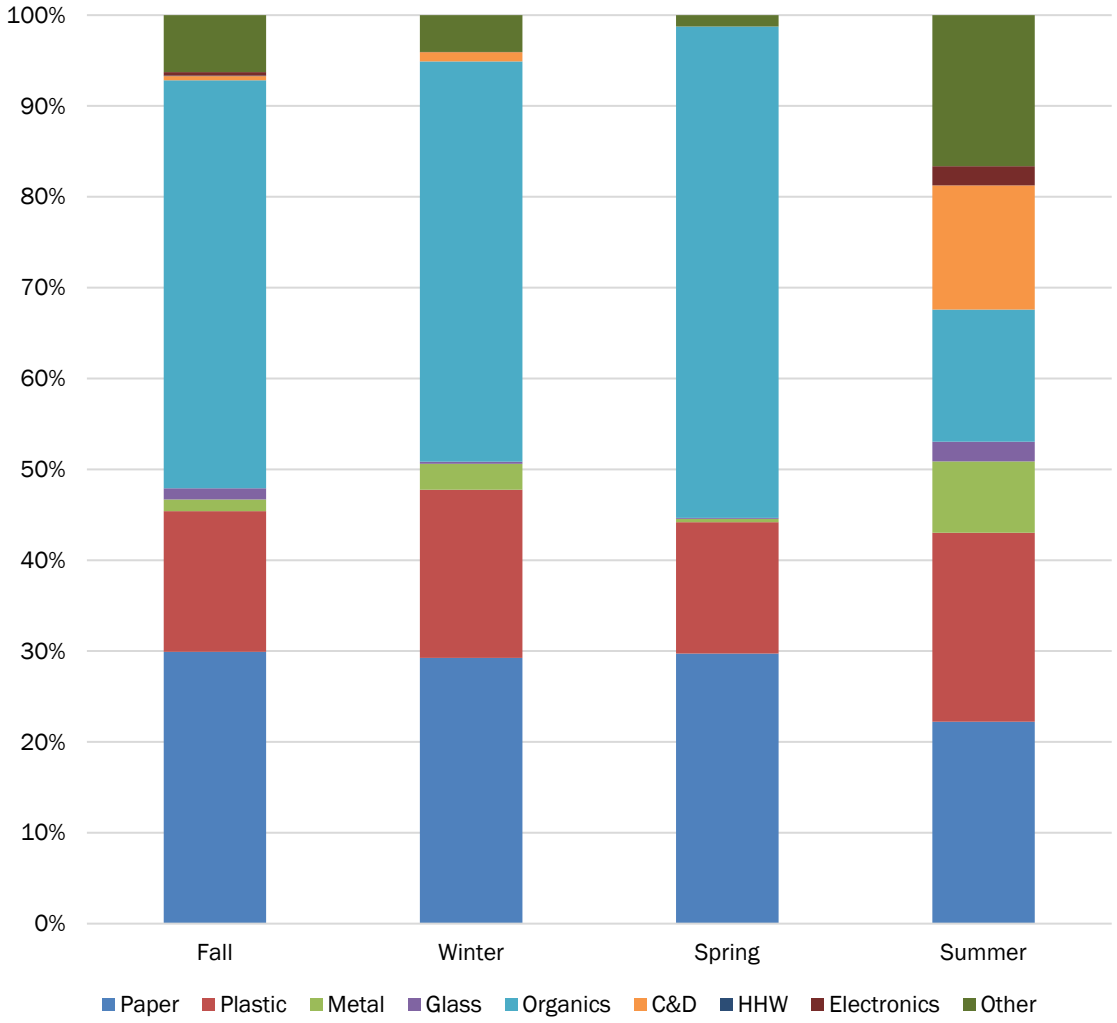


Figure 3-15 shows the seasonal differences in material divertibility at schools across the four seasons. Compostable waste is significantly lower due to less food waste generation from school breakfasts and

lunches. Once again, these results should not be considered statistically verifiable due to small sample sizes but appear reasonable.

Figure 3-15 Seasonal Differences in Public School Waste Divertibility

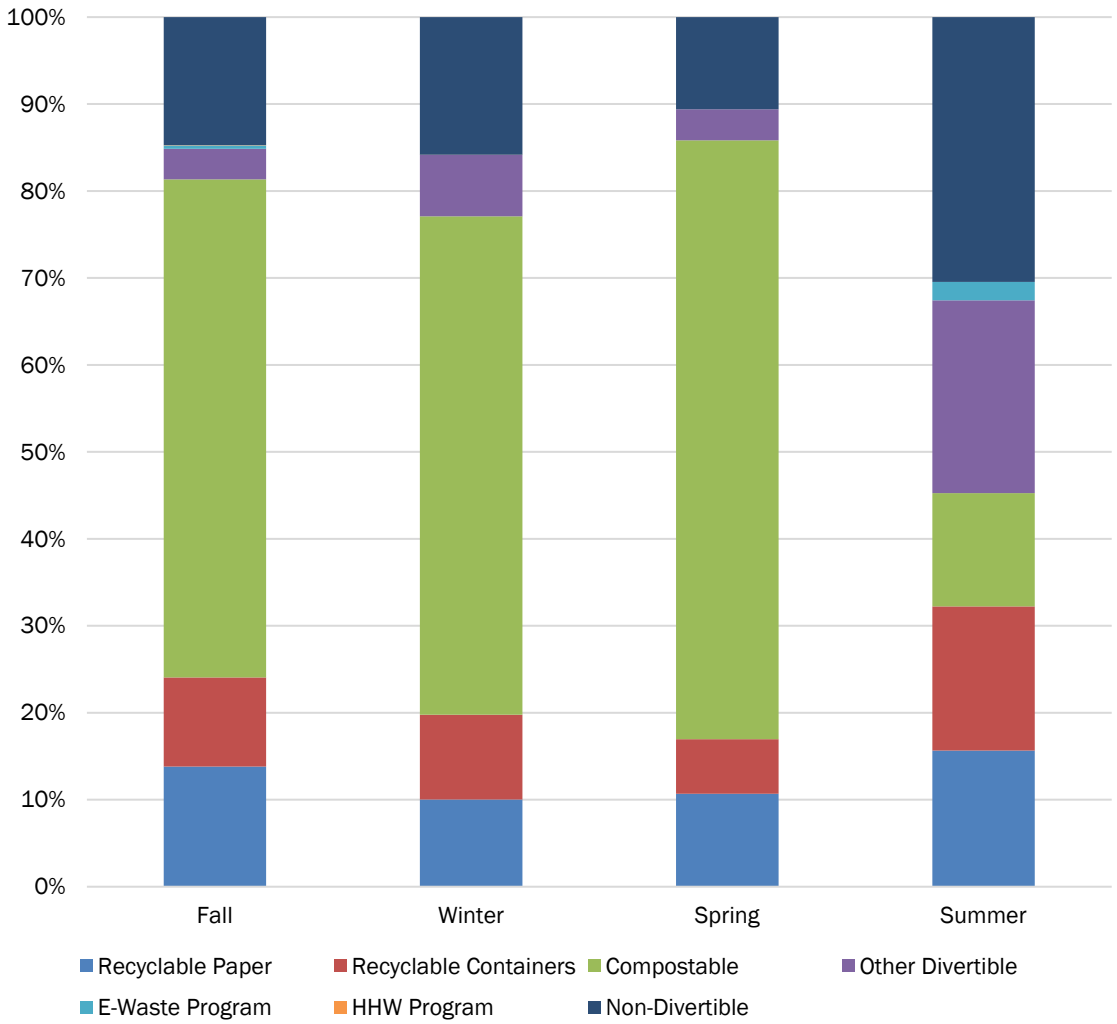
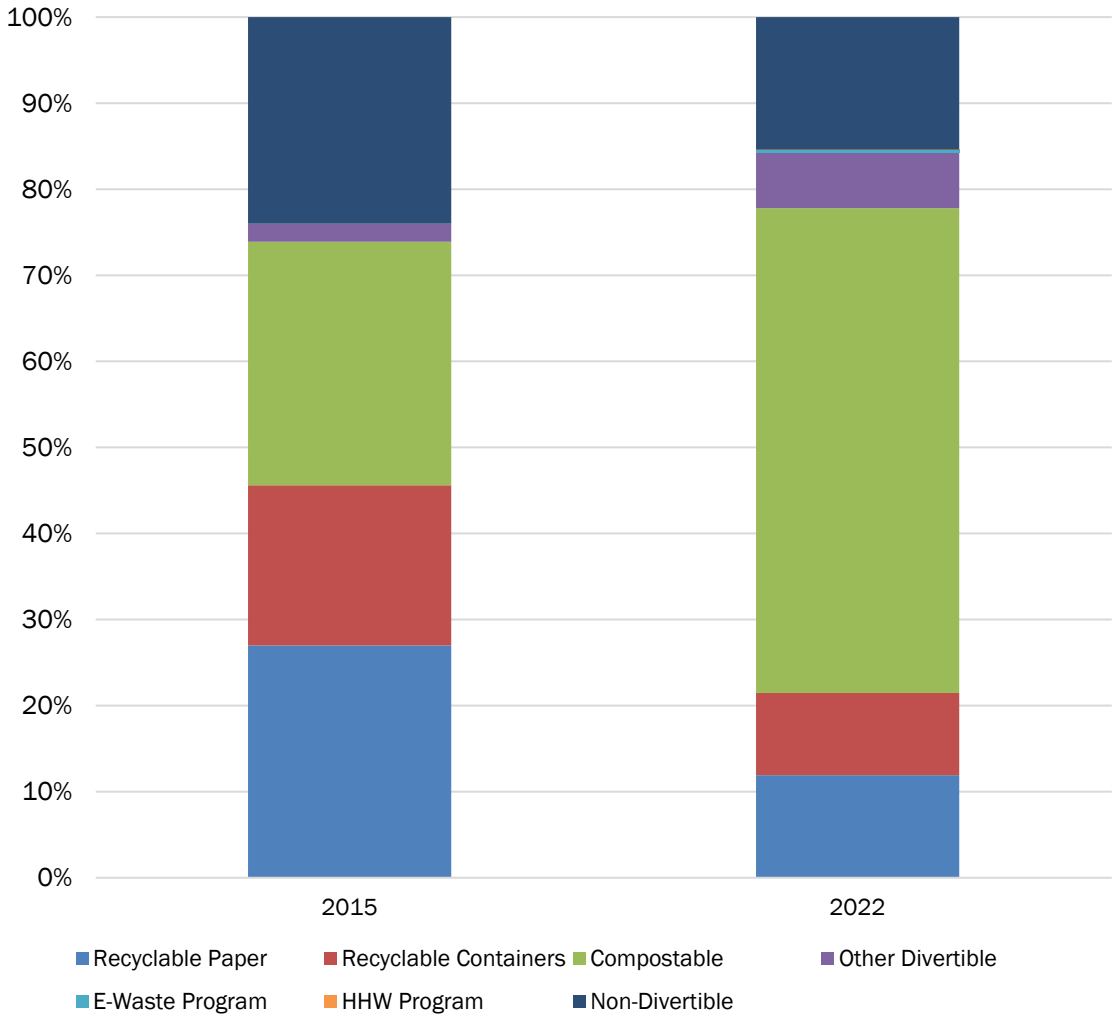


Figure 3-16 compares the divertibility of Public School wastes from the 2022 and 2015 Studies. This comparison must also be discounted due to small sample sizes in both studies. However, the incidence of

food wastes was found to be significantly higher in 2022 based on 15 samples, compared to 2015 based on eight samples.

Figure 3-16 Comparison of Divertibility in School Waste, 2022 v 2015 (Percent)



3.4 SELF-HAUL WASTE COMPOSITION

This section presents the results of the manual self-haul sort data and non-residential bulky visual surveys. Table 3-11 shows the detailed numerical results for this waste stream. These results are based on 203 visually surveyed samples and 13 manually sorted samples.

Table 3-11 Detailed Composition of Self-Haul Waste

Material Categories	Mean	+/-	Annual Tons	Material Categories	Mean	+/-	Annual Tons
Paper	**10.1%**	**4.9%**	**2,683**	**Organics**	**28.6%**	**9.5%**	**7,566**
Corrugated Cardboard (OCC)	3.4%	1.3%	913	Vegetative Food	3.1%	3.1%	830
Newspaper/Print (ONP)	0.2%	0.2%	45	Non-Vegetative Food	2.0%	1.6%	540
Magazines/Catalogs/Other Books	0.3%	0.3%	74	Leaves	1.6%	1.7%	428
Kraft Paper/Boxboard	0.8%	0.7%	208	Grass	0.2%	0.4%	50
Mixed Paper	2.0%	1.9%	521	Brush	2.4%	2.3%	627
Aseptic/Gable Top Cartons	0.1%	0.1%	18	Pallets/Lumber	5.9%	3.9%	1,553
Paper Towels/Napkins	1.2%	0.9%	307	Other Wood	13.2%	6.4%	3,502
Other Compostable Paper	0.6%	0.6%	151	Remainder/Composite Organics	0.1%	0.1%	37
Remainder/Composite Paper	1.7%	0.9%	445	**C&D**	**24.4%**	**15.0%**	**6,459**
Plastic	**8.6%**	**3.0%**	**2,289**	Concrete/Brick/Rock	0.2%	0.3%	52
PET (#1) Bottles	1.1%	0.7%	278	Sheet Rock	4.4%	4.4%	1,153
HDPE (#2) Bottles	0.2%	0.1%	42	Shingles	0.1%	0.0%	14
Other (#3-#7) Bottles	0.0%	0.0%	6	Carpet/Carpet Padding	6.2%	5.5%	1,652
Jars, Jugs, Tubs, Trays	0.6%	0.5%	159	Dirt	0.1%	0.2%	37
Flower Pots	0.0%	0.0%	0	Remainder/Composite C&D	13.4%	9.1%	3,551
Other Rigid Plastic	3.2%	1.6%	850	**HHW**	**0.6%**	**0.7%**	**162**
Plastic Shopping Bags	0.2%	0.2%	61	Paint	0.2%	0.3%	64
Other Plastic Film	0.8%	0.7%	201	Remainder/Composite HHW	0.4%	0.6%	98
Garbage Bags	1.5%	0.5%	393	**Other**	**19.8%**	**5.6%**	**5,252**
Multiple Layered Packaging	0.1%	0.1%	20	Textiles	2.7%	3.0%	720
Polystyrene	0.1%	0.1%	36	Shoes	0.3%	0.3%	71
Remainder/Composite Plastic	0.9%	0.5%	243	Rags	0.0%	0.0%	10
Metal	**4.2%**	**1.6%**	**1,125**	Diapers/Sanitary Products	0.8%	1.0%	215
Ferrous Cans	0.4%	0.3%	98	Animal Bi-Products	0.7%	0.9%	187
Aluminum Cans/Foil	0.5%	0.5%	141	Mattresses	1.9%	1.7%	498
Other Ferrous Metals	2.4%	1.3%	641	Box Springs	0.3%	0.0%	79
Non-Ferrous Metals	0.9%	0.7%	246	Furniture	8.9%	3.1%	2,367
Glass	**3.2%**	**2.1%**	**847**	Fines	0.3%	0.2%	91
Glass Bottles/Jars	2.7%	2.1%	715	Other MSW	0.6%	0.5%	151
Remainder/Composite Glass	0.5%	0.2%	131	PPE	0.0%	0.0%	11
Electronics	**0.4%**	**0.6%**	**98**	Other Bulky	3.2%	1.7%	852
Electronics	0.4%	0.6%	98	**Total**	**100.0%**		**26,480**
CRTs	0.0%	0.0%	0	**No. of Samples**	**216**		

Figure 3-17 shows a visual representative of the composition of self-haul waste by material group. As shown, this stream contains significantly less paper and plastic, and significantly more C&D-type debris.

Figure 3-17 Self-Haul Waste Composition by Material Group

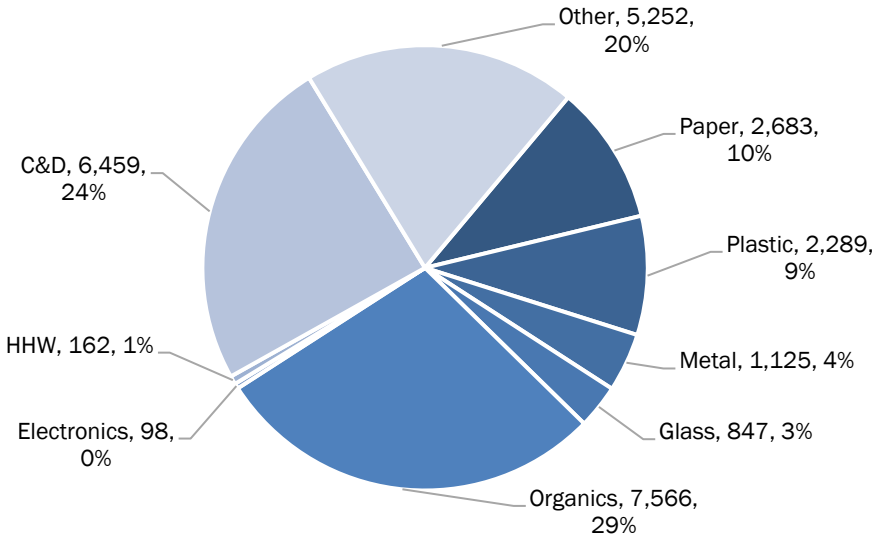


Figure 3-18 shows the difference in material composition between the visually surveyed and manually sorted self-haul loads. Self-haul wastes were manually sorted when they were found to contain predominantly bagged wastes and loose, non-bulky trash. However, most self-haul loads were found to contain bulky items and were visually surveyed. It has been estimated by MSW Consultants that 85 percent of the self-haul stream by weight consists of bagged materials, and the other 15 percent bulky items, and these factors have been used to combine the visually surveyed and manually sorted composition estimates for self-haul wastes.

Figure 3-18 Comparison of Manually Sorted vs Visually Surveyed Self-Haul Waste Composition

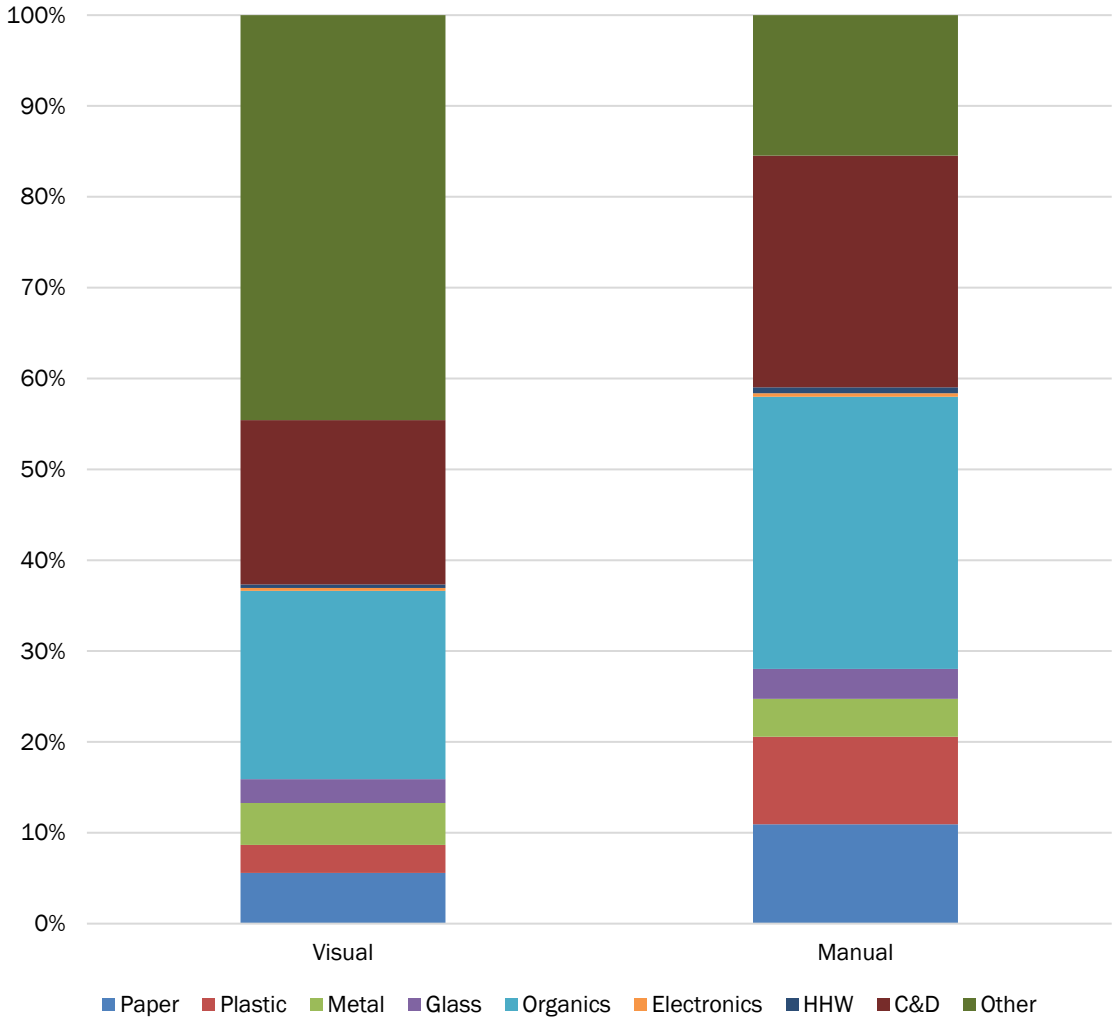


Figure 3-19 compares the divertibility of visually surveyed and manually sorted self-haul loads. As expected, visually surveyed loads contained a higher fraction of bulky, hard-to-divert materials compared to predominantly bagged self-haul wastes.

Figure 3-19 Comparison of Bulky v Non-Bulky Self-Haul Waste Divertibility

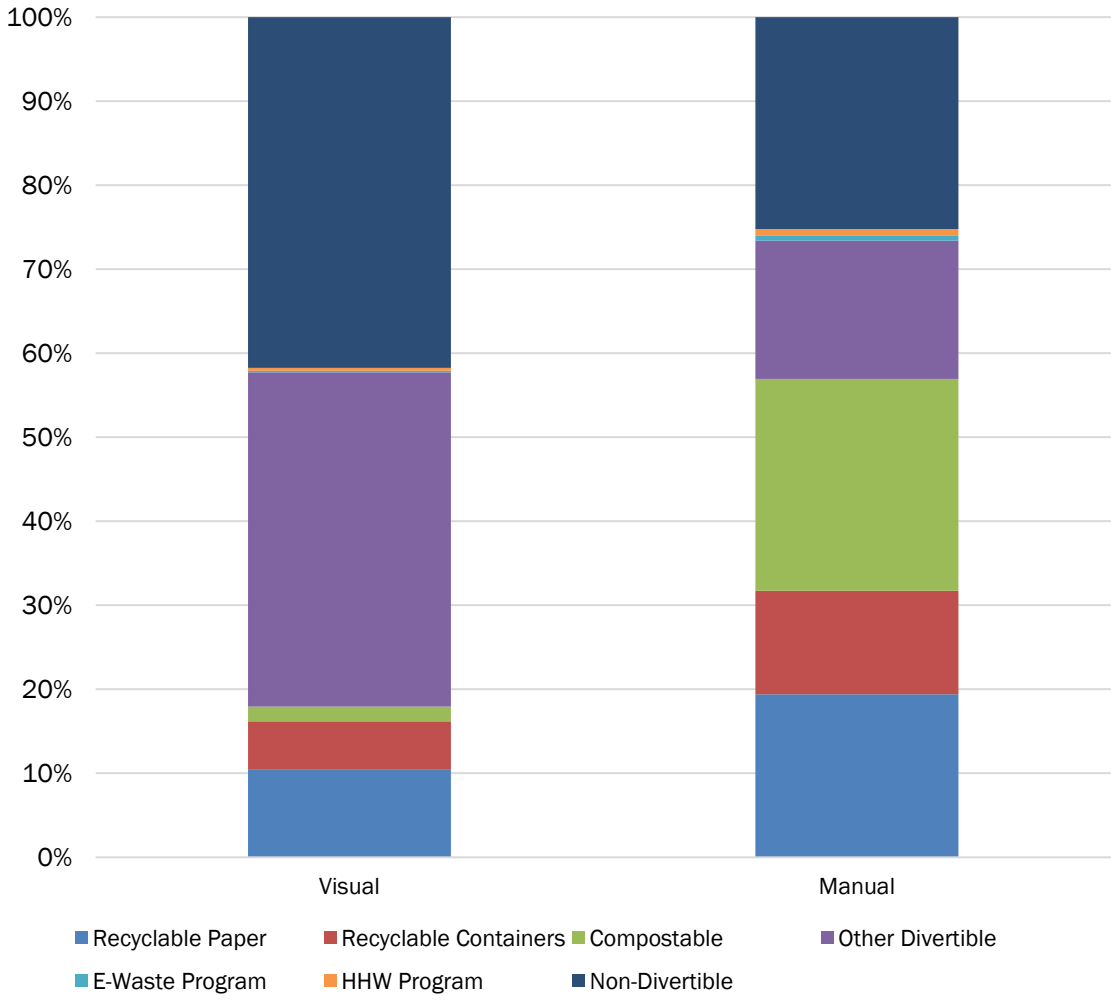


Table 3-12 and Table 3-14 show the detailed composition of manually sorted and visually surveyed self-haul waste, respectively. Note that Table 3-13 shows the unadjusted composition of the visually surveyed self-haul load samples; for consistency, Table 3-14 has been adjusted (mapped) to conform with the full list of material categories.

Table 3-12 Detailed Composition of Manually Sorted Self-Haul Waste

Material Category	Mean	+/-	Annual Tons	Material Category	Mean	+/-	Annual Tons
Paper	**10.9%**	**4.9%**	**2,895**	**Organics**	**30.0%**	**9.5%**	**7,933**
Corrugated Cardboard (OCC)	3.4%	1.3%	909	Vegetative Food	3.6%	3.1%	956
Newspaper/Print (ONP)	0.2%	0.2%	52	Non-Vegetative Food	2.3%	1.6%	621
Magazines/Catalogs/Other Books	0.3%	0.3%	85	Leaves	1.9%	1.7%	493
Kraft Paper/Boxboard	0.9%	0.7%	240	Grass	0.2%	0.4%	57
Mixed Paper	2.3%	1.9%	600	Brush	2.6%	2.3%	683
Aseptic/Gable Top Cartons	0.1%	0.1%	21	Pallets/Lumber	5.7%	3.9%	1,504
Paper Towels/Napkins	1.3%	0.9%	353	Other Wood	13.5%	6.4%	3,576
Other Compostable Paper	0.7%	0.6%	174	Remainder/Composite Organics	0.2%	0.1%	43
Remainder/Composite Paper	1.7%	0.9%	462	**C&D**	**25.5%**	**15.0%**	**6,753**
Plastic	**9.6%**	**3.0%**	**2,549**	Concrete/Brick/Rock	0.2%	0.3%	45
PET (#1) Bottles	1.2%	0.7%	321	Sheet Rock	4.8%	4.4%	1,262
HDPE (#2) Bottles	0.2%	0.1%	48	Shingles	0.0%	0.0%	0
Other (#3-#7) Bottles	0.0%	0.0%	7	Carpet/Carpet Padding	6.4%	5.5%	1,706
Jars, Jugs, Tubs, Trays	0.7%	0.5%	183	Dirt	0.2%	0.2%	42
Flower Pots	0.0%	0.0%	0	Remainder/Composite C&D	14.0%	9.1%	3,698
Other Rigid Plastic	3.4%	1.6%	897	**HHW**	**0.7%**	**0.7%**	**173**
Plastic Shopping Bags	0.3%	0.2%	70	Paint	0.3%	0.3%	74
Other Plastic Film	0.9%	0.7%	226	Remainder/Composite HHW	0.4%	0.6%	99
Garbage Bags	1.7%	0.5%	452	**Other**	**15.5%**	**5.6%**	**4,095**
Multiple Layered Packaging	0.1%	0.1%	23	Textiles	2.9%	3.0%	775
Polystyrene	0.2%	0.1%	41	Shoes	0.3%	0.3%	81
Remainder/Composite Plastic	1.1%	0.5%	280	Rags	0.0%	0.0%	11
Metal	**4.2%**	**1.6%**	**1,108**	Diapers/Sanitary Products	0.9%	1.0%	248
Ferrous Cans	0.4%	0.3%	113	Animal Bi-Products	0.8%	0.9%	216
Aluminum Cans/Foil	0.6%	0.5%	162	Mattresses	1.4%	1.7%	369
Other Ferrous Metals	2.4%	1.3%	622	Box Springs	0.0%	0.0%	0
Non-Ferrous Metals	0.8%	0.7%	211	Furniture	4.6%	3.1%	1,228
Glass	**3.3%**	**2.1%**	**873**	Fines	0.4%	0.2%	104
Glass Bottles/Jars	3.1%	2.1%	824	Other MSW	0.7%	0.5%	174
Remainder/Composite Glass	0.2%	0.2%	50	PPE	0.0%	0.0%	12
Electronics	**0.4%**	**0.6%**	**100**	Other Bulky	3.3%	1.7%	876
Electronics	0.4%	0.6%	100	**Total**	**100.0%**		**26,480**
CRTs	0.0%	0.0%	0	**No. of Samples**	**13**		

Table 3-13 Detailed Composition of Bulky (Visually Surveyed) Self-Haul Waste, Unadjusted

Material Category	Mean	+/-	Annual Tons	Material Category	Mean	+/-	Annual Tons
Paper	**4.2%**	**1.0%**	**1,117**	**Wood**	**16.2%**	**2.4%**	**4,283**
Uncoated OCC - Recyclable	3.1%	0.9%	823	Pallets/Crates	3.6%	1.3%	959
Other Paper	1.1%	0.4%	294	Wood - Clean	2.6%	0.7%	688
Plastics	**1.9%**	**0.4%**	**500**	Wood - Painted/Treated	10.0%	1.8%	2,637
Durable Plastic Items	1.2%	0.3%	309	**Glass**	**2.2%**	**1.0%**	**588**
Film Plastic (Comm./Indus.)	0.1%	0.0%	31	Non-Recyclable Glass	2.2%	1.0%	588
Other Plastic	0.6%	0.1%	160	**Furniture**	**39.2%**	**5.1%**	**10,377**
Metal	**4.9%**	**0.8%**	**1,307**	Predominantly Wood	19.1%	4.3%	5,063
Appliances	0.8%	0.4%	221	Predominantly Plastic	0.2%	0.1%	57
Ferrous Metal	2.5%	0.5%	671	Predominantly Metal	3.5%	1.3%	915
Non-Ferrous Metal	1.6%	0.3%	415	Predominantly Mixed	10.0%	2.1%	2,638
General C&D	**14.9%**	**3.7%**	**3,952**	Matresses	4.4%	1.3%	1,178
Dirt/Sand	0.0%	0.0%	2	Box Springs	2.0%	0.5%	526
Rock/Gravel	0.0%	0.0%	0	**Other**	**16.4%**	**3.6%**	**4,356**
Gypsum/Dry Wall	1.4%	0.8%	378	Other Bulky	1.5%	0.4%	386
Concrete/Brick	0.3%	0.4%	83	E-Waste	0.3%	0.2%	72
Asphalt Roofing	0.4%	0.4%	95	Yard Waste - Brush/Prunings	0.8%	0.6%	222
Asphalt Paving	0.0%	0.0%	0	Textiles	1.2%	0.4%	314
Carpet/Carpet Padding	4.3%	1.9%	1,134	Tires	0.3%	0.4%	80
Other C&D	8.5%	2.4%	2,260	Mixed MSW	12.4%	3.4%	3,283
				Total	**100%**		**26,480**
				No. of Samples	**203**		

Table 3-14 Detailed Composition of Bulky (Visually Surveyed) Self-Haul Waste, Adjusted

Material Categories	Mean	+/-	Annual Tons	Material Categories	Mean	+/-	Annual Tons
Paper	**5.6%**	**4.9%**	**1,476**	**Organics**	**20.7%**	**9.5%**	**5,488**
Corrugated Cardboard (OCC)	3.5%	1.3%	936	Vegetative Food	0.4%	3.1%	119
Newspaper/Print (ONP)	0.0%	0.2%	6	Non-Vegetative Food	0.3%	1.6%	77
Magazines/Catalogs/Other Books	0.0%	0.3%	10	Leaves	0.2%	1.7%	61
Kraft Paper/Boxboard	0.1%	0.7%	30	Grass	0.0%	0.4%	7
Mixed Paper	0.3%	1.9%	74	Brush	1.2%	2.3%	307
Aseptic/Gable Top Cartons	0.0%	0.1%	3	Pallets/Lumber	6.9%	3.9%	1,833
Paper Towels/Napkins	0.2%	0.9%	44	Other Wood	11.6%	6.4%	3,080
Other Compostable Paper	0.1%	0.6%	22	Remainder/Composite Organics	0.0%	0.1%	5
Remainder/Composite Paper	1.3%	0.9%	351	**C&D**	**18.1%**	**15.0%**	**4,789**
Plastic	**3.1%**	**3.0%**	**816**	Concrete/Brick/Rock	0.3%	0.3%	89
PET (#1) Bottles	0.2%	0.7%	40	Sheet Rock	2.0%	4.4%	535
HDPE (#2) Bottles	0.0%	0.1%	6	Shingles	0.4%	0.0%	95
Other (#3-#7) Bottles	0.0%	0.0%	1	Carpet/Carpet Padding	5.1%	5.5%	1,346
Jars, Jugs, Tubs, Trays	0.1%	0.5%	23	Dirt	0.0%	0.2%	7
Flower Pots	0.0%	0.0%	0	Remainder/Composite C&D	10.3%	9.1%	2,718
Other Rigid Plastic	2.2%	1.6%	580	**HHW**	**0.4%**	**0.7%**	**101**
Plastic Shopping Bags	0.0%	0.2%	9	Paint	0.0%	0.3%	9
Other Plastic Film	0.2%	0.7%	59	Remainder/Composite HHW	0.3%	0.6%	92
Garbage Bags	0.2%	0.5%	56	**Other**	**44.6%**	**5.6%**	**11,806**
Multiple Layered Packaging	0.0%	0.1%	3	Textiles	1.5%	3.0%	410
Polystyrene	0.0%	0.1%	5	Shoes	0.0%	0.3%	10
Remainder/Composite Plastic	0.1%	0.5%	35	Rags	0.0%	0.0%	1
Metal	**4.6%**	**1.6%**	**1,223**	Diapers/Sanitary Products	0.1%	1.0%	31
Ferrous Cans	0.1%	0.3%	14	Animal Bi-Products	0.1%	0.9%	27
Aluminum Cans/Foil	0.1%	0.5%	20	Mattresses	4.6%	1.7%	1,224
Other Ferrous Metals	2.8%	1.3%	748	Box Springs	2.0%	0.0%	526
Non-Ferrous Metals	1.7%	0.7%	441	Furniture	33.3%	3.1%	8,826
Glass	**2.6%**	**2.1%**	**696**	Fines	0.0%	0.2%	13
Glass Bottles/Jars	0.4%	2.1%	102	Other MSW	0.1%	0.5%	22
Remainder/Composite Glass	2.2%	0.2%	594	PPE	0.0%	0.0%	2
Electronics	**0.3%**	**0.6%**	**84**	Other Bulky	2.7%	1.7%	715
Electronics	0.3%	0.6%	84	**Total**	**100.0%**		**26,480**
CRTs	0.0%	0.0%	0	**No. of Samples**	**203**		

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4. CONCLUSIONS AND RECOMMENDATIONS

The Project Team offers the following conclusions and recommendations regarding the Prince George's County 2022 Waste Composition Study.

4.1 CONCLUSIONS

- **Comprehensive Waste Characterization Study**: By the virtue of capturing representative samples spanning four seasons, the residential and commercial generator sectors, and the various waste types entering the landfill, this study provides a robust and highly representative estimate of the composition of wastes being landfilled at BSRSL. The resulting data should be an important foundation to guide the County's waste management strategies and long-term program needs.
- **Comparability**: The incidence of recyclable paper, recyclable containers, compostable materials, and other divertible materials found in the 2022 Study can be closely compared to the results of the 2015 Study. These data establish a time series that may be extended in future studies.
- **Evolution of Data Collection Approach**: The 2022 Study was successfully able to build on the initial 2015 Study methodology and incorporate additional waste streams for inclusion in the overall composition analysis. The Self-Haul generator sector was added to the 2022 Study, and bulky waste visual surveys were added to capture samples of for MSW bulky loads from Self-Haul, Commercial, and the County's Residential-Bulky curbside material that were not fully characterized in the 2015 Study. The use of a tablet-based app that enabled visual estimates to be calibrated against the actual scale weight of inbound bulky loads contributed to a more robust analysis of the bulky waste stream in 2022.
- **Strong Client Support:** MES, the County and BSRSL staff were all instrumental in each season of data collection being effectively performed to completion. The support provided to the Project Team ensured all on and off-site study needs were met and we appreciated the County's efforts, particularly in regards to health & safety. Further, MES and County staff were able to provide detailed tonnage breakdowns so that the composition estimates could be accurately applied to underlying waste streams.
- **Opportunity for Improving Recycling Program Effectiveness**: The County targets a wide variety of materials in its recycling program. The findings of this study show that since 2015, the incidence of recyclable paper and containers in the disposed waste stream has decreased in percentage terms. Some of this decrease is likely attributable to macroeconomic changes such as the shift from print to digital media, and it is also possible that the expanded representativeness of the 2022 Study could have influenced this result. However, over time it is a worthy policy to reduce disposal of targeted recyclables to landfill, and this metric should continue to be tracked in future composition studies. Every ton of recyclable paper and containers shifted from the waste stream to the recycling program reduces landfill disposal cost and conserves airspace, increases material revenue, and improves the County's capture rate.[1]
- **Opportunity for Establishment of Organics Collection**: The County is in the process of piloting a residential organics program. As a significant quantity of the existing waste stream is comprised of organics, particularly food waste which was found to be 22 percent of the residential waste stream, an effective organics program will be important to increase diversion at BSRSL. However, long-term success of such a program will likely hinge on the ability of the County to collect a relatively

[1] It is noted that the County secured a grant to perform a Recycling Capture Rate Study in parallel with this waste composition study. The Capture Rate Study will provide a detailed evaluation of the effectiveness of the County's current curbside recycling program, and therefore no attempt has been made in this report to address recycling effectiveness in more detail.

uncontaminated stream of material. Markets for compost tend to be intolerant of many contaminants including film plastic, rigid plastic and broken glass. Therefore, it will be critical to monitor the cleanliness of residential organics and maintain aggressive outreach and education if this program is expanded beyond the pilot stage.

- **The Impact of Contamination on Recycling Markets**: It cannot be overemphasized that diversion of materials from landfill must be predicated on clean material streams. Markets for traditional curbside recyclables went through a prolonged downturn from 2017 to 2021, driven largely by the loss of export markets for highly contaminated commodities. Local governments like Prince George's County must operate their curbside recycling and organics collection programs not like a function of "waste" management, but rather as providers of a specialized feedstock for U.S. manufacturers of products and packaging in a circular economy. While public education and outreach are clearly important to meet goals of material purity, other communities are finding that ancillary programs – including recycling set-out monitoring, creative user fees and/or enforcement mechanisms, and routine inbound single stream composition audits – are needed to maintain a successful recycling program.

4.2 RECOMMENDATIONS

Numerous studies across the country have confirmed that the composition of the waste stream changes over time. As a consequence, it is recommended that as the County continues to update this waste characterization study at regular intervals in the future, as such data can be invaluable to solid waste and sustainability planners. Additionally, the following recommendations are offered for consideration by the County:

- **Perform a Dedicated Construction & Demolition Composition Study**: Construction and demolition (C&D) debris generation can be equal to that of municipal solid waste. Further, many of the constituents in C&D debris are highly recyclable and reusable. As Prince George's County looks at its entire waste stream, it may be advisable to quantify and characterize the C&D waste stream on a County-wide basis. The highly accurate methodology for estimating the composition of bulky wastes in this study are also applicable to C&D loads and have been developed and used in other state and local studies. The County may wish to more fully evaluate the composition of C&D waste streams in the future, to supplement this MSW composition study.
- **Consider Commercial Generator Studies**: This study devoted significant effort to estimating the composition of commercial wastes hauled to the BSRSL, and the results provide a solid snapshot of commercial wastes in their entirety. However, waste composition profiles vary dramatically across industries and business operations. Many counties and cities have initiated recycling technical assistance programs aimed at recycling at businesses with a high potential to divert waste from landfill. The County may consider commercial generator-specific waste audits to better measure the recycling potential at certain businesses. Such waste audits could be performed within a future waste composition study with help from haulers to deliver generator samples to the landfill, or on-site audits could be arranged at interested businesses.
- **Target Outreach on Under-captured Materials**: Although County recycling programs appears to be functioning effectively, the data in this study will be used in an upcoming report on recycling capture rates. Recycling planners can use the composition and divertibility data found in this study as well as the capture rate data from the supplemental capture rate study to focus messaging on the materials which, if captured to a higher degree, would most improve the diversion rate and/or the revenue profile of the recycled material stream.

APPENDIX A

MANUAL SORT MATERIAL CATEGORIES & DEFINITIONS

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APPENDIX A – MANUAL SORT MATERIAL CATEGORIES AND DEFINITIONS

	Material Description	Divertibility Category	Definition
PAPER			
1	Corrugated Cardboard (OCC)	Recyclable Paper	Packing/shipping boxes
2	Newspaper/Print (ONP)	Recyclable Paper	Daily/weekly newspapers, including inserts.
3	Magazines/Catalogs/Other Books	Recyclable Paper	TV Guide, periodicals, journals, hard cover books
4	Kraft Paper/Boxboard	Recyclable Paper	Grocery/shopping bags, paper grocery bags, soda/cereal boxes
5	Mixed Paper	Recyclable Paper	Copy paper, computer printouts, envelopes, brochures, flyers, junk mail, receipts, notebook paper
6	Aseptic/Gable Top Cartons	Recyclable Paper	Milk and juice cartons, juice boxes
7	Paper Towels/Napkins	Compostable	Tissues, napkins, paper towels
8	Other Compostable Paper	Compostable	Non-coated paper food trays, wax OCC
9	Remainder/Composite Paper	Other	All paper that doesn't fit into the categories specified above and items that are primarily paper but include other materials such as plastic or metal. Examples paper or boxboard coated with plastic or metal foil, photographs, laminated paper
PLASTIC			
10	PET (#1) Bottles	Recyclable Containers	Plastic water and soda bottles, marked #1
11	HDPE (#2) Bottles	Recyclable Containers	Milk and detergent bottles, marked with #2
12	Other (#3-#7) Bottles	Recyclable Containers	Prescription bottles, syrup bottles
13	Jars, Jugs, Tubs, Trays	Recyclable Containers	Jars/Jugs/Tubs/Trays marked with #1 through #5.
14	Flower Pots	Recyclable Containers	Recyclable flower pots, usually marked #5
15	Other Rigid Plastic	Recyclable Containers	Storage totes, furniture, toys, not marked with a #
16	Plastic Shopping Bags	Divertible	Grocery bags and shopping bags comprised of plastic film
17	Other Plastic Film	Other	Tarps, bubble wrap, food packaging bags, zipper pouches, etc.
18	Garbage Bags	Other	Plastic film bags used to contain trash
19	Multiple Layered Packaging	Other	Multi-layer chip bags and some wrappers

20	Polystyrene	Other	Expanded/regular clamshells, cutlery, cups
21	Remainder/Composite Plastic	Other	All other rigid plastic not elsewhere classified. Items such as food service, cup lids, toothbrushes, toys, and composite items that are made of 50% or more plastic.
METAL			
22	Ferrous Cans	Recyclable Containers	Pet food cans, soup cans, fruit cans, aerosols
23	Aluminum Cans/Foil	Recyclable Containers	Soda, beer cans, and aluminum foil
24	Other Ferrous Metals	Divertible	Ferrous and alloyed ferrous scrap materials originated from residential commercial, or institutional sources which are attracted to a magnet. This category includes wire coat hangers auto parts and composite materials that are made of 50% more ferrous.
25	Non-Ferrous Metals	Divertible	Non-magnetic metals such as brass, bronze, silver, lead copper, aluminum, zinc and composite non-ferrous materials that are made of 50% or more metal. Items such as insulated wiring or plumbing parts. Stainless steel house wares are also part of this category.
GLASS			
26	Glass Bottles/Jars	Recyclable Containers	Beer, wine, soda bottles, all colors
27	Remainder/Composite Glass	Other	All other glass items such as plate glass such as window and door glass, table-tops; auto glass; heat resistant cookware (Pyrex); pottery; drinking glasses; and. any other glass that was not used for containing food or drinks.
ORGANICS			
28	Vegetative Food	Compostable	Fruits, vegetables and rinds, breads
29	Non-Vegetative Food	Compostable	Meats, Dairy products
30	Leaves	Compostable	Leaves and pine needles
31	Grass	Compostable	Lawn clippings and hay
32	Brush	Compostable	Branches, brush, small sticks and twigs
33	Pallets/Lumber	Divertible	Forklift pallets, plywood, 2x4's, dimensional lumber
34	Other Wood	Divertible	Tree stumps, wooden chairs, misc. wooden items
35	Remainder/Composite Organics	Other	Organic material that doesn't fit into the categories specified above, and items that are primarily organic but include other materials such as plastic or metal.

			Examples include cotton balls, hair, Q-tips, wax, soap, animal carcasses, and wooden chopsticks/toothpicks/stirrers.
ELECTRONICS			
36	Electronics	E-Waste Program	Corded electronics, cell phones, appliances, etc.
37	CRTs	E-Waste Program	Cathode ray tube monitors (CRTs)
HHW			
38	Paint	HHW Program	Latex and oil-based paint
39	Remainder/Composite HHW	HHW Program	All other household or commercial products not categorized elsewhere characterized as “toxic”, “corrosive”, “flammable”, “ignitable”, “radioactive”, “poisonous”, and “reactive”. Examples include pesticides, automotive fluids, fluorescent tubes and bulbs, medical waste and lithium batteries.
C&D			
40	Concrete/Brick/Rock	Divertible	Gravel, bricks, stones, broken-up asphalt, concrete
41	Sheet Rock	Divertible	Drywall or gypsum board
42	Shingles	Divertible	Roofing shingles
43	Carpet/Carpet Padding	Divertible	Vinyl siding used for exterior house siding
44	Dirt	Divertible	Soil, rocky soil, clay, potting soil, silt, dirt
45	Remainder/Composite C&D	Other	Material generated from construction and demolition activities. Items such as HVAC ducting, caulking or adhesive tubes, used paint brushes, insulation, and other C&D material not elsewhere classified.
OTHER			
46	Textiles	Divertible	Clothing, upholstery, fabrics
47	Shoes	Divertible	Footwear
48	Rags	Divertible	Cloth rags
49	Diapers/Sanitary Products	Other	Diapers and sanitary products.
50	Animal Bi-Products	Other	Animal feces, kitty litter
51	Mattresses	Divertible	Mattresses
52	Box Springs	Divertible	Box Springs
53	Furniture	Other	Tables, chairs, couches, other furniture
54	Fines	Other	Small ½” or less fragments that are too mixed/indistinguishable to allocate to another category
55	Other MSW	Other	Materials not otherwise categorized

56	PPE	Other	Personal protective equipment, particularly used for COVID-19 protection (gloves, masks, face shields)
57	Other Bulky	Other	Other bulky material that does not fall in the bulky plastics, furniture or other categories that are usually mixed materials

APPENDIX B

BULKY WASTE VISUAL SURVEY MATERIAL CATEGORIES & DEFINITIONS

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APPENDIX B– BULKY WASTE VISUAL SURVEY MATERIAL CATEGORIES & DEFINITIONS

	Material Description	Definition	Manual Sort Category Mapping
PAPER			
1	Uncoated OCC - Recyclable	Paperboard containers consisting of Kraft (brown) linerboard with corrugated (fluted medium) fillings.	Corrugated Cardboard (OCC)
2	Other Paper	Consists of all other paper products.	Remainder/Composite Paper
PLASTIC			
3	Durable Plastic Items	Rigid plastic items designed for more than one use.	Other Rigid Plastic
4	Film Plastic (Comm./Indus.)	Large film plastic wrap, bags, tarps, and other film	Other Plastic Film
5	Other Plastic	All other plastic.	Other Rigid Plastic
METAL			
6	Appliances	Large and small appliances such as refrigerators, stoves, air conditioners, washing machines fans, irons, electrical kitchen ware, corded hand drills, and hair driers.	Other Bulky
7	Ferrous Metal	Ferrous and alloyed ferrous scrap materials originated from residential commercial, or institutional sources which are attracted to a magnet. This category includes wire coat hangers auto parts and composite materials that are made of 50% more ferrous.	Other Ferrous Metals
8	Non-Ferrous Metal	Non-magnetic metals such as brass, bronze, silver, lead copper, aluminum, zinc and composite non-ferrous materials that are made of 50% or more metal. Items such as insulated wiring or plumbing parts. Stainless steel house wares are also part of this category.	Non-Ferrous Metals
GENERAL C&D			
9	Dirt/Sand	Small fragments of dirt or sand.	Dirt

10	Rock/Gravel	Rock or gravel of any size.	Concrete/Brick/Rock
11	Gypsum/Dry Wall	Interior wall covering made of a sheet of gypsum sandwiched between paper layers. Examples include unused, broken or whole sheets of sheetrock, drywall, gypsum board, plasterboard, gypsum board, gyproc, and wallboard	Sheet Rock
12	Concrete/Brick	Concrete and brick.	Concrete/Brick/Rock
13	Asphalt Roofing	Asphalt composite shingles and other roofing material made with asphalt. Examples include asphalt shingles and attached roofing tar and tar paper	Shingles
14	Asphalt Paving	Asphalt paving (black or brown, tar-like material mixed with aggregate used as a paving material)	Remainder/Composite C&D
15	Carpet/Carpet Padding	Natural or manmade fibers woven to make floor covering or floor covering under laments items such as carpets, rugs or padding from residential or commercial buildings, including carpet backing.	Carpet/Carpet Padding
16	Other C&D	Material generated from construction and demolition activities. Items such as PVC pipe, HVAC ducting, caulking or adhesive tubes, used paint brushes, ceiling tiles, ash, and other C&D material not elsewhere classified.	Remainder/Composite C&D
WOOD			
17	Pallets/Crates	Wood pallets and crating materials commonly used for industrial and commercial packaging and shipping.	Pallets/Lumber
18	Wood - Clean	Any wood, such as dimensional lumber, which does not contain an adhesive, paint, stain, fire retardant, pesticide or preservative; includes such items as 2x4s, 2x6s, 4x4s, etc. May contains	Pallets/Lumber

		metal items such as screws and nails.	
19	Wood - Painted/Treated	Wood that contains an adhesive, paint, stain, fire retardant, pesticide or preservative. Painted or stained lengths of wood from construction or woodworking activities, particle board, OSB, and plywood.	Other Wood
GLASS			
20	Non-Recyclable Glass	Glass items such as plate glass such as window and door glass, table-tops; auto glass; heat resistant cookware (Pyrex); pottery; drinking glasses; and. any other glass that was not used for containing food or drinks.	Remainder/Composite Glass
FURNITURE			
21	Predominantly Wood	Furniture that is mostly wood by weight.	Furniture
22	Predominantly Plastic	Furniture that is mostly plastic by weight.	Furniture
23	Predominantly Metal	Furniture that is mostly metal by weight.	Furniture
24	Predominantly Mixed	Furniture made of multiple materials (textiles, metal, wood).	Furniture
25	Mattresses	Mattresses	Mattresses
26	Box Springs	Box springs	Box Springs
OTHER			
27	Other Bulky	Oversized items made of multiple materials that do not fall in an above category.	Other Bulky
28	E-Waste	Any plug-in item that contains a circuit board including, televisions, radio, stereo, computer, and CRT. Small Consumer Electronics that are rechargeable or contains a replaceable battery these include cell phones, iPods, PDAs, portable handheld calculators, portable digital assistants or other similar devices.	Electronics
29	Yard Waste - Brush/Prunings	Branches, limbs, logs or other trimmings.	Brush

30	Textiles	Woven natural or manmade fibers used to make items such as clothing, bedding, curtains, blankets, stuffed animals, rags and other cloth material.	Textiles
31	Tires	Solid or pneumatic rubber or steel belted tires. Includes motorized vehicle and bicycle tires.	Remainder/Composite HHW
32	Mixed MSW	Bagged waste and/or loose wastes that appear to be mixed residential or commercial waste	Self-Haul Composition Data (multiple categories)


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