



# FINAL Waste Characterization Study

Thurston County Public Works

Solid Waste Division

*Thurston County, Washington*

June 2023



*This page is intentionally left blank.*

## Contents

1.0	Overview.....	1
1.1	Introduction.....	1
1.2	Background .....	1
1.3	Sampling Methodology.....	2
2.0	Aggregate Waste Stream Results .....	4
2.1	Overall Waste Stream .....	4
2.2	Comparison of Waste by Sector .....	7
2.3	Key Findings.....	8
3.0	Residential Waste Stream Results.....	10
3.1	Overall Residential Waste Stream .....	10
3.2	WARC Residential Self-Haul.....	13
3.3	Residential Curbside .....	14
3.4	Rainier and Rochester Drop-Box Sites .....	14
3.5	Key Findings and Comparisons .....	15
4.0	Commercial Waste Stream Results .....	17
4.1	Overall Commercial Waste Stream .....	17
4.2	Commercial Self-Haul .....	19
4.3	Commercial Curbside.....	20
4.4	Key Findings and Comparisons .....	21
5.0	Visual Observation Results .....	23
5.1	Visual Observations – Recyclables.....	23
5.2	Visual Observations – Organics.....	25
6.0	Conclusions.....	29
6.1	Summary of Findings .....	29
6.1.1	Waste Seasonality.....	29
6.1.2	Durables .....	30
6.1.3	Reuse Potential .....	30
6.1.4	Household Hazardous Waste .....	30
6.1.5	Lightweight Items .....	31
6.2	Modifications to Future Sampling.....	31
6.3	Increased Diversion and Recommendations .....	32
6.4	Comparison to 2014 Study.....	32
6.5	Summary .....	34

## Tables

Table 1.	Sample Collection by Waste Generator – All Events.....	3
Table 2.	Thurston County Waste Stream Composition Results .....	6
Table 3.	Sampling Results by Material Category – All Residential Waste .....	12
Table 4.	Sampling Results by Material Category – All Commercial Waste .....	19
Table 5.	Recyclables Visual Observations.....	23

Table 6. Visual Observations of Organics.....	26
Table 7. Thurston County Waste Stream Composition Comparison .....	33

## Figures

Figure 1. Hand Sorting Samples .....	2
Figure 2. All Residential and Commercial Waste.....	5
Figure 3. Residential and Commercial Comparison .....	8
Figure 4. Residential Waste .....	11
Figure 5. WARC Self-Haul Sample .....	13
Figure 6. Residential Self-Haul .....	13
Figure 7. Residential Curbside.....	14
Figure 8. Drop-Box Sites.....	15
Figure 9. Residential Waste Comparison .....	16
Figure 10. August 2022 Commercial Sample .....	17
Figure 11. May 2023 Commercial Sample.....	17
Figure 12. Commercial Waste.....	18
Figure 13. Commercial Self-Haul .....	20
Figure 14. Commercial Curbside .....	21
Figure 15. Commercial Comparison .....	22
Figure 16. November 2022 Observations from LeMay Pacific Recycling Facility .....	25
Figure 17. August 2022 LeMay Ruddell Road South Recycling Observation .....	25
Figure 18. August 2022 WARC Commercial Organics Observation .....	27
Figure 19. November 2022 WARC Commercial Organics Observation .....	27
Figure 20. May 2023 WARC Commercial Organics Observation.....	28
Figure 21. Waste Seasonal Comparison .....	29
Figure 22. November 2022 Commercial Self-Haul .....	30
Figure 23. May 2023 Durable Waste Items .....	30

## Appendices

Appendix A: Sampling Plan

Appendix B: Waste Sort Data Final Memos: August 2022, November 2022, and May 2023

## Abbreviations and Acronyms

ASTM	American Society for Testing and Materials
C&D	construction and demolition debris
County	Thurston County, Washington
HDPE	high-density polyethylene
HDR	HDR Engineering, Inc.
HHW	household hazardous waste
MSW	Municipal Solid Waste
PET	polyethylene terephthalate
Plan	Thurston County Solid Waste Management Plan
WARC	Waste and Recovery Center

*This page is intentionally left blank.*

## 1.0 Overview

### 1.1 Introduction

Thurston County (County) commissioned a waste characterization study to analyze municipal solid waste (MSW) arriving for disposal at the Waste and Recovery Center (WARC) as well as an analysis of contaminants in the commingled recycling stream and organics.

The objective of the Waste Characterization Study is to provide the County with accurate composition data for the waste delivered to the WARC. Data was collected specific to the following generator types:

- Commercial (including curbside and self-haul)
- Residential (including single-family/multi-family curbside and self-haul)
- Drop-Box Facilities (Rainer and Rochester self-haul)
- Contaminants in recyclables and organics (commercial and residential)

The results of the Waste Characterization Study will allow the County to:

- Identify the types and quantities of potentially recyclable and compostable materials in the disposed waste stream;
- Evaluate contaminants in the recycling and organics stream;
- Gather data on the region's solid waste stream that can be used to help evaluate and potentially improve existing solid waste programs;
- Identify potential new program opportunities based on the waste stream; and
- Compare 2014 waste characterization results to the 2022 study results to identify changes in composition of disposed waste over the last 10 years.

### 1.2 Background

The County finalized the Solid Waste Management Plan (Plan) for years 2021–2026 in late 2021. This Plan included the Washington State Department of Ecology-required Recycling Contamination Reduction and Outreach Plan. The Plan made the following recommendation:

*Conduct a waste composition study to provide data that tracks progress towards waste reduction and diversion program performance, refines existing programs and identifies new program opportunities.*

The County requested that HDR, Inc. (HDR), develop and implement a comprehensive sampling, characterization, and analysis of MSW arriving for disposal at the WARC as well as an analysis of contaminants in the commingled recycling and organics streams.

The waste characterization study was conducted in accordance with the American Society for Testing and Materials (ASTM) Method D5231-92, Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste.

## 1.3 Sampling Methodology

A Sampling Plan was completed to outline sample allocations, locations, schedule, event coordination, and analysis. The Sampling Plan also includes appendices on material definitions, equipment, health and safety measures, and field forms. The Sampling Plan is located in Appendix A.

During the course of the Waste Characterization Study, the sampling schedule was modified from four sampling events to three due to operational issues encountered at the WARC. In addition, sampling hours were also modified to take place Monday through Thursday from 7:30 a.m. to 4:30 p.m. daily. The dates of the three sampling events were as follows:

- August 15–18, 2022
- November 7–10, 2022
- May 8–11, 2023

The Sampling Plan defines the material types and definitions for the Waste Characterization Study, grouped into standard material classes of paper, plastics, metals, glass, organics, wood, durables, household hazardous waste (HHW), and other. In addition, several material types were further classified based on volume of materials sorted during each event.

The Sampling Plan targeted 50 samples of MSW for sorting during each scheduled event (see Figure 1) based on ASTM Standards, noting that these 50 samples per event would be sufficient to calculate statistically significant characterization data for the overall disposed waste stream with a 90 percent confidence level. During the November sampling event, one drop-box site sample was not available, and a residential self-haul sample was completed instead. During the May sorting event, one residential self-haul sample was not completed. These modifications to the Sampling Plan do not constitute a statistically significant modification to the overall confidence level and do fall within acceptable parameters.

The intent of the Waste Characterization Study was to provide data for the County's entire waste stream permitting sampling data and collection procedures that allowed data to be collected on the quantity and composition of waste disposed of as well as the source (from a list of waste generators). Waste generators included the following types:



**Figure 1. Hand Sorting Samples**



- **Residential Self-Haul** – Waste brought to the WARC and deposited in the public tipping area. This waste is typically from homeowners or renters.
- **Residential Curbside** – Waste collected by Waste Connections or the City of Olympia from single-family homes.
- **Drop-Box Sites** – Waste brought to either the Rainer or Rochester Drop-Box site. This waste is primarily residential waste brought by self-haulers due to acceptance policies established for these sites.
- **Commercial Self-Haul** – Waste from businesses and contractors that was transported by an employee of the business or contractor.
- **Commercial** – Waste from businesses and multi-family establishments, which is typically collected in front-load garbage trucks, roll-off containers, or compactors.

Data from the sorting procedures provides information for each material type using a percentage-by-weight estimated composition, represented by the samples examined during the sorting events and the degree of precision of the composition estimate. In addition to the samples of MSW per event, visual observations of recycling and organics contamination were scheduled during the sorting events. Sample allocation was determined through review of the 2021 Thurston County Solid Waste Customer Report, which identified generator allocation percentages. Sample collection by generator through all sorting events is provided in Table 1.

**Table 1. Sample Collection by Waste Generator – All Events**

Generator	August 2022	November 2022	May 2023	Total Samples	Percentage
Residential Self-Haul	8	9	7	24	16%
Residential Curbside	20	20	20	60	40%
Drop-Box Sites	2	1	2	5	4%
<b>Total Residential</b>	<b>30</b>	<b>30</b>	<b>29</b>	<b>89</b>	<b>60%</b>
Commercial Self-Haul	5	5	5	15	10%
Commercial	15	15	15	45	30%
<b>Total Commercial</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>60</b>	<b>40%</b>
<b>Total Samples</b>	<b>50</b>	<b>50</b>	<b>49</b>	<b>149</b>	<b>100%</b>
Recyclables	4	4	4	12	-
Organics	8	8	8	24	-
<b>Total Visual Observations</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>36</b>	<b>-</b>
<b>Total All</b>	<b>62</b>	<b>62</b>	<b>61</b>	<b>184</b>	<b>-</b>

A memorandum for each sorting event was completed; these can be found in Appendix B. This Waste Characterization Report provides an aggregate review of the total waste stream analysis and provides information by generator type to assist the County with identification of material categories and sectors with high potential for diversion, recovery, or reuse and results of contamination found in recyclables and organics.

## 2.0 Aggregate Waste Stream Results

### 2.1 Overall Waste Stream

The material categories and generator types that were analyzed during the 2022/2023 waste sorts have been aggregated to show the composition of disposed waste through the County solid waste system. Figure 2 shows the combined composition of the tons of residential, self-haul, commercial, and drop-box sites that were disposed of, with tonnage from 2022 used as the basis for composition.

The waste samples include residential waste from curbside collection, self-haul to the WARC, and drop-box collection at Rainier and Rochester, as well as commercial waste from curbside and self-haul collection. Figure 2 provides the waste stream composition of all 149 samples of MSW from all residential and commercial generators as percentages by weight of material sampled. This data is shown by category of material and in further detail within each category.

The largest categories of waste include construction and demolition debris (C&D) (25.0 percent), furniture (11.7 percent), and food waste (9.2 percent). Figure 2 illustrates the data by categorizing the waste and then further dividing the categories into individual material types.

Table 2 provides an additional list of each material type with a breakdown of percentage by weight and total tons of materials based on the 2022 MSW tonnage accepted through the solid waste system.

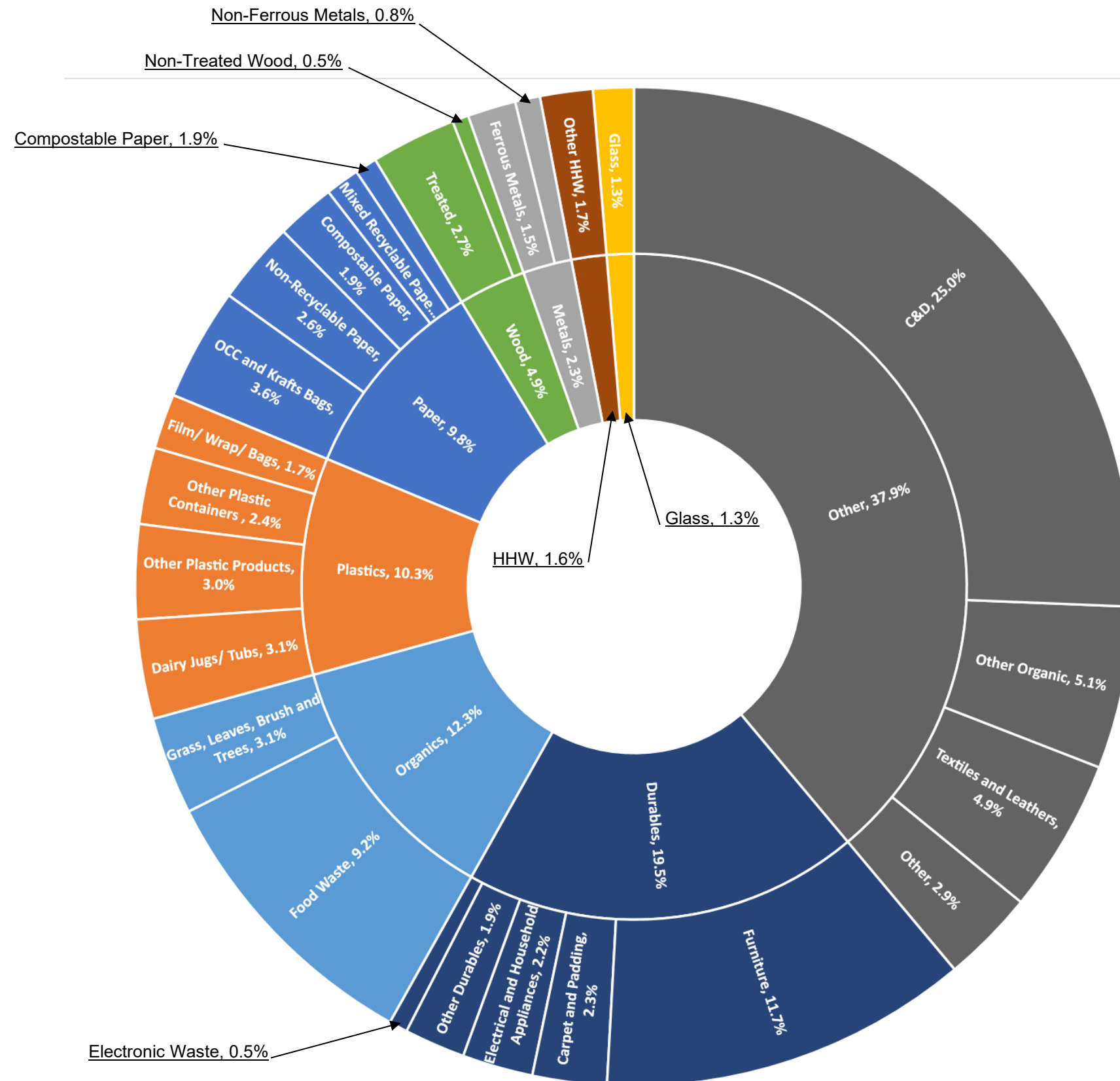


Figure 2. All Residential and Commercial Waste

Table 2. Thurston County Waste Stream Composition Results		
Material Type	Waste Stream	
	Percentage by Weight	Tons of Material <sup>1</sup>
<b>Paper</b>	<b>9.8%</b>	<b>25,558</b>
OCC and Kraft Bags	3.6%	9,389
Newspaper	0.0%	0
Mixed Recyclable Paper	1.1%	2,869
Compostable Paper	1.9%	4,693
Non-Recoverable Paper	2.6%	6,781
Magazines	0.1%	261
High-Grade Office Paper	0.6%	1,565
<b>Plastics</b>	<b>10.3%</b>	<b>26,862</b>
#1 PET	0.9%	2,347
#2 HDPE Bottles	0.6%	1,565
Dairy Tubs	1.0%	2,608
Other Plastic Containers	3.0%	7,824
Other Plastic Products	3.1%	8,084
Film/Wrap/Bags	1.7%	4,434
<b>Glass</b>	<b>1.3%</b>	<b>3,390</b>
Glass	1.2%	3,129
Other Mixed Cullet	0.1%	261
<b>Metals</b>	<b>2.3%</b>	<b>5,998</b>
Aluminum Cans	0.5%	1,304
Tin Cans	0.5%	1,304
Other Ferrous	1.1%	2,869
Other Non-Ferrous	0.3%	521
<b>Organics</b>	<b>12.3%</b>	<b>32,078</b>
Food Waste	9.2%	23,994
Grass and Leaves	2.6%	6,782
Brush and Trees	0.5%	1,304
<b>Other Materials</b>	<b>37.9%</b>	<b>98,845</b>
C&D	25.0%	65,202

**Table 2. Thurston County Waste Stream Composition Results**

Material Type	Waste Stream	
	Percentage by Weight	Tons of Material <sup>1</sup>
Textiles and Leathers	4.9%	12,7798
Polystyrene	0.5%	1,304
Rubber	0.3%	782
Tires	0.6%	1,565
Sharps	0.1%	261
Other Organic (includes disposable diapers)	5.1%	13,301
Other Inorganic	0.1%	261
Fines/Super Mix	0.4%	1,043
Other	0.9%	2,347
<b>Wood</b>	<b>4.9%</b>	<b>12,779</b>
Non-Treated Wood	2.7%	7,041
Treated Wood	2.2%	5,738
<b>Durables</b>	<b>19.5%</b>	<b>50,856</b>
Household Appliances	3.0%	7,824
CPUs and Peripherals	0.1%	261
Computer Monitors/TVs	0.4%	1,043
Other Durables	1.9%	4,955
Furniture	11.7%	30,775
Carpet and Padding	2.3%	5,998
<b>Household Hazardous Waste</b>	<b>1.7%</b>	<b>4,434</b>
Automotive Products	0.5%	1,304
Other HHW	1.2%	3,130
<b>Total 2022 Tons Disposed (in tons)</b>		<b>260,800</b>

Note: CPU = central processing unit; HDPE = high-density polyethylene; OCC = old corrugated cardboard; PET = polyethylene terephthalate.

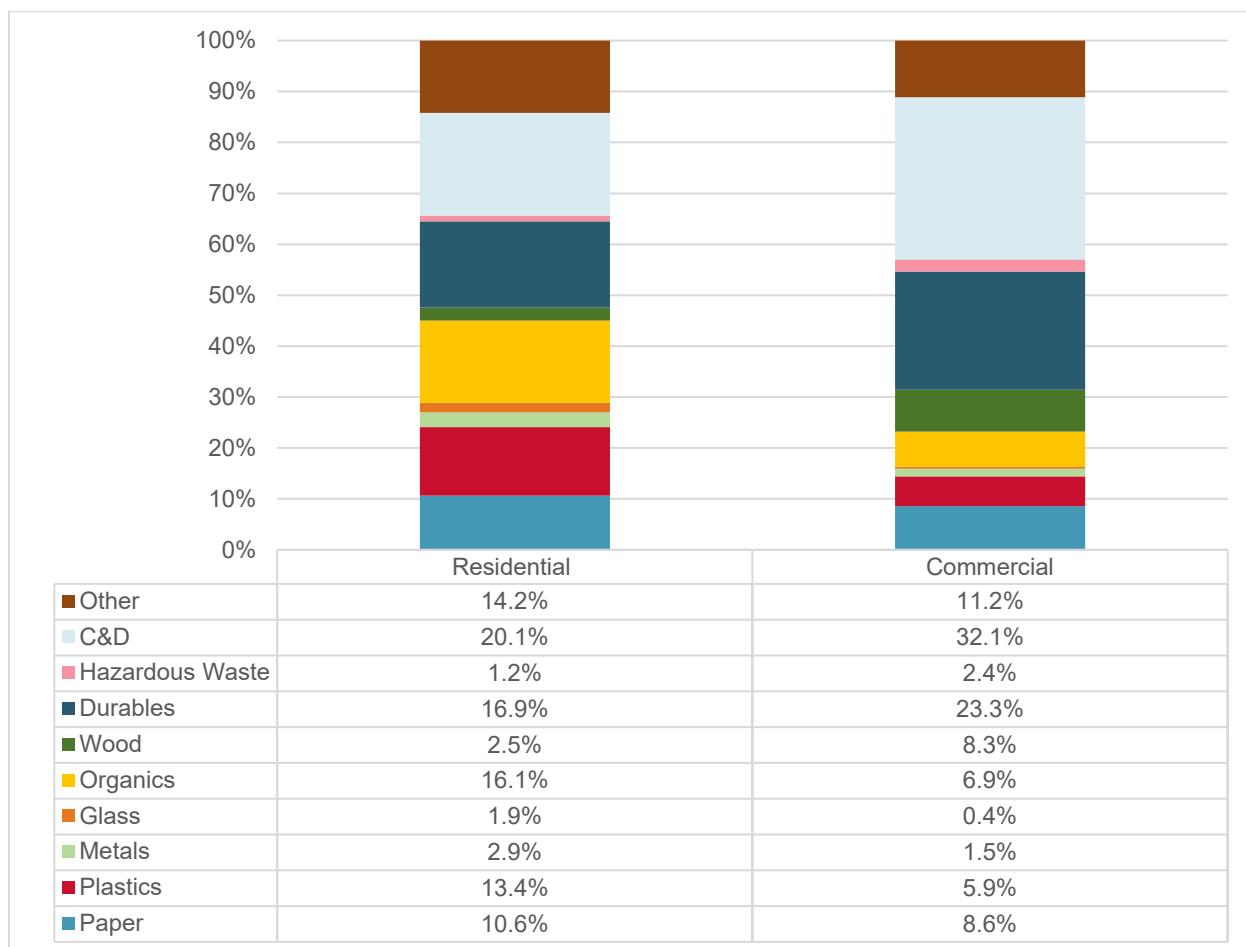
<sup>1</sup>Tons of materials based on Thurston County Solid Waste 2022 tonnage.

## 2.2 Comparison of Waste by Sector

Comparison of the residential and commercial waste streams by the percentage of waste, by weight of each category, is shown in Figure 3. In both waste streams, C&D

waste comprised a large portion of the other category, with C&D separated to illustrate this data more clearly.

The waste composition of residential and commercial waste is similar in that C&D was the largest category of waste by weight, and durables (which includes furniture, appliances, electronics, and other items) was the second-largest category for both residential and commercial waste. Organics was the third largest for residential waste, which includes food waste. Further details of the residential and commercial waste streams are included in Sections 3.0 and 4.0 of this report, respectively.



**Figure 3. Residential and Commercial Comparison**

## 2.3 Key Findings

The combined residential and commercial MSW data from the three waste sampling events provides an aggregate composition of all waste handled through the County solid waste system. Data from the sampling events illustrated that a quarter of the waste stream consists of C&D materials that include building materials, drywall, bricks, and other bulky construction and demolition items. Furniture, another bulky item that may have reuse or donation opportunities depending on the condition of items, comprised 11.7 percent of the waste stream. Food waste comprised 9.2 percent, which represents

an opportunity for diversion through the County's existing food waste and organics recycling program.

A portion of the MSW stream also contained items that are recyclable in the County's current program, including paper items (5.3 percent), plastic items (2.5 percent), and metals (2.3 percent). Additionally, many items can be recycled through specialty programs and drop-off opportunities like appliances (3.0 percent), electronics (0.5 percent), and plastic films (1.7 percent).

Results from the sampling events can be used to help refine existing programs or shape future programs in the County to increase diversion and reduce waste. As noted, many materials that are currently recyclable in the County were observed in the MSW.

Targeted and harmonized educational campaigns or information sharing about specific items may increase diversion. Textiles and clothing accounted for 4.9 percent of the waste stream, and sorting crews noted that many of the materials appeared to be acceptable for reuse or donation. Program refinements could include providing reuse or donation educational information to support efforts to keep those items from entering the MSW waste stream.

## 3.0 Residential Waste Stream Results

During the three sampling events, 89 residential waste samples were characterized. This material came from residential self-haul/WARC drop-box, residential curbside, and drop-box facilities located at Rainier and Rochester.

### 3.1 Overall Residential Waste Stream

The overall composition of the County's residential waste stream from the three sampling events can be seen in Figure 4. This graph illustrates the percentages of material by category and in detail for the waste stream observed in all residential MSW samples. Table 3 provides a breakdown of percentages by weight of each material within all residential waste categories.



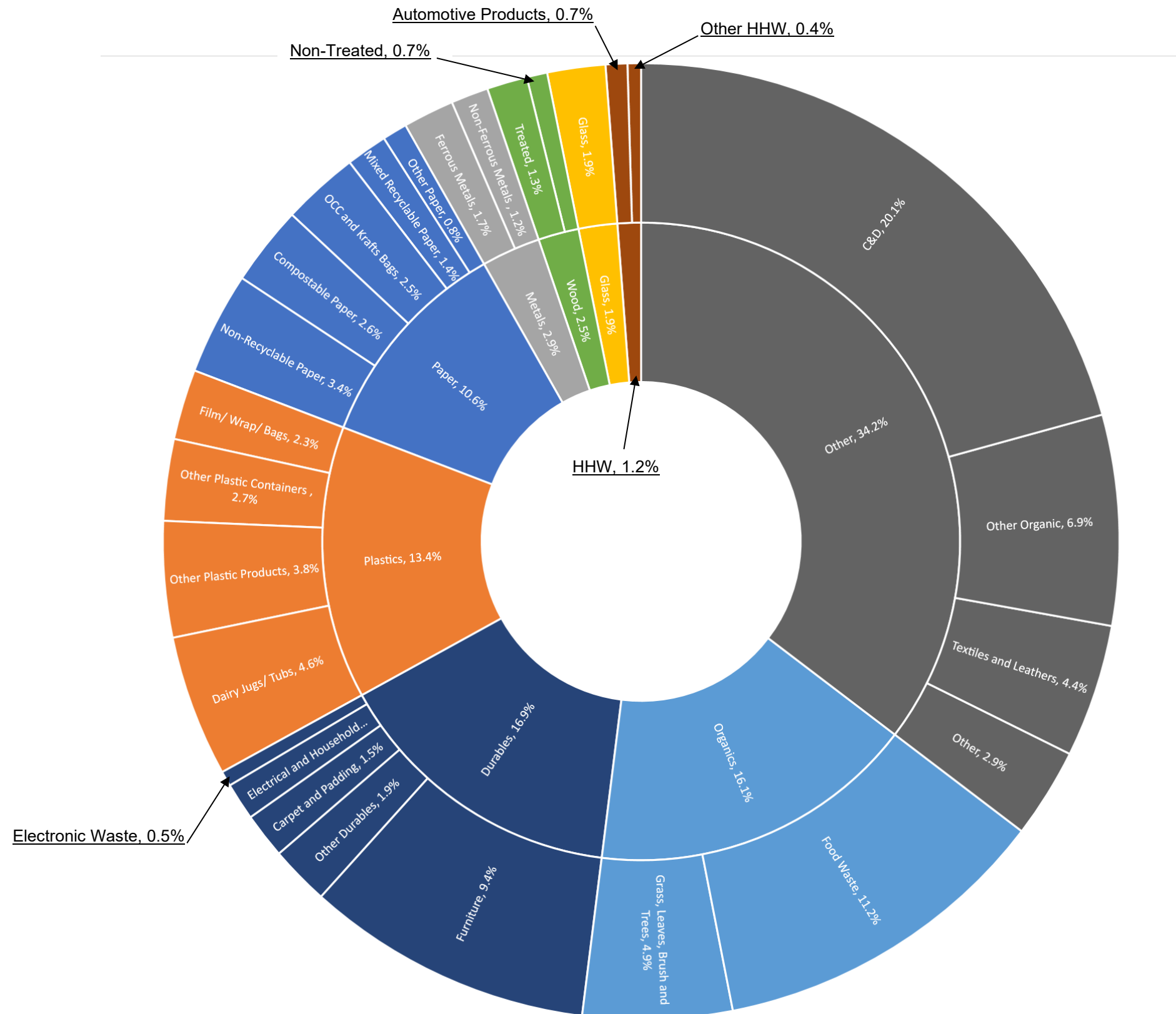


Figure 4. Residential Waste

**Table 3. Sampling Results by Material Category – All Residential Waste**

<b>Paper Total</b>	<b>10.6%</b>	<b>Organics Total</b>	<b>16.1%</b>
Newsprint	0.1%	Grass and Leaves	4.2%
Magazines	0.1%	Brush and Trees	0.7%
High-Grade Office Paper	0.6%	Food Waste	11.2%
OCC and Kraft Bags	2.5%		
Mixed Recyclable Paper	1.4%		
Non-Recyclable Paper	3.4%		
Compostable Paper	2.6%		
<b>Plastics Total</b>	<b>13.4%</b>	<b>Wood Total</b>	<b>2.5%</b>
#1 PET	1.1%	Non-Treated	1.3%
#2 HDPE	0.7%	Treated	1.2%
Dairy Tubs	0.9%		
Other Plastic Containers	3.8%		
Other Plastic Products	4.6%		
Film/Wrap/Bags	2.3%		
<b>Metals Total</b>	<b>2.9%</b>	<b>Household Hazardous Waste Total</b>	<b>1.1%</b>
Aluminum Beverage Containers	0.7%	Automotive Products	0.7%
Ferrous Containers	0.7%	Other HHW	0.4%
Other Ferrous Metals	1.0%		
Other Non-Ferrous Scrap	0.5%		
<b>Glass Total</b>	<b>1.9%</b>	<b>Other Total</b>	<b>34.2%</b>
Glass	1.8%	C&D	20.1%
Other Mixed Cullet	0.1%	Textiles and Leathers	4.4%
		Polystyrene	0.6%
		Rubber	0.0%
		Tires	0.9%
		Sharps	0.0%
		Other Organic	6.9%
		Other Inorganic	0.1%
		Fines/Super Mix	0.4%
		Other	0.8%
<b>Durables Total</b>	<b>16.9%</b>		
Household Appliances	3.6%		
CPUs and Peripherals	0.1%		
Computer Monitors/TVs	0.3%		
Other Durables	1.9%		
Furniture	9.4%		
Carpet and Padding	1.5%		
		<b>Total All</b>	<b>100%</b>

## 3.2 WARC Residential Self-Haul

The overall composition of the 24 samples from the WARC residential self-haul waste stream (see Figure 5) from the three sampling events is illustrated in Figure 6 which identifies the percentage of materials by category in the waste stream. The largest category by weight was C&D at 35.0 percent (included in other) and furniture at 25.2 percent (included in durables). This suggests that residents self-haul bulky items that likely cannot fit into their curbside cart for collection.

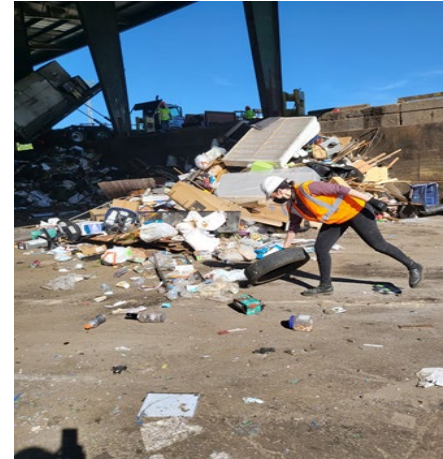


Figure 5. WARC Self-Haul Sample

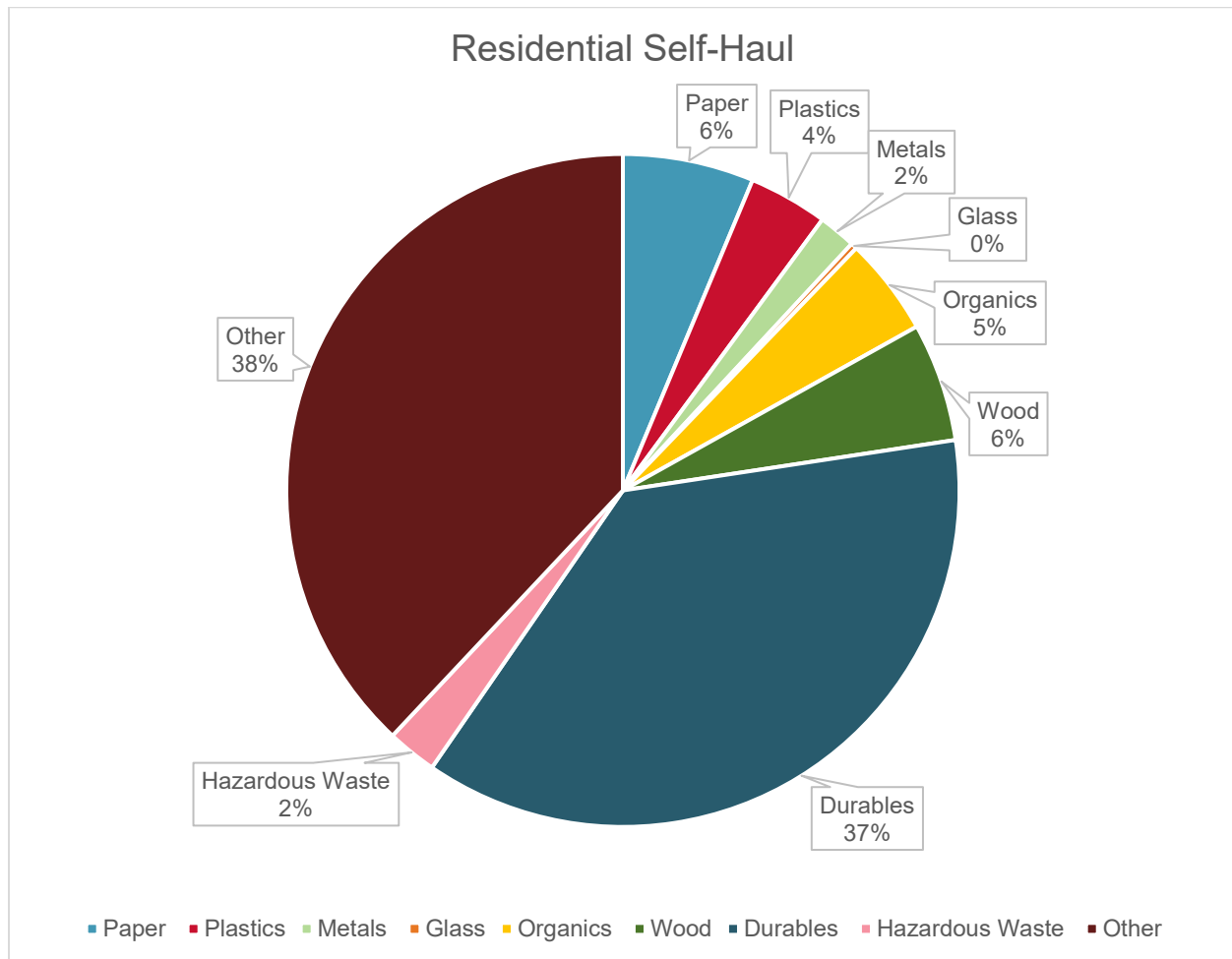


Figure 6. Residential Self-Haul

### 3.3 Residential Curbside

The overall composition of the 60 samples from the residential curbside waste stream from the three sampling events is shown in Figure 7, which identifies the percentage of materials by category in the waste stream. Compared to self-haul and drop-box (Section 3.4), the variety of waste by weight is more widely distributed between the various categories. The other category is 31.2 percent, which includes 11.5 percent C&D and 10.3 percent other organics, which included large quantities of diapers. The organics category is 22.8 percent, which includes 15.6 percent food waste. Residential curbside also included 18.4 percent plastics and 14.0 percent paper products.

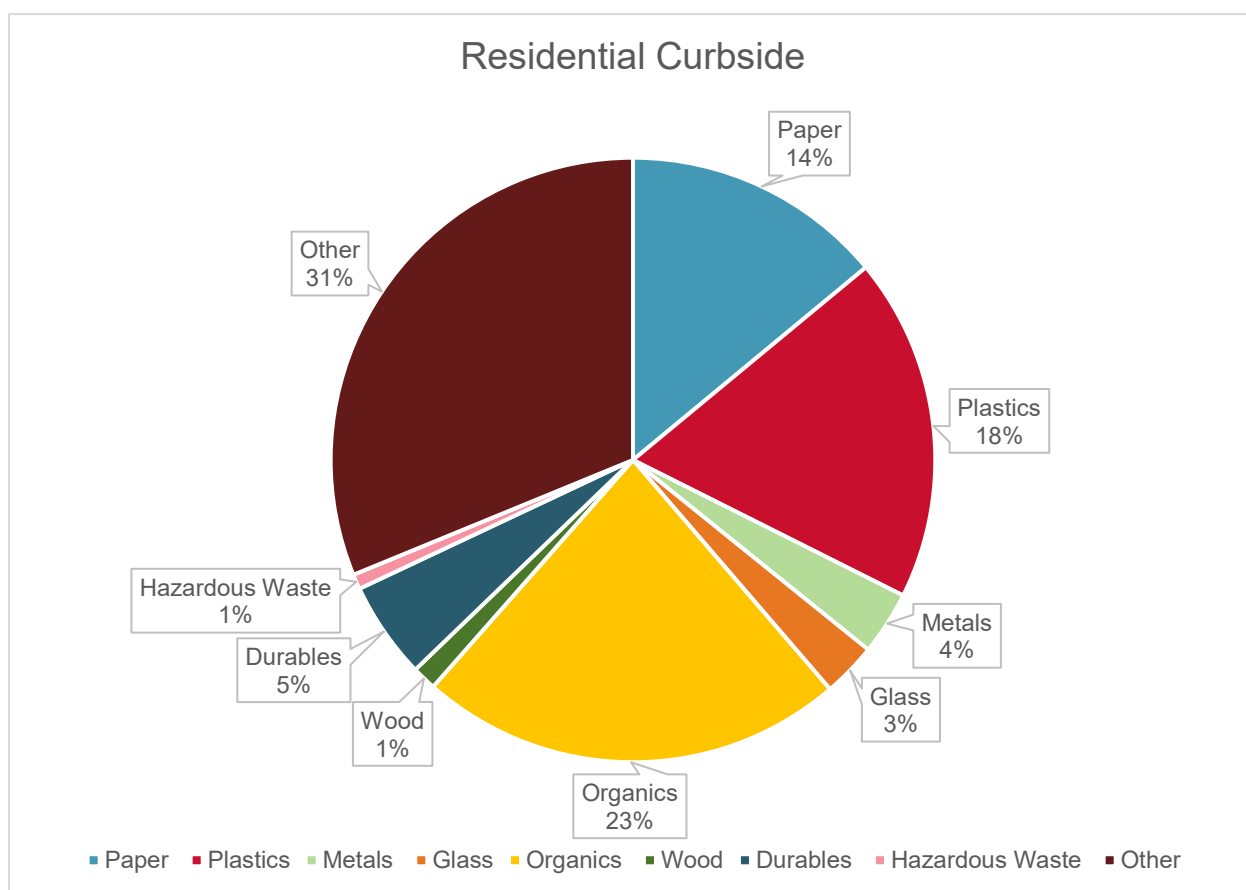


Figure 7. Residential Curbside

### 3.4 Rainier and Rochester Drop-Box Sites

Figure 8 shows the overall composition of the five samples from the Rainier and Rochester Drop-Box sites residential waste stream from the three sampling events and identifies the percentages of materials by category in the waste stream. The results are similar to the residential self-haul data. The largest categories by weight were also C&D

at 33.7 percent (included in other) and furniture at 20.4 percent (included in durables). Similarly, this suggests that residents drop off bulky items at the two drop-box sites.

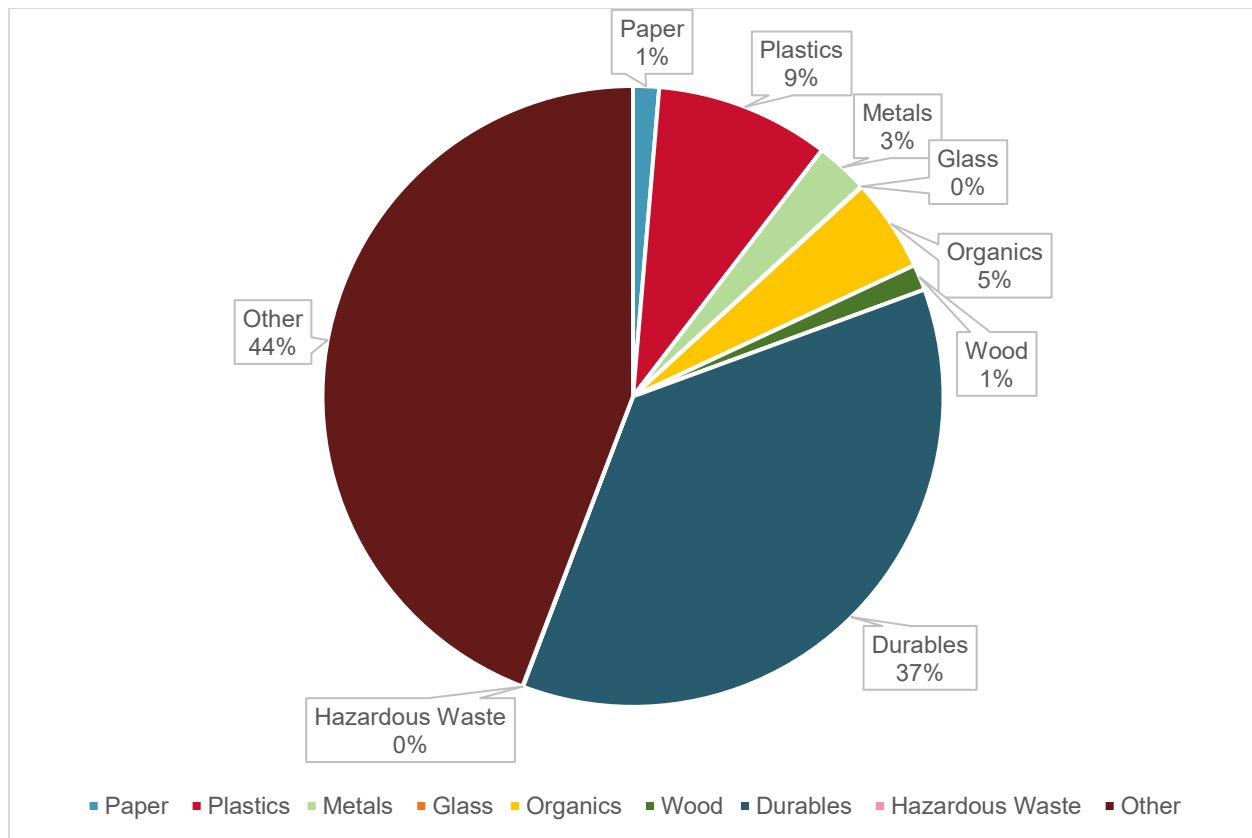


Figure 8. Drop-Box Sites

### 3.5 Key Findings and Comparisons

The waste streams observed in the self-haul and drop-box sampling events were relatively similar to comparable percentages of waste in most categories, including the largest categories observed. The residential curbside data had more variety of categories, including significantly higher organics and lower durables than the other two residential streams. This information indicates that residents are disposing of different materials curbside compared to self-haul or drop-box waste.

Bulky items such as C&D, furniture, carpet, and appliances likely account for much of the differences noted. Sampling crews also noted this difference based on visual inspections during the sampling events. Figure 9 compares the three residential waste streams by category.

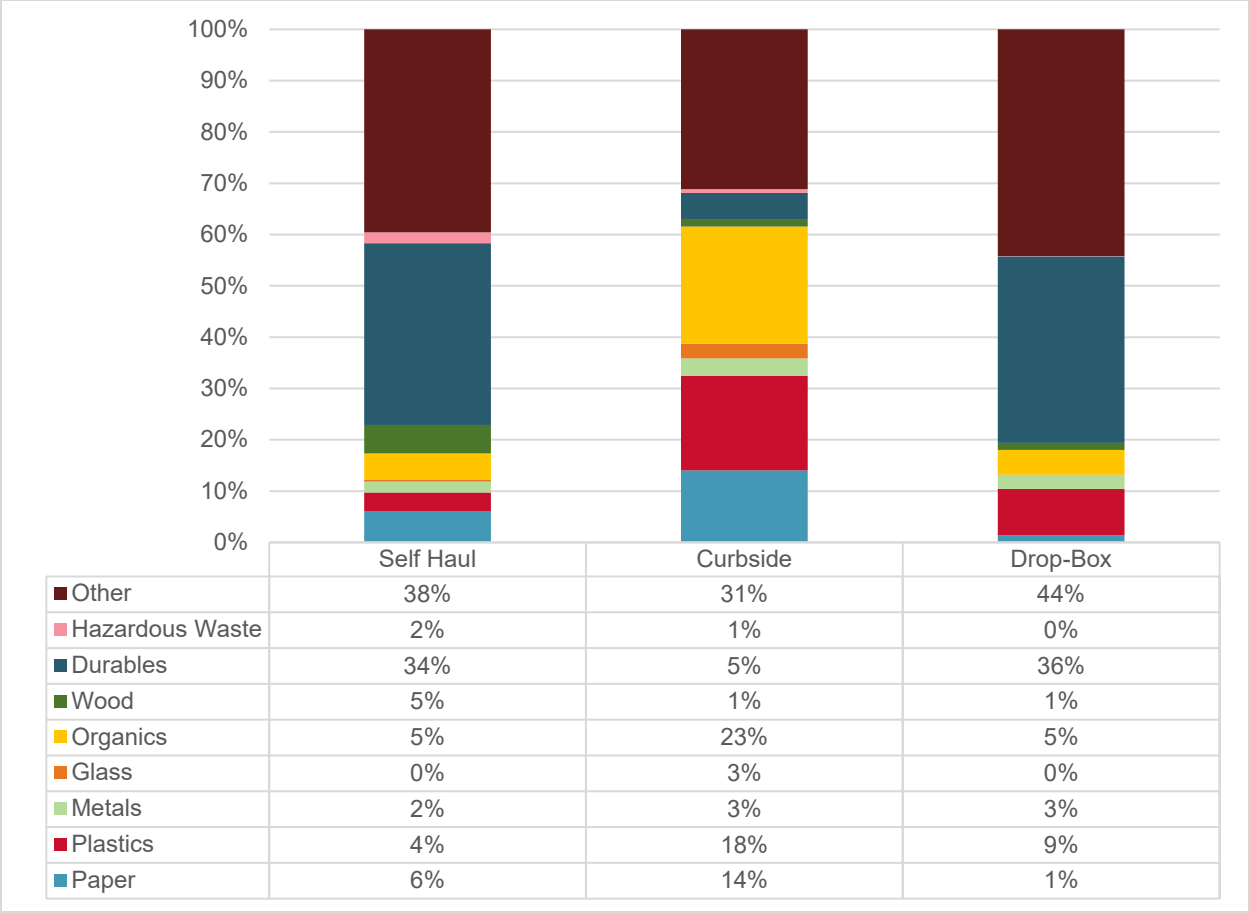


Figure 9. Residential Waste Comparison

## 4.0 Commercial Waste Stream Results

During the three sampling events, 60 commercial waste samples were characterized. This material came from both curbside and self-haul commercial waste generated in the County (see Figure 10 and Figure 11).

### 4.1 Overall Commercial Waste Stream

The overall composition of Thurston County's commercial waste stream from the three sampling events is shown in Figure 12. This graph illustrates the percentages of material by category and in detail for the waste stream observed in all commercial samples from curbside and self-haul. Table 4 provides a breakdown of percentages by weight of each material within the categories for all commercial waste.

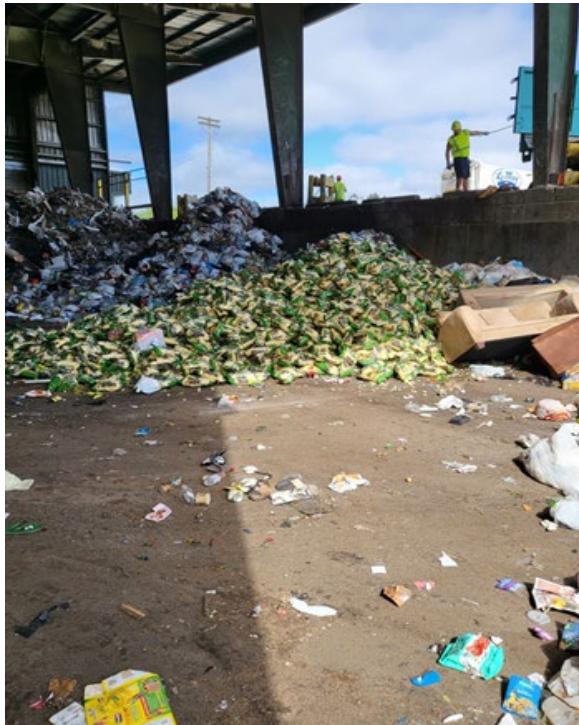


Figure 10. August 2022 Commercial Sample

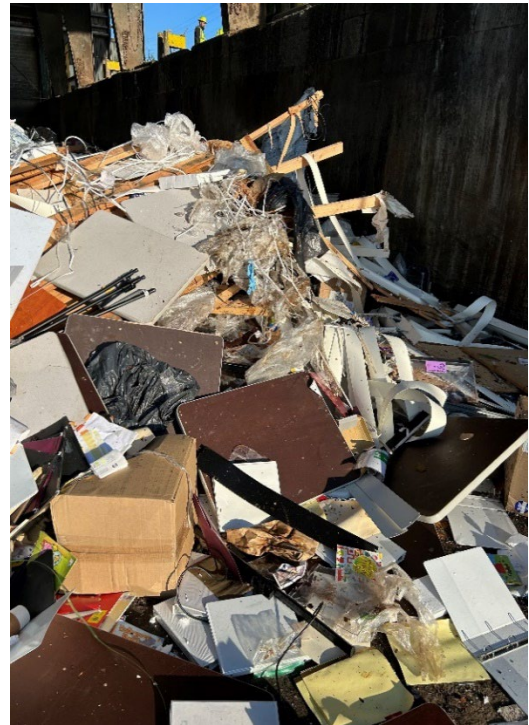


Figure 11. May 2023 Commercial Sample



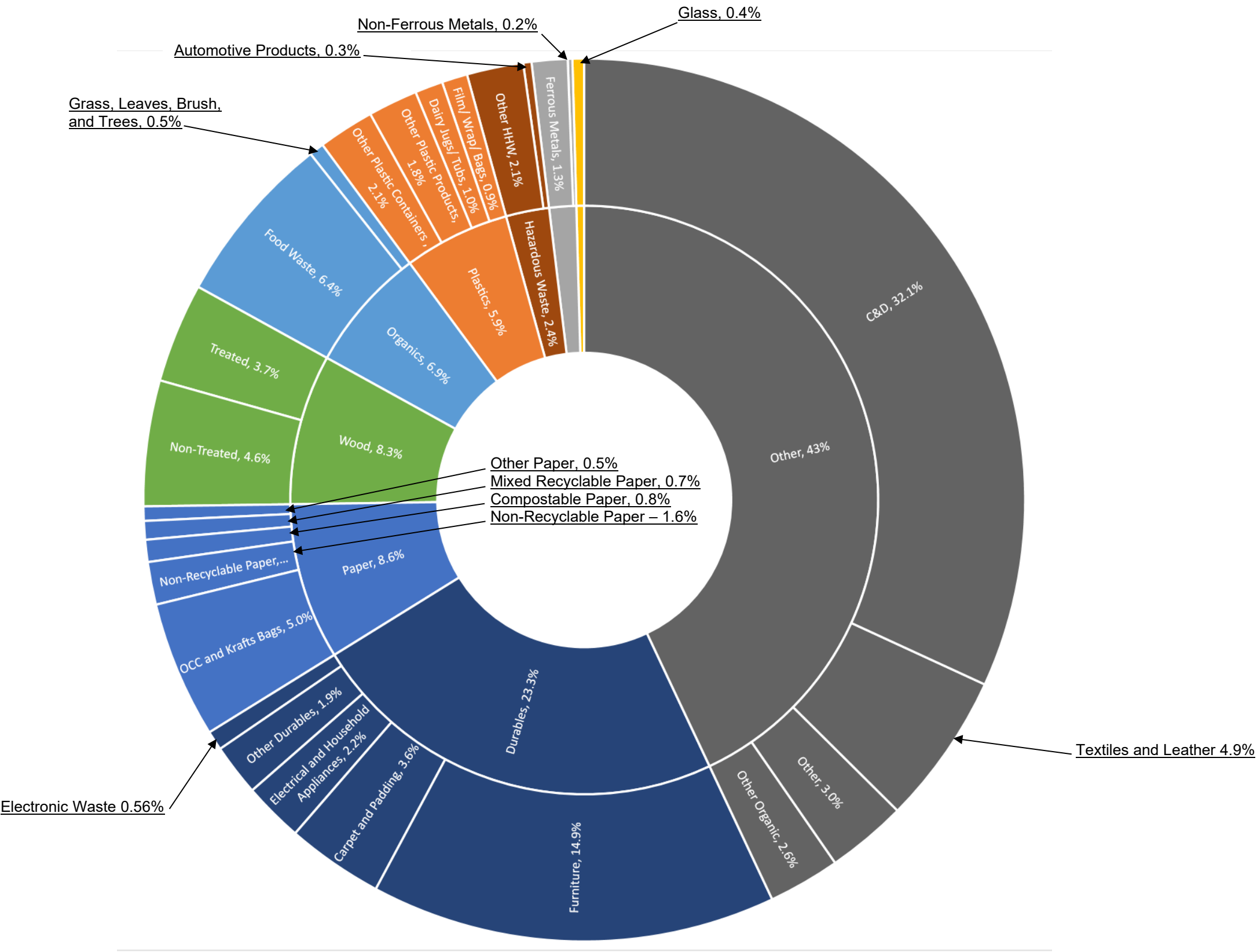


Figure 12. Commercial Waste



**Table 4. Sampling Results by Material Category – All Commercial Waste**

<b>Paper Total</b>	<b>8.6%</b>	<b>Organics Total</b>	<b>6.9%</b>
Newsprint	0.0%	Grass and Leaves	0.3%
Magazines	0.0%	Brush and Trees	0.3%
High-Grade Office Paper	0.5%	Food Waste	6.4%
OCC and Kraft Bags	5.0%		
Mixed Recyclable Paper	0.7%		
Non-Recyclable Paper	1.6%		
Compostable Paper	0.8%		
<b>Plastics Total</b>	<b>5.8%</b>	<b>Wood Total</b>	<b>8.3%</b>
#1 PET	0.6%	Non-Treated	4.6%
#2 HDPE	0.4%	Treated	3.7%
Dairy Tubs	1.0%		
Other Plastic Containers	1.0%		
Other Plastic Products	1.8%		
Film/Wrap/Bags	0.9%		
<b>Metals Total</b>	<b>1.5%</b>	<b>Household Hazardous Waste Total</b>	<b>2.4%</b>
Aluminum Beverage Containers	0.1%	Automotive Products	0.3%
Ferrous Containers	0.1%	Other HHW	2.1%
Other Ferrous Metals	1.2%		
Other Non-Ferrous Scrap	0.0%		
<b>Glass Total</b>	<b>0.4%</b>	<b>Other Total</b>	<b>43.0%</b>
Glass	0.4%	C&D	32.1%
Other Mixed Cullet	0.0%	Textiles and Leathers	5.6%
		Polystyrene	0.4%
		Rubber	0.7%
		Tires	0.2%
		Sharps	0.2%
		Other Organic	2.6%
		Other Inorganic	0.1%
		Fines/Super Mix	0.3%
		Other	1.1%
<b>Durables Total</b>	<b>23.3%</b>		
Household Appliances	2.2%		
CPUs and Peripherals	0.2%		
Computer Monitors/TVs	0.5%		
Other Durables	1.9%		
Furniture	14.9%		
Carpet and Padding	3.6%		
		<b>Total All</b>	<b>100%</b>

## 4.2 Commercial Self-Haul

The overall composition of the 15 self-haul commercial samples from the three sampling events is shown in Figure 13, which identifies the percentage of materials by category in the waste stream. This waste is likely from businesses in the area that either do not have curbside service or need to dispose of items that cannot be collected via their curbside

service, such as bulky items. C&D waste (included in other) accounted for 62 percent of the waste stream observed. Furniture (included in durables) accounted for 15 percent of the waste stream. These two items make up more than three-quarters of the commercial self-haul waste observed during the sampling events.

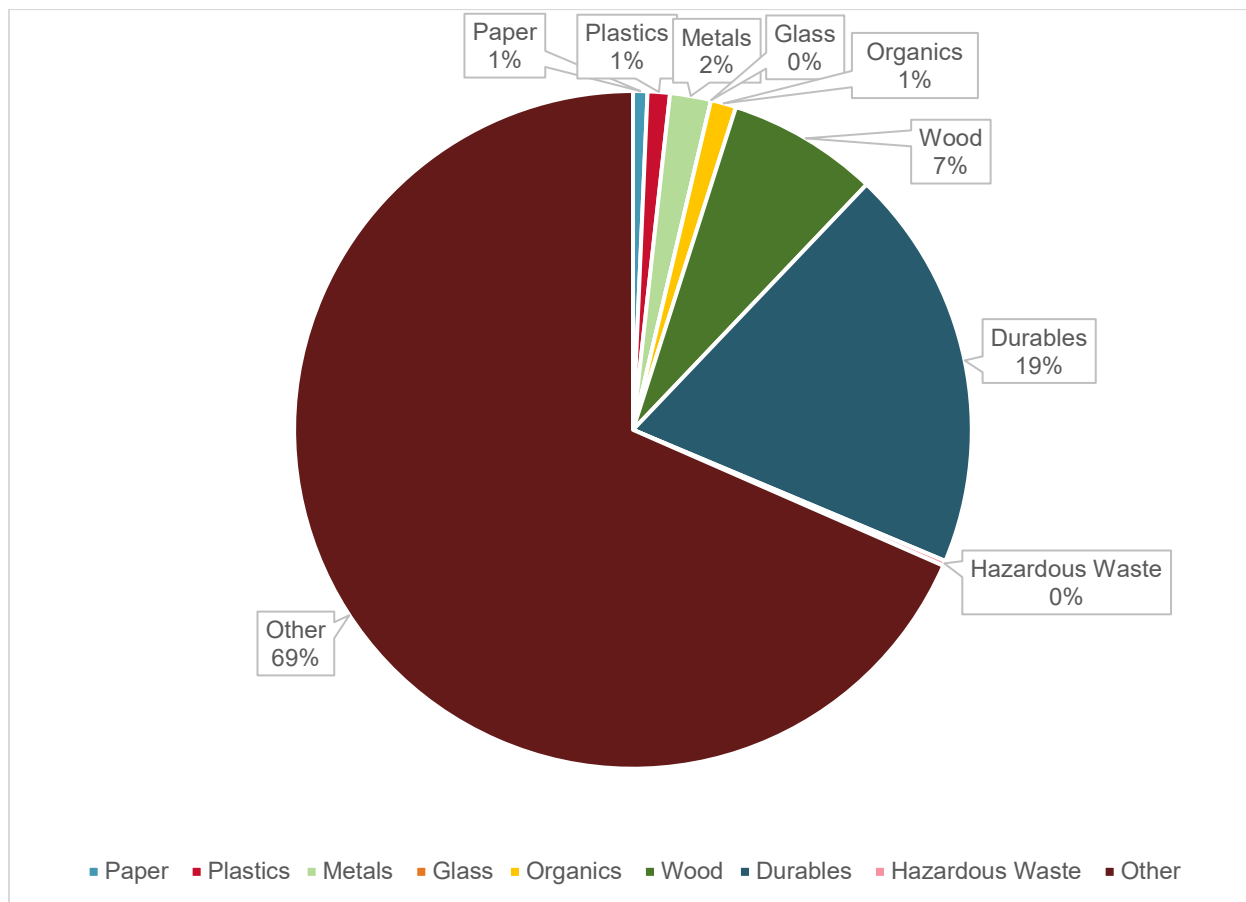


Figure 13. Commercial Self-Haul

### 4.3 Commercial Curbside

The overall composition of the 45 curbside commercial samples from the three sampling events is illustrated in Figure 14, which identifies the percentage of materials by category in the waste stream. This waste is likely from businesses, industry, and multi-unit housing such as apartments or senior living. The data shows a more diverse makeup of waste streams, more closely corresponding to the curbside residential waste. Specific items that occurred in high amounts include C&D (18 percent), furniture (12 percent), food waste (7 percent), and OCC and kraft paper (6 percent).

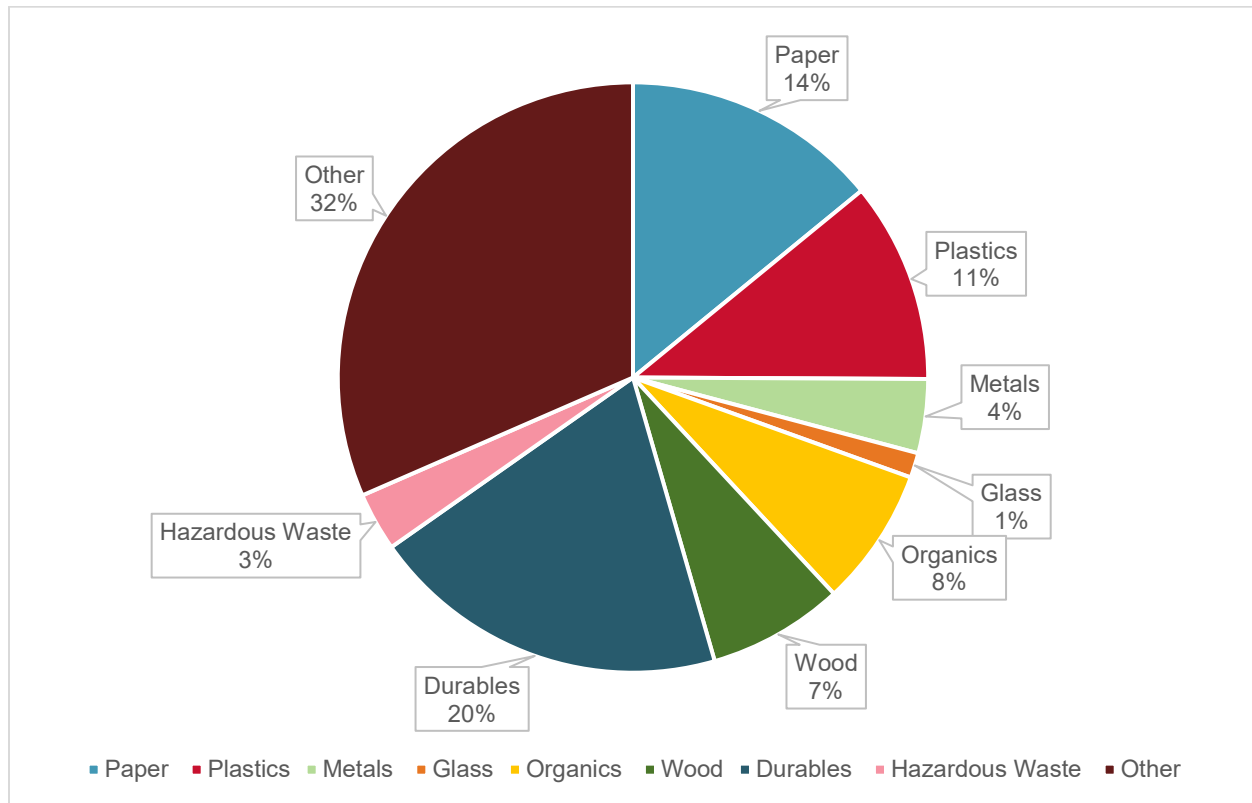


Figure 14. Commercial Curbside

## 4.4 Key Findings and Comparisons

Curbside and self-haul commercial wastes were observed to have differing compositions as displayed in Figure 15. Again, self-haul was comprised of a high percentage of C&D material and bulky waste. Curbside commercial results were more distributed between other categories including wood, organics, plastics, and paper.

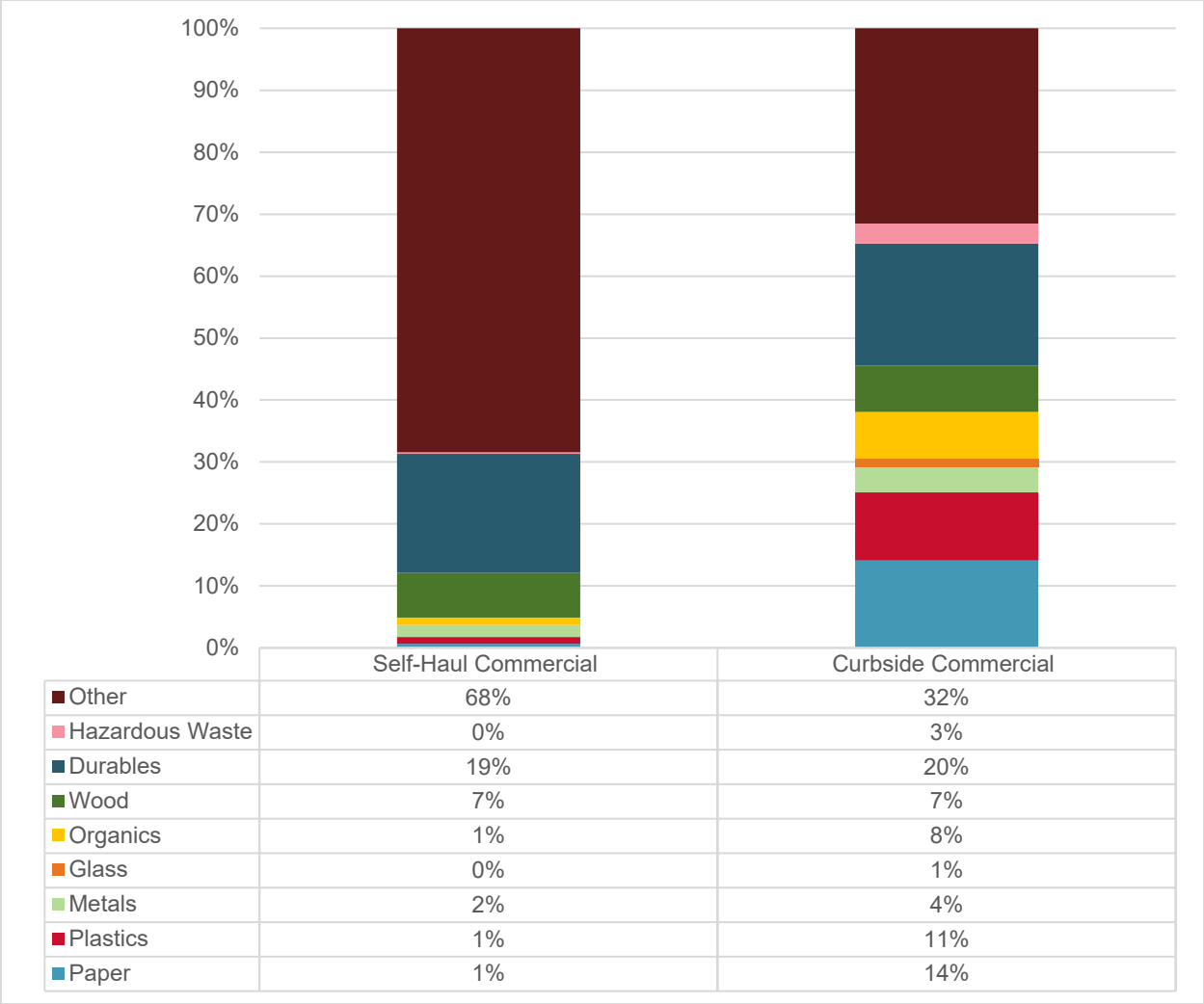


Figure 15. Commercial Comparison

## 5.0 Visual Observation Results

Each sampling event included visual observations of both recyclables and organics material streams. The observations were completed in a consistent manner for each study period. During the three sample events, 12 recyclables and 24 organics visual observations were completed.

### 5.1 Visual Observations – Recyclables

Visual observations of recycling occurred at the LeMay Pacific Recycling Facility in August and November 2022 and May 2023 as detailed in Table 5. In order to obtain visual observations of City of Olympia residential recycling loads, County staff made arrangements with LeMay Pacific Recycling and observed these loads at the facility on August 25, 2022; November 16, 2022; and May 2, 2023 (see Figure 16 and Figure 17). The average estimated contamination for the three sorts was 11 percent based on 15 samples.

Common contamination types included plastic bags and film, non-program paper, cardboard, plastics, textiles, waste, and more. There were two instances of no observed contamination.

**Table 5. Recyclables Visual Observations**

Date	Hauler	Generator	Estimated Contamination Percentage	Contamination Type
August 17 and 25, 2022	City of Olympia	Curbside Residential/Multi-Family – Westside	4%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastics (Clamshells)</li> <li>• Textiles</li> <li>• Non-Program Cardboard</li> </ul>
	LeMay Pacific Recycling	Commercial – Ruddell Road/ College – Lacey	10%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastics</li> <li>• Textiles</li> <li>• Stacking Units</li> <li>• Garbage</li> <li>• Other</li> </ul>
	LeMay Pacific Recycling	Curbside – Ruddell Road South	4%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastics</li> <li>• Styrofoam</li> <li>• Shredded Paper</li> </ul>
	LeMay Pacific Recycling	Commercial Cardboard – Tumwater	0%	<ul style="list-style-type: none"> <li>• No Visible Contamination</li> </ul>
	City of Olympia	Curbside Residential – West Olympia	5%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastics</li> <li>• Other</li> </ul>
	City of Olympia	Curbside Residential – West Olympia	3%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastics</li> <li>• Other</li> </ul>

Table 5. Recyclables Visual Observations				
Date	Hauler	Generator	Estimated Contamination Percentage	Contamination Type
November 16, 2022	City of Olympia – Front Load	Multifamily/Commercial Route Bellweather Apts., Ashwood Downs Apts., Hoffman Road	5%	<ul style="list-style-type: none"> <li>Plastic Bags and Film</li> <li>Non-Program Plastics</li> <li>Plastic Tablecloth</li> <li>Non-Program Paper</li> </ul>
	Waste Connections	Commercial OCC Lacey and Olympia Area	0%	<ul style="list-style-type: none"> <li>No Measurable Contamination</li> </ul>
	Waste Connections – Side Load	Residential – Yelm	19%	<ul style="list-style-type: none"> <li>Plastic Bags and Films</li> <li>Bagged Waste</li> <li>Non-Program Plastics</li> <li>Paper Plates</li> <li>Non-Program Paper</li> <li>Polystyrene</li> </ul>
	Waste Connections – Side Load	Residential – Steamboat Island and Summit Lake	12%	<ul style="list-style-type: none"> <li>Plastic Bags and Films</li> <li>Bagged Waste</li> <li>Non-Program Plastics</li> <li>Textiles</li> <li>Non-Program Paper</li> <li>Pizza Boxes</li> <li>Metal Cage</li> </ul>
May 2, 2023	Lemay/Waste Connections	Maytown, Lacey, Tumwater	2%	<ul style="list-style-type: none"> <li>Non-Program Paper</li> </ul>
	Lemay/Waste Connections	Boulevard and Yelm Highway	11%	<ul style="list-style-type: none"> <li>Propane and Helium Tanks</li> <li>Foam</li> <li>Shredded Paper</li> </ul>
	Lemay/Waste Connections	Boulevard and Haig Drive	13%	<ul style="list-style-type: none"> <li>Non-Program Paper</li> <li>Foam</li> </ul>
	City of Olympia	Roads off Lilly Road	17%	<ul style="list-style-type: none"> <li>Foam</li> <li>Shredded Paper</li> <li>Textile</li> <li>Wire</li> <li>Non-Program Paper</li> </ul>
Average Contamination			11%	



Figure 16. November 2022 Observations from LeMay Pacific Recycling Facility



Figure 17. August 2022 LeMay Ruddell Road South Recycling Observation

## 5.2 Visual Observations – Organics

Visual observations of organics occurred at the WARC site in August and November 2022 and May 2023 as detailed in Table 6 (also see Figure 18, Figure 19, and Figure 20). Each observation included an estimated contamination percentage for both commercial and self-haul organics collection on site. The average estimated contamination percentage for commercial organics was 3.5 percent and the average for self-haul was 0.8 percent, based on 13 samples of each. Observed contamination materials included plastic bags, pizza boxes, non-program plastics, toys, and even a roll-away cart. There were several observations with no visible contamination, including three commercial and four self-haul, all occurring during the November sampling event.

**Table 6. Visual Observations of Organics**

Date	Generator	Estimated Contamination Percentage	Contamination Type
August 15, 2022	Commercial	13%	<ul style="list-style-type: none"> <li>Plastic Bags and Film</li> <li>Non-Program Plastics</li> <li>Pizza Boxes</li> <li>Yard Roll-Away Cart</li> </ul>
	Self-Haul	1%	<ul style="list-style-type: none"> <li>Non-Program Plastics</li> </ul>
August 16, 2022	Commercial	2%	<ul style="list-style-type: none"> <li>Old, Corrugated Cardboard</li> <li>Other</li> </ul>
	Self-Haul	2%	<ul style="list-style-type: none"> <li>Plastic Bags and Films</li> <li>Non-Program Paper</li> </ul>
August 17, 2022	Commercial	6%	<ul style="list-style-type: none"> <li>Plastic Bags and Film</li> <li>Non-Program Plastics</li> <li>Styrofoam</li> <li>Mail</li> <li>Toys</li> </ul>
	Self-Haul	1%	<ul style="list-style-type: none"> <li>Toys</li> </ul>
August 18, 2022	Commercial	1%	<ul style="list-style-type: none"> <li>Shredded Paper</li> <li>Pizza Boxes</li> </ul>
	Self-Haul	1%	<ul style="list-style-type: none"> <li>Paper Yard Bags</li> </ul>
November 7, 2022	Commercial	5%	<ul style="list-style-type: none"> <li>Pizza Boxes</li> <li>Concrete</li> <li>Other</li> </ul>
	Self-Haul	1%	<ul style="list-style-type: none"> <li>Bags</li> </ul>
November 8, 2022	Commercial	1%	<ul style="list-style-type: none"> <li>Plastic Bags and Film</li> </ul>
	Self-Haul	0%	<ul style="list-style-type: none"> <li>No Visible Contamination</li> </ul>
November 9, 2022	Commercial	0%	<ul style="list-style-type: none"> <li>No Visible Contamination</li> </ul>
	Self-Haul	0%	<ul style="list-style-type: none"> <li>No Visible Contamination</li> </ul>
November 10, 2022	Commercial	0%	<ul style="list-style-type: none"> <li>No Visible Contamination</li> </ul>
	Self-Haul	0%	<ul style="list-style-type: none"> <li>No Visible Contamination</li> </ul>
November 16, 2022	Commercial	0%	<ul style="list-style-type: none"> <li>No Visible Contamination</li> </ul>
	Self-Haul	0%	<ul style="list-style-type: none"> <li>No Visible Contamination</li> </ul>
May 8, 2023	Commercial	5%	<ul style="list-style-type: none"> <li>OCC</li> <li>Plastic Bags</li> <li>Compostable Bags</li> <li>Plastics</li> </ul>
	Self-Haul	0.5%	<ul style="list-style-type: none"> <li>Paper Bags</li> <li>Other</li> </ul>
May 9, 2023	Commercial	1%	<ul style="list-style-type: none"> <li>Plastic Bags</li> </ul>
	Self-Haul	3%	<ul style="list-style-type: none"> <li>Other Plastics</li> <li>Treated Wood</li> <li>Bags</li> </ul>
May 10, 2023	Commercial	3%	<ul style="list-style-type: none"> <li>Pizza Boxes</li> <li>Paper Bags</li> </ul>
	Self-Haul	1%	<ul style="list-style-type: none"> <li>Plastic Bags</li> </ul>



**Table 6. Visual Observations of Organics**

Date	Generator	Estimated Contamination Percentage	Contamination Type
May 11, 2023	Commercial	8%	<ul style="list-style-type: none"> <li>• Pizza Boxes</li> <li>• Compostable Paper</li> <li>• Other Plastics</li> <li>• Aluminum Cans</li> <li>• Non-Recyclable Paper</li> </ul>
	Self-Haul	<1%	<ul style="list-style-type: none"> <li>• Other Plastics</li> </ul>
<b>Average Contamination</b>	<b>Commercial</b>	<b>3.5%</b>	
	<b>Self-Haul</b>	<b>0.8%</b>	



**Figure 18. August 2022 WARC Commercial Organics Observation**



**Figure 19. November 2022 WARC Commercial Organics Observation**



**Figure 20. May 2023 WARC Commercial Organics Observation**

## 6.0 Conclusions

This section provides a summary of findings, conclusions, and a comparison to the 2014 Waste Characterization Study.

### 6.1 Summary of Findings

#### 6.1.1 Waste Seasonality

The waste composition between seasons was compared to determine if specific items were more or less common during different season of the year. The data shows slight variations for organics which includes food waste, having the highest percentage in May and lowest in November. Furniture was very similar between November and May, with a slight 2 percent increase in August. Textiles percentage was similar in August and May, with about a 2 percent decrease in November. The largest seasonal change was observed to be for C&D waste. November data showed an average of 12 percent increase over August and May data. Figure 21 below illustrates the percentage of each category in the three seasons observed.

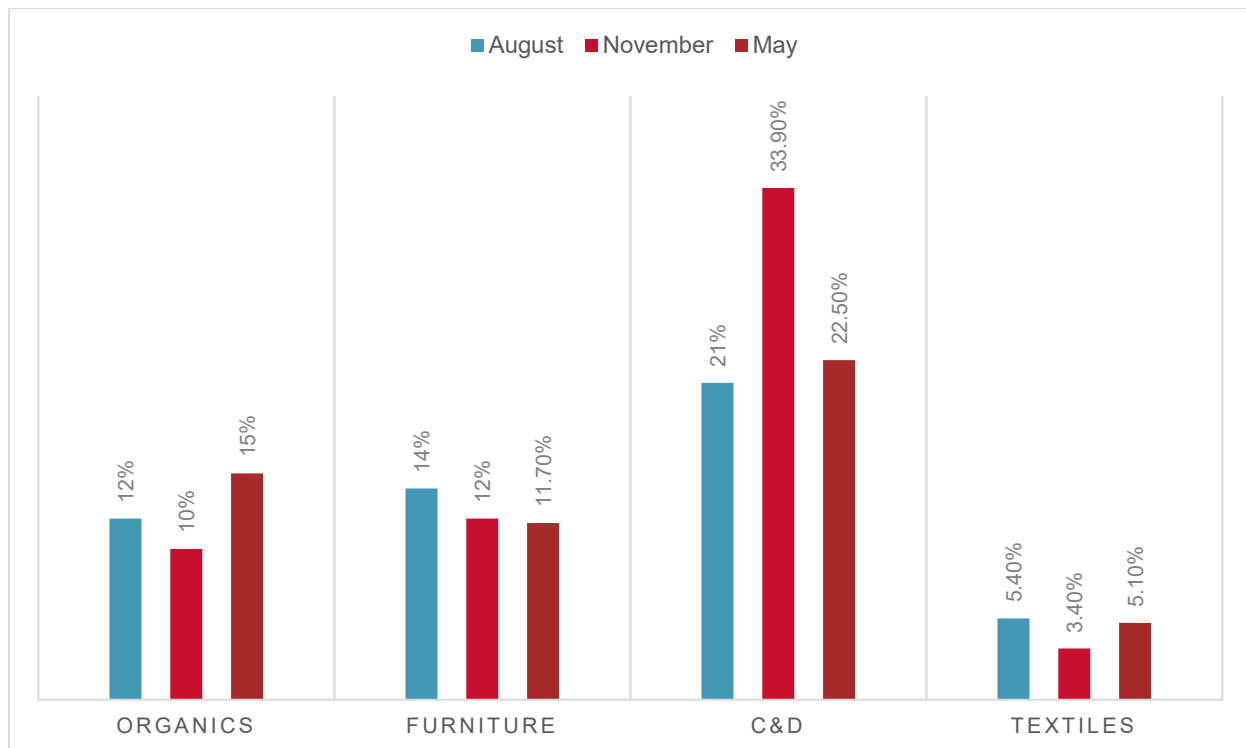


Figure 21. Waste Seasonal Comparison



### 6.1.2 Durables

All three sampling events found significant amounts of durable items in the trash including furniture, appliances, electronics, mattresses, carpet, and more (see Figure 22 and Figure 23). Many of the materials noted have existing recycling opportunities in Thurston County via drop-off at the WARC and private retailers. Durable materials were 16.9 percent of residential waste and 23.3 percent of commercial waste.

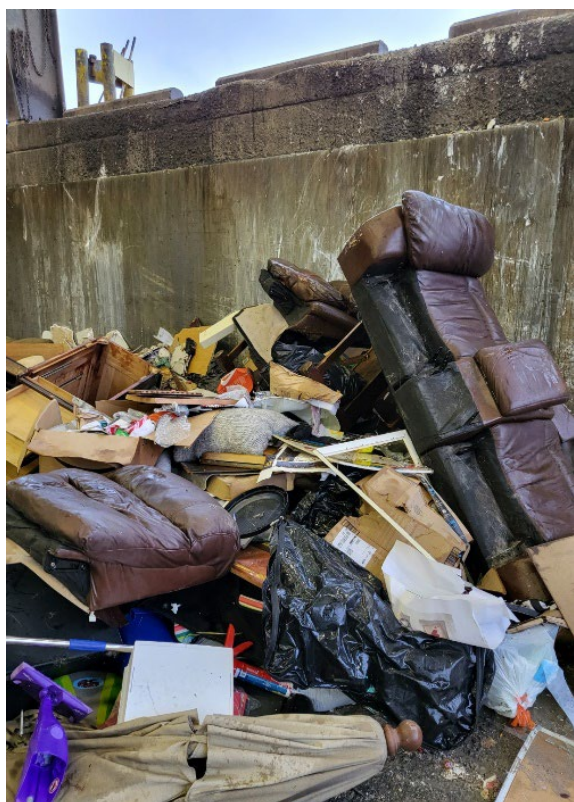


Figure 22. November 2022 Commercial Self-Haul

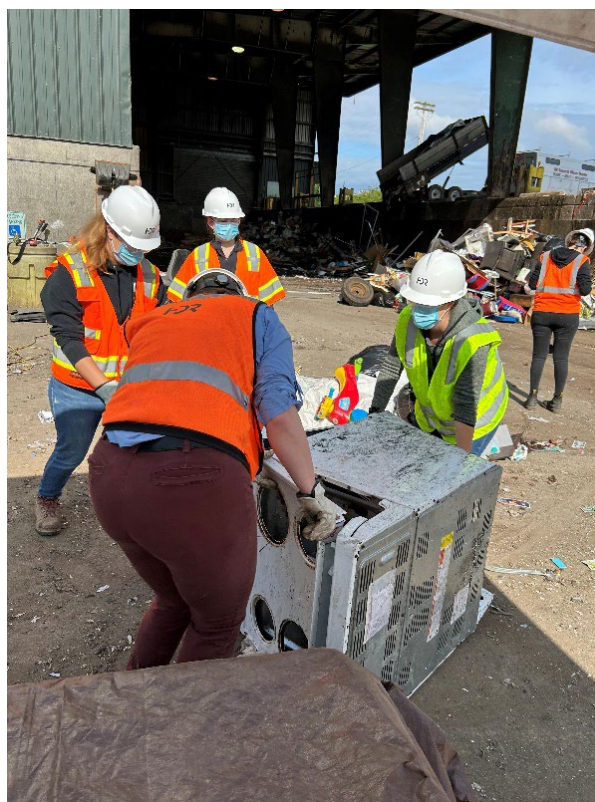


Figure 23. May 2023 Durable Waste Items

### 6.1.3 Reuse Potential

Determining what items within the waste streams are reusable could be difficult but sorting staff did observe items that appeared to be in usable condition including clothing, textiles, and durables. Many of these materials may have reuse potential and local outlets for donation or even resale. Identifying items for reuse would require a more detailed sorting processes but could provide valuable information about materials to target for reuse in the county.

### 6.1.4 Household Hazardous Waste

HHW materials were also noted in the waste streams from both residential and commercial samples, although only 1.2 percent of residential and 2.4 percent of commercial waste. Although they were found in small percentages, these materials have

the potential to be dangerous and also illegal in the waste stream. Items observed included paint, batteries, chemicals, products containing mercury, automotive products, and more.

### 6.1.5 Lightweight Items

Sorting staff noted a significant amount of plastic film, plastic wrap, and plastic bags during each of the waste sorts. Oftentimes the material sorting container for these items was full more than once for each load of waste. Although a large quantity of this material was noted, the weight of the material was 2.3 percent of residential and only 0.9 percent of commercial waste. The volume of this material was observed to be more significant than the weight reflects. Plastic film and wrap are often litter concerns, as the material floats easily and can be observed around solid waste facilities. Many of the items observed during the sampling event are also recyclable and represent potential diversion opportunities.

## 6.2 Modifications to Future Sampling

Consistency was key during the three waste sampling events completed for this study to ensure that data was comparable and accurate for each season. Data collection also allowed County staff to evaluate the material categories and consider modifications for future studies that would provide more useful information for planning purposes. County staff noted that various categories of mixed recyclable paper were not always sorted similarly, and future sorts could benefit from a combined category for newspaper, magazines, high-grade office paper, and mixed recyclable paper. OCC and kraft bags should remain as a separate category for future sorting events.

Sampling staff also noted that a significant amount of the other organics category was comprised of diapers. This material could be a separate category in future sampling to better quantify the number of diapers in the waste stream and to refine other materials accounted for in the other organics category.

County staff noted a desire to understand which materials in the waste stream are currently recoverable via existing recycling markets and which materials are not currently recoverable. This information would allow staff to better determine which materials could benefit from increased clarification or education about recyclability, either curbside or through drop-off programs. One category of note was textiles, which included clothing, bedding, fabrics, face masks, fabric softener sheets, and more. While some of those materials such as clothing or fabric may be reusable or could be donated locally, other items are not recoverable. Being able to separate these materials in future sampling events would provide detailed information of value to the County.

Compostable paper included paper towels and facial tissues. Although they can be composted, the County programs do not accept these materials if they contain bodily fluids. This category may benefit from further clarification or a different category name to reflect the fact that this material is currently not recoverable in the County.

## 6.3 Increased Diversion and Recommendations

The results of the waste characterization study provide data that can be useful in refining the County's solid waste recycling programs and educating residents and businesses about program details. Specific materials have existing diversion potential in the County's programs that could be better utilized or promoted to increase diversion. Food waste, grass, leaves, brush, and trees comprised 12.3 percent of the MSW from residential and commercial samples. Promotion or expansion of the County's programs may increase diversion of this material.

Traditional recyclables were also observed in the samples, including recyclable plastics such as #1 PET beverage containers, #2 HDPE containers, dairy jugs and tubs, and other plastic containers which were 5.6 percent of the waste. Recyclable paper also made-up 5.3 percent of the waste, including newspaper, magazines, high-grade office paper, OCC, kraft bags, and mixed recyclable paper. Glass bottles and jars accounted for 1.2 percent of the waste. In total, these traditional recyclable items account for over 12 percent of the overall MSW sampled and have existing diversion potential via recycling markets.

Focusing efforts on larger quantities of waste could also increase diversion. C&D materials were one-quarter of the overall waste stream. Although not all items may have diversion potential, targeting specific items that have value and existing markets could reduce waste.

As discussed previously, focusing on reuse and donation of usable items also has waste diversion potential. Educational information about reuse of furniture, textiles, appliances, and other items could benefit diversion in the County.

Other items were observed to have very low percentages by weight and may not be necessary to target for diversion, such as aluminum cans (0.5 percent), computers and TVs (0.4 percent), and cellphones and chargers (less than 0.1 percent).

## 6.4 Comparison to 2014 Study

The previous waste characterization study, conducted in 2014, was a four-season sort over the course of a year. While some of the material types were, in some instances, different than those in the 2022/2023 study, it is notable that C&D and furniture in the waste stream have significantly increased by 17.8 percent and 9.4 percent, respectively. In comparison, it is also of note that food waste decreased by 7.7 percent. Table 7 compares the data from the 2014 study to the data from the 2022/2023 study with the percentage changes by waste stream.

**Table 7. Thurston County Waste Stream Composition Comparison**

Material Type	Waste Stream		
	Percent by Weight 2014 Study	Percent by Weight 2022/2023 Study	Percentage Change +/-
<b>Paper</b>	<b>15.6%</b>	<b>9.8%</b>	<b>-5.8%</b>
OCC and Kraft Bags	3.3%	3.6%	+0.3%
Newspaper	0.5%	0.0%	-0.5%
Mixed Recyclable Paper	5.2%	1.1%	-4.1%
Compostable Paper	3.8%	1.9%	-1.9%
Non-Recoverable Paper	2.8%	2.6%	-0.2%
Magazines	N/A	0.1%	+0.1%
High-Grade Office Paper	N/A	0.6%	+0.6%
<b>Plastics</b>	<b>11.0%</b>	<b>10.3%</b>	<b>-0.7%</b>
#1 PET	0.8%	0.9%	+0.1%
#2 HDPE Bottles	0.5%	0.6%	+0.1%
Dairy Tubs	0.3%	1.0%	+0.7%
Other Plastic Containers	2.2%	3.0%	+0.8%
Other Plastic Products	2.7%	3.1%	+0.4%
Film/Wrap/Bags	4.5%	1.7%	-2.8%
<b>Glass</b>	<b>4.2%</b>	<b>1.3%</b>	<b>-2.9%</b>
Glass	2.7%	1.2%	-1.5%
Other Mixed Cullet	1.5%	0.1%	-1.4%
<b>Metals</b>	<b>4.9%</b>	<b>2.3%</b>	<b>-2.6%</b>
Aluminum Cans	0.4%	0.5%	+0.1%
Tin Cans	0.7%	0.5%	-0.2%
Other Ferrous	3.2%	1.1%	-2.1%
Other Non-Ferrous	0.6%	0.3%	-0.3%
<b>Organics</b>	<b>20.1%</b>	<b>12.3%</b>	<b>-7.8%</b>
Food Waste	16.9%	9.2%	-7.7%
Grass and Leaves	3.2%	2.6%	-0.6%
Brush and Trees	N/A	0.5%	+0.5%

**Table 7. Thurston County Waste Stream Composition Comparison**

Material Type	Waste Stream		
	Percent by Weight 2014 Study	Percent by Weight 2022/2023 Study	Percentage Change +/-
<b>Other Materials</b>	<b>27.5%</b>	<b>37.9%</b>	<b>+10.4%</b>
Construction and Demolition Debris	7.2%	25.0%	+17.8%
Textiles and Leathers	3.7%	4.9%	+1.2%
Polystyrene	0.7%	0.5%	-0.2%
Rubber	N/A	0.3%	+0.3%
Tires	N/A	0.6%	+0.6%
Sharps	N/A	0.1%	+0.1%
Other Organic (includes disposable diapers)	5.5%	5.1%	-0.4%
Other Inorganic	N/A	0.1%	+0.1%
Fines/Super Mix	8.4%	0.4%	-8.0%
Other	2.0%	0.9%	-1.1%
<b>Wood</b>	<b>9.3%</b>	<b>4.9%</b>	<b>-4.4%</b>
Non-Treated Wood	9.3%	2.7%	-6.6%
Treated Wood	N/A	2.2%	+2.2%
<b>Durables</b>	<b>6.8%</b>	<b>19.5%</b>	<b>+12.7%</b>
Household Appliances	N/A	3.0%	+3.0%
CPUs and Peripherals	N/A	0.1%	+0.1%
Computer Monitors/TVs	N/A	0.4%	+0.4%
Other Durables	N/A	1.9%	+1.9%
Furniture	2.3%	11.7%	+9.4%
Carpet and Padding	4.5%	2.3%	-2.2%
<b>Household Hazardous Waste</b>	<b>0.6%</b>	<b>1.7%</b>	<b>+1.1%</b>
Automotive Products	0.07%	0.5%	+0.5%
Other HHW/Special Wastes	0.6%	1.2%	+0.6%

## 6.5 Summary

The waste characterization study evaluated sample data from 149 samples over three seasons from five different types of generators. The results from this data provide the



County Solid Waste Department a better understanding of what types and quantities of waste are collected from both residential and commercial generators. The results will help them to better identify materials for diversion, recycling, and composting in future planning efforts. C&D was the most predominant waste category with 25 percent of the total waste stream. Furniture was the second largest category with 11.2 percent, and food waste was third with 9.2 percent of the waste stream.

Data from 36 visual observations provides details about contamination levels in both recyclables and organics to be utilized for further education and outreach activities.

Thurston County has a strong existing recycling and composting program available to its residents and commercial customers. The findings in this report can help refine existing programs, promote current recycling and composting opportunities, and provide data to consider for new programs.

# Appendix A: Sampling Plan



## 2022 Waste Characterization Study

### **Sampling Plan**

*Thurston County Public Works  
Solid Waste Division*

*February 18, 2022*



# Table of Contents

1 Overview..... 1

1.1 Sampling Plan Objectives ..... 1

1.2 Sampling Plan Organization..... 1

2 Sample Allocations, Locations, and Schedule ..... 1

3 Sampling Event Coordination..... 2

3.1 Sample Selection ..... 2

3.2 Sampling Procedures ..... 2

3.2.1 Sample Capture Procedure..... 2

3.2.2 Sorting Procedures..... 3

3.2.3 Visual Assessment Protocol..... 5

4. Analysis ..... 5

4.1 Method to Obtain Tonnage Data ..... 5

4.2 Number of Samples..... 5

4.3 Analysis of Results ..... 6

Appendix A: Material Categories and Definitions ..... 7

Appendix B: Equipment List..... 11

Appendix C: Health and Safety Measures ..... 12

Appendix D: Field Form ..... 18

Appendix E: Visual Observation Data Sheet ..... 22

## Figures

Figure 1. 16-Cell Grid for Sampling ..... 3

## Tables

Table 1. Sample Allocation by Generator (2021 Thurston County Customer Report) ..... 5

# 1 Overview

## 1.1 Sampling Plan Objectives

Thurston County (County) is commissioning a waste characterization study to analyze municipal solid waste (MSW) arriving for disposal at the Waste and Recovery Center (WARC) as well as an analysis of contaminants in the commingled recycling stream and organics.

The objective of the Waste Characterization Study is to provide the County with accurate composition data for the waste delivered to the WARC. Data will be collected specific to the following generator types:

- Commercial (including curbside and self-haul)
- Residential (including single-family curbside, multi-family curbside, and self-haul)
- Drop-Box Facilities (Rainer and Rochester self-haul)
- Contaminants in Recyclables and Organics (commercial and residential)

The results of the Waste Characterization Study will allow the County to:

- Identify the types and quantities of potentially recyclable and compostable materials in the disposed waste stream;
- Evaluate contaminants in the recycling and organics stream;
- Gather data on the region's solid waste stream that can be used to help evaluate and potentially improve existing and future solid waste programs; and
- Compare 2014 waste characterization results to the 2022 study results in order to identify changes in composition of disposed waste over the last 10 years.

## 1.2 Sampling Plan Organization

This Sampling Plan document (Plan) is organized into this overview section, followed by the following sections:

- Section 2: Sample Allocations, Locations, and Schedule;
- Section 3: Sampling Event Coordination; and
- Section 4: Analysis.

Appendices on material definitions, equipment, health and safety measures, and field forms are enclosed with this Plan.

# 2 Sample Allocations, Locations, and Schedule

This study will be conducted at the WARC site located at 2420 Hogum Bay Road NE, Lacey, WA 98516. The WARC is owned by the County and operated through a contract

with Republic Services for transfer station operations and with Waste Connections, Inc., for organics processing and composting. Curbside recyclables are collected by Waste Connections, Inc., and brought to their facility in Lacey for haul to Pioneer Recycling. Sampling will be conducted over the course of four (4) weeks, spread seasonally, as follows:

- April 25–29, 2022
- June 21–25, 2022
- August 16–20, 2022
- December 6–10, 2022

Sampling will begin on Tuesdays and conclude on Saturdays. Anticipated hours for sampling and sorting efforts are 7:30 a.m. to 4:30 p.m. daily. This methodology will allow HDR to ensure that samples are selected from a wide variety of areas and haulers from across the County.

Visual observations of recyclables and organics will be conducted for 4 hours each, during each sorting period. Visual observations of incoming recycling collection vehicles will be conducted at the Waste Connections site to screen for contaminants. Visual observations to screen for contaminants in the organics stream will occur at the WARC.

## 3 Sampling Event Coordination

Each sampling crew member must read and sign the health and safety guidelines located in Appendix C of this Plan. In addition, the following measures will be implemented for compliance with COVID-19 guidance:

- Question each member to determine if they have symptoms or recent exposure to known COVID-19.
- Personnel protective equipment (PPE) listed in Appendix B can also provide protection from COVID-19 exposure.

The sampling crew will collect and characterize samples as described below in Sections 3.1 and 3.2.

### 3.1 Sample Selection

The sampling crew will sample waste delivered to the WARC during the four sampling events conducted in 2022.

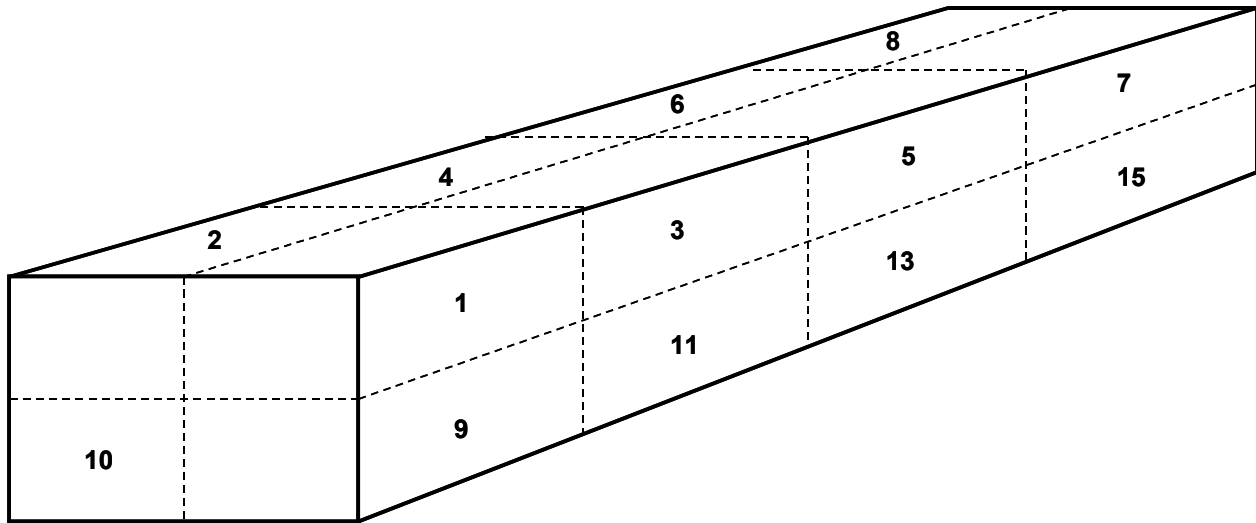
### 3.2 Sampling Procedures

The sampling crew will hand-sort all samples collected for this study.

#### 3.2.1 Sample Capture Procedure

- Selected loads of waste will be deposited in an elongated pile, typically 5 to 8 feet high.

- From each selected load, the HDR Field Supervisor will select a sample using an imaginary 16-cell grid superimposed over the deposited material (see Figure 1).



**Figure 1. 16-Cell Grid for Sampling**

- The HDR Field Supervisor will identify the randomly selected cell to be extracted from each load and will then ensure that the facility's loader operator obtains a sample of waste weighing at least 200–250 pounds. The sample will be obtained from the selected cell and transported to the facility scale to ensure that it meets this minimum weight requirement. Only one sample will be taken from each selected load.
- Each sample will be placed on a clean tarp and labeled for sorting. The HDR Field Supervisor will record the date, sample ID number, and route information on a label and attach the completed label to the tarp with the sample. The HDR Field Supervisor will also complete the top portion of the corresponding Field Form (see Appendix D).

### 3.2.2 Sorting Procedures

Sorting will be conducted according to the following procedures:

1. The Sampling Crew will move all materials in the sample to the sorting tables, opening bags with a cutting tool as necessary. Once the contents are emptied onto the table, empty bags shall be placed in the specified bin for plastic film/wrap/bags for the sample to be included in subsequent observation and weighing.
2. Each table will have a set of empty, specifically labeled bins for sorting each of the materials identified in Appendix A Material Categories and Definitions. Only materials associated with one material category will be placed in each bin. Tare weights for the bins will be recorded by the HDR Crew Chief prior to the start of each day's sorting activities.

3. All workers will wear PPE (as described in Appendix C Health and Safety Measures) while in the sorting area and will work solely from tables (versus the ground or floor). The use of tongs or hand rakes for sorting will be strongly encouraged. Closed or sealed containers will not be opened. Any suspicious, potentially dangerous, or hazardous materials will not be touched directly but will be moved to the designated hazardous/special waste container with shovel (preferred) or hand tools for subsequent observations and weighing.
4. The HDR Crew Chief will be available during the sorting process to answer questions regarding material classifications and sorting procedures. Any questionable materials will be set aside and the HDR Crew Chief will make a determination about their classification.
5. The Sampling Crew will work on sorting only one sample at a time.
6. If a bin becomes full during sorting, the bin will be weighed by the HDR Crew Chief, and the weight will be recorded to the nearest 0.1 pound on the appropriate Field Form (see Appendix D). Any unusual materials visual observations made by the sorters will be brought to the attention of the HDR Crew Chief at that time.
7. Once weighed, bins will be emptied in a designated location for removal from the sorting area by WARC facility staff.
8. Once each sample has been fully sorted, the HDR Crew Chief will oversee the collection and measurement of any sample residue from the sorting table and sample tarp, and from the area surrounding the sorting table. (Residue will typically include no discernable sort materials or materials that cannot be sorted due to moisture, small size, or inability to identify.)
9. At the completion of sorting each sample, all containers will be moved to a scale where the HDR Crew Chief will weigh each container and record the gross weight on the appropriate Field Form generated for each sample. All measurements will be made to the nearest 0.1 pound.
10. At the end of the sorting event, the sorting area will be returned to its original condition. No waste will be left in the sorting area unless authorized by WARC facility staff.

During the sorting event, the HDR Field Supervisor and Crew Chief will confirm all visual observations and photographs, as appropriate, of the loads, samples, and materials including:

- Collection vehicles selected for sampling;
- Collection vehicle loads once tipped but before they are sampled;
- Samples prior to sorting;
- Subcategories on the material list (such as types of plastics or paper); and
- Questionable materials (such as potentially hazardous waste) and contamination.

### 3.2.3 Visual Assessment Protocol

The HDR Field Supervisor and the Crew Chief will conduct visual observations of recycling and organics contamination, for 4 hours each, on 1 day during each sorting period. Visual observations of organics will take place at the WARC, and visual observations of recyclables will take place at the Waste Connections facility located at 2910 Hogum Bay Road NE Lacey, WA 98516. Contaminants will be documented and recorded on the Visual Observation Sheet (Appendix E).

The driver of each vehicle selected for observation will be interviewed to gather information specific to the load, including name of the hauler, source of material (curbside or self-haul), and origin of waste (city, county). The HDR Field Supervisor will obtain the gross and tare weights for each selected load, if available.

The HDR Field Supervisor and Crew Chief will visually examine the selected, dedicated load and segregate contaminants to estimate the percent by volume and specific contaminants for each material category listed on the Visual Observation Sheet. An estimated percentage, by volume, contained in each load will be recorded on the sheet.

During the analysis phase of the study, contaminants found will be categorized for each material category.

## 4. Analysis

### 4.1 Method to Obtain Tonnage Data

Annual tonnage information is required to complete the analysis. Thurston County will provide the following tonnage information to support the analysis:

- 2020 and 2021 tonnage collected by site, by commodity, and by waste generator classification.

### 4.2 Number of Samples

A total of 50 samples per sampling event of MSW are targeted for sorting during the study period. Based on ASTM Standards,<sup>1</sup> 50 samples per sampling event will be sufficient to calculate statistically significant characterization data for the overall disposed waste stream with a 90 percent confidence level and a 10 percent confidence interval. This level of confidence is considered the industry standard for waste characterization studies. The specific sampling procedures (discussed further in Section 3.2) will be designed to look at waste from each of the generator types identified.

In addition to the 50 samples per sampling event of MSW to be sorted and selected during this study, HDR will also randomly conduct visual observations of recycling and organics contamination for 4 hours during each sampling event on 1 day during each

---

<sup>1</sup> American Society for Testing and Materials (ASTM) Method D5231-92 Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (2016)



sorting period for separate visual characterization. This is discussed in more detail in Section 3.2.3.

Sample allocation by generator is provided in Table 1.

Table 8. Sample Allocation by Generator (2021 Thurston County Customer Report)						
Generator	March 2022	May 2022	August 2022	December 2022	Total Samples	Percentage
Residential Self-Haul	8	8	8	8	32	16%
Residential Curbside	20	20	20	20	80	40%
Drop-Box Sites	2	2	2	2	8	4%
<b>Total Residential</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>120</b>	<b>60%</b>
Commercial Self-Haul	5	5	5	5	20	10%
Commercial	15	15	15	15	60	30%
<b>Total Commercial</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>80</b>	<b>40%</b>
<b>Total Samples</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>200</b>	<b>100%</b>
Recyclables	4	4	4	4	16	-
Organics <sup>1</sup>	10	10	10	10	40	-
<b>Total Visual Observations</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>56</b>	<b>-</b>
<b>Total All</b>	<b>78</b>	<b>78</b>	<b>78</b>	<b>78</b>	<b>256</b>	<b>100%</b>

<sup>1</sup> Organics will be visually observed at the WARC in the organics area. Sample allocation may vary depending on number of loads unloaded prior to grinding.

## 4.3 Analysis of Results

HDR will provide a summary report that includes the following:

- Summary of sampling and analytical methods.
- Material definitions.
- Results in both tabular and narrative formats.
- Copies of the completed field forms.
- Identification of material categories and sectors with high potential for additional diversion.
- Results of contamination found in recyclables and organics.

## Appendix A: Material Categories and Definitions

PAPER	
<b>Newsprint</b>	Black and white newspaper newsprint including other paper normally distributed inside a newspapersuch as colored advertisements, comics, fliers, tabloids.
<b>Magazines</b>	All magazines plus promotional materials printed on slick paper.
<b>High Grade Office Paper</b>	High grade continuous form computer paper, white paper including bond, photocopy or notebook paperand colored ledger paper primarily from offices.
<b>OCC and Kraft Bags</b>	Uncoated old, corrugated containers (OCC) with a wavy core and not contaminated with other materials such as a wax or plastic coating. Includes brown paper bags.
<b>Mixed Recyclable Paper</b>	Box board - Uncoated; primarily used for boxes (such as cereal boxes and egg cartons), envelopes with and without windows, toilet paper cores and other mixed recyclable paper. Includes books.
<b>Non-Recyclable Paper</b>	Plastic or metal coated paper including cartons, photographs, and carbon paper.
<b>Compostable Paper</b>	Paper products including wax-coated paper, napkins, paper towels, frozen food packaging, tissues, paper plates, cups, and pizza boxes.
PLASTICS	
<b>#1 Polyethylene Terephthalate (PET) Containers</b>	Plastic containers coded #1 used for containing soda, water, fruit juice, sports drink, iced tea, liquor, hand soap, condiments, etc.
<b>#2 High Density Polyethylene (HDPE) Containers</b>	Plastic containers such as milk jugs, shampoo bottles, and laundry detergent bottles coded #2.
<b>Polystyrene/Styrofoam</b>	Styrofoam, hard block type.
<b>Dairy Tubs</b>	Plastic containers such as dairy tubs and yogurt containers.
<b>Other Plastic Containers</b>	Plastic Containers coded #3, #4, #5, #6, #7.

<b>Other Plastic Products</b>	End-user products including molded toys, extruded pipes and hoses, clothes hangers, cleaning tools, plastic utensils, razors, and Styrofoam.
<b>Film/Wrap/Bags</b>	Trash bags, grocery bags, storage bags, sheet film.
<b>METALS</b>	
<b>Aluminum Beverage Containers</b>	All beverage containers made from aluminum used for products containing soda, fruit juice, sports drink, iced tea, beer, soda water or similar carbonated drinks. (Excludes juice pouches).
<b>Ferrous Containers</b>	Tin and steel food and beverage containers, aerosol cans, paint cans, etc.
<b>Other Ferrous Metals</b>	Ferrous metal besides containers, including clothes hangers, sheet metal products, pipes, miscellaneous metal scraps, and other magnetic metal items.
<b>Other Non-Ferrous Scrap</b>	Other aluminum scraps besides beverage containers. Also includes other non-ferrous metal scrap such as brass, copper, or other non-magnetic metal.
<b>GLASS</b>	
<b>Glass</b>	All glass food, beverage, wine, liquor, and beer containers.
<b>Other Mixed Cullet</b>	Glass items other than food and beverage containers. Includes ceramics, drinking glasses, glass plates, cooking utensils, ash trays or mirrors.
<b>ORGANICS</b>	
<b>Grass and Leaves</b>	Debris such as grass clippings, leaves, and garden waste. Yard waste does include tree stumps.
<b>Brush and Trees</b>	Brush, branches, trees.
<b>Food Waste</b>	Food preparation waste, food scraps, spoiled food.
<b>WOOD</b>	
<b>Non-Treated</b>	Pallets, crates, and wood not defined below as treated.
<b>Treated</b>	Wood that is painted, stained, treated for exterior use, or glued such as plywood.
<b>DURABLES</b>	
<b>Electrical and Household Appliances</b>	Toasters, stereos, other small appliances and electronic equipment.
<b>Central Processing Units/Peripherals</b>	Computer components except for monitors.

<b>Computer Monitors/TV's</b>	Computer monitors and televisions.
<b>Cell Phones and Chargers</b>	Cell phones and chargers.
<b>Other Durables</b>	Household furniture and mattresses.
<b>Carpet and Padding</b>	Household carpet and padding.
<b>HOUSEHOLD HAZARDOUS WASTE (HHW)</b>	
<b>Automotive Products</b>	Automotive products including oil, antifreeze, gasoline, fluids.
<b>Latex and Oil Based Paints</b>	Architectural latex and oil-based paints.
<b>Other Paints and Solvents</b>	Paints and solvents.
<b>Pesticides, Herbicides, Fungicides</b>	Poisons to kill pests, weeds, and microorganisms.
<b>Household Cleaners</b>	Cleaning products including soaps, Lysol, bathroom cleaners, glass cleaner, and floor cleaning liquids.
<b>Lead Acid Batteries</b>	Car, motorcycle, and other lead acid batteries used in vehicles.
<b>Rechargeable Batteries</b>	Batteries that can be recharged.
<b>Other Batteries</b>	Batteries of various sizes used in households.
<b>Mercury Containing Products</b>	Thermostats, thermometers, light switches.
<b>Other HHW</b>	Please specify.
<b>OTHER</b>	
<b>Construction &amp; Demolition Debris (C&amp;D)</b>	Building materials including metals and rubble from construction or demolition of structures. Includes bricks, mortar, shingles, and drywall. Wood should be sorted into the wood categories.
<b>Textiles and Leathers</b>	Clothing and apparel, shop rags, blankets, shoes, leather products such as wallets, purses, and belts.
<b>Polystyrene</b>	Foam packaging, food containers, utensils, and straws.
<b>Rubber</b>	Rubber tubing, mats, hose, and some shoes.
<b>Tires</b>	Tires from cars, trucks, bicycles, and other devices.

<b>Sharps</b>	Hypodermic needles.
<b>Other Organic</b>	Organic (carbon-based) items not classified as part of the other material categories. Includes hair, leather that is not clothing, animal wastes, etc.
<b>Other Inorganic</b>	Inorganic items not classified as part of the other material categories. Includes inert materials such as rocks and dirt.
<b>Fines/Super Mix</b>	Residuals (2 inches or less in size) remaining once the sample has been sorted. Includes dirt, broken glass, shreds of paper, organics, and other difficult to identify or separate items.
<b>Other</b>	Please specify.

## Appendix B: Equipment List

This appendix presents the recommended list of equipment to use when gathering and sorting samples:

- Boots
- Gloves – Nitrile and Cut/Puncture-Resistant
- Hardhats
- Safety Vests
- Safety Glasses
- Shovels
- Rakes
- Baskets/Sorting Bins
- Brooms
- Tarps
- Scale – County supplied.
- Dust Masks (N95)
- Sorting Tables – County supplied.
- Clipboards
- Hand Wipes/Hand Sanitizer
- Calculator
- First Aid Kit/Eye Wash Kit – County supplied.
- Bottled Water
- Field Forms

## **Appendix C: Health and Safety Measures**

### **HEALTH AND SAFETY PROTOCOL Guidelines for Waste Characterization Studies in the State of Washington Publication No. 15-07-040**

#### **ARTICLE 6.0 DISPOSAL CHARACTERIZATION STUDIES**

##### **Health and Safety Guidelines for Waste Characterization Studies**

###### **1.0 Introduction:**

The purpose of this document is to provide safety guidelines for performing visual and/or physical characterizations of non-hazardous solid waste from various selected garbage dumpsters, transfer stations, and sanitary landfills.

###### **2.0 Table of Contents:**

- 1.0 Introduction
- 2.0 Table of Contents
- 3.0 Specific Procedure
  - 3.01 List of Potential Hazards
  - 3.02 Recommended Personal Safety/Protective Equipment
  - 3.03 Responsible Personnel
  - 3.04 General Safety Procedures
  - 3.05 Site Control in Work Zones
  - 3.06 Site Resources and Personnel
  - 3.07 Agreement to Comply with the Health and Safety Plan

###### **3.0 Specific Procedure:**

###### **3.01 List of Potential Hazards:**

The following section lists some possible hazards that may occur during a visual and a physical sort of solid waste.

- a. Physical hazards:
  - Cuts and punctures from handling hazardous materials: hypodermic needles, broken glass, razor blades, aerosol cans, chemicals, biohazards, bottles of unknown/unlabeled substances, plastic bottles containing used syringes, and other hazardous materials
  - Back injury
  - Slipping and falling
  - Heat stress and fatigue
  - Traffic or heavy equipment movement

- Noise exposure from operation of heavy equipment
- Animal and/or insect bites
- b. Airborne contaminants:
  - Dust from solid waste
- c. Chemical hazards:
  - Liquid spills from containers
  - Household and hazardous chemicals
- d. Biological hazards:
  - Household hazardous wastes
  - Medical wastes and sharps
  - Bloody rags or objects
  - Hypodermic needles

### **3.02 Recommended Personal Safety/Protective Equipment:**

The following section lists some of the personal safety/protective equipment recommended for a visual and physical sort of solid waste.

- a. Body protection:
  - Tyvek or equivalent, disposable coveralls
  - Chemical resistant coveralls, if appropriate
  - Hard bottomed, non-slip boots
  - A supply of outer rubber (cut and puncture resistant) gloves
  - Chemical goggles or safety glasses with splash shields
  - Dust masks
  - A supply of inner (latex) gloves
  - Snake guards, if appropriate
  - Insect repellent
  - Dog repellent
- b. Hearing protection (if site has equipment or activities that generate



loud noises):

- Ear plugs
- Earmuffs

c. Other safety equipment:

- Supportive back belt for heavy lifting
- Industrial first aid kit
- Field blanket
- Eye wash kit
- Moist, disposable towelettes (e.g., baby wipes)
- Six-foot pole
- Small fire extinguisher
- Portable telephone
- High visibility traffic cones and tapes
- Site specific safety plan
- Liquids to replenish fluids (water and cups for dehydration)

### **3.03 Responsible Personnel:**

The following section lists some of the duties and responsibilities of personnel who are supervising and conducting a visual/physical sort of solid waste.

a. Supervising Project Manager's duties and responsibilities:

- Check that all the site personnel have received, and documented training. Delegate health and safety responsibilities to the Site Safety Officer, ensure that proper procedures are implemented by qualified personnel in a safe manner, make available proper personal protective equipment, adequate time, and budget.
- Ensure that all field personnel have read, understood, and signed the master copy of this document.
- Ensure that all field personnel have read, understood, and signed the master on waste characterization methods, recognizing hazardous wastes, potential risks from handling hazardous materials, managing site traffic, controlling dust/airborne contaminants, and back injury prevention.

- b. Site Safety Officer's (can be the same person as above) duties and responsibilities:
- Has the duty and authority to stop unsafe operations, supervise CPR, and decide when to summon emergency services.
  - Ensure that the guidelines, rules, and procedures in this document are followed for all site work.
  - Be familiar with local emergency services and maintain a list of emergency phone numbers. Provide a map with the quickest route to a medical facility.
  - Conduct daily tailgate health and safety meetings before each shift, and a daily summary meeting at the end of each shift to discuss the day's safety issues, possible solutions, and notify personnel of all changes associated with health, safety, and protocol.
  - Maintain and inspect personal protective equipment. Ensure proper use of personal protective equipment by all employees.
  - Monitor on site hazards and the early health warning signs (e.g., heat stress/stroke, dehydration, or fatigue) of site personnel. It is recommended that on hot days, outdoor sampling should be done during the early hours.
  - Has completed appropriate health and safety training. (Recommended: 40-hour Hazardous Waste Operation & Emergency response, CCR, T8, Section 5192-OSHA).

#### **3.04 General Safety Procedures:**

The following section lists some of the general safety procedures recommended for a visual/physical sort of solid waste.

- a. All waste sorting personnel should: be in good physical condition, have had a recent medical exam, maintain a current tetanus booster and Hepatitis B shot (recommended), not be sensitive to odors and dust, and be able to read warning signs/labels on waste containers.
- b. There will be absolutely no eating, smoking, or drinking during sorting activities. Food and liquids are to be away from the sorting area. Plenty of fluids (e.g., water, sports drinks, etc.) and single use, disposable cups must be available at all times. Hands and faces should be washed before eating or drinking. Consume drinks and rest frequently during hot days.
- c. The "line of sight buddy system" must always be maintained at the sorting site. The "line of sight buddy system" is as follows: sorters are grouped into pairs and each member is to periodically assess the physical condition of his/her "buddy".
- d. Always wear the following before beginning the sorting procedure: both pairs of gloves (outer rubber and inner latex), chemical goggles or safety

glasses with splash shields, a dust mask, and disposable Tyvek overalls. Use safety boots especially when getting into bins.

- e. Make noise when approaching the actual waste site to allow any wildlife/pest animals to flee. Look for snakes and poisonous spiders around and inside a dumpster/bin by probing with a long stick.
- f. Do not attempt to identify unknown chemical substances present in the waste stream: vials of chemicals, unlabeled pesticide/herbicide containers, and substances (e.g., chemicals, or needles) in unlabeled plastic/glass bottles/jugs.
- g. Household hazardous wastes are those wastes resulting from products purchased by the public for household use which because of their quantity, concentration, physical, or infectious characteristics, may pose a substantial known or potential hazard to human or environmental health when improperly disposed. Empty containers of household hazardous wastes are generally not considered to be a hazardous waste. If hazardous wastes are detected, the Site Safety Officer will be notified.
- h. Hazardous materials and hazardous wastes should not be present in non-residential sources of municipal solid waste. If hazardous wastes are present in the municipal waste stream, from a commercial or industrial source, the material is not a household hazardous waste, it is a hazardous waste, and the Site Safety Officer must be notified.
- i. Biohazardous wastes are generally disposed of in red, plastic bags. Treated biohazardous wastes (by incineration, autoclave, chemical sterilization, etc.), are also usually in red bags. If biohazardous wastes are detected, the sort will be halted (the bag will not be removed from the dumpster/bin), and the Site Safety Officer (Field Supervisor) must be notified.
- j. A potential hazard that can arise in waste sampling is the presence of biohazardous wastes that are not in red bags, referred to as "fugitive regulated wastes". Sorters must be on alert for the indicators of fugitive biohazardous wastes: hypodermic needles, needle covers, medical tubing, articles contaminated with red (blood) colored substances, and medical device packaging. If fugitive biohazardous wastes are detected, the sort will be halted, and the Site Safety Officer notified.
- k. When sorting glass, remove the large pieces first, then remove the clear glass. Never use your hands to dig down through the waste. Use a rake or small shovel to pull/push the material to the side and continue sorting.
- l. At the end of each shift, remove all disposable clothing into a plastic trash bag, and place the bag into a solid waste receptacle. All sorters must shower at the end of each shift.

### **3.05 Site Control in Work Zones:**

The following section lists site control recommendations for a visual/physical sort of solid waste.

- a. Traffic cones or high visibility warning tape will be placed around the

active sorting area.

- b. Each work crew will always keep a site-specific safety plan on site.

### 3.06 Site Resources and Personnel:

The following section lists available site contacts and resources for a visual/physical sort of solid waste.

- a. On-site contact:

Main point of contact: Wendy Mifflin, HDR Project Manager

Telephone number: (509) 929-3868

Facility Manager: Jeff Bickford, Solid Waste Manager

Telephone number: (360) 867-2278

- b. Site resource's locations

Toilet facilities: On Site

Drinking water: Bottled Water on Site

- c. Medical information:

Local emergency medical facility:

**Providence St. Peter Hospital**  
**413 Lilly Road NE**  
**Olympia, WA 98506**  
**(360) 491-9480**

Fire Dept. phone number: Dial 911

Police Dept. phone number: Dial 911

Local ambulance phone number: Dial 911

### 3.07 Agreement to Comply with the Health and Safety Plan

I \_\_\_\_\_ have read and understand the health and safety plan and will follow the procedures and protocols detailed in the plan for waste characterization at all designated sites.

## Appendix D: Field Form

### FIELD FORM

Date: \_\_\_\_\_

Sample ID #: \_\_\_\_\_

ROUTE INFORMATION:		
Generator Type (circle one):	Type of Vehicle (circle one):	Other Notes:
Residential – Self-Haul Curbside	Rear-load Front-load Side-load Roll-off Self-Haul Other	Hauler:
Commercial – Self-Haul Curbside		Truck #:
Drop-Box Sites		

VISUAL LOAD OBSERVATION:

WEATHER INFORMATION:

MATERIAL CATEGORIES		WEIGHTS	OBSERVATIONS
PAPER	Newsprint		
	Magazines		
	High Grade Office Paper		
	OCC and Kraft Bags		
	Mixed Recyclable Paper		
	Non-Recyclable Paper		
	Compostable Paper		

MATERIAL CATEGORIES		WEIGHTS	OBSERVATIONS
PLASTICS	#1 PET Beverage Containers		
	#2 HDPE Containers		
	Polystyrene Styrofoam		
	Dairy Tubs		
	Other Plastic Containers		
	Other Plastic Products		
	Film/Wrap/Bags		
METALS	Aluminum Beverage Containers		
	Ferrous Containers		
	Other Ferrous Metals		
	Other Non- Ferrous Scrap		
GLASS	Glass Bottles & Jars		
	Other Mixed Cullet		

MATERIAL CATEGORIES		WEIGHTS	OBSERVATIONS
ORGANICS	Grass andLeaves		
	Brush and Trees		
	Food Waste		
WOOD	Non-Treated		
	Treated		
DURABLES	Electrical andHousehold Appliances		
	Central Processing Units/Peripherals		
	Computer Monitors/TV's		
	Cell Phones andChargers		
	Other Durables		
	Carpet & Padding		
HHW	AutomotiveProducts		
	Latex and Oil Based Paints		
	Other Paints and Solvents		
	Pesticides, Herbicides, Fungicides		

MATERIAL CATEGORIES		WEIGHTS	OBSERVATIONS
	Household Cleaners		
	Lead Acid Batteries		
	Rechargeable Batteries		
	Other Batteries		
	Mercury Containing Products		
	Other HHW		
OTHER	C&D		
	Textiles and Leathers		
	Polystyrene		
	Rubber		
	Tires		
	Sharps		
	Other Organic		
	Other Inorganic		
	Fines/Super Mix		
	Other		



## Appendix E: Visual Observation Data Sheet

### VISUAL OBSERVATION SHEET (Organics and Recyclables)

Date: \_\_\_\_\_ Origin of Waste: \_\_\_\_\_ Sample ID #: \_\_\_\_\_

ROUTE INFORMATION:		
Hauler:	Vehicle Type:	Source of Waste:

VISUAL LOAD OBSERVATION:

WEATHER INFORMATION:

MATERIAL CATEGORY	ESTIMATED PERCENTBY VOLUME
Plastic Bags and Film	
Non-Program Plastics	
Medical Waste/Hypodermic Needles	
Food and Liquids	
Hose, Wire, Rope	
Hazardous Materials	
C&D Materials	
Other – Bags of Garbage, Miscellaneous	
Recyclables/Organics	
Total	100%

## **Appendix B: Waste Sort Data Final Memos: August 2022, November 2022, and May 2023**

# Memorandum

Date: Friday, September 09, 2022

---

To: Amanda Romero and Jeff Bickford – Thurston County Public Works Solid Waste Division

---

From: Wendy Mifflin and Lacey Lancaster – HDR, Inc.

Subject: **Thurston County Waste Characterization – August 2022 Results**

## 1.0 Introduction and Study Methodology

Thurston County (County) commissioned a waste characterization study to analyze municipal solid waste (MSW) arriving for disposal at the Waste and Recovery Center (WARC) as well as an analysis of contaminants in the commingled recycling stream and organics. This memo focuses on the preliminary results from the sampling event held at the WARC from August 15 to 18, 2022.

### 1.1 Summary of Methodology

The objective of the Waste Characterization Study is to provide the County with accurate composition data for the waste delivered to the WARC for planning future programs. Data collected is specific to the following generator types:

- Commercial (including curbside and self-haul)
- Residential (including single-family curbside, multi-family curbside, and self-haul)
- Drop-Box Facilities (Rainier and Rochester self-haul)
- Contaminants in recyclables and organics (commercial and residential)

A Sampling Plan was drafted in February 2022 that provides for a sampling schedule over the course of four weeks spread seasonally. Since then, HDR and the County have adjusted the sampling schedule over the course of three sampling events spread seasonally as follows:

- August 15–18, 2022
- Tentative November 7–10, 2022
- TBD February/March 2023

The Sampling Plan also defines the material types and definitions for this study, grouped into standard materials classes of paper, plastics, metals, glass, organics, wood, durables, household hazardous waste (HHW), and other. In addition, several material types were further classified based on volume of material sorted during the event.

The Sampling Plan targeted 50 samples per event of MSW for sorting during each scheduled event based on ASTM Standards, noting that these 50 samples per event would be sufficient to calculate statistically significant characterization data for the overall disposed waste stream with a 90 percent

confidence level. Data from the sorting procedures provide information for each material type, utilizing a percentage by weight estimated composition, represented by the samples examined during the sorting event and the degree of precision of the composition estimate. In addition to the 50 samples of MSW per event, visual observations of recycling and organics contamination were scheduled during the sorting event. Sample allocation by generator is provided in Table 1.1.

Table 1.1. Sample Allocation by Generator					
Generator	August 2022	November 2022	Spring 2023	Total Samples	Percentage
Residential Self-Haul	8	8	8	24	16%
Residential Curbside	20	20	20	60	40%
Drop-Box Sites	2	2	2	6	4%
<b>Total Residential</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>90</b>	<b>60%</b>
Commercial Self-Haul	5	5	5	15	10%
Commercial	15	15	15	45	30%
<b>Total Commercial</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>60</b>	<b>40%</b>
<b>Total Samples</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>100%</b>
Recyclables	4	4	4	12	-
Organics <sup>1</sup>	8	8	8	24	-
<b>Total Visual Observations</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>36</b>	<b>-</b>
<b>Total All</b>	<b>62</b>	<b>62</b>	<b>62</b>	<b>186</b>	<b>100%</b>

Source: 2021 Thurston County Solid Waste Customer Report

<sup>1</sup> Organics will be visually observed at the WARC in the organics area. Sample allocation may vary depending on number of loads unloaded prior to grinding.

This memo provides information and results from the August 15–18, 2022, sorting event.

## 2.0 Data Collection

This section details data collection methods and site conditions during the August 15–18, 2022, sorting event.

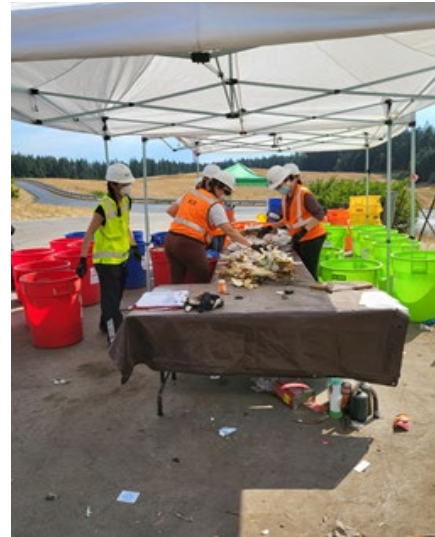
### 2.1 Sorting Crew

HDR employees from the Green Team at the Olympia, Washington, office volunteered to assist in the August sort. The Green Team is an internal HDR club made up of motivated professionals who have a mission to build a culture of sustainability in the HDR offices through education and outreach events. Volunteers from the HDR Olympia Green Team came from different market sectors including water and wastewater, bridge construction, and value engineering. Assisted by Wendy Mifflin, Lacey Lancaster, Alyssa Bailey, and Jennifer Volkman from HDR and Amanda Romero and Faire Holliday from Thurston County, the sorting crew team worked efficiently to hand-sort waste arriving at the WARC facility.

## 2.2 Hand Sort Samples

For this sorting event, the HDR team hand-sorted samples. Figure 2.1 illustrates hand sorting of samples. The field crew sorted and weighed each sample into more than 50 material types. Materials smaller than one-half inch were sorted into the fines material type on the sampling form. The crew leader recorded weights for each sorted material type on the sampling form and reviewed the form, with data being entered from the form into a custom database for analysis. The custom database information was separately reviewed for quality control through the HDR quality control/quality assurance protocols.

In addition, HDR and County staff conducted visual characterization of organics loads at the WARC organics area and recyclables at the LeMay Pacific Recycling Facility. The visual characterization involved correlating each sample's composition estimate and volume to visually characterize contaminants in each waste stream.



**Figure 2.1. Hand Sorting of Samples**

## 2.3 Site Conditions

Temperatures encountered at the WARC during the August sorting event ranged from 85 to 96 degrees Fahrenheit. HDR recently implemented a Heat Stress training program that empowered the sorting leader to hold more frequent breaks, set up a cooling area, and end sorting before the heat reached the highest peak for the day. The County provided tents for the sorting area and cooling area.

## 2.4 Samples Collected

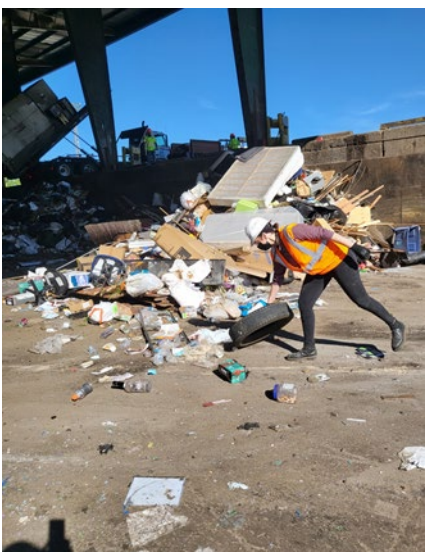
Utilizing County-provided tonnage information for 2021 by generator, sampling was targeted at 50 samples per event. Loads for sampling were systematically selected on each day of sampling based on generator type to ensure random sampling. Table 2.1 provides the sample collection allocation by generator as outlined in the Sampling Plan and the actual number of samples by generator collected during the August 2022 sampling event.

Table 2.1. Sample Collection – August Sorting Event		
Generator	Sampling Plan Allocation of Samples	August 2022 Samples Collected
Residential Self-Haul	8	8
Residential Curbside	20	20
Drop-Box Sites	2	2
<b>Total Residential</b>	<b>30</b>	<b>30</b>
Commercial Self-Haul	5	5
Commercial	15	15
<b>Total Commercial</b>	<b>20</b>	<b>20</b>
<b>Total Samples</b>	<b>50</b>	<b>50</b>

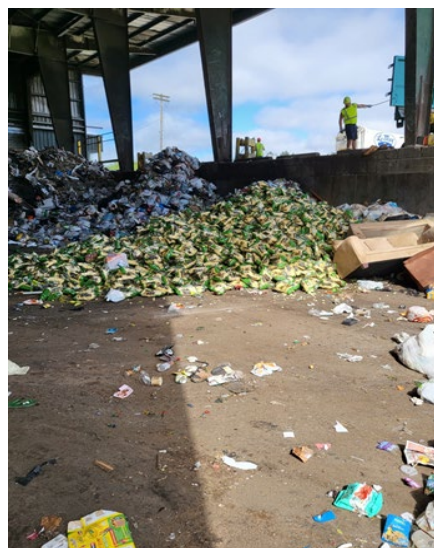
**Table 2.1. Sample Collection – August Sorting Event**

Generator	Sampling Plan Allocation of Samples	August 2022 Samples Collected
Recyclables	4	4
Organics	8	8
<b>Total Visual Observations</b>	<b>12</b>	<b>12</b>
<b>Total All</b>	<b>62</b>	<b>62</b>

Figure 2.2 and Figure 2.3 show examples of loads segregated for sorting.



**Figure 2.2. WARC Self-Haul Load**



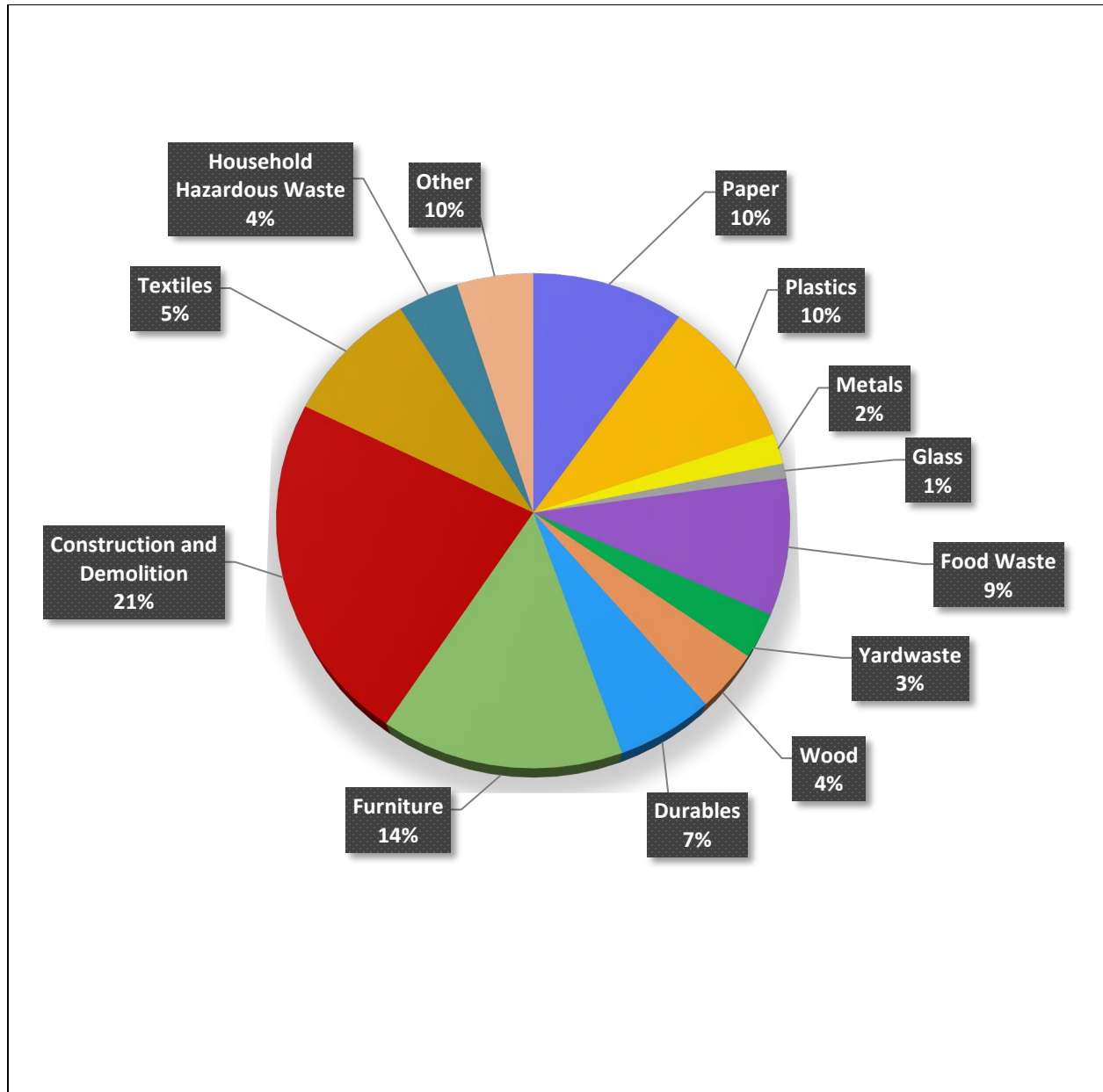
**Figure 2.3. Commercial Load**

## 3.0 Results of August 2022 Sort

This section details the initial results from the August 2022 sorting event.

### 3.1 Municipal Solid Waste Results

The overall composition of Thurston County's residential and commercial waste streams from the August 2022 sorting event are depicted in Figure 3.1, which identifies the percentages of materials, by category, that are available in the waste stream for potential recycling.



**Figure 3.1. Sampling Results by Material Category**

Table 3.1 provides additional information by material category and sub-category percentages for the August 2022 sorting event.

**Table 3.1. Sampling Results by Material Category – August 2022 Event<sup>1</sup>**

Category	Percentage	Category	Percentage
<b>Paper Total</b>	<b>10%</b>	<b>Organics Total</b>	<b>12%</b>
Newsprint	0.02%	Grass and Leaves	2.4%
Magazines	0.1%	Brush and Trees	0.6%
High-Grade Office Paper	1.4%	Food Waste	8.7%
OCC and Kraft Bags	3.4%		
Mixed Recyclable Paper	0.9%		
Non-Recyclable Paper	1.9%		
Compostable Paper	1.8%		
<b>Plastics Total</b>	<b>10%</b>	<b>Wood Total</b>	<b>4%</b>
#1 PET	1.1%	Non-Treated	1.6%
#2 HDPE	0.6%	Treated	1.9%
Polystyrene	0.3%		
Dairy Tubs	0.1%		
Other Plastic Containers	2.0%		
Other Plastic Products	4.4%		
Film/Wrap/Bags	1.9%		
<b>Metals Total</b>	<b>2%</b>	<b>Household Hazardous Waste Total</b>	<b>4%</b>
Aluminum Beverage Containers	0.7%	Automotive Products	1.3%
Ferrous Containers	0.4%	Paints/Solvents	0.3%
Other Ferrous Metals	1.0%	Pesticide/Herbicides/Fungicides	0.06%
Other Non-Ferrous Scrap	0.3%	Household Cleaners	0.01%
		Other Batteries	0.01%
		Other HHW	2.2%
<b>Glass Total</b>	<b>1%</b>	<b>Other Total</b>	<b>36%</b>
Glass	1.0%	C&D	21.0%
Other Mixed Cullet	0.1%	Textiles and Leathers	5.4%
		Rubber	0.2%
		Tires	0.5%
		Sharps	0.2%
		Other Organic	5.7%
		Other Inorganic	0.2%
		Fines/Super Mix	0.5%
		Other	2.3%
<b>Durables Total</b>	<b>21%</b>		
Household Appliances	2.5%		
CPUs and Peripherals	0.3%		
Computer Monitors/TVs	0.6%		
Cell Phone/Chargers	0.03%		
Furniture	14.0%		
Other Durables	3.0%		
Carpet and Padding	0.7%		
		<b>Total All</b>	<b>100%</b>

Note: C&D = construction and demolition; CPU = central processing unit; HDPE = high-density polyethylene; OCC = old, corrugated cardboard; PET = polyethylene terephthalate.

<sup>1</sup>Percentages for material types may not total 100% due to rounding.

## 3.2 Recyclables Visual Results

Visual observations of recycling occurred at the LeMay Pacific Recycling Facility on August 17 and August 25, 2022. In order to obtain visual observations of City of Olympia residential recycling loads,



County staff made arrangements with LeMay Pacific Recycling and observed these loads at the facility on August 25, 2022. Table 3.2 provides additional information on the recycling visual observations.

Table 3.2. Recyclables Visual Observations – August 17 and 25, 2022			
Hauler	Generator	Estimated Contamination Percentage	Contamination Type
City of Olympia	Curbside Residential/Multi-Family – Westside	4%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastics (Clamshells)</li> <li>• Textiles</li> <li>• Non-Program Cardboard</li> </ul>
LeMay Pacific Recycling	Commercial - Ruddell Road/ College – Lacey	10%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastics</li> <li>• Textiles</li> <li>• Stacking Units</li> <li>• Garbage</li> <li>• Other</li> </ul>
LeMay Pacific Recycling	Curbside – Ruddell Road South	4%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastic</li> <li>• Styrofoam</li> <li>• Shredded Paper</li> </ul>
LeMay Pacific Recycling	Commercial Cardboard – Tumwater	0%	<ul style="list-style-type: none"> <li>• No Visible Contamination</li> </ul>
City of Olympia	Curbside Residential – West Olympia	5%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastics</li> <li>• Other</li> </ul>
City of Olympia	Curbside Residential – West Olympia	3%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastics</li> <li>• Other</li> </ul>

Figure 3.2 and Figure 3.3 provide recycling visual observations noted during the LeMay Pacific Recycling Facility tour.



**Figure 3.2. LeMay Ruddell Road South**



**Figure 3.3. City of Olympia Westside Route**

### 3.3 Organics Visual Results

Visual observations of organics occurred at the WARC site on August 15, 16, 17, and 18, 2022. Table 3.3 provides additional information on the organics visual observations.

**Table 3.3. Organics Visual Observations – August 15–18, 2022**

Date	Generator	Estimated Contamination Percentage	Contamination Type
August 15, 2022	Commercial	13%	<ul style="list-style-type: none"> <li>Plastic Bags and Film</li> <li>Non-Program Plastics</li> <li>Pizza Boxes</li> <li>Animal Waste</li> <li>Yard Roll-Away Cart</li> </ul>
	Self-Haul	1%	<ul style="list-style-type: none"> <li>Non-Program Plastics</li> </ul>
August 16, 2022	Commercial	2%	<ul style="list-style-type: none"> <li>Old, Corrugated Cardboard</li> <li>Other</li> </ul>
	Self-Haul	2%	<ul style="list-style-type: none"> <li>Plastic Bags and Films</li> <li>Non-Program Paper</li> </ul>
August 17, 2022	Commercial	6%	<ul style="list-style-type: none"> <li>Plastic Bags and Film</li> <li>Non-Program Plastics</li> <li>Styrofoam</li> <li>Mail</li> <li>Toys</li> </ul>
	Self-Haul	1%	<ul style="list-style-type: none"> <li>Toys</li> </ul>
August 18, 2022	Commercial	1%	<ul style="list-style-type: none"> <li>Shredded Paper</li> <li>Pizza Boxes</li> </ul>
	Self-Haul	1%	<ul style="list-style-type: none"> <li>Paper Yard Bags</li> </ul>

Figures 3.4 and 3.5 provide a visual of the observations noted at the WARC Organics Processing Area.



Figure 3.4. WARC Commercial Organics



Figure 3.5. WARC Commercial Organics

## 4.0 Key Findings

The following are key findings of note obtained from the August 2022 sorting event:

- Construction and demolition (C&D) debris accounted for 21 percent of the materials sorted, with 45 percent of C&D sorted coming from residential self-haul and 23 percent from commercial.
- Furniture accounted for 14 percent of materials sorted, with 44 percent of the materials sorted coming from commercial and 31 percent coming from residential self-haul.
- Food waste, which accounted for 8.7% of the materials sorted, was higher than the statewide average found in the 2020-2021 Washington Statewide Waste Characterization report at 6.4%. The Statewide Waste Characterization Study was conducted during the Covid 19 pandemic which may have had an effect on materials sorted. This material category will be reviewed in future waste sorting events.
- The County and HDR reviewed upcoming sampling dates and concur that changing the December 5–9, 2022, sampling date to a November 2022 sampling date would provide a better seasonal sampling schedule.
- Visual recyclable materials observations were completed, with residential curbside materials showing a 4 to 10 percent contamination rate. The highest contamination rate was observed from a commercial recycling route collected in Lacey. Due to the wide percentage spread of contaminants between visual recyclable materials observed in the loads, this range in contamination rates will

be reviewed through visual observations to calculate an overall contamination rate to assist with data interpretation.

- Visual organics observations were conducted at the WARC, with self-haul organics exhibiting low contamination percentages. Commercial visual organics observations noted contamination rates from 1 to 13 percent.

The next sorting event is tentatively scheduled for the week of November 7–11, 2022.

# Memorandum

Date: Thursday, December 01, 2022

To: Amanda Romero and Jeff Bickford – Thurston County Public Works Solid Waste Division

From: Wendy Mifflin – HDR, Inc.

Subject: **Thurston County Waste Characterization – November 2022 Results**

## 1.0 Introduction and Study Methodology

Thurston County (County) commissioned a waste characterization study to analyze municipal solid waste (MSW) arriving for disposal at the Waste and Recovery Center (WARC) as well as an analysis of contaminants in the commingled recycling stream and organics. This memo focuses on the preliminary results from the sampling event held at the WARC from November 7 to 10, 2022.

### 1.1 Summary of Methodology

The objective of the Waste Characterization Study is to provide the County with accurate composition data for the waste delivered to the WARC for planning future programs. Data collected are specific to the following generator types:

- Commercial (including curbside and self-haul)
- Residential (including single-family curbside, multi-family curbside, and self-haul)
- Drop-Box Facilities (Rainier and Rochester self-haul)
- Contaminants in recyclables and organics (commercial and residential)

A Sampling Plan was drafted in February 2022 that provides for a sampling schedule over the course of 4 weeks spread seasonally. Since then, HDR, Inc. (HDR), and the County have adjusted the sampling schedule over the course of three sampling events as follows:

- August 15–18, 2022
- November 7–10, 2022
- TBD March 2023

The Sampling Plan also defines the material types and definitions for this study, grouped into standard materials classes of paper, plastics, metals, glass, organics, wood, durables, household hazardous waste (HHW), and other. In addition, several material types were further classified based on volume of material sorted during each event.

The Sampling Plan targeted 50 samples per event of MSW for sorting during each scheduled event based on ASTM Standards, noting that these 50 samples per event would be sufficient to calculate statistically significant characterization data for the overall disposed waste stream with a 90 percent confidence level. Data from the sorting procedures provide information for each material type utilizing a percentage by weight estimated composition, represented by the samples examined

during the sorting event and the degree of precision of the composition estimate. In addition to the 50 samples of MSW per event, visual observations of recycling and organics contamination were scheduled during the sorting event. Sample allocation by generator is provided in Table 1.1.

<b>Generator</b>	<b>August 2022</b>	<b>November 2022</b>	<b>Spring 2023</b>	<b>Total Samples</b>	<b>Percentage</b>
Residential Self-Haul	8	8	8	24	16%
Residential Curbside	20	20	20	60	40%
Drop-Box Sites	2	2	2	6	4%
<b>Total Residential</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>90</b>	<b>60%</b>
Commercial Self-Haul	5	5	5	15	10%
Commercial	15	15	15	45	30%
<b>Total Commercial</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>60</b>	<b>40%</b>
<b>Total Samples</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>100%</b>
Recyclables	4	4	4	12	-
Organics <sup>1</sup>	8	8	8	24	-
<b>Total Visual Observations</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>36</b>	<b>-</b>
<b>Total All</b>	<b>62</b>	<b>62</b>	<b>62</b>	<b>186</b>	<b>100%</b>

Source: 2021 Thurston County Solid Waste Customer Report

<sup>1</sup> Organics will be visually observed at the WARC in the organics area. Sample allocation may vary depending on number of loads unloaded prior to grinding.

This memo provides information and results from the November 7–10, 2022, sorting event.

## 2.0 Data Collection

This section details data collection methods and site conditions during the November 7–10, 2022, sorting event.

### 2.1 Sorting Crew

HDR employees from the Green Team at the Olympia, Washington, office volunteered to assist in the November sort. The Green Team is an internal HDR club made up of motivated professionals who have a mission to build a culture of sustainability in the HDR offices through education and outreach events. Volunteers from the HDR Olympia Green Team came from different market sectors including water and wastewater, bridge construction, and value engineering. Assisted by Wendy Mifflin, Lacey Lancaster, Alyssa Bailey, and Amanda Erickson from HDR and Amanda Romero and Rob Pudner from Thurston County, the sorting crew team worked efficiently to hand-sort waste arriving at the WARC facility.



## 2.2 Hand Sort Samples

For this sorting event, the HDR team hand-sorted samples. Figure 2.1 illustrates hand sorting of samples. The field crew sorted and weighed each sample into more than 50 material types. Materials smaller than one-half inch were sorted into the fines material type on the sampling form. The crew leader recorded weights for each sorted material type on the sampling form and reviewed the form, with data being entered from the form into a custom database for analysis. The custom database information was separately reviewed for quality control through the HDR quality control/quality assurance protocols.

In addition, HDR and County staff conducted visual characterization of organics loads at the WARC organics area. County staff conducted the recyclables visual characterization at the LeMay Pacific Recycling Facility on November 16, 2022. The process involved correlating each sample's composition estimate and volume to visually characterize contaminants in each waste stream.



Figure 2.1. Hand Sorting of Samples

## 2.3 Site Conditions

Temperatures encountered at the WARC during the November sorting event ranged from 37 to 41 degrees Fahrenheit. Site conditions were rain on November 7, wind on November 8, and sunny on November 9 and 10. The HDR sorting leader held frequent breaks for staff to warm themselves in the WARC breakroom and provided hand warmers to the sorting crew. The County provided tents for the sorting area.

## 2.4 Samples Collected

Utilizing County-provided tonnage information for 2021 by generator, sampling was targeted at 50 samples per event. Loads for sampling were systematically selected on each day of sampling based on generator type to ensure random sampling. Table 2.1 provides the sample collection allocation by generator as outlined in the Sampling Plan and the actual number of samples by generator collected during the November 2022 sampling event.

**Table 2.1. Sample Collection – November 2022 Sorting Event**

Generator	Sampling Plan Allocation of Samples	November 2022 Samples Collected
Residential Self-Haul	8	9
Residential Curbside	20	20
Drop-Box Sites <sup>1</sup>	2	1
<b>Total Residential</b>	<b>30</b>	<b>30</b>
Commercial Self-Haul	5	5
Commercial	15	15
<b>Total Commercial</b>	<b>20</b>	<b>20</b>
<b>Total Samples</b>	<b>50</b>	<b>50</b>
Recyclables <sup>2</sup>	4	4
Organics	8	8
<b>Total Visual Observations</b>	<b>12</b>	<b>12</b>
<b>Total All</b>	<b>62</b>	<b>62</b>

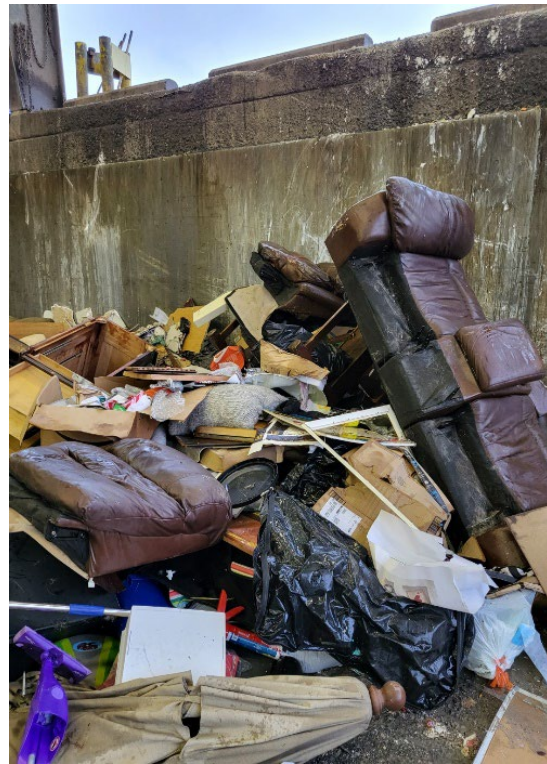
<sup>1</sup>The sampling crew was unable to sample from the Rochester site and instead added an additional residential self-haul sample from the WARC.

<sup>2</sup>Visual observations of recyclables were conducted by County staff on November 16, 2022.

Figure 2.2 and Figure 2.3 show examples of loads segregated for sorting.



**Figure 2.2. Residential Curbside Load**



**Figure 2.3. Commercial Self-Haul Load**



## 3.0 Results of November 2022 Sort

This section details the initial results from the November 2022 sorting event.

### 3.1 Municipal Solid Waste Results

The overall composition of Thurston County's residential and commercial waste streams from the November 2022 sorting event is depicted in Figure 3.1, which identifies the percentages of materials, by category, that are available in the waste stream for potential recycling.

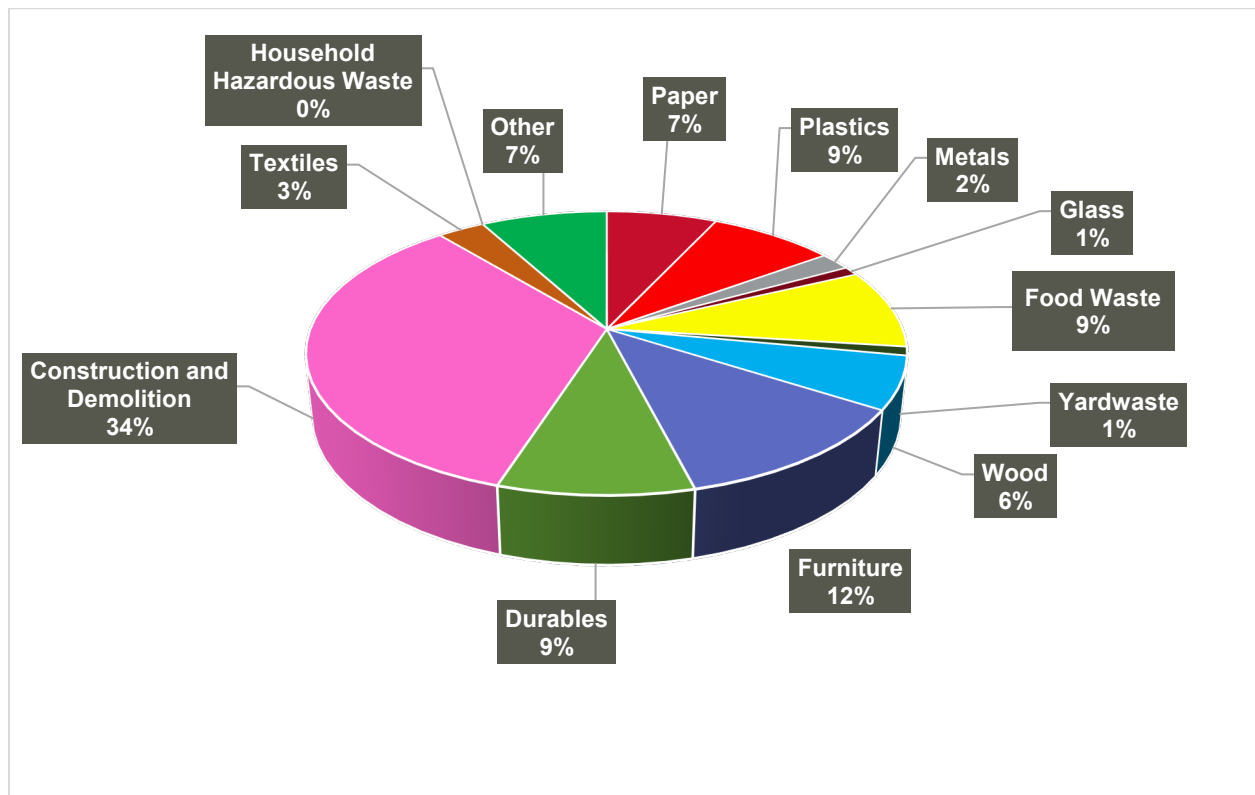


Figure 3.1. Sampling Results by Material Category

Table 3.1 provides additional information by material category and sub-category percentages for the November 2022 sorting event.

**Table 3.1. Sampling Results by Material Category – November 2022 Event<sup>1</sup>**

<b>Paper Total</b>	<b>7%</b>	<b>Organics Total</b>	<b>10%</b>
Newsprint	0.1%	Grass and Leaves	0.3%
Magazines	0.1%	Brush and Trees	0.4%
High-Grade Office Paper	0.1%	Food Waste	8.8%
OCC and Kraft Bags	2.0%		
Mixed Recyclable Paper	1.1%		
Non-Recyclable Paper	2.3%		
Compostable Paper	1.7%		
<b>Plastics Total</b>	<b>9%</b>	<b>Wood Total</b>	<b>6%</b>
#1 PET	0.9%	Non-Treated	4.9%
#2 HDPE	0.6%	Treated	0.6%
Polystyrene	0.9%		
Dairy Tubs	0.1%		
Other Plastic Containers	0.8%		
Other Plastic Products	4.1%		
Film/Wrap/Bags	1.5%		
<b>Metals Total</b>	<b>2%</b>	<b>Household Hazardous Waste Total</b>	<b>0%</b>
Aluminum Beverage Containers	0.5%	Automotive Products	0.3%
Ferrous Containers	0.6%	Other HHW	0.1%
Other Ferrous Metals	0.4%		
Other Non-Ferrous Scrap	0.2%		
<b>Glass Total</b>	<b>1%</b>	<b>Other Total</b>	<b>44%</b>
Glass	1.3%	C&D	33.9%
Other Mixed Cullet	0.1%	Textiles and Leathers	3.4%
		Rubber	0.8%
		Sharps	0.1%
		Other Organic	5.6%
		Fines/Super Mix	0.4%
		Other	0.3%
<b>Durables Total</b>	<b>21%</b>		
Household Appliances	2.5%		
CPUs and Peripherals	0.1%		
Computer Monitors/TVs	0.8%		
Other Durables	1.5%		
Furniture	12.0%		
Carpet and Padding	3.8%		
		<b>Total All</b>	<b>100%</b>

Note: C&D = construction and demolition; CPU = central processing unit; HDPE = high-density polyethylene; OCC = old, corrugated cardboard; PET = polyethylene terephthalate.

<sup>1</sup>Percentages for material types may not total 100% due to rounding.

## 3.2 Recyclables Visual Results

Visual observations of recycling occurred at the LeMay Pacific Recycling Facility on November 16, 2022. In order to obtain visual observations of City of Olympia residential recycling loads, County staff made arrangements with LeMay Pacific Recycling and observed these loads at the facility on November 16, 2022. Table 3.2 provides additional information on the recycling visual observations.

Table 3.2. Recyclables Visual Observations – November 16, 2022			
Hauler	Generator	Estimated Contamination Percentage	Contamination Type
City of Olympia – Front Load	Multifamily/Commercial Route Bellweather Apts., Ashwood Downs Apts., Hoffman Road	5%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> <li>• Non-Program Plastic</li> <li>• Plastic Tablecloth</li> <li>• Non-Program Paper</li> </ul>
Waste Connections	Commercial OCC Lacey and Olympia Area	0%	<ul style="list-style-type: none"> <li>• No Measurable Contamination</li> </ul>
Waste Connections – Side Load	Residential - Yelm	19%	<ul style="list-style-type: none"> <li>• Plastic Bags and Films</li> <li>• Bagged Waste</li> <li>• Non-Program Plastics</li> <li>• Paper Plates</li> <li>• Non-Program Paper</li> <li>• Polystyrene</li> </ul>
Waste Connections – Side Load	Residential – Steamboat Island and Summit Lake	12%	<ul style="list-style-type: none"> <li>• Plastic Bags and Films</li> <li>• Bagged Waste</li> <li>• Non-Program Plastics</li> <li>• Textiles</li> <li>• Non-Program Paper</li> <li>• Pizza Boxes</li> <li>• Metal Cage</li> </ul>

Figure 3.2 and Figure 3.3 provide recycling visual observations noted during the LeMay Pacific Recycling Facility tour.



Figure 3.2. Observations from LeMay Pacific Recycling Facility Tour

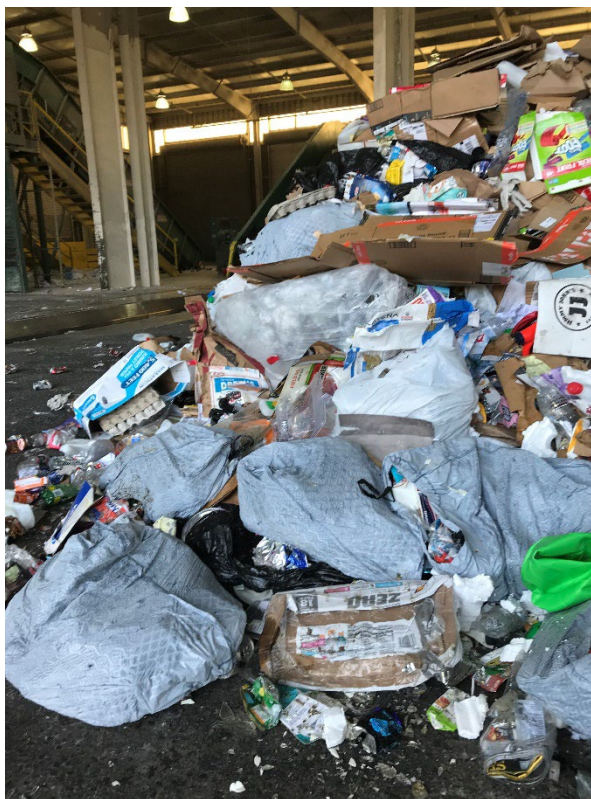


Figure 3.3. Observations from LeMay Pacific Recycling Facility Tour

### 3.3 Organics Visual Results

Visual observations of organics occurred at the WARC site on November 7, 8, 9, 10, and 16, 2022. Table 3.3 provides additional information on the organic's visual observations.

Table 3.3. Organic's Visual Observations – November 7-16, 2022

Date	Generator	Estimated Contamination Percentage	Contamination Type
November 7, 2022	Commercial	5%	<ul style="list-style-type: none"> <li>• Pizza Boxes</li> <li>• Concrete</li> <li>• Other</li> </ul>
	Self-Haul	1%	<ul style="list-style-type: none"> <li>• Bags</li> </ul>
November 8, 2022	Commercial	1%	<ul style="list-style-type: none"> <li>• Plastic Bags and Film</li> </ul>
	Self-Haul	0%	<ul style="list-style-type: none"> <li>• No Visible Contamination</li> </ul>
November 9, 2022	Commercial	0%	<ul style="list-style-type: none"> <li>• No Visible Contamination</li> </ul>
	Self-Haul	0%	<ul style="list-style-type: none"> <li>• No Visible Contamination</li> </ul>
November 10, 2022	Commercial	0%	<ul style="list-style-type: none"> <li>• No Visible Contamination</li> </ul>
	Self-Haul	0%	<ul style="list-style-type: none"> <li>• No Visible Contamination</li> </ul>
November 16, 2022	Commercial	0%	<ul style="list-style-type: none"> <li>• No Visible Contamination</li> </ul>
	Self-Haul	0%	<ul style="list-style-type: none"> <li>• No Visible Contamination</li> </ul>

Figure 3.4 provides a visual of the observations noted at the WARC Organics Processing Area.



Figure 3.4. WARC Commercial Organics

## 4.0 Key Findings

The following are key findings of note obtained from the November 2022 sorting event:

- Construction and demolition (C&D) debris accounted for 34 percent of the materials sorted. This is an increase from the August 2022 sorting event where C&D accounted for 21 percent of the materials sorted. Of the C&D sorted, 47 percent was transported by commercial haulers and 25 percent was from the WARC residential self-haul.
- Furniture accounted for 12 percent of materials sorted, with 54 percent of the materials sorted coming from the WARC residential self-haul area and 31 percent coming from commercial self-haul.
- Food waste, which accounted for 8.8 percent of the materials sorted, was higher than the statewide average of 6.4 percent found in the 2020-2021 Washington Statewide Waste Characterization Study. The Statewide Waste Characterization Study was conducted during the Covid-19 pandemic, which may have had an effect on materials sorted. This material category will be reviewed in future waste sorting events.



- During the sampling week, waste from the Rochester Drop-Box Site was not disposed at the WARC while sampling staff were onsite. The County and HDR concurred that an extra sample of waste from the WARC self-haul area would be sorted to provide for 50 samples.
- Household hazardous waste was found in identified samples that accounted for less than 1 percent of the waste stream. Figure 3.1 Sampling Results by Material Category illustrates those results while Table 3.1 Sampling Results by Material Category – November 2022 Event provides the categories found in samples by percentage.
- The County and HDR reviewed upcoming sampling dates and concur that a March 2023 sampling date would provide a better seasonal sampling schedule.
- Visual recyclable materials observations were completed, with residential curbside materials showing a 0 to 19 percent contamination rate. The highest contamination rate was observed from a residential recycling route collected in Yelm. Due to the wide percentage spread of contaminants between recyclable materials visually observed in the loads, this range in contamination rates will be reviewed through visual observations to calculate an overall contamination rate to assist with data interpretation.
- Visual organics observations were conducted at the WARC, with self-haul organics exhibiting low contamination percentages. Commercial visual organics observations noted contamination rates from 0 to 5 percent.
- The next sorting event is tentatively scheduled for March 2023, with the exact event dates to be reviewed and approved with County and HDR staff in January 2023.

# Memorandum

Date: Tuesday, May 30, 2023

---

To: Amanda Romero and Jeff Bickford – Thurston County Public Works Solid Waste Division

---

From: Tracie Bills and Wendy Mifflin– HDR, Inc.

Subject: **Thurston County Waste Characterization – May 2023 Results**

## 1.0 Introduction and Study Methodology

Thurston County (County) commissioned a waste characterization study to analyze municipal solid waste (MSW) arriving for disposal at the Waste and Recovery Center (WARC) as well as an analysis of contaminants in the commingled recycling stream and organics. This memorandum focuses on the preliminary results from the sampling event held at the WARC from May 8 to 11, 2023.

### 1.1 Summary of Methodology

The objective of the Waste Characterization Study is to provide the County with accurate composition data for the waste delivered to the WARC for planning future programs. Data collected are specific to the following generator types:

- Commercial (including curbside and self-haul)
- Residential (including single-family curbside, multi-family curbside, and self-haul)
- Drop-Box Facilities (Rainier and Rochester self-haul)
- Contaminants in recyclables and organics (commercial and residential)

A Sampling Plan was drafted in February 2022 that provides for a sampling schedule over the course of 4 weeks spread seasonally. Since then, HDR, Inc. (HDR), and the County adjusted the sampling schedule to include three sampling events as follows:

- August 15–18, 2022
- November 7–10, 2022
- May 8–11, 2023

The Sampling Plan also defines the material types and definitions for this study, grouped into standard materials classes of paper, plastics, metals, glass, organics, wood, durables, household hazardous waste (HHW), and other. In addition, several material types were further classified based on volume of material sorted during each event.

The Sampling Plan targeted 50 samples of MSW for sorting during each scheduled event based on ASTM Standards, noting that 50 samples per event would be sufficient to calculate statistically significant characterization data for the overall disposed waste stream with a 90 percent confidence level. Data from the sorting procedures provide information for each material type, utilizing percentage-by-weight estimated composition represented by the samples examined during the

sorting event and the degree of precision of the composition estimate. In addition to the 50 samples of MSW per event, visual observations of recycling and organics contamination were scheduled during the sorting event. Targeted sample allocation by generator is provided in Table 1.1.

Generator	August 2022	November 2022	May 2023	Total Samples	Percentage
Residential Self-Haul	8	8	8	24	16%
Residential Curbside	20	20	20	60	40%
Drop-Box Sites	2	2	2	6	4%
<b>Total Residential</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>90</b>	<b>60%</b>
Commercial Self-Haul	5	5	5	15	10%
Commercial Curbside	15	15	15	45	30%
<b>Total Commercial</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>60</b>	<b>40%</b>
<b>Total Samples</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>100%</b>
Recyclables	4	4	4	12	-
Organics <sup>1</sup>	8	8	8	24	-
<b>Total Visual Observations</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>36</b>	<b>-</b>
<b>Total All</b>	<b>62</b>	<b>62</b>	<b>62</b>	<b>186</b>	<b>100%</b>

Source: 2021 Thurston County Solid Waste Customer Report.

<sup>1</sup> Organics will be visually observed at the WARC in the organics area. Sample allocation may vary depending on number of loads unloaded prior to grinding.

This memorandum provides information and results from the May 8–11, 2023, sorting event.

## 2.0 Data Collection

This section details data collection methods and site conditions during the May 8–11, 2023, sorting event.

### 2.1 Sorting Crew

HDR employees from the Green Team at the Olympia, Washington, office volunteered to assist in the May sort. The Green Team is an internal HDR club made up of motivated professionals who have a mission to build a culture of sustainability in the HDR offices through education and outreach events. Volunteers from the HDR Olympia Green Team came from different market sectors including water and wastewater, bridge construction, and value engineering. Assisted by Tracie Onstad Bills, Lacey Lancaster, Alyssa Bailey, and Amanda Erickson from HDR and Amanda Romero, Danielle Winski, and Rob Pudner from Thurston County, the sorting crew team worked efficiently to hand-sort waste arriving at the WARC facility.



## 2.2 Hand Sort Samples

For this sorting event, the HDR team hand-sorted samples. Figure 2.1 illustrates hand sorting of samples. The field crew sorted and weighed each sample into more than 50 material types. Materials smaller than one-half inch were sorted into the fines material type on the sampling form. The crew leader recorded weights for each sorted material type on the sampling form and reviewed the form. The data was then entered from the form into a custom database for analysis. The custom database information was separately reviewed for quality through the HDR quality control and quality assurance protocols.

In addition, HDR and County staff conducted visual characterization of organics loads at the WARC organics area. County staff conducted the recyclables visual characterization at the LeMay Pacific Recycling Facility on May 2, 2023. The process involved correlating each sample's composition estimate and volume to visually characterize contaminants in each waste stream.



Figure 2.1. Hand Sorting of Samples

## 2.3 Site Conditions

Temperatures encountered at the WARC during the May sorting event ranged from 48 to 70 degrees Fahrenheit. Site conditions were sunny throughout the sorting event. The County provided tents for the sorting area.

## 2.4 Samples Collected

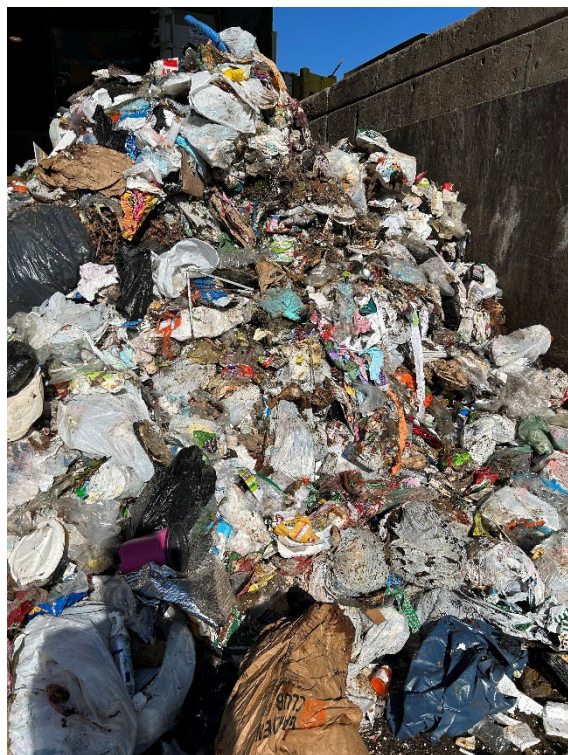
Utilizing County-provided tonnage information for 2021 by generator, sampling was targeted at 50 samples per event; 49 samples were collected during the May 2023 event. Loads for sampling were systematically selected on each day of sampling based on generator type to ensure random sampling. Table 2.1 provides the sample collection allocation by generator as outlined in the Sampling Plan and the actual number of samples by generator collected during the May 2023 sampling event.

**Table 2.1. Sample Collection – May 2023 Sorting Event**

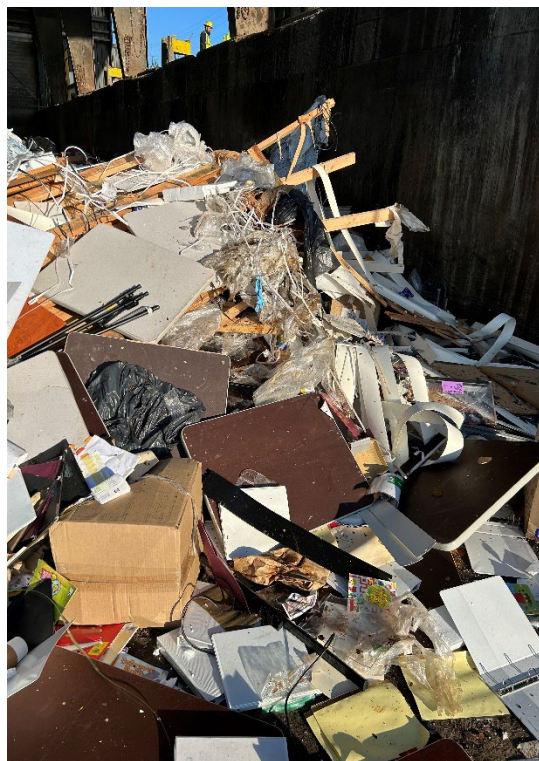
Generator	Sampling Plan Allocation of Samples	May 2023 Samples Collected
Residential Self-Haul	8	7
Residential Curbside	20	20
Drop-Box Sites	2	2
<b>Total Residential</b>	<b>30</b>	<b>29</b>
Commercial Self-Haul	5	5
Commercial Curbside	15	15
<b>Total Commercial</b>	<b>20</b>	<b>20</b>
<b>Total Samples</b>	<b>50</b>	<b>49</b>
Recyclables <sup>1</sup>	4	4
Organics	8	8
<b>Total Visual Observations</b>	<b>12</b>	<b>12</b>
<b>Total All</b>	<b>62</b>	<b>61</b>

<sup>1</sup>Visual observations of recyclables were conducted by County staff on May 2, 2023.

Figure 2.2 and Figure 2.3 show examples of loads segregated for sorting.



**Figure 2.2. Residential Curbside Load**



**Figure 2.3. Commercial Self-Haul Load**

## 3.0 Results of May 2023 Sort

This section details the initial results from the May 2023 sorting event.

### 3.1 Municipal Solid Waste Results

The overall composition of Thurston County's residential and commercial waste streams from the May 2023 sorting event is depicted in Figure 3.1, which identifies the percentages of materials, by category, that are available in the waste stream for potential recycling.

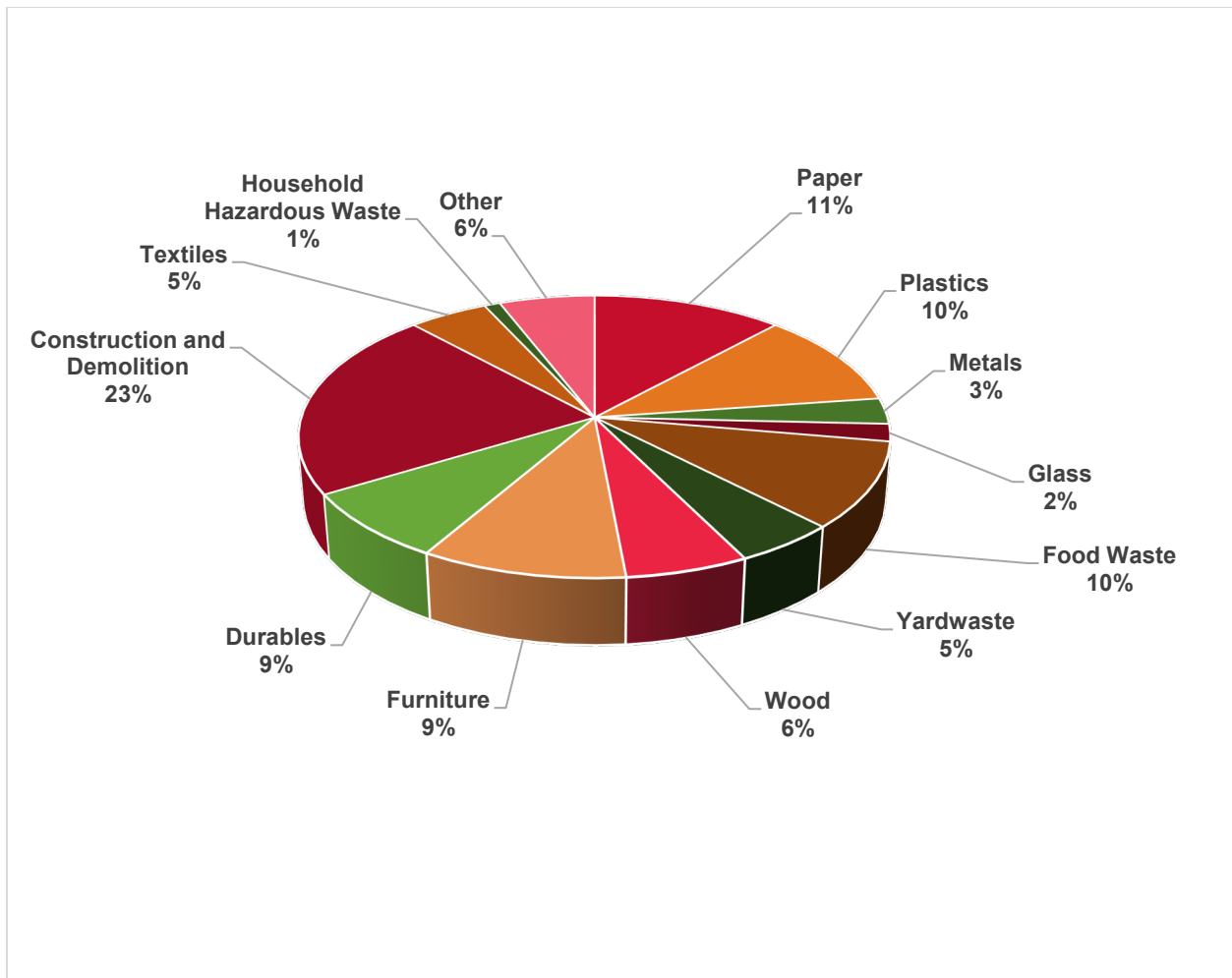


Figure 3.1. Sampling Results by Material Category

Table 3.1 provides additional information by material category and sub-category percentages for the May 2023 sorting event.

**Table 3.1. Sampling Results by Material Category – May 2023 Event<sup>1</sup>**

<b>Paper Total</b>	<b>11%</b>	<b>Organics Total</b>	<b>15%</b>
Newsprint	0.1%	Grass and Leaves	4.5%
High-Grade Office Paper	0.1%	Brush and Trees	0.6%
OCC and Kraft Bags	4.9%	Food Waste	9.7%
Mixed Recyclable Paper	1.3%		
Non-Recyclable Paper	3.6%		
Compostable Paper	2.0%		
<b>Plastics Total</b>	<b>10%</b>	<b>Wood Total</b>	<b>6%</b>
#1 PET	0.6%	Non-Treated	2.0%
#2 HDPE	0.6%	Treated	4.0%
Polystyrene	0.4%		
Dairy Tubs	0.3%		
Other Plastic Containers	0.8%		
Other Plastic Products	6.4%		
Film/Wrap/Bags	1.6%		
<b>Metals Total</b>	<b>3%</b>	<b>Household Hazardous Waste Total</b>	<b>1%</b>
Aluminum Beverage Containers	0.3%	Other Batteries	0.1%
Ferrous Containers	0.4%	Other HHW	0.8%
Other Ferrous Metals	1.9%		
Other Non-Ferrous Scrap	0.4%		
<b>Glass Total</b>	<b>2%</b>	<b>Other Total</b>	<b>33%</b>
Glass	1.6%	C&D	22.5%
Other Mixed Cullet	0.2%	Textiles and Leathers	5.1%
		Tires	1.1%
		Other Organic	4.1%
		Other Inorganic	0.1%
		Fines/Super Mix	0.3%
<b>Durables Total</b>	<b>18%</b>		
Household Appliances	4.6%		
Other Durables	0.9%		
Furniture	9.2%		
Carpet and Padding	2.9%		
		<b>Total All</b>	<b>100%</b>

Note: C&D = construction and demolition; HDPE = high-density polyethylene; OCC = old, corrugated cardboard; PET = polyethylene terephthalate.

<sup>1</sup>Percentages for material types may not total 100% due to rounding.



## 3.2 Recyclables Visual Results

Visual observations of recycling occurred at the LeMay Pacific Recycling Facility on May 2, 2023. In order to obtain visual observations of City of Olympia residential recycling loads, County staff made arrangements with LeMay Pacific Recycling and observed these loads at the facility on May 2, 2023. Table 3.2 provides additional information on the recycling visual observations.

Table 3.2. Recyclables Visual Observations – May 2, 2023			
Hauler	Generator	Estimated Contamination Percentage	Contamination Type
Lemay/Waste Connections	Maytown, Lacey, Tumwater	2%	<ul style="list-style-type: none"> <li>Non-Program Paper</li> </ul>
Lemay/Waste Connections	Boulevard and Yelm Highway	11%	<ul style="list-style-type: none"> <li>Propane and Helium Tanks</li> <li>Foam</li> <li>Shredded Paper</li> </ul>
Lemay/Waste Connections	Boulevard and Haig Drive	13%	<ul style="list-style-type: none"> <li>Non-Program Paper</li> <li>Foam</li> </ul>
City of Olympia	Roads off Lilly Road	17%	<ul style="list-style-type: none"> <li>Foam</li> <li>Shredded Paper</li> <li>Textile</li> <li>Wire</li> <li>Non-Program Paper</li> </ul>

Figure 3.2 and Figure 3.3 provide recycling visual observations noted during the LeMay Pacific Recycling Facility tour.



Figure 3.2. Observations from LeMay Pacific Recycling Facility Tour – Commercial Load



Figure 3.3. Observations from LeMay Pacific Recycling Facility Tour – Residential Load

### 3.3 Organics Visual Results

Visual observations of organics occurred at the WARC site on May 8, 9, 10, and 11, 2023. Table 3.3 provides additional information on the organics visual observations.

Table 3.3. Organics Visual Observations – May 8-11, 2023			
Date	Generator	Estimated Contamination Percentage	Contamination Type
May 8, 2023	Self-Haul	0.5%	<ul style="list-style-type: none"> <li>• Paper Bags</li> <li>• Other</li> </ul>
	Commercial	5%	<ul style="list-style-type: none"> <li>• OCC</li> <li>• Plastic Bags</li> <li>• Compostable Bags</li> <li>• Plastics</li> </ul>
May 9, 2023	Self-Haul	3%	<ul style="list-style-type: none"> <li>• Other Plastics</li> <li>• Treated Wood</li> <li>• Bags</li> </ul>
	Commercial	1%	<ul style="list-style-type: none"> <li>• Plastic Bags</li> </ul>
May 10, 2023	Self-Haul	1%	<ul style="list-style-type: none"> <li>• Plastic Bags</li> </ul>
	Commercial	3%	<ul style="list-style-type: none"> <li>• Pizza Boxes</li> <li>• Paper Bags</li> </ul>
May 11, 2023	Self-Haul	<1%	<ul style="list-style-type: none"> <li>• Other Plastics</li> </ul>
	Commercial	8%	<ul style="list-style-type: none"> <li>• Pizza Boxes</li> <li>• Compostable Paper</li> <li>• Other Plastics</li> <li>• Aluminum Cans</li> <li>• Non-Recyclable Paper</li> </ul>

Figure 3.4 provides a visual of the observations noted at the WARC Organics Processing Area.



Figure 3.4. WARC Commercial Organics

## 4.0 Key Findings

The following are key findings of note obtained from the May 2023 sorting event:

- Construction and demolition (C&D) debris accounted for 23 percent of the materials sorted. This is a slight increase from the August 2022 results (21 percent) but a decrease from the November 2022 results (34 percent). The percentage breakdown by generator will be further evaluated in the final Waste Characterization Report.
- Organics accounted for 15 percent of the materials sorted, which was an increase over the August 2022 results (12 percent) and the November 2022 results (10 percent). Of the organics sorted, 9.7 percent was attributed to food waste, which continues to be higher than the statewide average found in the 2020-2021 Washington Statewide Waste Characterization Report (6.4 percent). The Statewide Waste Characterization Study was conducted during the Covid-19 pandemic, which may have had an effect on materials sorted.
- During the sampling week, one load from the WARC Self-Haul area was not accounted for. Total samples collected during the May 8–11, 2023, week totaled 61 rather than the 62 accounted for in the August and November sampling weeks.
- Visual recyclable materials observations were completed by County staff on May 2, 2023. Residential curbside materials collected for recycling showed a 2 to 17 percent contamination rate. The highest contamination rate was observed from a residential recycling route from the streets off Lilly Drive. Due to the wide percentage spread of contaminants between recyclable materials visually observed in the loads, the range of contamination will be further reviewed, and an overall contamination rate established in the final report to assist the County with data interpretation.
- Visual organics observations were conducted at the WARC, with self-haul organics again exhibiting low contamination percentages. Commercial visual organics observations noted contamination rates from 1 to 8 percent.
- Three sorting events have been completed in August and November 2022 and May 2023. Information from these events will be compiled and a final report submitted to the County in June 2023.