



# Waste Characterization and Capture Rate Study

RecycleSmart

FINAL REPORT

*Central Contra Costa County, California*  
September 18, 2025



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# Acronyms and Abbreviations

ASTM	American Society for Testing and Materials
ASTM D5231-92 Method	Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste
C&D	Construction & Demolition
CalRecycle	California's Department of Resources Recycling and Recovery
County	Unincorporated areas of central Contra Costa County
CRV	California Redemption Value
HDPE	high-density polyethylene
HDR	HDR Engineering, Inc.
HDR Team	HDR Engineering, Inc., and Nothing Wasted Consulting project team
kg	kilogram(s)
lb	pound(s)
Martinez Transfer Station	Republic Services Contra Costa Transfer Station
Nothing Wasted	Nothing Wasted Consulting
PET	polyethylene terephthalate
PP	polypropylene
PPE	personal protective equipment
QC	Quality Control
RecycleSmart	Central Contra Costa Solid Waste Authority
Republic	Republic Services
Sample Collection Team	Two HDR Team members that collected single-family samples during the Capture Rate Study
Service Area	The six communities of Danville, Lafayette, Moraga, Orinda, Walnut Creek, and some unincorporated areas of central Contra Costa County (including Alamo, Blackhawk, and Diablo)
SH&E	Safety, Health & Environment
Sort Crew	Six HDR Team members responsible for sorting and weighing samples
Study	Waste Characterization and Capture Rate Study
WCS	Waste Characterization Study

# Key Definitions

**Capture Rate Study:** A capture rate study collects samples from the source (in this case, single-family residences) and allows for the calculation of recycling rates of specific materials.

**Waste Characterization Study:** A traditional waste composition study collects back-of-truck samples from incoming vehicles arriving to a transfer or disposal facility.

## Sectors:

- **Commercial:** Material hauled by a contracted vehicle in which 80 percent or more of the waste is from institutional, commercial, or industrial sources. May include waste from multifamily properties.
- **Multifamily:** Material generated by multifamily properties such as apartments and condominiums with shared garbage services.
- **Single-family:** Material generated by households or residences designed for one family only and hauled by a contracted vehicle.

## Streams:

- **Landfill:** Material collected curbside (single-family, multifamily, and commercial) and destined to be disposed of in a landfill.
- **Recycling:** Recyclable materials collected curbside from single-family residences and placed in the blue recycling bin. These materials are intended to be diverted from the landfill through end markets.
- **Organics:** Compostable materials collected curbside from single-family residences in the green organics bin.

## Recoverability:

- **Compostable:** Materials currently accepted in the organics bin and readily recovered
- **Recyclable:** Materials currently accepted in the recycling bin and readily recovered.
- **Currently Recovered through Special Programs:** Materials that have existing programs/outlets for recovery other than curbside diversion programs.
- **Potentially Recoverable:** Materials that have the potential to be recovered but do not have existing programs currently.
- **Non-recoverable:** Materials that cannot be recovered through diversion programs and belong in the landfill.

# 1 Introduction

The Central Contra Costa Solid Waste Authority (RecycleSmart) received an SB 1383 Local Assistance grant from California's Department of Resources Recycling and Recovery (CalRecycle) and contracted HDR Engineering, Inc., (HDR) to perform a Waste Characterization and Capture Rate Study (Study) within its service area. HDR partnered with Nothing Wasted Consulting, a trusted local firm specializing in conducting waste characterization studies, to perform fieldwork associated with the Study. HDR and Nothing Wasted Consulting are collectively referred to as the HDR Team.

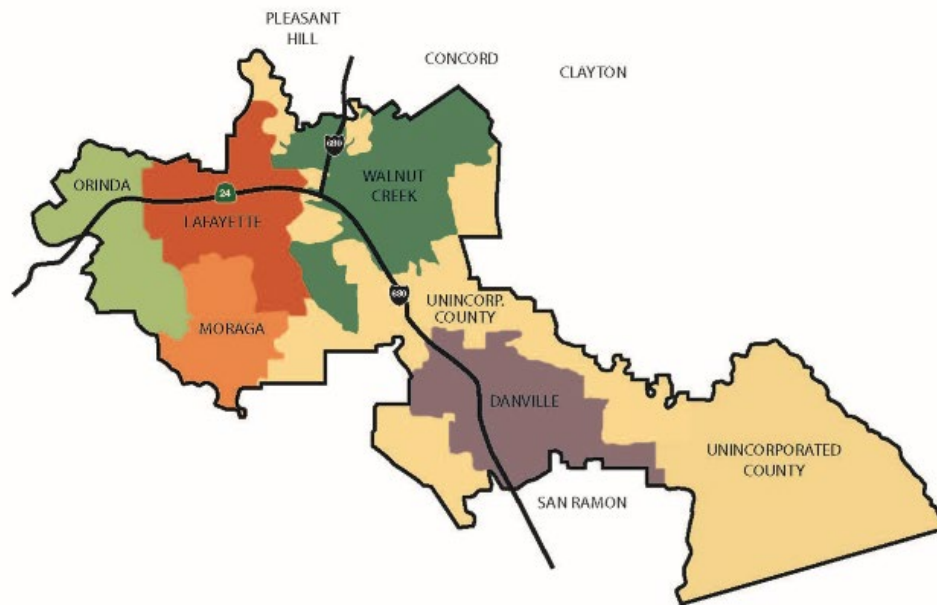
## 1.1 Purpose

The purpose of this Study was to determine statistically valid composition data regarding the materials that make up the residential and commercial material within the RecycleSmart service area.

The Study analyzed the landfill, recycling, and organics streams in the single-family sector, and the landfill stream in the multifamily and commercial sectors within the service area. A Capture Rate Study was performed to collect data from the single-family sector, and a Waste Characterization Study (WCS) was performed to collect data from the multifamily and commercial sectors. This Study will analyze and summarize composition data regarding the materials that appear in each of these streams, with a focus on contaminants and capture rates of certain materials from single-family residences.

## 1.2 Background

RecycleSmart contracts for solid waste services with Republic Services (Republic) and Mt. Diablo Resource Recovery. The service area includes the towns of Danville and Moraga, and the cities of Orinda, Walnut Creek and Lafayette, and portions of unincorporated areas of Contra Costa County (County), including Alamo, Blackhawk, and Diablo, as shown in Figure 1



**Figure 1 RecycleSmart Service Areas**

RecycleSmart maintains an exclusive franchise agreement with Republic for residential and commercial curbside collection of solid waste, recyclables, and organics material from the six member agencies' service areas. Republic provides once-a-week collection of residential landfill, recycling, and organics material—collected in separate trucks—with routes running Monday through Friday each week. Commercial and multifamily collection of landfill, recycling, commingled organics and food scraps (for certain commercial accounts only) service is provided at least once a week, Monday through Friday, utilizing separate trucks for each stream.

## 2 Study Methodology

Both the Capture Rate Study and WCS utilized the same material list, field work location, and similar Safety, Health & Environment (SH&E) Plans. The detailed sampling plan (created before field work occurred) is included as **Appendix C. Sampling Plan**.

### 2.1 Category and Material Definitions

The material list used for the Study consisted of 62 unique material types organized into six material categories: Paper, Plastic, Metal, Glass, Organics, and Other. The “Other” material category includes miscellaneous materials such as hazardous waste, special waste, batteries, e-waste, construction and demolition (C&D), bulky items, tangles, textiles, and pet waste. The complete list of material types and their definitions is provided in **Appendix A. Material List**. The Organics material category was informed by the 2021 Disposal Facility-based Characterization of Solid Waste in California report to provide continuity with state data.<sup>1</sup>

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<sup>1</sup> <https://calrecycle.ca.gov/wcs/dbstudy/>



Finalized material type definitions were reviewed and discussed by the HDR Team prior to commencement of fieldwork so that a uniform Study was performed.

## 2.2 Health and Safety

HDR prepared separate site-specific SH&E Plans that were unique to the Capture Rate Study and WCS. HDR worked closely with RecycleSmart, Republic, and Nothing Wasted to promote safe practices during sample collection and characterization. The HDR Team staff conducted daily safety briefings prior to sample collection and characterization activities.

The HDR Team, as well as stakeholders observing the Study, were provided with personal protective equipment (PPE), which included Tyvek coveralls, nitrile gloves, cut resistant gloves, safety glasses, hard hats, and masks. No reported injuries or emergencies occurred during the study

## 2.3 Project Location

All samples were collected from the service area either by the HDR Team (single-family) or by Republic (multifamily and commercial) and delivered to Republic Services' Contra Costa Transfer Station (Martinez Transfer Station). All samples were characterized and then disposed of onsite at the transfer station.

## 2.4 Field Work Schedule

Field work for the Study occurred over four consecutive weeks in March 2025. Single-family sampling occurred during the first two weeks, followed by three days of multifamily sampling, and finally one week of commercial sampling. All field work occurred Monday–Friday. See Table 1 for details.

**Table 1. Field Work Schedule**

Sector	Dates
Single-family	March 3–7; March 10–14
Multifamily	March 19–21
Commercial	March 24–28

# 3 Capture Rate Study Methodology

HDR developed a sampling plan prior to fieldwork commencing which detailed the Capture Rate Study procedures (**Appendix C. Sampling Plan**). This section summarizes the methodology used to collect landfill, recycling, and organics samples from single-family residences.

## 3.1 Sample Selection

The Capture Rate Study occurred over a two-week period and sampling was distributed proportionally among each of RecycleSmart's six member agencies.. The County, town of Danville, and cities of Lafayette and Walnut Creek were selected to be sampled

across two days due to the greater number of routes in those service areas. The city of Orinda and town of Moraga, the less populated service areas, were each sampled during a single day.

HDR developed an initial list of routes and addresses to sample in each service area using the `=rand()` function in Microsoft Excel. HDR worked with Republic to review the randomly chosen routes and addresses for potential logistical and safety concerns for the Sample Collection Team. Any addresses and/or routes that posed safety risks to the Sample Collection Team were removed from the database and replaced with an alternative, randomly selected route in the same service area to preserve target sample allocations.

## 3.2 Sample Collection

The Sample Collection Team consisted of two HDR Team members using various sized tarps and bins, and one 26-foot-long box truck. Each day of field work, the Sample Collection Team drove along the selected route up to two hours ahead of Republic's collection trucks to minimize the study's impact on collection operations and allow the Sample Collection Team time to maneuver safely.

If a household had landfill material set out, but no recycling or organics set out, the Sample Collection Team collected the landfill sample and recorded the recycling and organics samples as “zero weight” samples. If no carts were set out or if the material had already been collected that day and the bins were empty, the Sample Collection Team collected material from a neighboring property along the same route.

The Sample Collection Team separately extracted the material from each cart by placing the extracted material onto a tarp or into a bin and securing the tarp or bin with a sample placard for sample identification (Figure 2). The team verified that samples were tagged with a placard, no samples were mixed, and samples from the same address were marked as such. The Sample Collection Team then delivered the collected samples to the Martinez Transfer Station for weighing and sorting.



**Figure 2. Sample Collection Crew Wrapping up a Single-family Sample**

The Sample Collection Team successfully collected samples from at least twelve addresses along the route on nine out of the ten days of field work. During one day of field work, the Sample Collection Team was only able to collect samples from nine of 12 addresses before Republic serviced the route. The Sample Collection Team collected samples from 15 addresses the following day of field work to make up the difference and meet the study goal of collecting samples from a total of 120 households as shown in Table 2.

**Table 2 Single-family Sampling by Service Area and Collection Date**

Service Area	Number of Households Sampled by Collection Date										Grand Total
	3/3/25	3/4/25	3/5/25	3/6/25	3/7/25	3/10/25	3/11/25	3/12/25	3/13/25	3/14/25	
County						12	12				24
Danville		10		2				12			24
Lafayette					12				9		21
Moraga			12								12
Orinda	12										12
Walnut Creek				12						15	27
Grand Total											120

Table 3 shows the total number of samples collected by service area and waste stream (not including zero weight samples<sup>2</sup>).

**Table 3. Single-family Sample Collection by Service Area and Stream**

Service Area	Number of Samples Collected			
	Landfill	Recycling	Organics	Grand Total
County	21	20	22	63
Danville	22	23	19	64
Lafayette	20	18	17	55
Moraga	12	10	8	30
Orinda	11	10	11	32
Walnut Creek	24	21	15	60
Grand Total	110	102	92	304

<sup>2</sup> If a particular stream was not set out by the household, it was recorded as a zero weight sample. Zero weight samples are not included in this table.

### 3.3 Sample Characterization

Once collected and transported to the Martinez Transfer Station, all samples were removed from the box truck and placed near the sorting area. Each sample was placed on a sorting table and separated by hand by the Sort Crew into the 62 materials described in **Appendix A.**

**Material List.** Sort Crew members were assigned to and specialized in specific material categories to increase efficiency. The Sort Crew placed materials into separate containers identified for unique material types (Figure 3).

Once the entire sample had been characterized, the Sort Crew moved the containers to the weighing area to separately weigh each material type.

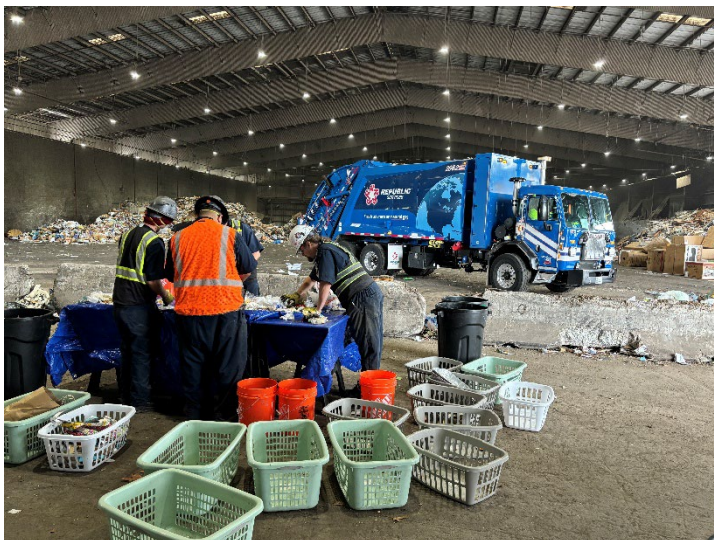


Figure 3. Sample Characterization

The Field Manager reviewed the characterized material of each sample for homogeneity before the container was weighed. The gross weight of the material and container, and the tare weight of each container were recorded in the digital field form generated for each sample by Survey123. Net weights for each material were calculated in Survey123 by subtracting the tare weight of the bin from the gross weight of the material plus the bin. Once the weights were recorded, the material was discarded into a pile near the work area for removal by Republic staff.

This process was repeated until all the samples collected that day were characterized and weighed. Proper site layout and close supervision of sampling were maintained to reduce sampling bias or other impacts on the integrity of the data, as well as to reduce impacts on facility operations.

### 3.4 Analysis Calculation Procedures

This section describes the analysis calculation procedures for the Capture Rate Study. Rigorous Quality Control (QC) checks were conducted at various points in the analysis to ensure accurate and reliable data.

#### 3.4.1 Overall Single-family Composition

The composition of residential landfill, recycling and organics streams was calculated using the ASTM D5231-92 method, which gives equal weight to each sample. To evaluate uncertainty and reliability of sample estimates, 90 percent confidence intervals or bounds (error ranges) were calculated.

The composition of each sample was determined using the net weights calculated in Survey123. The composition calculation involved dividing the material net weight by the total sample net weight, resulting in a percentage associated with each specific material.

$$\text{Composition (\%)} = \frac{\text{Material Net Weight}}{\text{Total Sample Net Weight}} * 100$$






For example, *aluminum* from a given sample with a net weight of 2.1 pounds and the net weight of full sample at 250 pounds results in a composition of 0.84 percent for that material.

All service areas were equally represented in the results and the composition of each sample collected from the two-week Capture Rate Study period was calculated on an aggregate basis. QC checks were conducted at various points during the analysis to ensure accurate and reliable results.

### 3.4.2 Contamination Rate of Single-family Recycling and Organics Streams

The contamination rate determines the percentage of non-recyclable or non-compostable material (i.e., contaminants) improperly disposed of in the recycling or organics streams, respectively. A discussion of the Single-Family landfill stream is found in Section 5.1.1. Each material type was assigned a recoverability classification (see full list in **Appendix E. Recoverability Group Designations**). Table 4 includes the recoverability classifications and their definitions.

**Table 4. Recoverability Group Designations**

Recoverability Group Designation	Recoverability Group Description	Group Color
Compostable	Materials currently accepted in the organics bin and readily recovered	
Recyclable	Materials currently accepted in the recycling bin and readily recovered	
Currently Recovered through Special Programs	Materials that have existing programs/outlets for recovery other than curbside diversion programs	
Potentially Recoverable	Materials that have the potential to be recovered but do not have existing programs currently	
Non-recoverable	Materials that cannot be recovered through diversion programs and belong in the landfill.	

The net weight of the materials from non-acceptable recoverability classes from each recycling or organics sample were summed to represent the net weight of contaminants. The net weight of contaminant material was divided by the sample net weight to find the contamination rate for that sample. This calculated value was multiplied by 100 to give a percentage value as shown in the equation below.

$$\text{Contamination Rate (\%)} = \frac{\text{Net Weight of Contaminants}}{\text{Sample Net Weight}} * 100$$

To find the overall contamination rates for the recycling and organics streams, the contamination rates of all samples from each respective stream were averaged.



The top contaminants in the recycling and organics streams were identified by dividing the total net weight of the non-acceptable material by the total net weight of all samples in that stream. This calculated value was multiplied by 100 to give a percentage by weight value for contamination.

### 3.4.3 Capture Rate

The Capture Rate Study determines the percentage of curbside recyclable and organic material types that are disposed of or “captured” properly (in the recycling and organics stream, respectively).

The capture rate calculation for each material uses the total net weight of the material identified in each applicable stream. For example, a recycling capture rate will use the total net weight of the material identified in the recycling, organics, and landfill streams. The total net weight of the material identified in the recycling stream was divided by the total net weight of that recyclable material identified in the landfill, organics, and recycling streams. This calculated value was multiplied by 100 to give a percentage value. See the equation and example below:

Recycling Capture Rate Equation:

$$\text{Recycling Capture Rate (\%)} = \frac{\text{Total Net Weight of Material in Recycling Stream}}{\text{Total Net Weight of Material in Recycling, Organics, and Garbage Streams}} * 100$$

Recycling Capture Rate Example (Aluminum):

$$\frac{49.6 \text{ lbs Aluminum in Recycling Samples}}{2.6 \text{ lbs in Garbage Stream} + 1.0 \text{ lb in Organics Stream} + 48.6 \text{ lbs in Recycling Stream}} * 100 = 95\%$$

### 3.4.4 Limiting Factors

As previously detailed, the sorting procedures for the Capture Rate Study were generally guided by the ASTM D5231-92 method. This method could not be followed exactly due to how the ASTM D5231-92 method defines a *sorting sample* as “...a 200 to 300-lb (91 to 136-kg) portion deemed to represent the characteristics of a vehicle load of MSW.”

The focus of this Capture Rate Study was on RecycleSmart customers at the single-family household level and was conducted over a two-week period. The sorting sample weight as defined in the ASTM D5231-92 method could not be met due to the random amount of waste generated by individual households. Single-family to four-unit households do not typically generate 200–300 pounds of landfill material, recycling or organics on a weekly basis. For this Study, the average garbage sample collected was 20 pounds, the average recycling sample collected was 12 pounds, and the average organics sample collected was 39 pounds.

## 4 Waste Characterization Study Methodology

The WCS analyzed landfill material from the commercial and multifamily sectors. The detailed sampling plan developed by HDR prior to field work can be found in **Appendix C. Sampling Plan**. The following sections summarize the fieldwork procedures.

## 4.1 Route Selection

Multifamily landfill material is routed with commercial landfill material. To ensure pure loads of multifamily-only material for sampling, HDR coordinated special routes with Republic to pick up and deliver to the transfer station.

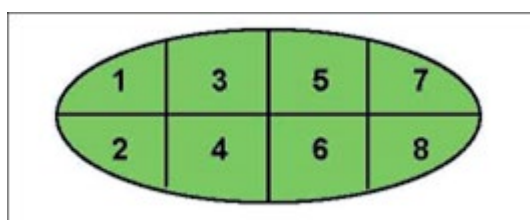
To select loads for sampling from the commercial sector, HDR randomly preselected commercial landfill material routes. Only commercial loads containing at least 80 percent commercial material were considered for commercial sector sampling.

Republic notified HDR of the anticipated arrival time for the trucks to the facility. Selected commercial landfill material vehicles and trucks containing multifamily landfill material were directed to dump their material loads into a designated area at the transfer station.

## 4.2 Sample Collection

To select representative material for sampling and sorting, the Sample Collection Team extracted samples from predetermined, random locations within the selected loads. Samples from the commercial and multifamily landfill streams were collected as follows:

1. Targeted collection vehicles were directed to dump in a designated area. This area had adequate room to allow for inspection and access around the pile.
2. The load was visually separated into approximately eight subsections as shown in Figure 4. The HDR Field Manager identified the randomly preselected subsection and instructed the front loader to grab approximately 200 pounds of material from that subsection. The Sort Crew weighed the sample prior to characterization to confirm that the target weight had been achieved. If there were not enough commercial or multifamily vehicles to meet the daily sample quota, multiple samples were removed from a single load.



**Figure 4. Plan View Showing Pile Cells**

**Table 5** shows the number of samples collected by service area and sector. The final number of samples met the original study quota of 50 commercial samples and 24 multifamily samples.

**Table 5. Multifamily and Commercial Sample Collection by Service Area**

Service Area	Number of Samples Collected		
	Commercial	Multifamily	Total
County	9	8	17
Danville	10	0	10
Lafayette	9	8	17

Service Area	Number of Samples Collected		
	Commercial	Multifamily	Total
Moraga	6	8	14
Orinda	7	0	7
Walnut Creek	9	0	9
<b>Grand Total</b>	<b>50</b>	<b>24</b>	<b>74</b>

### 4.2.1 Sample Characterization

The hand sorting procedure for characterized samples was based on the ASTM D5231-92 Method and sorting protocols followed the same characterization procedure described in the Capture Rate Study Sample Characterization section.

This process was repeated until all the samples collected that day had been characterized and weighed. Proper site layout and close supervision of sampling was maintained to reduce sampling bias or other impacts on the integrity of the data, as well as to reduce impacts on facility operations.

### 4.2.2 Analysis Calculation Procedures

Landfill composition for the multifamily and commercial streams was calculated using the ASTM D5231-92 method, which gives equal weight to each sample. To evaluate uncertainty and reliability of sample estimates, 90 percent confidence intervals or bounds (error ranges) were calculated. The analysis calculations for composition of multifamily and commercial composition used the same method described in the Overall Single-family Composition section. Rigorous QC checks (including verifying formulas for accuracy, tracing cell references, and use of error-checking tools and peer reviews) were conducted at various points in the analysis.

## 5 Results

The results of the Capture Rate Study and Waste Characterization Study are detailed in the following sections and offer key insights regarding the waste generated within the RecycleSmart service area. The results include:

- Single-family
  - Composition of the landfill, recycling, and organics streams by material category
  - Composition of the landfill, recycling, and organics streams by recoverability group
  - Capture rates of focus materials in recycling and organics streams
  - Top contaminants in the recycling and organics streams
  - Recoverable materials found in the landfill stream
- Multifamily and Commercial
  - Composition of landfill stream



- Recoverable materials found in the landfill stream

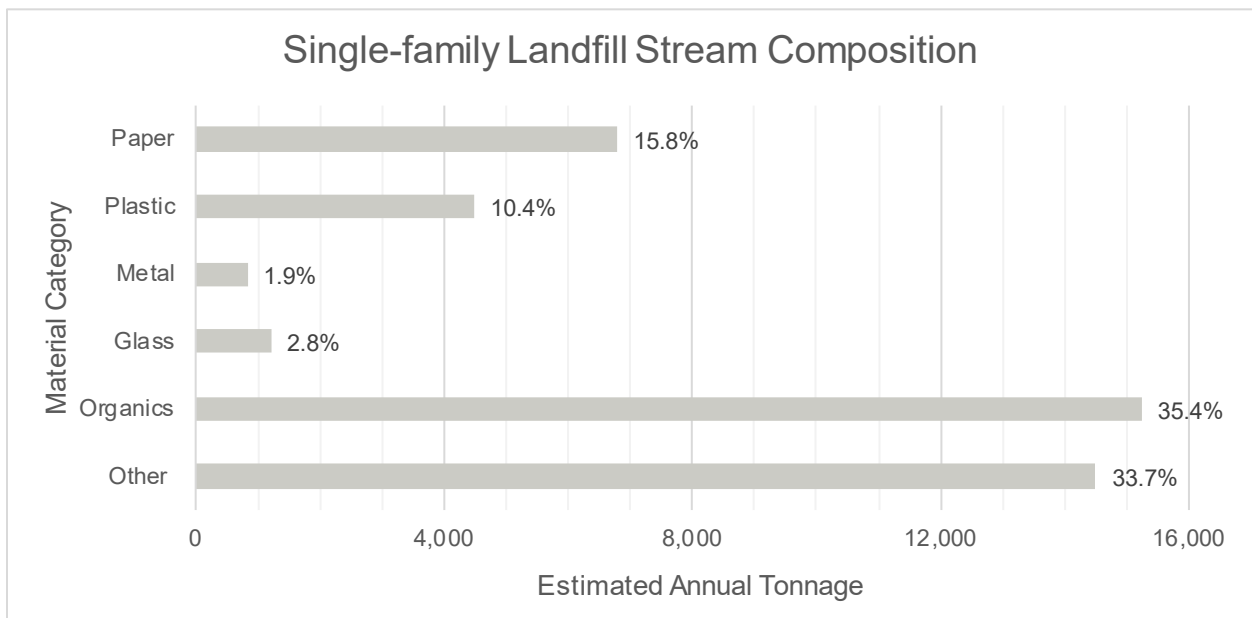
## 5.1 Single-family

This section presents the results of the single-family Capture Rate Study.

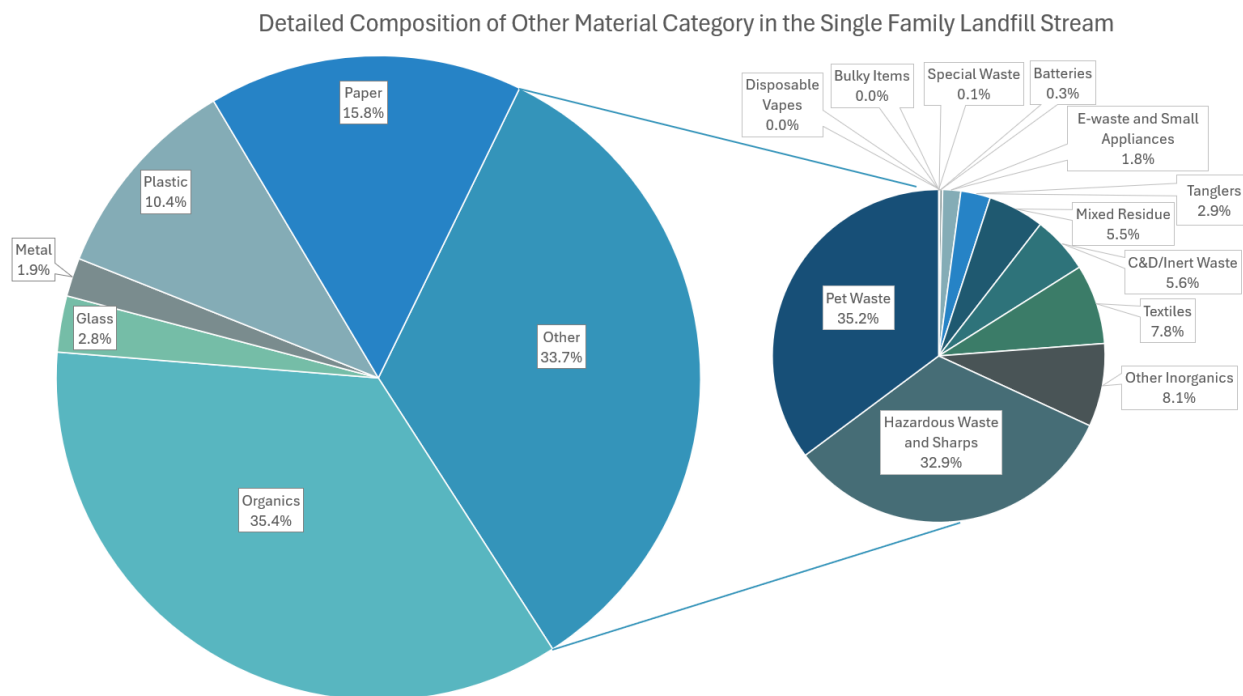
### 5.1.1 Landfill Composition

As presented in Figure 5, Organics was the most common material category in the single-family landfill stream at 35.4% (15,235 tons) of the overall composition, followed by Other at 33.7% (14,502 tons). Paper comprised the third most common material category at 15.8% (6,789 tons).

The Other material category is further broken out by material in Figure 6. Pet waste and hazardous waste and sharps materials comprise the majority of the Other material category at 35.2% and 32.9%, respectively.



**Figure 5. Single-family Landfill Composition by Material Category**



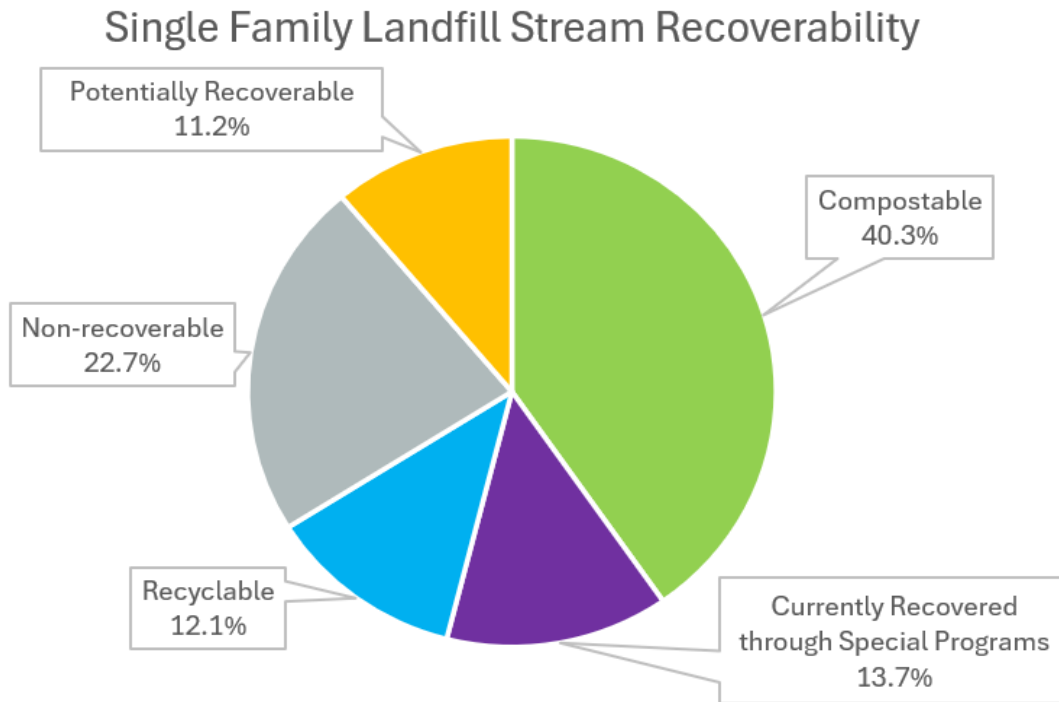
**Figure 6. Breakdown of Other Material Category in Single-Family Landfill Stream**

Table 6 shows that *food - not donatable non-meat* comprised 14.2% of the single-family landfill stream, as the top ranked material. *Pet waste*, representing 11.9%, was the second most prevalent material type, followed by *hazardous waste and sharps* and *food – inedible* at 11.1% and 11.0%, respectively. Of the top 10 materials, four were recyclable or compostable.

**Table 6. Top 10 Materials, Single-family Landfill Stream**

Rank	Material	Composition	± %	Estimated Annual Tonnage
1	Food - Not Donatable non-Meat	14.2%	1.8	6,129.8
2	Pet Waste	11.9%	2.6	5,102.8
3	Hazardous Waste and Sharps	11.1%	3.2	4,775.0
4	Food - Inedible	11.0%	1.8	4,755.5
5	Compostable Paper	7.3%	1.2	3,157.9
6	Other Film Plastic	3.4%	0.9	1,452.3
7	Low Grade Mixed Recyclable Paper	3.1%	0.6	1,338.0
8	Other Inorganics	2.7%	0.7	1,172.3
9	Textiles	2.6%	0.9	1,124.4
10	Remainder/Composite (non-recyclable) Paper	2.2%	0.7	928.6

**Figure 7 shows that compostable and recyclable materials make up approximately half of the single-family landfill stream by recoverability group.** Non-recoverable materials were 22.7% of the stream, and potentially recoverable materials as well as materials that can currently be recovered through special programs were 13.7%.



**Figure 7. Single-family Landfill Composition by Recoverability Group**

### Key Insights

This section describes key insights derived from the single-family landfill composition results.

- Organic material that belongs in the organics cart represents more than one-third of the material in the single-family landfill stream. There is significant opportunity to divert compostable materials from the landfill through the green organics cart and to increase awareness about food waste reduction strategies.
- The majority of organic material in the single-family landfill stream was non-donatable (non-meat) food products and inedible food, which consist of open or partially consumed food as well as inedible parts such as eggshells and banana peels.
- Less than one-quarter of the landfill stream is considered non-recoverable, meaning those materials do not currently have the potential for diversion and are meant to be destined for the landfill. Over three-quarters of the landfill stream is recoverable or potentially recoverable.

## 5.1.2 Recycling Composition

The photo to the right shows an example of a single-family recycling sample. Figure 8 shows that Paper was the most common material category in single-family recycling stream at 53.4% (13,684.7 tons) of the overall composition, followed by Glass at 15.2% (3,887.1 tons). Plastic comprised the third most common material category at 12.2% (3,115.3 tons).



Figure 8. Single-family Recycling Sample

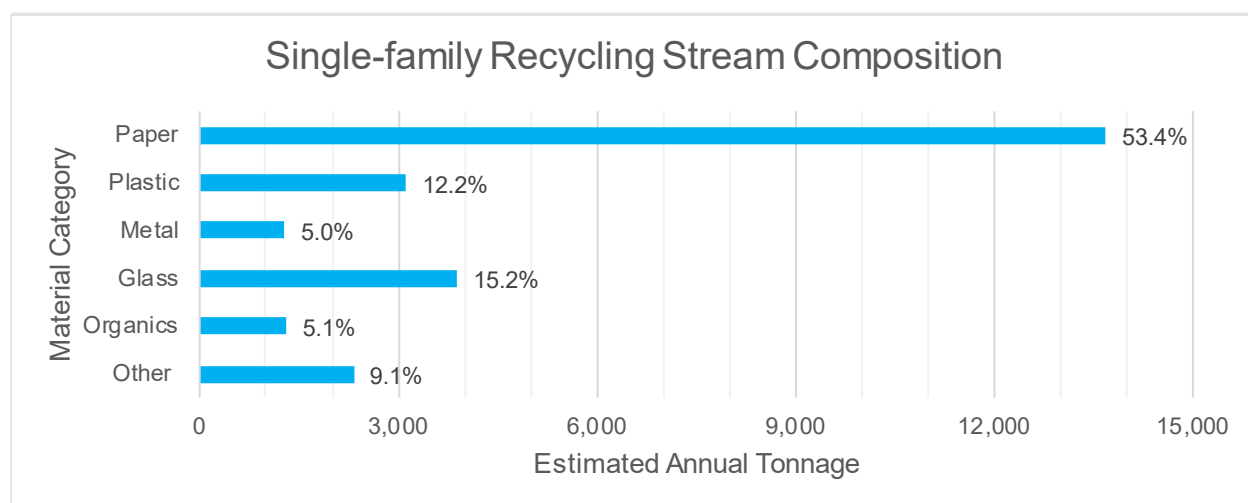


Figure 9. Single-family Recycling Composition by Material Category

Table 7 shows that *corrugated cardboard* comprised 21.1% of the single-family recycling stream and was the most prevalent material type. *Low grade mixed recyclable paper*, representing 17.7%, was the second most prevalent, followed by *high grade recyclable paper* at 9.9% and *CRV glass bottles and jars* at 9.3% of the overall composition. Six of the ten top materials are considered readily recyclable.

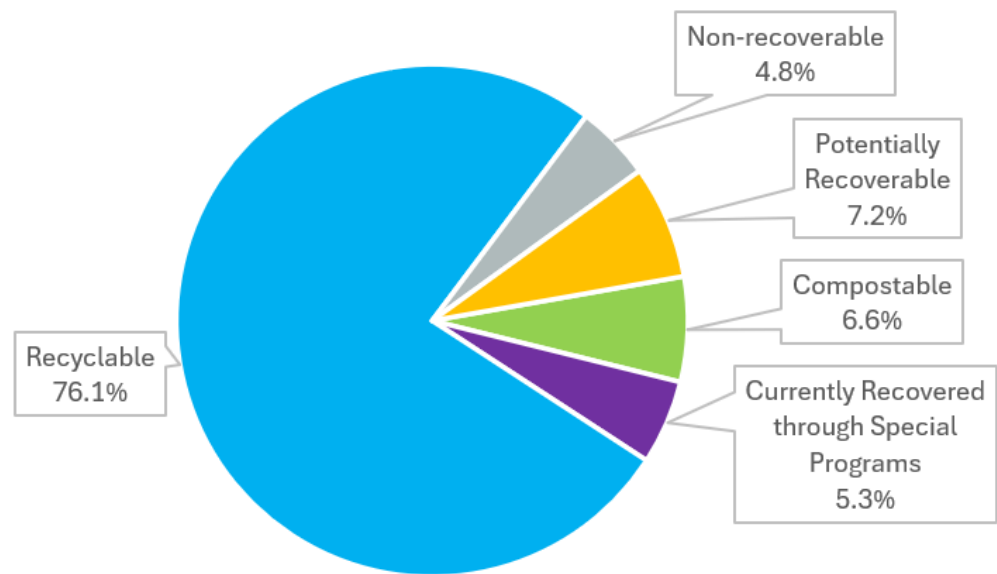
Table 7. Top 10 Materials, Single-family Recycling

Rank	Material	Composition	± %	Estimated Annual Tonnage
1	Corrugated Cardboard	21.1%	3.2	5,405.5
2	Low Grade Mixed Recyclable Paper	17.7%	2.2	4,527.8
3	High Grade Recyclable Paper	9.9%	2.1	2,525.4
4	CRV Glass Bottles and Jars	9.3%	1.9	2,390.6
5	Non-CRV Glass Bottles and Jars	5.0%	0.8	1,286.7
6	Hazardous Waste and Sharps	2.9%	0.4	739.3
7	Food - Potentially Donatable - Packaged Non-Perishable	2.1%	1.0	533.9
8	Bulky Items	2.0%	0.0	521.2

Rank	Material	Composition	± %	Estimated Annual Tonnage
9	Non-CRV HDPE (#2) Bottles and Containers	2.0%	0.5	511.2
10	Other Film Plastic	1.9%	0.3	474.1

Figure 9 shows the composition of the single-family recycling stream by recoverability group. Recyclable materials represented 76.1% of the material. Potentially recoverable materials were 7.2% of the stream, 6.6% of the material was compostable, and another 5.3% could be recovered through special programs. The remaining 4.8% is considered non-recoverable. Overall, the recycling contamination rate is 23.9%.

### Single Family Recycling Stream Recoverability



**Figure 10. Single-family Recycling Composition by Recoverability Group**

Table 8 presents the top 10 contaminant materials in the single-family recycling stream. The top contaminant is *hazardous waste and sharps* at 2.9% and the top ten contaminants collected make up nearly 18% of the overall composition. The *hazardous waste and sharps* material included items like used diapers, which tend to be relatively heavy in comparison to the other materials in the *hazardous waste and sharps* category. The weight from the used diapers may have skewed the total weight of the *hazardous waste and sharps* material.

**Table 8. Top Ten Contaminants, Single-family Recycling**

Rank	Material	Total Weight in Recycling (lb)	% of Total Recycling
1	Hazardous Waste and Sharps	40.85	2.9
2	Food - Potentially Donatable - Packaged Non-Perishable	29.5	2.1
3	Bulky Items	28.8	2.0
4	Other Film Plastic	26.2	1.9
5	Food - Not Donatable non-Meat	25.8	1.8
6	Remainder/Composite (non-recyclable) Paper	24.0	1.7
7	Compostable Paper	21.8	1.5
8	E-waste and Small Appliances	20.9	1.5
9	Other Remainder/Composite Plastic	13.9	1.0
10	C&D/Inert Waste	13.7	1.0

### Key insights

This section describes key insights derived from the single-family recycling composition results.

- The most prevalent material category in the single-family recycling stream is paper that does belong in the recycling bin, the majority being cardboard and recyclable paper (both low and high grade).
- Over half of the materials present in the single-family recycling stream are indeed recyclable. Nearly one-quarter of the materials have the potential for recycling but are not easily or readily recycled through reliable markets. The remaining portion (<20%) is contamination, or materials that do not belong in the recycling bin.
- *Hazardous waste and sharps* included diapers which cannot be recovered through existing programs. This is important to note because diapers are heavy and likely make up a significant portion of the *hazardous waste and sharps* material type.

### 5.1.3 Organics Composition

Figure 11 shows a typical organics sample collected from the single-family sector. Figure 12 shows that organic materials represent the vast majority of the single-family organics stream at 92.6% (60,426.9 tons) of the overall composition. Materials in the Other category represented the most significant non-organic portion at 5.5% (3,591.3 tons) of the overall composition.



Figure 11. Single-family Organics Sample

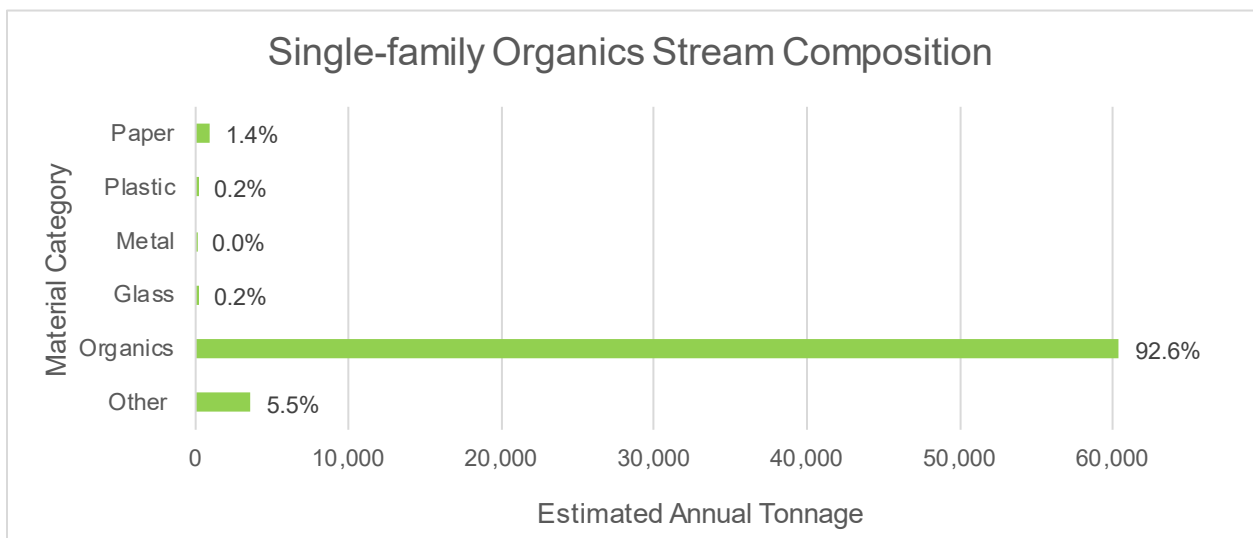


Figure 12. Single-family Organics Composition by Material Category

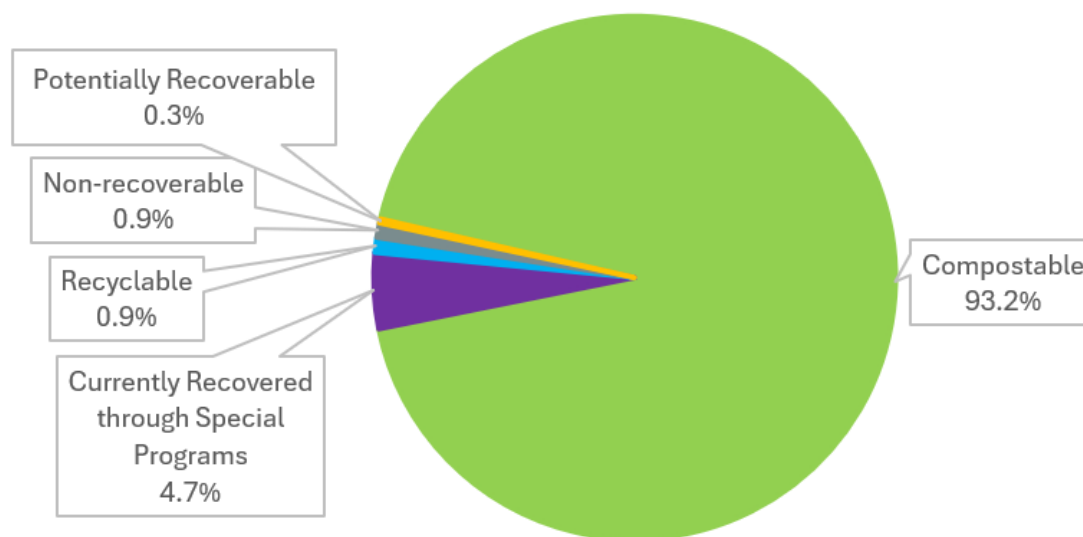
Table 9 shows that *leaves and grass* comprised 67.2% of the single-family organics stream, as the top ranked material. *Prunings and trimmings*, representing 18.7%, was the second most prevalent material type, followed by *C&D/inert waste* at 4.6% of the overall composition. Six of the top ten materials are considered readily compostable. The *C&D/inert waste* material included potting soil and rocks which are typically heavy and represent a significant proportion of the weight of the *C&D/inert waste* material type.



**Table 9. Top 10 Materials, Single-family Organics**

Rank	Material	Composition	± %	Estimated Annual Tonnage
1	Leaves and Grass	67.2%	5.7	43,880.9
2	Prunings and Trimmings	18.7%	3.5	12,171.6
3	C&D/Inert Waste	4.6%	1.5	2,996.3
4	Food - Inedible	3.1%	2.2	2,030.6
5	Food - Not Donatable non-Meat	2.8%	1.4	1,810.4
6	Compostable Paper	0.6%	0.6	423.7
7	Pet Waste	0.5%	0.5	302.1
8	Corrugated Cardboard	0.5%	0.5	298.6
9	Clean Dimensional Lumber	0.3%	0.3	197.2
10	CRV Glass Bottles and Jars	0.2%	0.2	141.2

Figure 13 shows the composition of the single-family organics stream by recoverability group. Compostable materials made up the majority of the composition (93.2%). Materials that could be recovered through special programs were 4.7% of the stream, and recyclable, non-recoverable and potentially recoverable materials were 0.9%, 0.9% and 0.3% of the stream, respectively. The contamination rate is 6.8% overall.



**Figure 13. Single-family Organics Composition by Recoverability Group**

Table 10 presents the top 10 contaminant materials in the single-family organics stream. The top contaminant in the single-family organics stream is *C&D/inert waste*. The top ten contaminants collected make up approximately 7% of the overall composition. As previously discussed, the *C&D/inert waste* material weight includes potting soil and rocks.



**Table 10. Top Ten Contaminants, Single-family Organics Stream**

Rank	To 10 Organics Contaminant	Total Weight in Organics (lb)	% of Total Organics
1	C&D/Inert Waste	214.3	4.6
2	Pet Waste	21.6	0.5
3	Corrugated Cardboard	21.4	0.5
4	CRV Glass Bottles and Jars	10.1	0.2
5	Mixed Residue	9.1	0.2
6	Low Grade Mixed Recyclable Paper	5.7	0.1
7	Textiles	4.4	0.1
8	Hazardous Waste and Sharps	4.0	0.1
9	Treated/Painted/ Stained Wood	2.7	0.1
10	Other Remainder/Composite Plastic	2.7	0.1

### Key insights

This section describes key insights derived from the single-family organics composition results.

- Approximately 80% of the single-family organics stream is yard materials (leaves and grass, and prunings and trimmings) and 93% is compostable materials placed correctly in the organics bin. This means that contamination accounts for only 7% of the total stream. While there is minimal room for improvement, the single-family organics bin is relatively homogeneous for properly sorted materials.
- C&D/Inert waste* (which was mostly soil and rocks) was the top contaminant material in the organics stream. The Sort Crew observed that the majority of *C&D/inert waste* was attributed to rocks and soil, which, while organic, are not accepted in the curbside organics bin.

## 5.1.4 Capture Rates

The recycling capture rate identifies how much recyclable material is captured through curbside recycling collection. Figure 14 displays the average capture rate for the 14 material categories that can be recycled curbside in the RecycleSmart service area.

*CRV HDPE (#2) bottles* had the highest capture rate at 100% followed by *corrugated cardboard* (90%) and *high-grade recyclable paper* (86%). *Bulky rigid plastics*, which includes durable plastic items such as buckets and toys, had by far the lowest average capture rate at 5%.

The organics capture rate identifies how much compostable material is captured through curbside organics collection. Figure 15 shows that *prunings and trimmings* and *leaves and grass* have by far the highest capture rate (98%). While some food inedible material types such as *food – inedible*, *food – not donatable non-meat* and *food – not donatable – meat* are being captured in the organics bin (one-third or less), other potentially donatable food categories such as *food – potentially donatable – packaged non-perishable* have a capture rate of 0%.

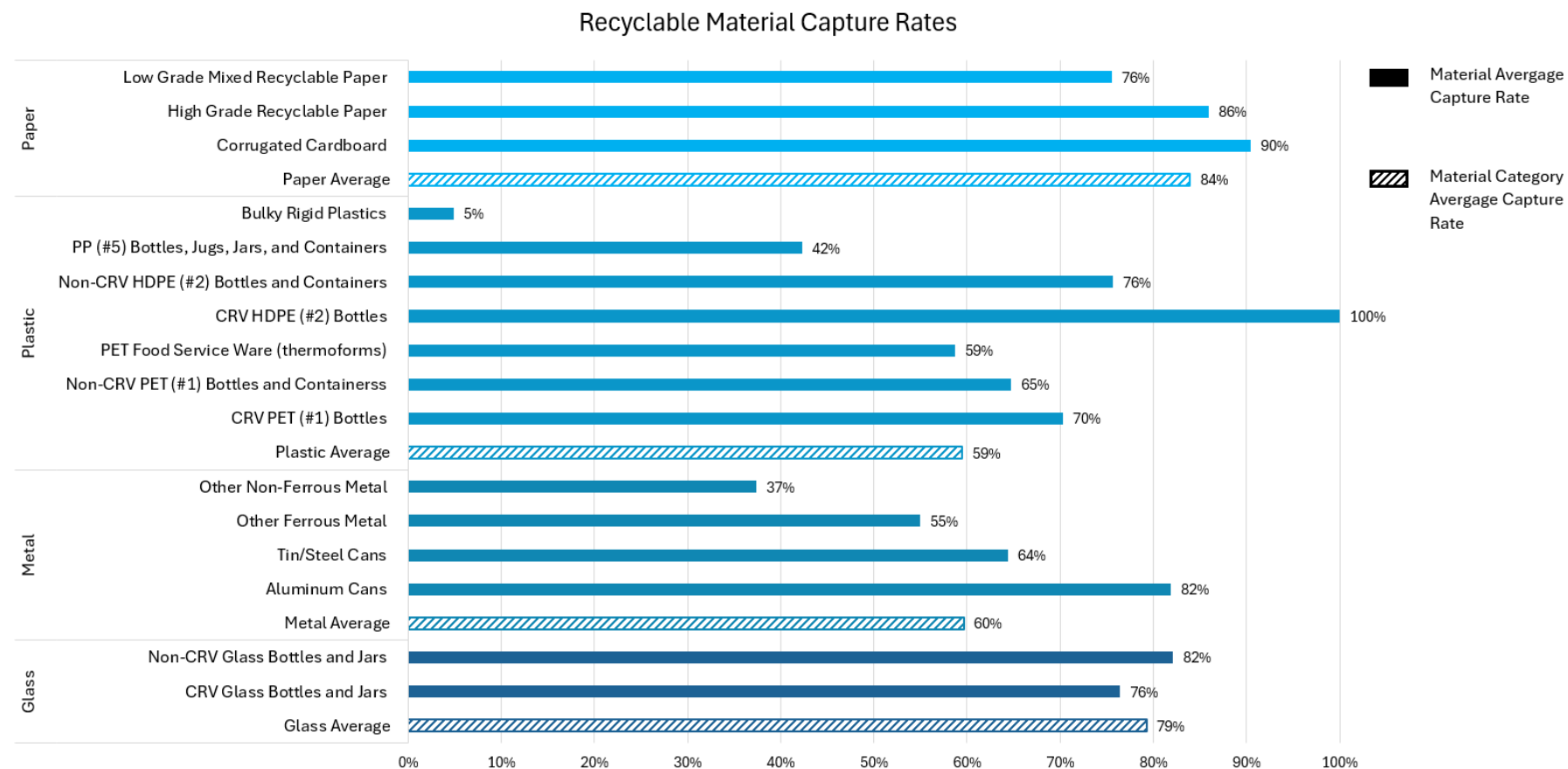


Figure 14. Capture Rate of Recyclable Materials, Single-family

### Compostable Material Capture Rates

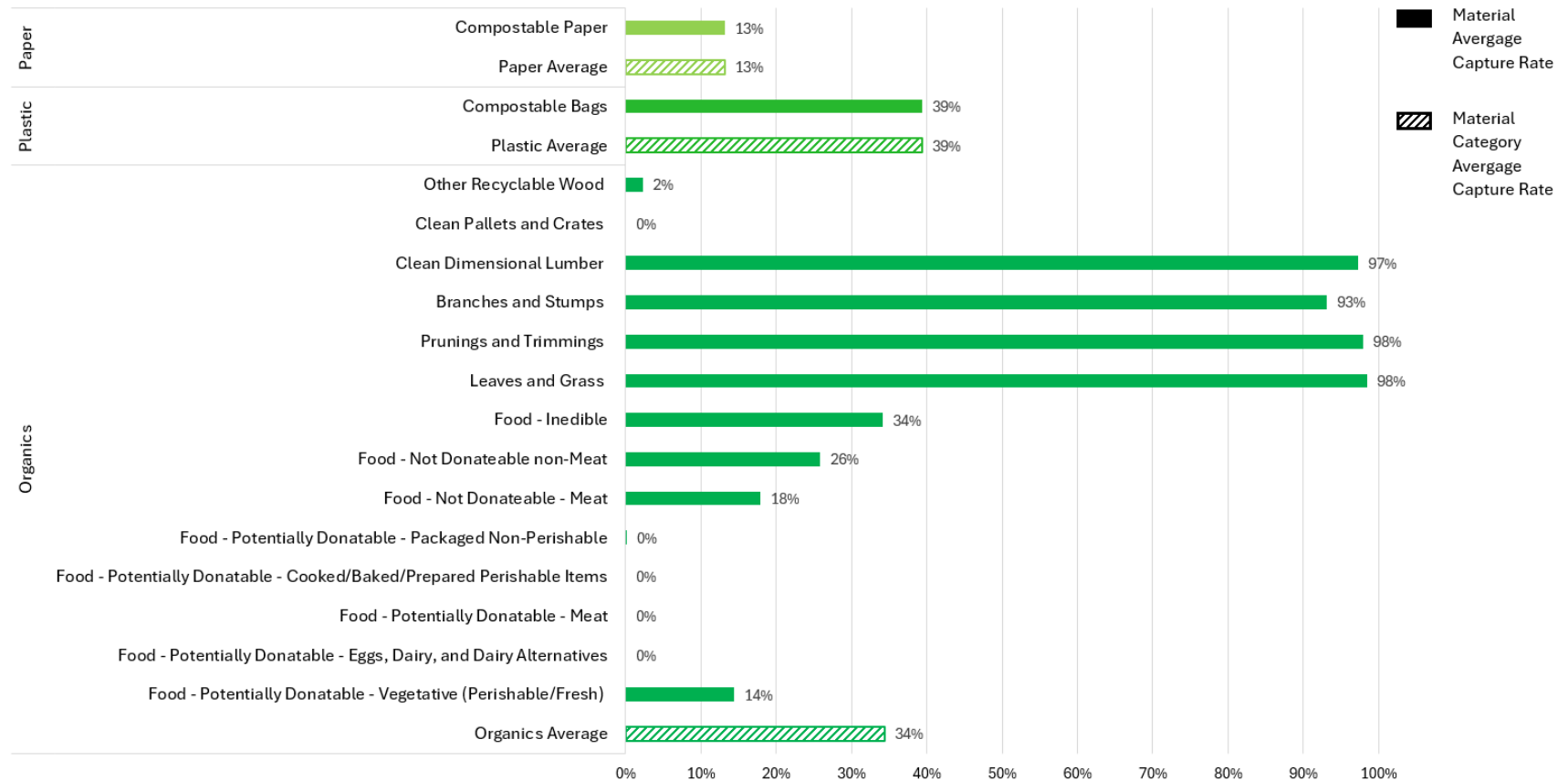


Figure 15. Capture Rate of Organics Materials, Single-family

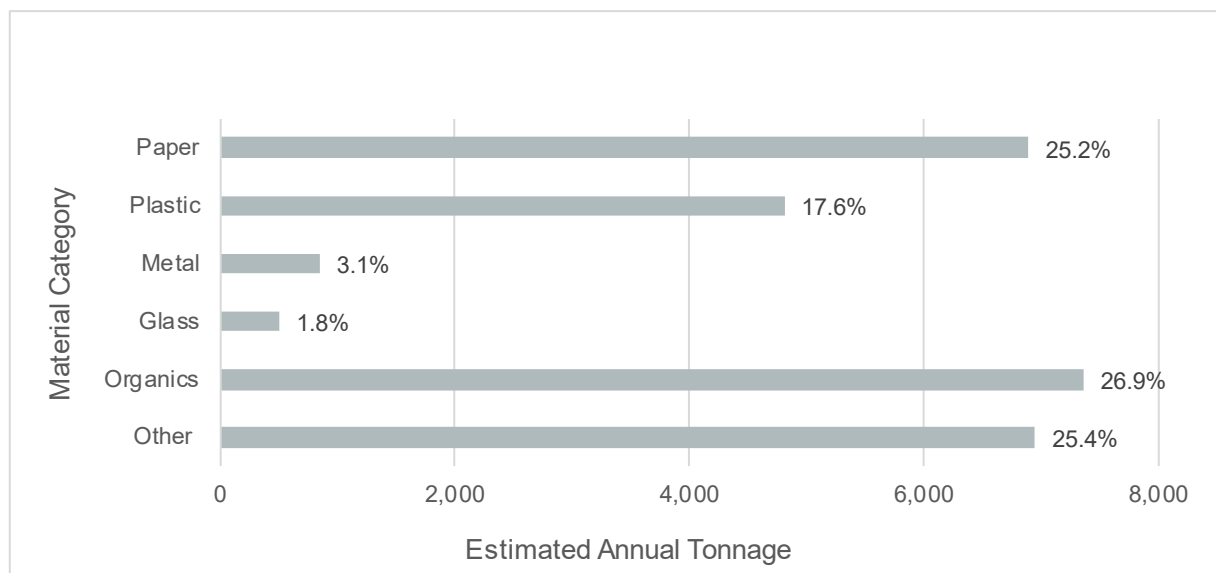
## Key insights

This section describes key insights derived from the single-family capture rate analysis of the single-family recycling and organics streams.

- Recyclable material types had an average capture rate of 65%. The average capture rate for Plastics was 59%, with the highest capture rates for HDPE and PET bottles and containers. The average capture rate for Glass and Metal was 79% and 73%, respectively.
- Typical yard waste, such as *leaves and grass* and *prunings and trimmings*, make up the vast majority of the single-family organics stream and those materials have nearly perfect capture rates. **Residences are very effectively using their organics bin for yard trimmings, but could divert significantly more food scraps through their organics bin.** Most food waste ends up in the landfill, especially for the potentially donatable material types.

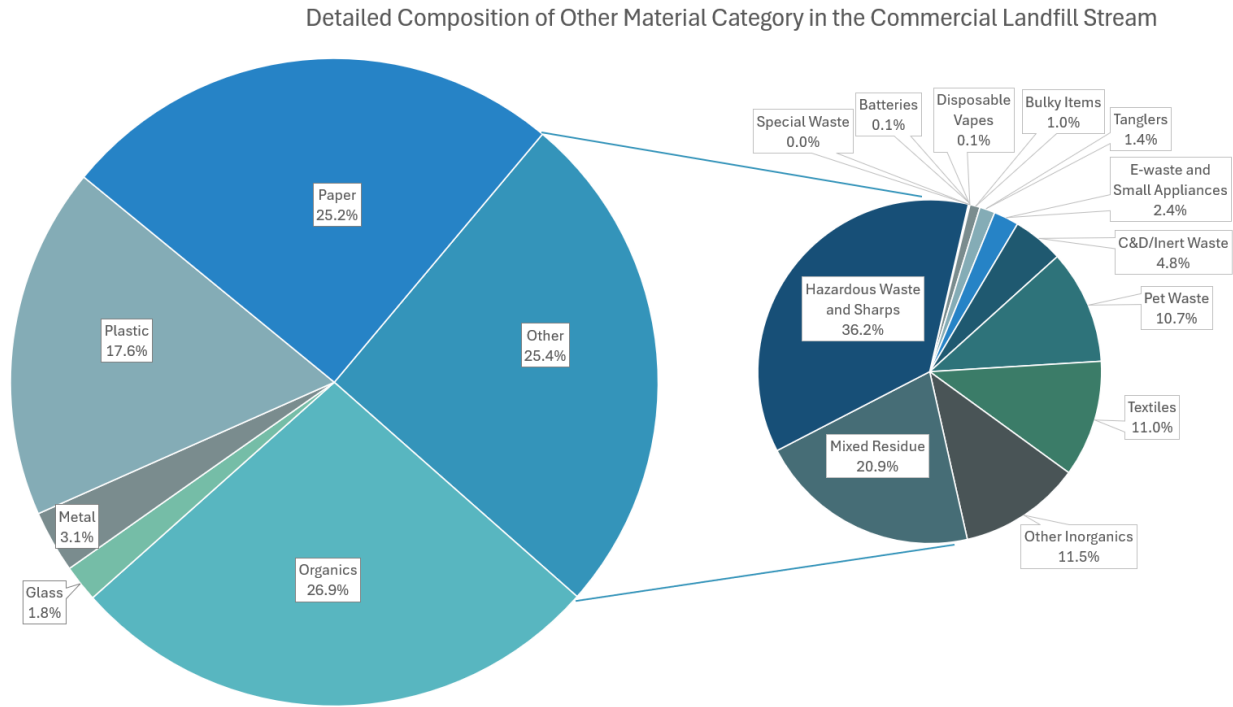
## 5.2 Commercial

Figure 16 shows that Organics was the most common material category in the commercial landfill stream at 26.9% (7,361.4 tons) of the overall composition, followed by Other at 25.4% (6,949.3 tons). Paper comprised the third most common material category at 25.2% (6,892.3 tons).



**Figure 16. Composition by Material Category, Commercial Landfill Stream**

The Other material category was broken out by material in Figure 17. *Hazardous waste and sharps* and *mixed residue* materials comprise the majority of the Other material category at 36.2% and 20.9%, respectively



**Figure 17 Breakdown of Other Materials in Commercial Landfill Stream**

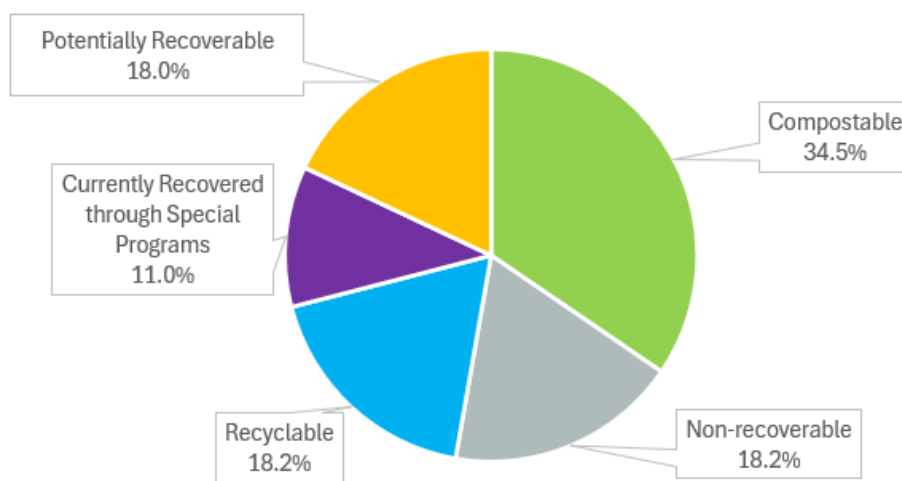
Table 11 shows that *food-not donatable non-meat* comprised 13.2% of the commercial landfill stream, as the top ranked material. *Compostable paper*, representing 9.7%, was the second most prevalent material type, followed by *hazardous waste and sharps* at 9.2% of the overall composition. Three of the top four materials are compostable.

**Table 11. Top 10 Materials, Commercial Landfill Stream**

Rank	Material	Composition	± %	Estimated Tons
1	Food - Not Donatable non-Meat	13.2%	1.8	3,598.2
2	Compostable Paper	9.7%	0.8	2,652.7
3	Hazardous Waste and Sharps	9.2%	2.1	2,515.9
4	Food - Inedible	7.4%	1.2	2,026.5
5	Low Grade Mixed Recyclable Paper	5.6%	0.5	1,537.2
6	Mixed Residue	5.3%	0.6	1,454.2
7	Plastic Garbage and Merchandise Bags	4.6%	0.4	1,266.7
8	Other Film Plastic	4.6%	0.6	1,251.6
9	Poly-coated and semi-poly-coated paper	4.0%	0.6	1,084.7
10	Other Inorganics	2.9%	0.5	798.0

Figure 16 shows the composition of the commercial landfill stream by recoverability group, where compostable materials represented 34.5% of the material. Potentially recoverable materials were 18.0% of the stream, 18.2% of the material was non-recoverable, and 18.2% was recyclable.

### Commercial Sector Landfill Stream Recoverability



**Figure 18. Composition by Recoverability Group, Commercial Landfill Stream**

#### Key insights

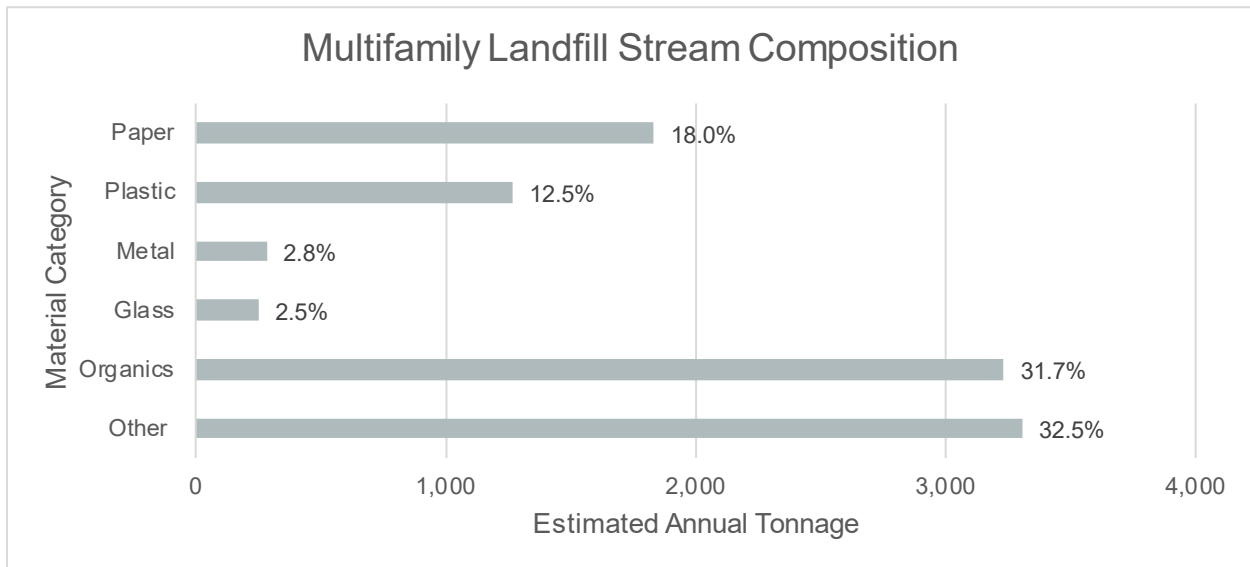
This section describes key insights derived from the commercial landfill composition results.

- Compared to the other landfill streams included in this study, the commercial landfill stream had the highest percentage of recyclable materials (15%).
- Approximately one-third of the commercial landfill stream was organic material, the majority of which was not donatable (non-meat) food products and compostable paper.
- Hazardous waste accounted for more than 9% of the commercial landfill stream, presenting an opportunity to increase awareness about the proper disposal channels available to businesses.<sup>3</sup>

## 5.3 Multifamily

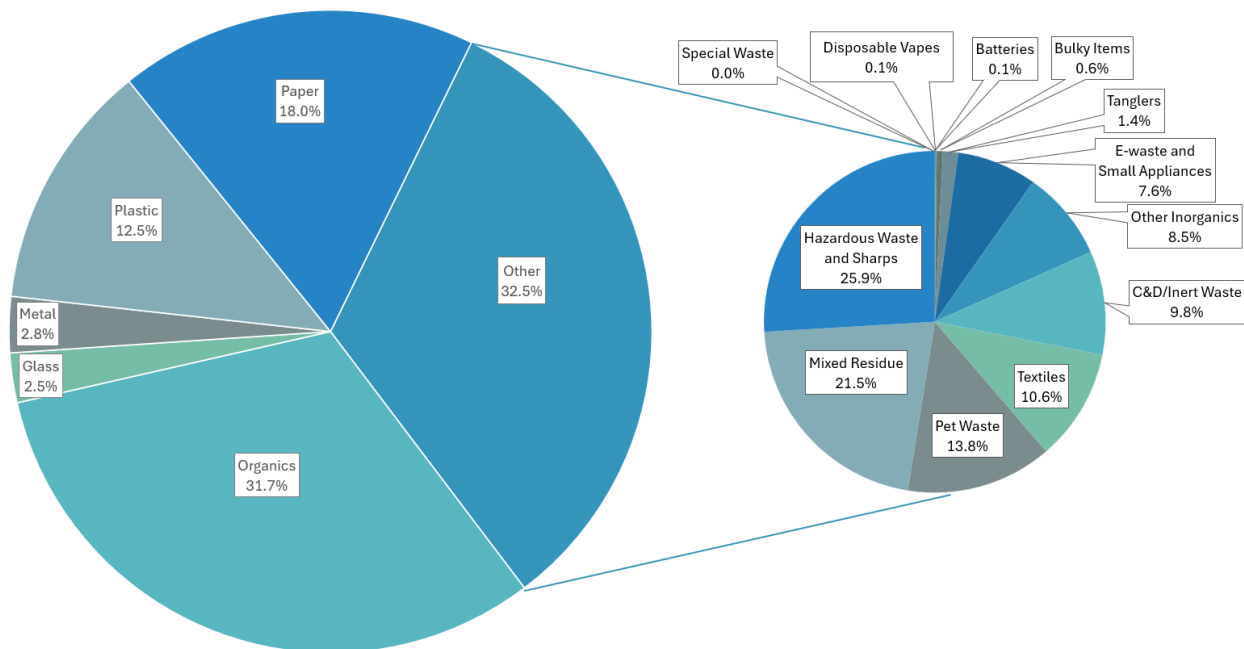
Figure 19 shows that Other was the most common material category in the multifamily landfill stream at 32.5% (3,308 tons) of the overall composition, followed by Organics at 31.7% (3,234 tons). Paper comprised the third most common material category at 18.0% (1,835 tons).

<sup>3</sup> Guidance for proper disposal is found here: [Hazardous Recycling and Waste Disposal - RecycleSmart](#)



**Figure 19. Composition by Material Category, Multifamily Landfill Stream**

The Other material category was broken out by material in Figure 20. *Hazardous waste and sharps* and *mixed residue* materials comprise the majority of the Other material category at 25.9% and 21.5%, respectively.



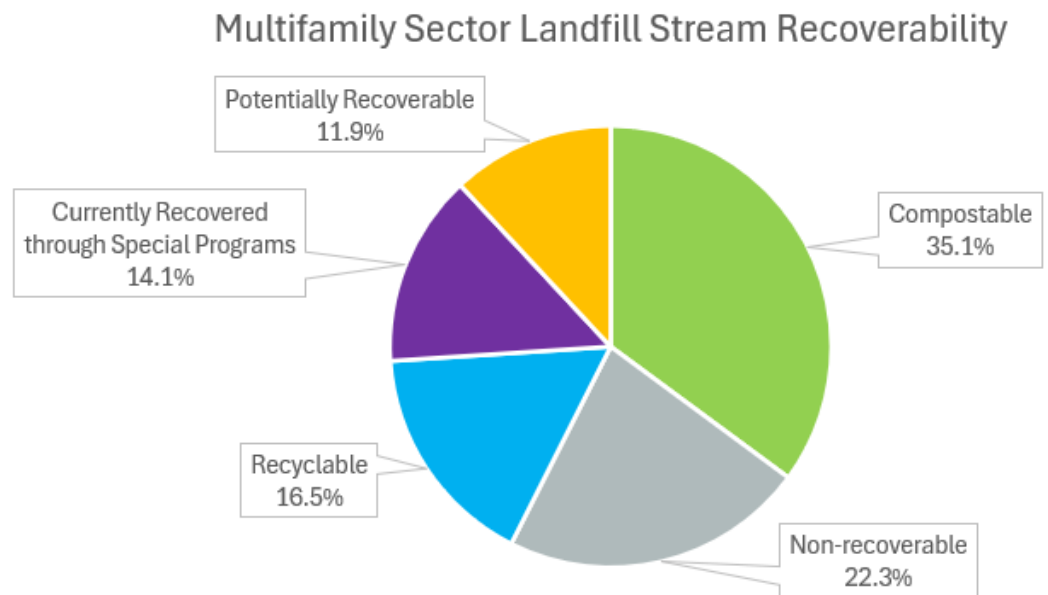
**Figure 20 Breakdown of Other Materials in Multifamily Landfill Stream**

Table 12 shows that *food - not donatable non-meat* comprised 11.5% of the multifamily landfill stream, as the top ranked material. *Food - inedible*, representing 9.5%, was the second most prevalent material type, followed by *hazardous waste and sharps* at 8.4% of the overall composition. Three of the top four materials are compostable.

**Table 12. Top Ten Materials, Multifamily Landfill Stream**

Rank	Material	Composition	± %	Estimated Tons
1	Food - Not Donatable non-Meat	11.5%	1.3	1,175.7
2	Food - Inedible	9.5%	1.5	967.9
3	Hazardous Waste and Sharps	8.4%	1.7	858.3
4	Compostable Paper	7.4%	0.7	752.0
5	Mixed Residue	7.0%	0.9	712.1
6	Low Grade Mixed Recyclable Paper	5.6%	0.7	570.4
7	Pet Waste	4.5%	1.4	457.7
8	Textiles	3.4%	0.7	350.3
9	Other Film Plastic	3.4%	0.3	348.5
10	Remainder/Composite Organics	3.3%	2.3	334.5

Figure 21 shows the composition of the multifamily landfill stream by recoverability group, where compostable materials represented 35.1% of the material. Non-recoverable material was 22.3% of the stream, 11.9% of the material was potentially recoverable, 16.5% are readily recyclable, and 14.1% could be recovered through special programs.



**Figure 21. Composition by Recoverability Group, Multifamily Landfill Stream**

### Key Insights

This section describes key insights derived from the multifamily landfill composition results.

- Similar to the single-family stream, there is significant opportunity to divert organic materials from the multifamily landfill stream. Over one-third of the material overall



was organic material, and 20% of the multifamily landfill stream was not donatable (non-meat) food waste and inedible parts of food waste.

- More than 8% of the multifamily landfill stream was hazardous waste (including sharps), which should instead be safely disposed of through the various drop-off programs in the area. As noted previously, *Hazardous waste and sharps* included diapers which are heavy and likely make up a significant portion of the *hazardous waste and sharps* material type.

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## Appendix A. Material List

Material Class	Material #	Material	Material Definition
PAPER	1	Plastic and Wax Coated Cardboard	Corrugated cardboard with a plastic and/or wax layer around it.
PAPER	2	Corrugated Cardboard	Paper laminate usually composed of three layers with a wavy layer on the inside.
PAPER	3	High Grade Recyclable Paper	High quality paper products such as paper grocery bags, kraft paper, newspaper, and office paper that is not wet, coated, or mixed with other materials.
PAPER	4	Low Grade Mixed Recyclable Paper	Other lower quality paper products. May be made of mixed materials, are shiny, or coated. Examples include mail, magazines, egg cartons, or padded packaging envelopes.
PAPER	5	Aseptic Cartons and Gable tops	Paper-based cartons with a triangular top (e.g. milk cartons) and polycoated paperboard or foil lined containers for shelf-stable products (e.g., broth boxes, juice boxes).
PAPER	6	Poly-coated and semi-poly-coated paper	Paper products lined with polycoat material such as ice cream containers, coated coffee cups, serviceware, and take-out boxes.
PAPER	7	Compostable Paper	Compostable paper that does not fit in another category and/or is contaminated with food or moisture.
PAPER	8	Remainder/Composite (Non-recyclable) Paper	All other paper items not found in another definition, including items made mostly of paper but combined with other materials.
PLASTIC	9	CRV PET (#1) Bottles	Beverage bottles marked with PET/PETE/#1 and CRV values.
	10	Non-CRV PET (#1) Bottles and Containers	Other bottles and durable containers made of polyethylene (marked with PET/PETE/#1) and not marked with CRV values. Does not include PET food serviceware (thermoforms).
PLASTIC	11	PET Food Service Ware (thermoforms)	Plastic packaging meant to contain or transport food items such as clamshells. Excludes compostable food service ware.
PLASTIC	12	CRV HDPE (#2) Bottles	Beverage bottles marked with HDPE/#2 and CRV values.
PLASTIC	13	Non-CRV HDPE (#2) Bottles and Containers	Other bottles and durable containers made of high-density polyethylene (marked with HDPE #2) and not marked with CRV.
PLASTIC	14	PP (#5) Bottles, Jugs, Jars, and Containers	Durable containers, bottles, jugs, and jars made of polypropylene (marked with PP/#5).
	15	Compostable Bags	Bags that are designed and certified as compostable.
PLASTIC	16	Compostable Plastic (#7)	Any compostable plastic certified as PLA or #7. Includes utensils and compostable food service ware containers. Excludes compostable plastic bags.
PLASTIC	17	Bulky Rigid Plastics	Durable bulky plastic items such as buckets and plastic toys.
PLASTIC	18	Other Rigid Plastics	Includes rigid plastics not found in another category.
PLASTIC	19	Industrial Commercial/Industrial Packaging Film	Film plastic used for large-scale packaging or transport packaging.

Material Class	Material #	Material	Material Definition
PLASTIC	20	Plastic Bags	Plastic garbage bags and merchandise bags. Does not include produce bags.
PLASTIC	21	Other Film Plastic	Other film plastic not mentioned in other categories. Includes produce bags.
PLASTIC	22	Flexible Plastic Pouches	Plastic pouches made of thicker, multilayer flexible material such as Capri-sun or baby food pouch.
PLASTIC	23	Other Remainder/ Composite Plastic	Includes non-film plastics 1–7 not included in other categories. Excludes compostable plastic, expanded polystyrene, and film plastic.
METAL	24	Aluminum Cans	Any food or beverage container that is made mainly of aluminum.
METAL	25	Tin/Steel Cans	Metal cans that will stick to a magnet and may be tin coated.
METAL	26	Major Appliances	Large household appliances such as a dryer or dishwasher.
METAL	27	Other Ferrous Metal	Other metal items that will stick to a magnet.
METAL	28	Other Non-Ferrous Metal	Other metal items that are not magnetic.
METAL	29	Other Remainder/ Composite Metal	All other metal items not mentioned in other categories and items made of mostly metal but mixed with other materials.
GLASS	30	CRV Glass Bottles and Jars	Clear and colored glass CRV containers.
GLASS	31	Non-CRV Glass Bottles and Jars	Other clear and colored glass not labeled as CRV.
GLASS	32	Remainder/Composite Glass	All other glass items such as windshields, mirrors, and items composed mostly of glass but mixed with other materials.
ORGANICS	33	Food - Potentially Donatable - Vegetative (Perishable/Fresh)	Uncooked or cooked fresh vegetables, fruits, and fungi that are in a whole state (i.e., not partially consumed) and are unmixed with non-vegetative food types. Items in their whole state are either in original, unopened packaging or unpackaged items from commercial sector that have clearly not been consumed (e.g., a whole apple or entire head of lettuce). Items that are excluded from this category include condiments, non-perishable packaged fruits, and vegetables such as: packaged dried fruits and vegetables, canned fruits and vegetables, and nuts. Any unpackaged vegetables, fruits, and fungi found in a whole state in residential loads are excluded from this category and should be sorted as “not donatable – non-meat.” However, unpackaged vegetables, fruits, and fungi found in a whole state in commercial loads are included in this category.
ORGANICS	34	Food - Potentially Donatable - Eggs, Dairy, and Dairy Alternatives	Egg or dairy products and dairy alternatives that are in a whole state, unmixed with other food types, and in the original unopened package. Items may be refrigerated or shelf stable.
ORGANICS	35	Food - Potentially Donatable - Meat	Any uncooked or cooked meat (beef, poultry, pork, lamb) or fish product that is in a whole state, is unmixed with other food types, and is in the original unopened package. This includes meat alternatives.

Material Class	Material #	Material	Material Definition
ORGANICS	36	Food - Potentially Donatable - Cooked/Baked/Prepared Perishable Items	Items that are in a whole state but could have multiple food types mixed together as a part of cooking or preparation and are still in their original unopened package.
ORGANICS	37	Food - Potentially Donatable - Packaged Non-Perishable	Shelf-stable foods that are in a whole state and are in the original unopened package. Includes foods contained in aseptic or retort packages and other products that do not require refrigeration until after opening. Also includes non-perishable beverages such as sodas. Excluded from this category are shelf – stable meats, shelf-stable dairy products, and shelf-stable dairy alternatives.
ORGANICS	38	Food - Not Donatable - Meat	Any food that is predominantly meat or fish, but the product is not in a whole state (i.e., partially consumed), or the product's packaging has been opened, or the product was not contained in any packaging at all.
ORGANICS	39	Food - Not Donatable non-Meat	Any food that is not predominantly meat or fish, not in a whole state, or not in its original unopened package. Includes any non-meat partially consumed foods, any non-meat foods in a package that has been opened – as best as can be determined, any non-meat foods that are not in their original packaging. Item may contain small amounts of meat or fish. This category also includes fruit and vegetable peels, skins, trimmings, and or any parts of fruits and vegetables not included in the inedible category. In addition, this category also includes any indistinguishable food.
ORGANICS	40	Food - Inedible	Items typically not consumed by people in the United States. Categories of inedible parts include bones, pits, shells, banana peels, coffee grounds and tea leaves, rinds, woody stems/tops and vines, and corn cobs/husks. Note that small amounts of edible material associated with the inedible material are permitted to be included as “inedible.” Excludes other fruit and vegetable peels, skins, trimmings, cores, and ends not included in the previous categories (e.g., potato peels, carrot tops, apple cores, broccoli stalks, cucumber ends).
ORGANICS	41	Leaves and Grass	Plant material, except woody material, from any public or private landscape. This type does not include woody material or material from agricultural sources.
ORGANICS	42	Prunings and Trimmings	Woody plant material up to 4 inches in diameter from any public or private landscape. This type does not include stumps, tree trunks, or material from agricultural sources.
ORGANICS	43	Branches and Stumps	Woody plant material, branches, and stumps that exceed 4 inches in diameter, from any public or private landscape.
ORGANICS	44	Manures	Manure and soiled bedding materials from large domestic, farm, or ranch animals. Does not include feces from small household pets such as dogs and cats.
ORGANICS	45	Clean Dimensional Lumber	Unpainted new or demolition dimensional lumber. May contain nails or other trace contaminants.

Material Class	Material #	Material	Material Definition
ORGANICS	46	Clean Engineered Wood	Unpainted new or demolition scrap from sheeted goods. May contain nails or other trace contaminants.
ORGANICS	47	Clean Pallets and Crates	Unpainted wood pallets, crates, and packaging made of lumber. May contain nails or other trace contaminants.
ORGANICS	48	Treated / Painted / Stained Wood	Wood that has been treated with a chemical preservative for purposes of protecting the wood against attacks from insects, microorganisms, fungi, and other environmental conditions that can lead to decay of the wood; and wood that has had an external coating such as paint, varnish, or other finish applied.
ORGANICS	49	Other Recyclable Wood	Recyclable wood not included in any other category. This may include scrap from production of prefabricated wood products that have not been treated with paint, stain, or other chemical finish. Wood material should not be contaminated with another material (e.g., tar). May contain nails or other trace contaminants.
ORGANICS	50	Remainder / Composite Organics	Organic material that cannot be put in any other type.
OTHER	51	Hazardous Waste and Sharps	Household materials that are harmful or dangerous to people or the environment such as cleaning products, paint, and motor oil. Includes pharmaceuticals and medical sharps. Includes bagged bathroom waste and diapers.
OTHER	52	Special Waste	Items that sometimes have another method of disposal such as tires and mattresses.
OTHER	53	Batteries	Batteries of all types that consist of one or more cells. Includes rechargeable batteries and automotive batteries.
OTHER	54	E-waste and Small Appliances	Electrical and electronic devices such as VCRs, stereos, electric toothbrush charges, and small appliances such as toaster ovens and microwaves.
OTHER	55	C&D/Inert Waste	Materials derived from construction and demolition activities such as concrete, asphalt roofing, carpet, rocks and soil.
OTHER	56	Bulky Items	Large hard-to-handle items such as furniture.
OTHER	57	Tanglers	Long rope-like items that wrap around sorting equipment such as an extension cord or rope.
OTHER	58	Textiles	Synthetic and non-synthetic clothing, shoes, purses, and belts.
OTHER	59	Pet Waste	Domestic pet waste such as doggy bags, kitty litter, and the animal excrement they contain.
OTHER	60	Other Inorganics	Other inorganic items not mentioned elsewhere such as ceramics, dryer sheets, cosmetics, and toothpaste.
OTHER	61	Mixed Residue	Materials smaller than 2" in diameter and unable to be sorted.
OTHER	62	Disposable Vapes	Disposable vapes that are pre-filled, self-contained electronic cigarettes designed for one-time use.

## Appendix B. Detailed Composition Tables

The following tables show the detailed composition by sector and stream. Note that estimated composition percentages are rounded to the nearest 0.1% and will therefore show 0.0% for an amount <.05%.

**Table B-1. Detailed Composition Table, Single-family Landfill Stream**

Single-family Garbage			
Material	Composition (%)	± %	Estimated Tons
Plastic and Wax Coated Cardboard	0.0%	0.0%	7.1
Corrugated Cardboard	0.4%	0.3%	181.6
High Grade Recyclable Paper	0.8%	0.4%	364.2
Low Grade Mixed Recyclable Paper	3.1%	0.6%	1,338.0
Aseptic Cartons and Gable tops	0.3%	0.3%	121.4
Poly-coated and semi-poly-coated paper	1.6%	0.5%	690.2
Compostable Paper	7.3%	1.2%	3,157.9
Remainder/Composite (non-recyclable) Paper	2.2%	0.7%	928.6
<i>Paper</i>	<b>15.8%</b>	<b>2.1%</b>	<b>6,789.0</b>
CRV PET (#1) Bottles	0.4%	0.1%	158.6
Non-CRV PET (#1) Bottles and Containers	0.3%	0.1%	144.4
PET Food Service Ware (thermoforms)	0.7%	0.2%	315.4
CRV HDPE (#2) Bottles	0.0%	0.0%	0.0
Non-CRV HDPE (#2) Bottles and Containers	0.4%	0.2%	159.5
PP (#5) Bottles, Jugs, Jars, and Containers	1.2%	0.2%	500.6
Compostable Bags	0.1%	0.1%	62.0
Compostable Plastic (#7)	0.0%	0.0%	18.6
Bulky Rigid Plastics	1.0%	0.1%	451.9
Other Rigid Plastics	0.5%	0.1%	218.9
Industrial Commercial/Industrial Packaging Film	0.2%	0.1%	88.6
Plastic Garbage and Merchandise Bags	1.2%	0.2%	499.7
Other Film Plastic	3.4%	0.9%	1,452.3
Flexible Plastic Pouches	0.1%	0.1%	63.8
Other Remainder/Composite Plastic	0.8%	0.7%	352.7
<i>Plastic</i>	<b>10.4%</b>	<b>1.5%</b>	<b>4,487.0</b>
Aluminum Cans	0.2%	0.1%	86.8
Tin/Steel Cans	0.4%	0.2%	192.3
Major Appliances	0.0%	0.0%	0.0
Other Ferrous Metal	0.6%	0.2%	251.6
Other Non-Ferrous Metal	0.6%	0.3%	258.7
Other Remainder/Composite Metal	0.1%	0.1%	43.4
<i>Metal</i>	<b>1.9%</b>	<b>0.4%</b>	<b>832.9</b>
CRV Glass Bottles and Jars	1.3%	0.5%	544.0
Non-CRV Glass Bottles and Jars	0.6%	0.3%	265.8
Remainder/Composite Glass	0.9%	0.5%	404.0
<i>Glass</i>	<b>2.8%</b>	<b>0.8%</b>	<b>1,213.9</b>
Food - Potentially Donatable - Vegetative (Perishable/Fresh)	0.8%	0.3%	347.3
Food - Potentially Donatable - Eggs, Dairy, and Dairy Alternatives	0.3%	0.1%	121.4
Food - Potentially Donatable - Meat	0.1%	0.1%	49.6
Food - Potentially Donatable - Cooked/Baked/Prepared Perishable Items	0.7%	0.7%	294.2
Food - Potentially Donatable - Packaged Non-Perishable	0.9%	0.5%	395.2
Food - Not Donatable - Meat	1.7%	0.5%	744.3
Food - Not Donatable non-Meat	14.2%	1.8%	6,129.8
Food - Inedible	11.0%	1.8%	4,755.5
Leaves and Grass	2.1%	1.2%	894.9
Prunings and Trimmings	0.8%	0.3%	325.2
Branches and Stumps	0.0%	0.0%	10.6
Manures	1.4%	0.9%	604.3
Clean Dimensional Lumber	0.0%	0.0%	0.0
Clean Engineered Wood	0.0%	0.0%	1.8
Clean Pallets and Crates	0.0%	0.0%	0.0
Treated/Painted/ Stained Wood	0.2%	0.2%	82.4
Other Recyclable Wood	0.2%	0.1%	67.3
Remainder/Composite Organics	1.0%	0.6%	411.1
<i>Organics</i>	<b>35.4%</b>	<b>3.3%</b>	<b>15,235.0</b>
Hazardous Waste and Sharps	11.1%	3.2%	4,775.0
Special Waste	0.0%	0.0%	9.7
Batteries	0.1%	0.1%	40.8
E-waste and Small Appliances	0.6%	0.3%	254.3
C&D/Inert Waste	1.9%	0.9%	808.1
Bulky Items	0.0%	0.0%	0.0
Tanglers	1.0%	0.5%	417.3
Textiles	2.6%	0.9%	1,124.4
Pet Waste	11.9%	2.6%	5,102.8
Miscellaneous Inorganics	2.7%	0.7%	1,172.3
Mixed Residue	1.8%	0.4%	792.1
Disposable Vapes	0.0%	0.0%	5.3
<i>Miscellaneous</i>	<b>33.7%</b>	<b>3.8%</b>	<b>14,502.2</b>



**Table B-2. Detailed Composition Table, Single-family Recycling**

Single-family Recycling			
Material	Composition (%)	± %	Estimated Tons
Plastic and Wax Coated Cardboard	0.0%	0.0%	3.6
Corrugated Cardboard	21.1%	3.2%	5,405.5
High Grade Recyclable Paper	9.9%	2.1%	2,525.4
Low Grade Mixed Recyclable Paper	17.7%	2.2%	4,527.8
Aseptic Cartons and Gable tops	0.9%	0.3%	238.0
Poly-coated and semi-poly-coated paper	0.6%	0.1%	155.6
Compostable Paper	1.5%	0.4%	394.5
Remainder/Composite (non-recyclable) Paper	1.7%	0.5%	434.3
<i>Paper</i>	<b>53.4%</b>	<b>4.3%</b>	<b>13,684.7</b>
CRV PET (#1) Bottles	1.6%	0.5%	408.1
Non-CRV PET (#1) Bottles and Containers	1.1%	0.3%	270.5
PET Food Service Ware (thermoforms)	1.8%	0.5%	461.5
CRV HDPE (#2) Bottles	0.1%	0.1%	16.3
Non-CRV HDPE (#2) Bottles and Containers	2.0%	0.5%	511.2
PP (#5) Bottles, Jugs, Jars, and Containers	1.5%	0.3%	380.9
Compostable Bags	0.1%	0.0%	21.7
Compostable Plastic (#7)	0.0%	0.0%	12.7
Bulky Rigid Plastics	0.1%	0.1%	23.5
Other Rigid Plastics	0.2%	0.2%	63.3
Industrial Commercial/Industrial Packaging Film	0.1%	0.1%	34.4
Plastic Garbage and Merchandise Bags	0.7%	0.2%	174.6
Other Film Plastic	1.9%	0.3%	474.1
Flexible Plastic Pouches	0.0%	0.0%	10.9
Other Remainder/Composite Plastic	1.0%	0.2%	251.5
<i>Plastic</i>	<b>12.2%</b>	<b>1.5%</b>	<b>3,115.4</b>
Aluminum Cans	1.7%	0.4%	428.9
Tin/Steel Cans	1.4%	0.4%	361.0
Major Appliances	0.0%	0.0%	0.0
Other Ferrous Metal	1.3%	0.6%	332.1
Other Non-Ferrous Metal	0.6%	0.1%	164.7
Other Remainder/Composite Metal	0.0%	0.0%	1.8
<i>Metal</i>	<b>5.0%</b>	<b>0.9%</b>	<b>1,288.5</b>
CRV Glass Bottles and Jars	9.3%	1.9%	2,390.6
Non-CRV Glass Bottles and Jars	5.0%	0.8%	1,286.7
Remainder/Composite Glass	0.8%	0.5%	209.9
<i>Glass</i>	<b>15.2%</b>	<b>2.1%</b>	<b>3,887.2</b>
Food - Potentially Donatable - Vegetative (Perishable/Fresh)	0.0%	0.0%	0.0
Food - Potentially Donatable - Eggs, Dairy, and Dairy Alternatives	0.0%	0.0%	11.8
Food - Potentially Donatable - Meat	0.0%	0.0%	0.0
Food - Potentially Donatable - Cooked/Baked/Prepared Perishable Items	0.0%	0.0%	0.0
Food - Potentially Donatable - Packaged Non-Perishable	2.1%	1.0%	533.9
Food - Not Donateable - Meat	0.1%	0.0%	19.0
Food - Not Donateable non-Meat	1.8%	0.5%	466.9
Food - Inedible	0.9%	0.2%	219.0
Leaves and Grass	0.0%	0.0%	5.4
Prunings and Trimmings	0.0%	0.0%	10.0
Branches and Stumps	0.0%	0.0%	0.0
Manures	0.0%	0.0%	0.0
Clean Dimensional Lumber	0.0%	0.0%	7.2
Clean Engineered Wood	0.0%	0.0%	0.0
Clean Pallets and Crates	0.0%	0.0%	0.0
Treated/Painted/ Stained Wood	0.0%	0.0%	0.9
Other Recyclable Wood	0.0%	0.0%	9.0
Remainder/Composite Organics	0.1%	0.0%	29.0
<i>Organics</i>	<b>5.1%</b>	<b>1.3%</b>	<b>1,312.0</b>
Hazardous Waste and Sharps	2.9%	0.4%	739.3
Special Waste	0.0%	0.0%	0.0
Batteries	0.0%	0.0%	0.0
E-waste and Small Appliances	1.5%	0.0%	378.2
C&D/Inert Waste	1.0%	0.1%	247.9
Bulky Items	2.0%	0.0%	521.2
Tanglers	0.2%	0.1%	39.8
Textiles	0.7%	0.3%	171.0
Pet Waste	0.0%	0.0%	11.8
Miscellaneous Inorganics	0.6%	0.3%	161.1
Mixed Residue	0.2%	0.1%	55.2
Disposable Vapes	0.0%	0.0%	1.8
<i>Miscellaneous</i>	<b>9.1%</b>	<b>0.8%</b>	<b>2,327.2</b>

**Table B-3. Detailed Composition Table, Single-family Organics**

Single-family Organics			
Material	Composition (%)	± %	Estimated Tons
Plastic and Wax Coated Cardboard	0.0%	0.0%	22.4
Corrugated Cardboard	0.5%	0.5%	298.6
High Grade Recyclable Paper	0.1%	0.1%	32.9
Low Grade Mixed Recyclable Paper	0.1%	0.1%	79.0
Aseptic Cartons and Gable tops	0.0%	0.0%	0.7
Poly-coated and semi-poly-coated paper	0.1%	0.0%	32.9
Compostable Paper	0.6%	0.6%	423.7
Remainder/Composite (non-recyclable) Paper	0.0%	0.0%	20.3
<i>Paper</i>	1.4%	1.4%	910.4
CRV PET (#1) Bottles	0.0%	0.0%	8.4
Non-CRV PET (#1) Bottles and Containers	0.0%	0.0%	0.0
PET Food Service Ware (thermoforms)	0.0%	0.0%	2.1
CRV HDPE (#2) Bottles	0.0%	0.0%	0.0
Non-CRV HDPE (#2) Bottles and Containers	0.0%	0.0%	1.4
PP (#5) Bottles, Jugs, Jars, and Containers	0.0%	0.0%	7.0
Compostable Bags	0.1%	0.1%	42.7
Compostable Plastic (#7)	0.0%	0.0%	0.7
Bulky Rigid Plastics	0.0%	0.0%	0.0
Other Rigid Plastics	0.0%	0.0%	7.0
Industrial Commercial/Industrial Packaging Film	0.0%	0.0%	0.0
Plastic Garbage and Merchandise Bags	0.0%	0.0%	11.9
Other Film Plastic	0.1%	0.0%	35.7
Flexible Plastic Pouches	0.0%	0.0%	1.4
Other Remainder/Composite Plastic	0.1%	0.1%	37.8
<i>Plastic</i>	0.2%	0.2%	155.9
Aluminum Cans	0.0%	0.0%	4.9
Tin/Steel Cans	0.0%	0.0%	2.8
Major Appliances	0.0%	0.0%	0.0
Other Ferrous Metal	0.0%	0.0%	11.9
Other Non-Ferrous Metal	0.0%	0.0%	9.1
Other Remainder/Composite Metal	0.0%	0.0%	0.0
<i>Metal</i>	0.0%	0.0%	28.7
CRV Glass Bottles and Jars	0.2%	0.2%	141.2
Non-CRV Glass Bottles and Jars	0.0%	0.0%	7.0
Remainder/Composite Glass	0.0%	0.0%	1.4
<i>Glass</i>	0.2%	0.2%	149.6
Food - Potentially Donatable - Vegetative (Perishable/Fresh)	0.1%	0.1%	46.2
Food - Potentially Donatable - Eggs, Dairy, and Dairy Alternatives	0.0%	0.0%	0.0
Food - Potentially Donatable - Meat	0.0%	0.0%	0.0
Food - Potentially Donatable - Cooked/Baked/Prepared Perishable Items	0.0%	0.0%	0.0
Food - Potentially Donatable - Packaged Non-Perishable	0.0%	0.0%	0.7
Food - Not Donatable - Meat	0.2%	0.2%	131.5
Food - Not Donatable non-Meat	2.8%	1.4%	1,810.4
Food - Inedible	3.1%	2.2%	2,030.6
Leaves and Grass	67.2%	5.7%	43,880.9
Prunings and Trimmings	18.7%	3.5%	12,171.6
Branches and Stumps	0.2%	0.2%	113.3
Manures	0.0%	0.0%	0.0
Clean Dimensional Lumber	0.3%	0.3%	197.2
Clean Engineered Wood	0.0%	0.0%	0.7
Clean Pallets and Crates	0.0%	0.0%	0.0
Treated/Painted/ Stained Wood	0.1%	0.0%	37.8
Other Recyclable Wood	0.0%	0.0%	1.4
Remainder/Composite Organics	0.0%	0.0%	4.9
<i>Organics</i>	92.6%	6.4%	60,427.0
Hazardous Waste and Sharps	0.1%	0.1%	55.9
Special Waste	0.0%	0.0%	0.0
Batteries	0.0%	0.0%	0.7
E-waste and Small Appliances	0.0%	0.0%	0.7
C&D/Inert Waste	4.6%	1.5%	2,996.3
Bulky Items	0.0%	0.0%	0.0
Tanglers	0.0%	0.0%	21.0
Textiles	0.1%	0.1%	60.8
Pet Waste	0.5%	0.5%	302.1
Miscellaneous Inorganics	0.0%	0.0%	26.6
Mixed Residue	0.2%	0.2%	127.3
Disposable Vapes	0.0%	0.0%	0.0
<i>Miscellaneous</i>	5.5%	1.8%	3,591.4

**Table B-4. Detailed Composition Table, Commercial Landfill Stream**

Commercial Garbage			
Material	Composition (%)	± %	Estimated Tons
Plastic and Wax Coated Cardboard	0.0%	0.0%	7.7
Corrugated Cardboard	1.7%	0.3%	455.4
High Grade Recyclable Paper	1.6%	0.5%	432.6
Low Grade Mixed Recyclable Paper	5.6%	0.5%	1,537.2
Aseptic Cartons and Gable tops	0.7%	0.2%	201.0
Poly-coated and semi-poly-coated paper	4.0%	0.6%	1,084.7
Compostable Paper	9.7%	0.8%	2,652.7
Remainder/Composite (non-recyclable) Paper	1.9%	0.6%	520.9
<i>Paper</i>	<b>25.2%</b>	<b>1.7%</b>	<b>6,892.3</b>
CRV PET (#1) Bottles	0.7%	0.1%	185.4
Non-CRV PET (#1) Bottles and Containers	0.3%	0.1%	89.9
PET Food Service Ware (thermoforms)	0.9%	0.1%	257.5
CRV HDPE (#2) Bottles	0.0%	0.0%	2.4
Non-CRV HDPE (#2) Bottles and Containers	1.0%	0.2%	261.8
PP (#5) Bottles, Jugs, Jars, and Containers	1.7%	0.2%	457.2
Compostable Bags	0.1%	0.0%	16.2
Compostable Plastic (#7)	0.1%	0.0%	37.7
Bulky Rigid Plastics	0.4%	0.3%	102.6
Other Rigid Plastics	0.7%	0.1%	193.1
Industrial Commercial/Industrial Packaging Film	0.3%	0.3%	84.1
Plastic Garbage and Merchandise Bags	4.6%	0.4%	1,266.7
Other Film Plastic	4.6%	0.6%	1,251.6
Flexible Plastic Pouches	0.1%	0.0%	23.6
Other Remainder/Composite Plastic	2.1%	0.3%	578.2
<i>Plastic</i>	<b>17.6%</b>	<b>1.2%</b>	<b>4,807.9</b>
Aluminum Cans	0.6%	0.1%	156.5
Tin/Steel Cans	0.6%	0.2%	170.5
Major Appliances	0.0%	0.0%	0.0
Other Ferrous Metal	0.9%	0.3%	238.2
Other Non-Ferrous Metal	0.8%	0.2%	223.8
Other Remainder/Composite Metal	0.2%	0.2%	59.9
<i>Metal</i>	<b>3.1%</b>	<b>0.6%</b>	<b>849.0</b>
CRV Glass Bottles and Jars	1.2%	0.1%	316.9
Non-CRV Glass Bottles and Jars	0.3%	0.1%	94.4
Remainder/Composite Glass	0.3%	0.1%	91.8
<i>Glass</i>	<b>1.8%</b>	<b>0.2%</b>	<b>503.1</b>
Food - Potentially Donatable - Vegetative (Perishable/Fresh)	0.1%	0.1%	23.9
Food - Potentially Donatable - Eggs, Dairy, and Dairy Alternatives	0.2%	0.1%	54.1
Food - Potentially Donatable - Meat	0.1%	0.1%	23.6
Food - Potentially Donatable - Cooked/Baked/Prepared Perishable Items	0.3%	0.1%	94.4
Food - Potentially Donatable - Packaged Non-Perishable	0.8%	0.3%	216.2
Food - Not Donatable - Meat	1.0%	0.3%	279.3
Food - Not Donatable non-Meat	13.2%	1.8%	3,598.2
Food - Inedible	7.4%	1.2%	2,026.5
Leaves and Grass	0.6%	0.4%	170.3
Prunings and Trimmings	0.5%	0.3%	131.8
Branches and Stumps	0.0%	0.0%	0.0
Manures	0.0%	0.0%	0.0
Clean Dimensional Lumber	0.5%	0.3%	124.4
Clean Engineered Wood	0.0%	0.0%	7.7
Clean Pallets and Crates	0.1%	0.1%	17.8
Treated/Painted/ Stained Wood	1.5%	0.9%	409.8
Other Recyclable Wood	0.1%	0.0%	19.4
Remainder/Composite Organics	0.6%	0.2%	164.2
<i>Organics</i>	<b>26.9%</b>	<b>2.5%</b>	<b>7,361.4</b>
Hazardous Waste and Sharps	9.2%	2.1%	2,515.9
Special Waste	0.0%	0.0%	1.6
Batteries	0.0%	0.0%	4.0
E-waste and Small Appliances	0.6%	0.3%	164.2
C&D/Inert Waste	1.2%	0.6%	332.3
Bulky Items	0.2%	0.2%	66.6
Tanglers	0.4%	0.2%	100.5
Textiles	2.8%	0.6%	762.0
Pet Waste	2.7%	1.2%	744.5
Miscellaneous Inorganics	2.9%	0.5%	798.0
Mixed Residue	5.3%	0.6%	1,454.2
Disposable Vapes	0.0%	0.0%	5.6
<i>Miscellaneous</i>	<b>25.4%</b>	<b>2.8%</b>	<b>6,949.3</b>

**Table B-5. Detailed Composition Table, Multifamily Landfill Stream**

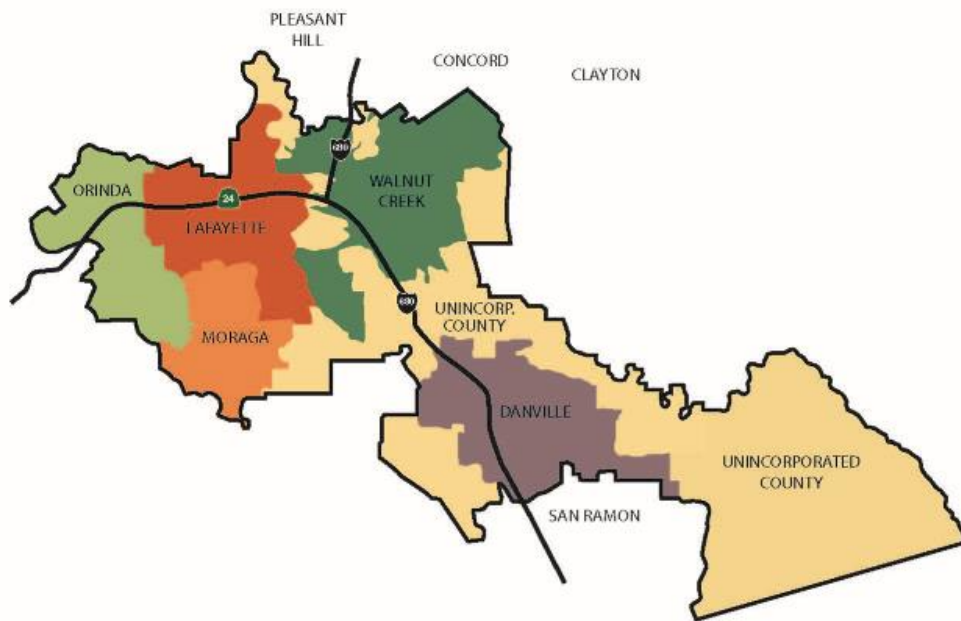
Multifamily Garbage			
Material	Composition (%)	± %	Estimated Tons
Plastic and Wax Coated Cardboard	0.0%	0.0%	0.0
Corrugated Cardboard	1.7%	0.5%	176.7
High Grade Recyclable Paper	0.5%	0.2%	55.0
Low Grade Mixed Recyclable Paper	5.6%	0.7%	570.4
Aseptic Cartons and Gable tops	0.4%	0.1%	38.3
Poly-coated and semi-poly-coated paper	1.7%	0.3%	171.9
Compostable Paper	7.4%	0.7%	752.0
Remainder/Composite (non-recyclable) Paper	0.7%	0.1%	70.7
<i>Paper</i>	<b>18.0%</b>	<b>1.4%</b>	<b>1,835.0</b>
CRV PET (#1) Bottles	0.5%	0.1%	50.4
Non-CRV PET (#1) Bottles and Containers	0.4%	0.1%	45.2
PET Food Service Ware (thermoforms)	0.9%	0.1%	93.6
CRV HDPE (#2) Bottles	0.0%	0.0%	1.8
Non-CRV HDPE (#2) Bottles and Containers	0.4%	0.1%	43.0
PP (#5) Bottles, Jugs, Jars, and Containers	1.1%	0.2%	116.2
Compostable Bags	0.2%	0.1%	21.1
Compostable Plastic (#7)	0.0%	0.0%	0.8
Bulky Rigid Plastics	0.5%	0.5%	52.6
Other Rigid Plastics	0.5%	0.1%	52.2
Industrial Commercial/Industrial Packaging Film	0.0%	0.0%	0.0
Plastic Garbage and Merchandise Bags	2.3%	0.2%	231.5
Other Film Plastic	3.4%	0.3%	348.5
Flexible Plastic Pouches	0.0%	0.0%	4.2
Other Remainder/Composite Plastic	2.0%	0.4%	208.6
<i>Plastic</i>	<b>12.5%</b>	<b>1.1%</b>	<b>1,269.6</b>
Aluminum Cans	0.3%	0.1%	34.5
Tin/Steel Cans	0.6%	0.1%	62.2
Major Appliances	0.0%	0.0%	0.0
Other Ferrous Metal	1.1%	0.4%	111.8
Other Non-Ferrous Metal	0.7%	0.1%	69.5
Other Remainder/Composite Metal	0.1%	0.1%	8.6
<i>Metal</i>	<b>2.8%</b>	<b>0.4%</b>	<b>286.7</b>
CRV Glass Bottles and Jars	1.0%	0.2%	99.2
Non-CRV Glass Bottles and Jars	1.0%	0.2%	101.8
Remainder/Composite Glass	0.5%	0.2%	53.6
<i>Glass</i>	<b>2.5%</b>	<b>0.3%</b>	<b>254.6</b>
Food - Potentially Donatable - Vegetative (Perishable/Fresh)	0.8%	0.6%	82.3
Food - Potentially Donatable - Eggs, Dairy, and Dairy Alternatives	0.1%	0.1%	14.5
Food - Potentially Donatable - Meat	0.2%	0.1%	17.9
Food - Potentially Donatable - Cooked/Baked/Prepared Perishable Items	0.7%	0.3%	71.9
Food - Potentially Donatable - Packaged Non-Perishable	1.3%	0.5%	134.1
Food - Not Donatable - Meat	1.3%	0.3%	133.3
Food - Not Donatable non-Meat	11.5%	1.3%	1,175.7
Food - Inedible	9.5%	1.5%	967.9
Leaves and Grass	1.1%	0.8%	108.4
Prunings and Trimmings	0.7%	0.4%	75.9
Branches and Stumps	0.0%	0.0%	0.0
Manures	0.0%	0.0%	0.0
Clean Dimensional Lumber	0.2%	0.2%	19.7
Clean Engineered Wood	0.0%	0.0%	4.4
Clean Pallets and Crates	0.0%	0.0%	0.0
Treated/Painted/ Stained Wood	0.9%	0.5%	91.7
Other Recyclable Wood	0.0%	0.0%	2.6
Remainder/Composite Organics	3.3%	2.3%	334.5
<i>Organics</i>	<b>31.7%</b>	<b>2.4%</b>	<b>3,234.7</b>
Hazardous Waste and Sharps	8.4%	1.7%	858.3
Special Waste	0.0%	0.0%	0.0
Batteries	0.0%	0.0%	3.6
E-waste and Small Appliances	2.5%	1.4%	250.1
C&D/Inert Waste	3.2%	1.9%	324.6
Bulky Items	0.2%	0.2%	18.9
Tanglers	0.5%	0.3%	47.6
Textiles	3.4%	0.7%	350.3
Pet Waste	4.5%	1.4%	457.7
Miscellaneous Inorganics	2.8%	0.6%	282.5
Mixed Residue	7.0%	0.9%	712.1
Disposable Vapes	0.0%	0.0%	2.8
<i>Miscellaneous</i>	<b>32.5%</b>	<b>2.3%</b>	<b>3,308.5</b>

## Appendix C. Sampling Plan

# Waste Characterization and Capture Rate Study

## Overview & Background

The Central Contra Costa Solid Waste Authority (RecycleSmart) received a grant from CalRecycle and contracted HDR Engineering, Inc., (HDR) to perform a Waste Characterization and Capture Rate Study (Study) within its service area. RecycleSmart provides solid waste services for central Contra Costa County including the communities of Danville, Lafayette, Moraga, Orinda, Walnut Creek, and some unincorporated areas of the County including Alamo, Blackhawk, and Diablo, as shown in Figure 1. .



**Figure 1. RecycleSmart Service Areas<sup>1</sup>**

The Study will analyze the garbage, recycling, and organics streams in the single-family sector, and the garbage stream in the multifamily and commercial sectors within the service area. A Capture Rate Study will be performed to collect data from the single-family sector, and a traditional Waste Characterization Study will be performed to collect data from the multifamily and commercial sectors. This Study will analyze and summarize composition data regarding the materials that appear in each of these streams, with a focus on contaminants and other materials of interest. This document describes the sampling plan for collecting and characterizing samples from each stream and each sector.

## Definitions

- **Waste Characterization Study:** A traditional waste composition study collects back-of-truck samples from incoming vehicles arriving to a transfer or disposal facility.

<sup>1</sup> <https://www.recyclesmart.org/service-area/>



- **Capture Rate Study:** A capture rate study collects samples from the source (in this case, single-family residences) and allows for the calculation of recycling rates of specific materials.
- **Sectors:**
  - **Single-family:** Waste generated by households or residences designed for one family only and hauled by a contracted vehicle.
  - **Multifamily:** Waste generated by multifamily properties such as apartments and condominiums with shared garbage services.
  - **Commercial:** Waste hauled by a contracted vehicle in which 80 percent or more of the waste is from institutional, commercial, or industrial sources. May include waste from multifamily properties.

### Schedule

The fieldwork portion of this Study will occur in March 2025 over four consecutive weeks. Sampling of the single-family sector will be conducted over a two-week period (10 days), Monday through Friday, multifamily sampling will occur over three consecutive days, and commercial sampling will occur over the course of a single week (5 days). Table 1 details the field work schedule.

**Table 1. Field Work Schedule**

Sampling Sector	Dates (2025)
Single-family	March 3–7; March 10–14
Multifamily	March 19–21
Commercial	March 24–28

### Sample Sources

All sample collection and sorting will occur on site at the Republic Services' Contra Costa Transfer & Recovery Station (CCTRS) in Martinez (951 Waterbird Way, Martinez, CA 94553) with the exception of the single-family Capture Rate Study, during which samples will be collected directly from households by HDR.

### Sample Allocation

Table 2 presents an overview of the sample allocations by sector and stream over the course of the study. To ensure representative samples for each sector, samples are spread as evenly as possible across each of the six jurisdictions in the RecycleSmart service area (as outlined in Table 3).

**Table 2. Sample Allocations by Stream**

Stream	Garbage	Recycling	Organics	TOTAL
Single-family	Up to 120	Up to 120	Up to 120	Up to 360





Stream	Garbage	Recycling	Organics	TOTAL
Multifamily	24	0	0	24
Commercial	50	0	0	50
TOTAL	<= 194	<= 120	<= 120	<= 434

For the traditional Waste Characterization Study of commercial samples, the number of samples included in the study aligns with ASTM standards to ensure statistical significance. As ASTM standards do not apply to capture rates studies, the number of households aligns with other models studies performed in other cities. All results will be presented with a 90% confidence interval.

#### SINGLE-FAMILY CAPTURE RATE STUDY

During the course of the Capture Rate Study, up to one sample each of garbage, organics, and recycling will be collected from 12 single-family residences each day. This means the team will collect a total of up to 120 garbage samples, 120 recycling samples, and 120 organics samples, for a grand total of up to 360 samples. The final sample count may be less than 360 if participating households do not have all three streams set out. Table 3 and Table 4 show the number of single-family households selected for sampling in each jurisdiction by week.

**Table 3. Week 1: Number of Households by Jurisdiction and Day of Week**

Jurisdiction	Mon 3/3	Tues 3/4	Wed 3/5	Thurs 3/6	Fri 3/7	Total
Orinda						0
Walnut Creek				12		12
Danville					12	12
Lafayette			12			12
Moraga		12				12
Uninc. County	12					12
<b>Total</b>	12	12	12	12	12	60

**Table 4. Week 2: Number of Households by Jurisdiction and Day of Week**

Jurisdiction	Mon 3/10	Tues 3/11	Wed 3/12	Thurs 3/13	Fri 3/14	Total
Orinda					12	12
Walnut Creek	12					12
Danville			12			12
Lafayette				12		12
Moraga						0
Uninc. County		12				12
<b>Total</b>	12	12	12	12	12	60

## MULTIFAMILY WASTE CHARACTERIZATION

Over the course of three days, 24 samples will be collected from the multifamily garbage stream. Table 5 shows the number of samples that will be collected from each jurisdiction by day.

**Table 5. Multifamily Sample Allocations by Jurisdiction and Day of Week**

Jurisdiction	Wed 3/19	Thurs 3/20	Fri 3/21	Total
Uninc. County	4			4
Danville	4			4
Lafayette		4		4
Orinda		4		4
Walnut Creek			4	4
Moraga			4	4
<b>Total</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>24</b>

## COMMERCIAL WASTE CHARACTERIZATION

Over the course of one week, 50 samples will be collected from the commercial sector. Table 6 shows the daily number of commercial samples that will be collected from each jurisdiction.

**Table 6 Commercial Sample Allocations by Jurisdiction and Day of Week**

Jurisdiction	Mon 3/24	Tues 3/28	Wed 3/29	Thurs 3/30	Fri 3/31	Total
Uninc. County	2	2	1	2	2	9
Danville	2	2	1	2	2	9
Lafayette	2	1	2	2	1	8
Orinda	2	1	2	2	1	8
Walnut Creek	1	2	2	1	2	8
Moraga	1	2	2	1	2	8
<b>Total</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>50</b>

## Coordination of Field Work and Safety Protocols

HDR held a Study kickoff meeting with RecycleSmart on November 4, 2025, to discuss the Study objectives, Study protocols, material list, and roles and responsibilities. On December 12, 2025, the project team met with Republic Services (Republic) to discuss sampling protocols and data needs to complete this sampling plan. On January 2, 2025, HDR and RecycleSmart met with Republic at the CCTRS to discuss fieldwork logistics, including identifying a site contact, discussing sorting area requirements, personal protective equipment (PPE) and safety protocols, and sampling procedures.

HDR's field crew will consist of one field manager and six crew members. HDR will provide and monitor the field crew responsible for sample collection and sorting. The HDR team will provide PPE, scales, field forms and other equipment necessary to conduct the fieldwork. The field crew

will be fully equipped with hard hats, inner and outer gloves, safety glasses, vests, and steel-toed boots to safely perform their responsibilities. Example field forms are included in Appendix B. Example Field Forms

The Site-Specific Safety, Health & Environment (SH&E) Plan is included in Appendix C. Health & Safety Plan. Safety protocols outlined in the SH&E Plan will be followed by all HDR and subcontractor staff in addition to any safety requirements/protocols in place at the CCTRS. Daily training refreshers, Job Hazard Analysis reviews, and safety moments will be organized and led by the HDR Field Manager to discuss any relevant safety topics. In alignment with the SH&E Plan, the following listed safety procedures will be followed:

- Do not dig into a sample, but instead carefully lift materials so that staff does not get stuck by a needle, cut by broken glass or dip hand into hazardous materials;
- Do not touch syringes or suspicious materials (including any materials with red staining, containers taped together, or any unusual amount of ammonia bottles, cold capsules, or similar containers; these items may indicate methamphetamine paraphernalia) – move these materials to the designated material bin using shovel or hand tools;
- Do not touch other potentially hazardous materials – move these materials to the designated household hazardous waste (HHW) bin using a dustpan or hand tools;
- Work from the tables instead of the ground;
- Take rest and refreshment breaks as needed; and
- No eating in the characterization area.

## Select Routes

### Single-family

Republic provided HDR with a list of every single-family route. To randomly select routes for sampling, HDR organized routes by collection day and service area, then used the =rand() function in Microsoft Excel. This function randomly assigns numbers to each address and the highest numbers were selected for sampling. From those routes, HDR randomly selected 12 addresses for sampling. Random selection ensures accurate representation of households and high-quality data.

### Multifamily

Republic's commercial routes normally collect material from both multifamily and commercial customers along the same route. To separate multifamily material and confirm pure multifamily loads for sampling, Republic provided HDR with a complete list of multifamily properties in the RecycleSmart service area. HDR randomly selected multifamily addresses to create a specialized collection route for each day of multifamily sampling.

Republic will direct drivers of the specialized routes to pick up multifamily material from the pre-determined properties and deliver the material to the CCTRS. Republic will notify HDR of their anticipated time of arrival and the vehicle will be directed to tip their load in a designated tipping

area. Loads will be collected the day prior to scheduled sorting and left at the CCTRS overnight to ensure material is ready for sorting at the start of the field day.

### **Commercial**

Republic provided HDR with a commercial garbage route schedule and HDR randomly selected the garbage routes to include in the study. HDR determined the daily number of incoming vehicles to select from each jurisdiction to ensure equal representation across the service area. During field work, the scalehouse will be provided with a list of pre-selected commercial loads on a *Vehicle Selection Sheet*. When those vehicles arrive, the scalehouse attendant will confirm that the loads are 80 percent commercial material. If the load qualifies for sampling, the scalehouse attendant will ask the driver to tip their load in a designated area and notify the field crew of the incoming load. If the load is less than 80 percent commercial material, the scalehouse attendant will instead select the next eligible incoming vehicle from that jurisdiction for sampling.

## **Selected Samples**

### **Single-family**

The single-family sample collection team (Sample Collection Team) will consist of the HDR Field Manager and one additional staff member. Each day of field work, the Sample Collection Team will drive along the selected residential route and collect samples from the pre-selected households. The team will drive the routes approximately one hour ahead of the collection vehicles to verify that the study does not impact collection operations while providing residents with the maximum amount of time to set out their carts.

When the Sample Collection Team arrives at an address selected for sampling, they will separately collect the material from the garbage, recycling, and organics carts. If no carts are set out, they will move to the next address on that route. If the material has already been collected and the carts are empty along a route, they will move on to an alternative route, if necessary. If a household has garbage set out, but no recycle or organics set out, for example, the Sample Collection Team will collect the garbage sample and record the recycle sample and organics sample as “zero weight” samples.

The Sample Collection Team will place the extracted material from each cart onto a tarp, and secure the tarp with a *Sample Placard*. The Sample Collection Team will take care to verify that samples are tagged with a *Sample Placard*, so no samples are mixed, and samples from the same address are marked as such. The Sample Collection Team will then deliver the collected samples to the Martinez Transfer Station for weighing and sorting.

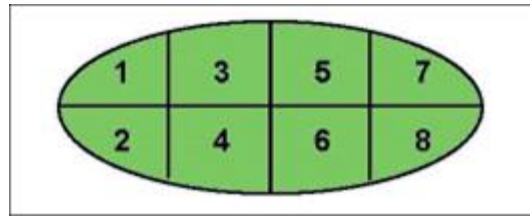
### **Multifamily and Commercial**

Pre-selected commercial garbage loads and specialized multifamily loads will be directed to dump into a designated area at the transfer station. The Field Manager will be notified by the scalehouse when a load arrives and meet the incoming vehicle in the designated tipping area. To ensure representative material for sampling and sorting, the Field Manager will select

samples from random locations within the selected loads. A random cell number (see Figure 2) will be preprinted on each individual *Sample Placard* provided by HDR.

Samples from the commercial and multifamily garbage streams will be obtained as follows:

1. Targeted vehicles will be directed to dump in a designated area. This area should have appropriate room to allow inspection and access around the pile.
2. The load of waste material will be visually separated into approximately eight subsections (Figure 2). With support from facility staff, the HDR field staff will identify the randomly pre-selected subsection, and will instruct the front loader to grab 200–225 pounds of material from that subsection. The crew will weigh the sample prior to sorting to confirm that the target weight has been achieved. If there are not enough commercial or multifamily vehicles to meet the daily sample quota, multiple samples may be removed from a single load.



**Figure 2. 8-cell Load**

## Sort Samples

HDR's hand sort procedure is generally guided by the ASTM Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (ASTM D5231-92). All samples will be hand sorted into the 61 material categories listed in Appendix A. Material Categories.

The following steps will be taken to hand sort each sample:

1. Move materials included in the sample from the staging area to the sorting area and place on sort table.
2. Hand sort all material into the 61 material categories, placing each material into its designated bins. Members of the sorting team will be assigned specific material categories for efficiency.
3. Conduct a quality check of the sorted material. After all materials in the sample have been sorted, the Field Manager will conduct a final QC check of the bins to ensure materials were properly categorized and take photographs of the bins.
4. Weigh each bin. The crew members will manually transport the bins from the characterization area to the scale. The Field Manager will work with the field crew members to document the gross weight of each bin to the nearest 0.1 pound into a digital database and ensure no bins are emptied prior to weighing. *Paper Material Tally Forms* will be created as a back-up in the case of digital equipment failure.



5. Dispose of material. After weights are recorded, the field crew will empty the weighed material into a designated container provided by Republic.
6. Clean the station. At the conclusion of each day of field work, the field crew will clean the area and reorganize the empty bins.

This process will be repeated until all the samples have been sorted and weighed. Proper site layout and close supervision of sampling will be maintained to reduce sampling bias or other impacts on the integrity of the data, as well as to reduce impacts on facility operations.

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# Appendix D. Recoverability Group Designations

Materials			Recoverability Designation				
Mat Class	Mat #	Material Type	Recyclable	Compostable	Non-recoverable	Potentially Recoverable	Currently Recovered through Special Programs
PAPER	1	Plastic and Wax Coated Cardboard				X	
PAPER	2	Corrugated Cardboard	X				
PAPER	3	High Grade Recyclable Paper	X				
PAPER	4	Low Grade Mixed Recyclable Paper	X				
PAPER	5	Aseptic Cartons and Gable tops				X	
PAPER	6	Poly-coated and semi-poly-coated paper				X	
PAPER	7	Compostable Paper		X			
PAPER	8	Remainder/Composite (Non-recyclable) Paper			X		
PLASTIC	9	CRV PET (#1) Bottles	X				
PLASTIC	10	Non-CRV PET (#1) Bottles and Containers	X				
PLASTIC	11	PET Food Service Ware (thermoforms)	X				
PLASTIC	12	CRV HDPE (#2) Bottles	X				
PLASTIC	13	Non-CRV HDPE (#2) Bottles and Containers	X				
PLASTIC	14	PP (#5) Bottles, Jugs, Jars, and Containers	X				
PLASTIC	15	Compostable Bags		X			
PLASTIC	16	Compostable Plastic (#7)			X		
PLASTIC	17	Bulky Rigid Plastics	X				
PLASTIC	18	Other Rigid Plastics				X	
PLASTIC	19	Industrial Commercial/Industrial Packaging Film				X	
PLASTIC	20	Plastic Garbage and Merchandise Bags				X	
PLASTIC	21	Other Film Plastic				X	
PLASTIC	22	Flexible Plastic Pouches			X		
PLASTIC	23	Other Remainder/Composite Plastic			X		
METAL	24	Aluminum Cans	X				
METAL	25	Tin/Steel Cans	X				
METAL	26	Major Appliances					X
METAL	27	Other Ferrous Metal	X				
METAL	28	Other Non-Ferrous Metal	X				
METAL	29	Other Remainder/Composite Metal			X		
GLASS	30	CRV Glass Bottles and Jars	X				
GLASS	31	Non-CRV Glass Bottles and Jars	X				
GLASS	32	Remainder/Composite Glass			X		
ORGANICS	33	Food - Potentially Donatable - Vegetative		X			
ORGANICS	34	Food - Potentially Donatable - Eggs, Dairy, and Dairy		X			
ORGANICS	35	Food - Potentially Donatable - Meat		X			
ORGANICS	36	Food - Potentially Donatable - Cooked/Baked/Prepared Perishable Items		X			
ORGANICS	37	Food - Potentially Donatable - Packaged Non-		X			
ORGANICS	38	Food - Not Donatable - Meat		X			
ORGANICS	39	Food - Not Donatable non-Meat		X			
ORGANICS	40	Food - Inedible		X			
ORGANICS	41	Leaves and Grass		X			
ORGANICS	42	Prunings and Trimmings		X			
ORGANICS	43	Branches and Stumps		X			
ORGANICS	44	Manures				X	
ORGANICS	45	Clean Dimensional Lumber		X			
ORGANICS	46	Clean Engineered Wood				X	
ORGANICS	47	Clean Pallets and Crates		X			
ORGANICS	48	Treated/Painted/ Stained Wood			X		
ORGANICS	49	Other Recyclable Wood		X			
ORGANICS	50	Remainder/Composite Organics			X		
OTHER	51	Hazardous Waste and Sharps					X
OTHER	52	Special Waste					X
OTHER	53	Batteries					X
OTHER	54	E-waste and Small Appliances					X
OTHER	55	C&D/Inert Waste					X
OTHER	56	Bulky Items				X	
OTHER	57	Tanglers			X		
OTHER	58	Textiles				X	
OTHER	59	Pet Waste			X		
OTHER	60	Miscellaneous Inorganics			X		
OTHER	61	Mixed Residue			X		
OTHER	62	Vapes			X		