Memorandum MONTEREY REGIONAL

WASTE MANAGEMENT DISTRICT

\_ Date: 10 /16 /2020 Reviewed by:

DATE: October 16, 2020

TO: General Manager

FROM: Senior Engineer and Director of Engineering & Compliance

SUBJECT: 2020 Single Stream Recycling Characterization Study by SCS Engineers

**RECOMMENDATION**: That the Board receive the 2020 Single Stream Recycling Characterization Study by SCS Engineers.

#### BACKGROUND

At their June 19, 2020 meeting, the Board authorized staff to engage SCS Engineers to conduct the second annual Characterization Study of the Single Stream Recyclables (SSR) materials delivered to MRWMD's Material Recovery Facility (MRF). This study was successfully conducted during July and August of 2020 and yielded a weighted average contamination rate of 30.0% for all SSR being delivered to MRWMD. The previous year's contamination rate was 22.0%.

#### DISCUSSION

The 2020 Single Stream Recycling Characterization Study was successfully conducted during July and August of 2020 and yielded a weighted average contamination rate of 30.0% for all SSR being delivered to MRWMD.

District staff worked with SCS to determine the statistically significant sample ratio for each jurisdiction delivering SSR to MRWMD. The District also worked with the collection companies to determine the pick-up schedule for each jurisdiction.

On each day of the study, scale staff directed the selected number of trucks to the sort area. SCS Engineers then pulled randomly selected samples from the chosen load and prepared them for processing.

The manual recycling characterization procedure used was based on ASTM procedure D 5231-92 which is consistent with the California statutory requirements in Public Resources Code 41030, et. Seq. and regulatory requirements of CalRecycle for performing recycling characterization studies. The 150-pound sample was placed on a sorting table and separated by hand into pre-determined material types (See "Category Table" on page 2). Each material type was weighed, and the composition of the sample was documented.

Residue material, which is material that does not fit into the pre-determined categories mentioned above, was characterized visually.

Of note is the impact that the COVID-19 pandemic had on the study and the public's behavior. With the reduction of the tourism industry on the Central Coast and the impact of shelter in place orders, this year's study results should be understood in that context. SCS has provided a section in their report to explain some of the observations they made in the field.

SCS Engineers WC Study October 16, 2020 Page 2

#### **RESULTS**

Results for the 2020 SSR composition study are included in the report. On average, the results show that 70.0% of the SSR being delivered to MRWMD is recyclable and 30.0% is contamination.

Major Waste Fractions	Waste Component Categories	Examples
i ya ina kata kata	Uncoated Corrugated Cardboard	Non-waxed shipping/moving boxes, 3-layers, no food residue
	White Office Paper	White paper
	Mixed Paper	office paper, computer paper, paper bags, phone books, magazines and catalogs, food/detergent boxes, office mix, junk mail
	Paper Board	Thick paper-based material, cereal box, supply box
	ONP	Oid newspaper
	PET	CRV containers, soda and water bottles
	PET Thermoform	Clamshells, cups, tubs, lids, boxes, trays, egg cartons and similar rigid, non-bottle packaging made of PET (#1) plastic resin
	Natural HDPE	Milk jugs, small juice bottles
		Detergent bottles, some hair-care bottles, some
seid	Pigment HDPE	margarine and yogurt tubs, clamshell packaging, empty motor oil, empty antifreeze, and other empty vehicle and equipment fuid containers
Recycla	Polypropylene #5 Polypropylene #5 Polypropylene #5	
	Rigid Plastic	Tubs backets toys
	Mixed Plastic #3, 4, 6, 7	Detergent/cleaning product bottles, personal care bottles, food containers, yogurt cups, synup bottles, microwave trays, clamshell-shaped fast food containers, vitamin bottles
	Film Plastic	Shrink-wrap, mattress bags, furniture wrap, and film bubble wrap, plastic shopping bags, dry cleaning bags, agricultural film
	Mixed Glass	All glass bottles and jars (mayonnaise, apple juice bottles, wine bottles, etc.), CA redemption bottles (beer, juice, wine coolers, etc.)
	Bi Metal	Steel/tin food and beverage cans, and foil food trays
	Aluminum	Aluminum beverage cans
	Aluminum other	Aluminum food cans (e.g., cat food cans), foil
Organics	Organic	Food Waste, food soiled paper, green waste, landscaping
-	ннж	Paint, vehicle and equipment fuid, used oil, batteries, mercury containing items, fuore-scentificity
	Batteries	Household battereries, watch battereis.
ľ	Medical Waste	Sharps, bandages, items containing bodily fluids
Other	Manufactured Products	Electronic waste, items with cord, brown goods, white goods
-	Połystyrene	Styrofoam clam shells, Styrofoam packaging
ļ.	Aseptic lined containers	Soup containers, soy containers
	Refuse	Anything else that does not fit in the above category

#### **Category Table**

#### CONCLUSION

The results of the study to characterize the materials in the recycling stream received at the District's MRF have multiple benefits of informing the MRF operations, informing improvements in the public outreach of recycling programs, reducing contamination in the recycling stream, and improving the quality of the bales of recyclable materials. Staff designs outreach and operational adjustments to take advantage of the information collected. Therefore, it is recommended that the Board receive the 2019 Single Stream Recycling Characterization Study by SCS Engineers.

David Ramifez

Guy R. Petraborg

Attachment: 2020 Recycling Characterization Study by SCS Engineers

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# 2020 Recycling Characterization Study

Monterey Regional Waste Management District 14201 Del Monte Blvd. Monterey County, CA 93933-1670

Attn: David Ramirez, P.E.

# SCS ENGINEERS

01219161.02 | October 17, 2020

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# 1.0 INTRODUCTION

The Monterey Regional Waste Management District (MRWMD or District) retained SCS Engineers (SCS) to conduct physical characterizations of the commercial and residential single-stream recycling (SSR) materials hauled to the District's Materials Recycling Facility (MRF) by GreenWaste Recovery, Monterey Disposal, Waste Management, Republic Services, City of Watsonville Public Works, and Recology. The project's goals are to understand the types of recyclable materials present, their relative presence, and the level of non-recyclable materials (referred to herein as "contamination" or "residual materials") delivered to the MRF by each of the franchised haulers for each of the municipalities they service. This characterization provides data to inform stakeholders of the composition and contamination rates of the SSR. It will also inform outreach staff regarding the contaminants to be targeted for behavior change and outreach efforts.

Hauler	Municipality Served		
	Marina		
	Sand City		
	Del Rey Oaks		
Greenwaste Recovery	Seaside		
	Carmel by the Sea		
	Pebble Beach		
	Pacific Grove		
Monterey City Disposal	City of Monterey		
Waste Management	Unincorporated Monterey County		
waste wanagement	King City		
Republic Services	Salinas		
City of Watsonville Public Works Department	Watsonville		
Recology	San Benito County		

Exhibit 1. Haulers and the Municipalities they Serve

# 2.0 METHODS

This section summarizes methods used to characterize the recycling stream generated from the cities of Marina, Sand City, Del Rey Oaks, Seaside, Carmel by the Sea, Pebble Beach, Pacific Grove, Monterey, King City, Salinas, and Watsonville; and portions of both San Benito County and Unincorporated Monterey County. Sampling and sorting activities for the study took place during the months of July and August 2020. Characterization activities involved manually sorting single stream recycling samples into 25 pre-determined material categories over two two-week periods (four weeks total). Data were recorded on the Manual Data Sorting Form for each sample, presented in **Exhibit 2**. Examples for each of the material types are included on the Sorting Form.

# 2.1 SELECTING THE SAMPLES TO BE SORTED

Efforts were made to minimize sampling bias or other impacts consistent with good practice in such sampling programs. To this end, field sampling was coordinated to avoid holidays and other out of the ordinary events. SCS reviewed average monthly quantities of recyclables delivered to MRWMD by hauler and by municipality to estimate the number of samples required. Using data from the recycling composition studies completed in 2018 and 2019, SCS estimated the number of samples

needed from each municipality in order to obtain an estimate of the composition of materials delivered with statistically representative accuracy and precision.

The SCS Sampling and Sorting Supervisor communicated with the scale house to direct the targeted load to the sorting location. Once the targeted recyclables collection vehicle was deemed suitable for sampling and sorting, the SCS field staff professional directed the driver to a pre-arranged area at the MRF for load discharge. The pile was divided into an imaginary eight-section grid and a sample of materials weighing approximately 150 pounds was extracted from a randomly selected section of the discharged load. This sample was then transported to the sorting area.

### 2.2 CHARACTERIZATION PROCEDURES

### 2.2.1 Manual Characterization Procedures

SCS provided two Sampling and Sorting Supervisors and five contracted sorters to manually sort each of the samples. The manual recycling characterization procedure is based on American Society for Testing and Materials (ASTM) procedure D 5231-92 and consistent with California statutory requirements contained in Public Resources Code 41030, et. seq. and regulatory requirements of CalRecycle for performing recycling characterization studies. The sample was placed on a sorting table and separated by hand into the pre-determined material types as listed in **Exhibit 2**.

Separated materials were placed in containers and weighed and recorded. Members of the sorting crew were assigned material categories on which to focus. The recycling samples were sorted until no more than a small amount of homogeneous fine material ("Refuse") remained, which was determined by the SCS Sampling and Sorting Field Supervisor. The overall goal was to sort each sample directly into the material categories in order to reduce the amount of indistinguishable fines or miscellaneous categories.

For each sample, the SCS Sampling and Sorting Field Supervisor reviewed the sorted material for homogeneity before the containers were weighed using a pre-calibrated scale and recorded the weights for each sorted material category on the sampling form.

When household hazardous materials were discovered during the sorting process, they were weighed and then set aside for proper handling.

### 2.2.2 Visual Characterization Procedure

Once the entire sample was sorted into the defined material categories, the residual of the sorted stream was emptied onto the sorting table and separated for viewing. SCS performed a visual characterization by splitting the refuse into sections then estimated the percentage of notable materials by volume percentage and recorded the data on the data form. For example, if after reviewing the entire sample there appeared to be a significant number of textiles or multi-layered products, those percentages were noted. The objective was to identify large amounts of contaminants (e.g., the predominance of contaminant type(s)) that will help inform the MRWMD and the franchise collection companies (aka "haulers") on appropriate outreach efforts and changes to the recycling program.

MRWMD Recycling Characterization Study					
Date:		M T W TH F Time:			
Sample #:		Route:	Source:		
			WEI	GHT (In Pounds	;)
Major Waste Waste Component Fractions Categories		Examples	Gross Wt.	Tare	Net Wt.
	Uncoated Corrugated Cardboard	Non-waxed shipping/moving boxes, 3-layers, no food residue			
	White Office Paper	White paper			
	Mixed Paper	office paper, computer paper, paper bags, phone books, magazines and catalogs, food/detergent boxes, office mix, junk mail			
	Paper Board	Thick paper-based material, cereal box, supply box			
	ONP	Old newspaper			
	PET	CRV containers, soda and water bottles			
	PET Thermoform	Clamshells, cups, tubs, lids, boxes, trays, egg cartons and similar rigid, non-bottle packaging made of PET (#1) plastic resin			
	Natural HDPE	Milk jugs, small juice bottles			
bles	Pigment HDPE	Detergent bottles, some hair-care bottles, some margarine and yogurt tubs, clamshell packaging, empty motor oil, empty antifreeze, and other empty vehicle and equipment fluid containers			
Recyclal	Polypropylene #5	Food containers (ketchup, yogurt, cottage cheese, margarine, syrup, take-out), medicine containers, straws, bottle caps, Britta filters, Rubbermaid and other opaque plastic containers, including baby bottles			
	Rigid Plastic	Tubs, buckets, toys			
	Mixed Plastic #3, 4, 6, 7	Detergent/cleaning product bottles, personal care bottles, food containers, yogurt cups, syrup bottles, microwave trays, clamshell-shaped fast food containers, vitamin bottles			
	Film Plastic	Shrink-wrap, mattress bags, furniture wrap, and film bubble wrap, plastic shopping bags, dry cleaning bags, agricultural film			
	Mixed Glass	All glass bottles and jars (mayonnaise, apple juice bottles, wine bottles, etc.), CA redemption bottles (beer, juice, wine coolers, etc.)			
	Bi Metal	Steel/tin food and beverage cans, and foil food trays			
	Aluminum	Aluminum beverage cans			
	Aluminum other	Aluminum food cans (e.g., cat food cans), foil			
Organics	Organic	Food Waste, food soiled paper, green waste, landscaping			
	ннw	Paint, vehicle and equipment fluid, used oil, batteries, mercury containing items, fluorescent lights			
	Batteries	Household battereries, watch battereis.			
	Medical Waste	Sharps, bandages, items containing bodily fluids			
Other	Manufactured Products	Electronic waste, items with cord, brown goods, white goods			
_	Polystyrene	Styrotoam clam shells, Styrofoam packaging			
	Aseptic lined containers	Soup containers, soy containers		-	
	Refuse	Anything else that does not fit in the above category			
Comments:					

### Exhibit 2. Manual Sorting Data Form

This procedure involved four steps:

- 1. Estimating the volume of refuse;
- Recording the estimated percentage of the residuals corresponding to each material class, and then record the estimated percentage for specific material types within the material classes;
- 3. Reconciling the percentages to be 100; and
- 4. Recording the weight of the entire load.

Data gathered from fieldwork were summarized to develop the composition of collected recyclables from each geographic area and each franchised hauler. The composition of materials delivered to the MRWMD MRF from each municipality is discussed in subsections below.

Contamination of source-separated recyclables that are delivered to the MRWMD MRF includes materials that typically do not have a market for recycling and which must be disposed in a landfill. Contaminants were initially classified into the following types of materials:

- Film Plastic
- Organics
- HHW
- Batteries
- Medical Waste
- Manufactured Products
- Polystyrene
- Aseptic Lined Containers
- Refuse

At the end of sorting each sample, the field crew emptied materials in the Refuse category onto the sorting table and visually characterized the items into the subcategories defined in **Exhibit 3**.

The true proportion of contamination is estimated by the average of the individual samples. The 90% confidence interval contains the true proportion of contamination with 90% probability. The length of the confidence interval is based on sample-to-sample variability and the number of samples. For example, if the average sampled contamination is 20 percent and the associated 90% confidence interval is calculated to be plus/minus five percent, there is a 90% probability that the true proportion of contamination is between 15 and 25 percent of material delivered (20 percent +/-five percent). If the sampled municipality delivers 100 tons of source separated recyclables each month, the quantity of contamination is estimated to be 20 tons (20 percent of 100 tons per month) with a 90% probability of being between 15 and 25 tons per month.

The goal of the project was to minimize the length of the 90% confidence interval. Since the individual municipalities delivered between 10 and 1,600 tons of source-separated recyclables each month, the number of samples was proportional to the monthly tonnage delivered by each municipality and varied between five and 50 samples.

Exhibit 3.	Visual Characterization	of Refuse

entially yclable	Contaminated Recyclable	Recyclable paper, plastic, or metal that is contaminated with food or other debris
Pote Rec	Glass	Glass bottles and jars that are contaminated with food or other materials.
	Green waste	Leaves,grass, plants, pruning, trimmings, branches, stumps
	Food waste	Food, meat, fruit, egg shells, etc. Containerized liquids.
<i>(</i> <b>0</b>	Compostable namer	Paper contaminated with food / wax / moisture, waxed OCC, napkins,
ic	Compostable paper	paper towels, paper plates, tissues
Organ	Organic debris (less than 3")	Mix of green waste, food, and or compostable paper with dimensions less than 3 inches
Ŭ	Clean wood	Clean and untreated wood and dimensional lumber including plywood and shingles. NO paint or preservative treatment
	Pallets	Untreated and treated wood pallets
		Includes rock brick Portland-cement concrete asphaltic-cement
	Crushable Inerts	concrete, tile, and ceramics
Inerts	Gypsum Boards	Gypsum-based wallboard including board for use in the drywall or plaster trades.
	Treated Wood Waste	Any wood with paint or preservative treatment including particleboard
		White Goods - Discarded, enamel-coated major appliances, such as
	Brown Coode (White Coode	washing machines and refrigerator. Brown Goods - Electronically
S	Brown Goods / White Goods	powered household products fabricated from metals and plastics,
inc		includes hair dryers, toasters, and other common house electronics.
ec-tro	Computer-Related Electronics	Processors, keyboards, printers, fax machines, mice, disk drives, and modems
Ξ	Other Small Consumer	Cell phones, phone systems, phone answering machines, computer games and other electronic toys, portable CD players, camcorders, digital cameras
	Paints/Adhesives & Vehicle Fluids	Containers with a measurable amount of liquid, including used oil filters. NO dried paint, NO empty paint/aerosol containers.
>	Universal Hazardous Waste	Common hazardous waste materials including, fluorescent light bulbs, mercury containing devices, and non-empty airosol cans that contain hazardous materials.
NHH	Medical Waste	Treated medical waste that has been sanitized prior to disposal or untreated medical waste such as sharps, surgical instruments, and bloody bandages. Includes Medicine in either pill or liquid form.
	Other Hazardous Waste	Hazardous waste not described above including household cleaners and chemicals, detergents, fire extinguishers, pesticides, and herbicides.
	Textiles / Leather	Fabric materials from natural and man-made fibers including clothing, rugs, curtains,leather such as belts and wallets, and shoes.
	Carpet	Carpets made from natural and man-made materials. Includes carpet padding.
ther	Poly-coated paper	Paper or paperboard with a plastic layer or treatment on the surface often used in food and drink packaging
Ő	Polystyrene	Platic often used for are: disposable cutlery, plastic models, CD's & DVD cases, and smoke detector housings. Styrofoam.
	Tires	Tires from trucks, automobiles, motorcycles, heavy equipment, lawn mowers, and bycycles
	Other	Material not identified above.

# 2.2.3 Changes to Procedures of Prior Studies

Field procedures for the most part were identical for each of the studies conducted in 2018, 2019, and 2020. Procedures that changed in 2020 include:

- Waxed Cartons Classified as Refuse: Waxed cartons were sorted and classified as recyclable in 2018 and 2019; however, waxed cartons were not separated from refuse in the 2020 study.
- **Batteries Separated:** Batteries were included with non-recyclable HHW in 2018 and 2019; however, batteries were separated for the 2020 study.
- Increased Communication with Haulers: Sampling targets were established before initiating fieldwork and were based on the desired statistical precision and quantity of material delivered by hauler and city. In 2018, vehicles were selected for sampling upon arrival to the MRWMD MRF and after the driver was interviewed to confirm the origin of materials in the load. In 2019, we used both driver interviews and discussions with haulers to select appropriate loads for sampling. In 2020, due to safety concerns for the coronavirus, drivers were not interviewed and trucks were targeted based on coordination with hauler representatives.
- Additional Visual Characterization Categories: An expanded list of materials was used to visually characterize the materials in SSR that were classified as refuse. Material types included in 2020 that were not used for visually characterizing refuse include:
  - **Organics:** Green Waste, Food Waste, Compostable Paper, Organic Debris less than three inches, Clean Wood, Treated Wood, and Pallets.
  - Inerts: Crushable Inerts and Gypsum Boards
  - **Electronics:** Brown/White Goods, Computer-Related Electronics, and Other Small Consumer Electronics
  - **HHW:** Paints/Adhesives/Vehicle Fluids, Universal Hazardous Waste, Medical Waste, and Other Hazardous Waste
  - o **Other:** Carpet, Polystyrene, Tires

# 3.0 RESULTS

### 3.1 STUDYWIDE

Overall, the MRWMD MRF receives about 4,700 tons of source-separated recyclables each month from six haulers delivering material from 13 municipalities. On average, 30 percent (1,415 tons) of this material is contamination. The City of Salinas delivers the most material to the MRWMD MRF and also has the highest proportion of contamination (34.9 percent of material delivered) which equates to about 558 tons per month. There is a 90% probability that the true quantity of contamination delivered from Salinas is between 511 and 605 tons each month. In contrast, about 19.7 percent of the recyclables delivered from City of Monterey are contamination; however, since the City of Monterey delivers about one-ninth the quantity of recyclables per month, their 34 tons of contamination delivered per month has a lesser impact.

**Exhibit 4** presents the results of a four-week field effort that collected and manually characterized 200 samples of source-separated recyclables from residential and commercial sources delivered to the MRWMD MRF.

			Contamination			
	Tons/	No of	Propo	ortion	Monthl	y Tons
	Month	Samples	A	90%	A	90%
			Average	Confidence	Average	Confidence
Greenwaste Recovery	905	60	27.0%	+/- 2.1%	244	+/-19
Marina	170	10	27.5%	+/- 4.3%	47	+/-7
Sand City	10	5	37.0%	+/- 6.6%	4	+/- 0.7
Del Rey Oaks	25	5	29.2%	+/-11.1%	7	+/- 3
Seaside	265	10	30.2%	+/- 6.2%	80	+/- 17
Carmel by the Sea	150	10	24.1%	+/- 4.6%	36	+/-7
Pebble Beach	110	10	23.6%	+/- 3.6%	26	+/- 4
Pacific Grove	175	10	23.3%	+/- 4.3%	41	+/-7
Monterey Disposal	175	10	19.7%	+/- 1.6%	34	+/- 3
City of Monterey	175	10	19.7%	+/- 1.6%	34	+/- 3
Waste Management	1,500	50	<b>29.9</b> %	+/- 2.9%	448	+/- 43
Unincorporated Monterey County	1,350	40	31.1%	+/- 2.8%	420	+/- 38
King City	150	10	25.0%	+/- 9%	37	+/- 14
Republic Services	1,600	50	34.9%	+/- 2.9%	558	+/- 47
Salinas	1,600	50	34.9%	+/- 2.9%	558	+/- 47
City of Watsonville (Public Works Dept.)	120	10	27.6%	+/- 6.2%	33	+/-7
City of Watsonville	120	10	27.6%	+/- 6.2%	33	+/-7
Recology	416	20	33.6%	+/- 4.4%	140	+/- 18
San Benito County	416	20	33.6%	+/- 4.4%	140	+/- 18
IN DISTRICT	2,430	110	27.8%	+/- 1.6%	676	+/- 39
OUT OF DISTRICT	2,286	90	32.7%	+/- 2.3%	747	+/- 53
Total	4,716	200	30.0%	+/- 1.4%	1,415	+/- 66

Exhibit 4.	Summary	of Contamination Delivered to MRWMD Per Month
	o ann in an y	

### 3.1.1 Comparison to 2018 and 2019 Results by Hauler

**Exhibit 5** presents the average and associated confidence intervals for the proportion of contamination delivered by each hauler. The bold yellow horizontal line identifies the maximum desired level of contamination for a municipal recycling program of 10 percent. With the exception of Monterey (served by Monterey City Disposal), the SSR materials for every other municipality (served by other haulers) exceeds 20 percent contamination in 2020 with statistical confidence.



Exhibit 5. Average Proportion of Contamination and Associated 90% Confidence Intervals by Hauler: 2018 - 2020

**Exhibit 6** presents the average monthly tons and associated 90% confidence intervals for each hauler. Since the municipalities served by Republic and Waste Management bring in substantially more SSR materials each month, the effect of high contamination has a greater impact on the MRF processing activities than small tonnage sources.



# Exhibit 6. Average Monthly Tons of Contamination and Associated 90% Confidence Intervals by Hauler: 2018 - 2020

### 3.1.2 Comparison to 2018 and 2019 Results by Municipality

As presented in **Exhibit 7**, every municipality, with the exception of the City of Monterey, likely have contamination that exceeds 20 percent of the total materials delivered to the MRWMD MRF. All locations have significantly more than the 10 percent maximum level of contamination desired in a municipal recycling program.



# Exhibit 7. Average Proportion of Contamination and Associated 90% Confidence Intervals by Municipality: 2018 - 2020

### 3.1.3 Comparison to 2018 and 2019 Results by Composition of Materials

**Exhibit 8** presents the composition of incoming SSR (overall including all cities and haulers) for the past three yearly studies. In general, most materials have similar proportions from year to year with the exception of Mixed Glass and Refuse. Mixed Glass has declined from 20.3 percent of incoming SSR in 2019 to 11.0 percent of incoming SSR in 2020. Refuse has increased from 14.2 percent of SSR in 2019 to 20.8 percent of SSR in 2020.

	ALL MATERIAL BY	YEAR		
0		(	Compositior	1
Category	Materiai iype	2020	. 2019	2018
	Uncoated Corrugated Cardboard	25.4%	27.4%	28.1%
	White Office Paper	2.8%	0.8%	3.9%
	Mixed Paper	10.2%	10.8%	8.2%
Paper	Paper Board	4.9%	3.2%	5.5%
	Old Newspaper	2.4%	1.9%	3.8%
	Waxed Cartons	*	0.1%	0.3%
	PET	2.1%	1.8%	2.0%
	PET Thermoform	1.2%	1.0%	1.8%
	Natural HDPE	1.1%	0.9%	1.2%
	Pigment HDPE	1.7%	1.1%	1.4%
Plastic	Polypropylene #5	0.9%	0.6%	0.9%
	Mixed Plastic #3, 4, 6, 7	0.4%	0.3%	0.7%
	Rigid Plastic	1.5%	3.4%	1.7%
	Film Plastic	2.6%	1.6%	2.9%
Glass	Mixed Glass	11.0%	20.3%	15.8%
	Bi Metal	3.3%	3.7%	3.4%
Metal	Aluminum	0.7%	0.4%	0.4%
	Aluminum - Other	0.4%	0.3%	0.3%
Organics	Organics	3.1%	3.2%	4.8%
Other	ННЖ	0.5%	0.2%	0.3%
	Batteries	0.0%	*	*
	Medical Waste	0.4%	0.1%	0.0%
	Manufactured Products	2.0%	2.2%	1.3%
	Polystyrene	0.2%	0.1%	0.3%
	Aseptic Lined Containers	0.5%	0.2%	0.2%
	Refuse	20.8%	14.2%	10.6%
Total		100.0%	100.0%	100.0%
Contamina	tion (noted in grey shading above)	30.0%	21.9%	21.0%

#### Exhibit 8. Detailed Recycling Composition by Year

\* Waxed cartons are included with Refuse in 2020. Batteries are included with Refuse in 2019 and 2018.

Exhibits 9 and 10 present the proportion of recyclable materials and contaminants, respectively.



Exhibit 9. Average Proportion of Recyclable Materials in SSR and Associated 90% Confidence Intervals: 2018 - 2020





## 3.1.4 Visual Characterization of Refuse in SSR

After sorting each sample into the material categories identified in **Exhibit 2**, materials in the Refuse category were spread on a tarp and visually characterized by volume into the material types identified in **Exhibit 3**. While this method does not provide statistically reliable results, it does provide information on the types of refuse materials that are in the SSR delivered to the MRWMD MRF. Recyclable materials that are classified as Refuse are dirty, soiled, wet, or contain food and or liquids.

**Exhibit 11** presents the average volume of Refuse materials in the 200 SSR samples. Refuse materials comprise 20.8 percent of SSR in 2020. The largest component of Refuse materials are Other materials (unclassified) at 5.9 percent followed by Textiles/Leather at 3.8 percent, contaminated OCC at 2.5 percent, and Compostable Paper at 1.9 percent.





## **3.2** HAULER: GREENWASTE

Greenwaste Recovery is the franchise hauler for Carmel by the Sea, Del Rey Oaks, Pacific Grove, Pebble Beach, Sand City and Seaside. In total, SCS completed 60 recycling stream samples from the cities that Greenwaste Recovery services. Of the material sampled, 73 percent is Recyclable and 27 percent is Contamination as shown in **Exhibit 12**.

	Greenwaste						
Catogory	Matorial Typo	Average	Monthly To	ons (90% Co	nfidence)		
Category	Material Type	Composition	Low	Average	High		
	Uncoated Corrugated Cardboard	19.9%	153	180	206		
	White Office Paper	3.6%	24	33	42		
Paper	Mixed Paper	11.5%	94	104	115		
	Paper Board	4.6%	37	41	45		
	Old Newspaper	3.4%	26	31	35		
	PET	2.6%	21	23	26		
	PET Thermoform	1.0%	7	9	11		
	Natural HDPE	0.9%	6	8	9		
Diactic	Pigment HDPE	1.3%	9	12	15		
Plasuc	Polypropylene #5	0.9%	7	9	10		
	Mixed Plastic #3, 4, 6, 7	0.4%	2	4	5		
	Rigid Plastic	1.4%	9	13	16		
	Film Plastic	2.2%	18	20	23		
Glass	Mixed Glass	17.0%	133	154	176		
	Bi Metal	3.2%	23	29	35		
Metal	Aluminum	1.0%	8	9	10		
	Aluminum - Other	0.3%	2	3	3		
Organics	Organics	2.8%	20	25	31		
Other	HHW	0.5%	2	5	8		
	Batteries	0.1%	< 0.5	1	1		
	Medical Waste	0.3%	1	3	4		
	Manufactured Products	2.9%	16	26	36		
	Polystyrene	0.2%	1	2	3		
	Aseptic Lined Containers	0.5%	4	4	5		
	Refuse	17.5%	143	158	174		
Total		100.0%		905			
Contaminat	ion (noted in grey shading above)	27.0%	225	244	263		

Exhibit 12. Detailed Recycling Composition of Loads Hauled by Greenwaste

The following section examines the recycling composition per municipality that Greenwaste Recovery services. Results are compared to similar studies performed in the summers of 2018 and 2019.

# 3.2.1 Carmel By the Sea (Carmel)

#### **Recycling Composition**

The composition of Carmel's recycling stream by category is presented in **Exhibit 13**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 37.1 percent of the overall recycling stream. Recyclable Glass represents 31 percent of the overall recycling stream, and Contamination represents 24.1 percent, which is a significant increase from the 2019 study.



Exhibit 13. Composition of Recyclable Loads from Carmel, 2018 to 2020

A detailed breakdown of Carmel By The Sea's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 14**.

	CARMEL BY THE SEA						
Catogory	Matorial Typo	Average	Monthly To	ons (90% Co	nfidence)		
Calegory	Material Type	Composition	Low	Average	High		
	Uncoated Corrugated Cardboard	15.3%	20	23	26		
	White Office Paper	2.6%	2	4	5		
Paper	Mixed Paper	11.2%	14	17	19		
	Paper Board	3.2%	5	5	5		
	Old Newspaper	4.8%	6	7	8		
	PET	1.8%	2	3	3		
	PET Thermoform	0.6%	1	1	1		
	Natural HDPE	0.4%	1	1	1		
Diactio	Pigment HDPE	0.4%	<0.5	1	1		
Plastic	Polypropylene #5	0.7%	1	1	1		
	Mixed Plastic #3, 4, 6, 7	0.1%	<0.5	0	0		
	Rigid Plastic	0.3%	<0.5	1	1		
	Film Plastic	2.1%	3	3	4		
Glass	Mixed Glass	31.0%	41	47	52		
	Bi Metal	2.1%	2	3	4		
Metal	Aluminum	0.9%	1	1	2		
	Aluminum - Other	0.3%	<0.5	0	0		
Organics	Organics	2.8%	3	4	5		
Other	HHW	0.1%	<0.5	0	0		
	Batteries	0.1%	< 0.5	0	0		
	Medical Waste	0.1%	< 0.5	0	0		
	Manufactured Products	2.0%	2	3	4		
	Polystyrene	0.1%	<0.5	0	0		
	Aseptic Lined Containers	0.4%	<0.5	1	1		
	Refuse	16.4%	22	25	27		
Total		100.0%		150			
Contaminat	tion (noted in grey shading above)	24.1% +/- 4.6%	29	36	43		

### Exhibit 14. Detailed Recycling Composition from Carmel

The residual in Carmel's recycling stream are 24.5 percent of incoming recyclables which includes 16.9 percent refuse. **Exhibit 15** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at 5.4 percent. OCC represents 2.5 percent and Textiles/Leather and Compostable Paper each represent 2.5 percent of SSR.



Exhibit 15. Composition of Refuse Materials in SSR from Carmel

As presented in **Exhibit 16**, all samples from Carmel by the Sea in 2020 were from mixed loads (both residential and commercial sources).

Sector	2020		2019	
Seciol	Number of Samples	Contamination	Number of Samples	Contamination
Residential	0	NA	4	20.5%
Commercial	0	NA	1	13.2%
Mixed Loads	10	24.1%	6	13.5%
Total	10	24.1%	11	16.0%

Exhibit 16.	Proportion	of Residuals from	Carmel by Sector
LAINDI IO.	roportion	or nesiduals norm	Summer by Sector

# 3.2.2 Del Rey Oaks

#### **Recycling Composition**

The composition of Del Rey Oak's recycling stream by category is presented in **Exhibit 17**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 41.6 percent of the overall recycling stream. Contamination represents the second most prevalent material category at 29.2 percent by weight, which is a significant increase from the 2019 and 2018 studies.



Exhibit 17. Composition of Recyclable Loads from Del Rey Oaks, 2018 to 2020

A detailed breakdown of Del Rey Oak's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 18**.

DEL REY OAKS						
Catagory	Matorial Type	Average	Monthly To	ons (90% Co	nfidence)	
Calegory	Material Type	Composition	Low	Average	High	
	Uncoated Corrugated Cardboard	20.3%	4	5	6	
	White Office Paper	3.6%	<0.5	1	2	
Paper	Mixed Paper	9.7%	2	2	3	
	Paper Board	5.2%	1	1	1	
	Old Newspaper	2.8%	1	1	1	
	PET	3.0%	1	1	1	
	PET Thermoform	1.0%	<0.5	0	0	
	Natural HDPE	0.8%	<0.5	0	0	
Diactic	Pigment HDPE	1.7%	<0.5	0	1	
Plasiic	Polypropylene #5	1.0%	<0.5	0	0	
	Mixed Plastic #3, 4, 6, 7	0.4%	<0.5	0	0	
	Rigid Plastic	1.1%	<0.5	0	0	
	Film Plastic	2.4%	<0.5	1	1	
Glass	Mixed Glass	14.8%	2	4	5	
	Bi Metal	3.8%	<0.5	1	2	
Metal	Aluminum	1.1%	<0.5	0	0	
	Aluminum - Other	0.3%	<0.5	0	0	
Organics	Organics	2.2%	<0.5	1	1	
Other	ннพ	0.3%	<0.5	0	0	
	Batteries	0.0%	NA	0	NA	
	Medical Waste	0.0%	<0.5	0	0	
	Manufactured Products	0.4%	<0.5	0	0	
	Polystyrene	0.1%	<0.5	0	0	
	Aseptic Lined Containers	0.6%	<0.5	0	0	
	Refuse	23.2%	4	6	8	
Total		100.0%		25		
Contamina	tion (noted in grey shading above)	29.2% +/- 11.1%	5	7	10	
"NA indicate	s that we did not find the material durir	ng the field effor	t.			

Exhibit 18.	Detailed Recycling Compositi	on from Del Rey Oaks
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The residual in Del Rey Oak's recycling stream are 30.4 percent of incoming recyclables which includes 23.2 percent refuse. **Exhibit 19** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at six percent. Food Waste represents 4.4 percent and Polystyrene represents 2.8 percent of SSR.





The residuals varied significantly by sector as presented in **Exhibit 20**, with residential loads having 20.4 percent residuals compared to commercial loads which had 31.4 percent residuals in 2020. The distinction was evident in the 2019 study also.

Sector		2020		2019	
		Number of Samples	Contamination	Number of Samples	Contamination
Residential		1	20.4%	2	12.5%
Commercial		0	NA	0	NA
Mixed Loads		4	31.4%	3	18.1%
1	otal	5	29.2%	5	15.9%

### 3.2.3 Marina

#### **Recycling Composition**

The composition of Marina's recycling stream by category is presented in **Exhibit 21**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 51.5 percent of the overall recycling stream. Contamination represents the second most prevalent material category at 27.5 percent of the overall recycling stream.



Exhibit 21. Composition of Recyclable Loads from Marina, 2018 to 2020

A detailed breakdown of Marina's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 22.** 

	MARINA						
Catogory	Matorial Typo	Average	Monthly To	ons (90% Co	nfidence)		
Calegoly		Composition	Low	Average	High		
	Uncoated Corrugated Cardboard	29.0%	40	49	59		
	White Office Paper	4.9%	6	8	11		
Paper	Mixed Paper	9.9%	15	17	18		
	Paper Board	4.9%	7	8	9		
	Old Newspaper	2.8%	4	5	6		
	PET	2.6%	4	4	5		
	PET Thermoform	1.0%	1	2	2		
	Natural HDPE	0.8%	1	1	2		
Diactic	Pigment HDPE	0.8%	1	1	2		
FIASUC	Polypropylene #5	1.2%	1	2	3		
	Mixed Plastic #3, 4, 6, 7	0.7%	<0.5	1	2		
	Rigid Plastic	1.7%	2	3	4		
	Film Plastic	2.1%	3	4	4		
Glass	Mixed Glass	9.0%	13	15	18		
	Bi Metal	2.5%	3	4	5		
Metal	Aluminum	0.6%	1	1	1		
	Aluminum - Other	0.2%	< 0.5	0	0		
Organics	Organics	2.7%	3	5	6		
Other	HHW	0.7%	1	1	2		
	Batteries	0.2%	<0.5	0	1		
	Medical Waste	0.2%	< 0.5	0	0		
	Manufactured Products	2.9%	3	5	7		
	Polystyrene	0.2%	<0.5	0	0		
	Aseptic Lined Containers	0.5%	1	1	1		
	Refuse	18.0%	27	31	34		
Total		100.0%		170			
Contaminat	tion (noted in grey shading above)	27.5% +/- 4.3%	39	47	54		

Exhibit 22.	Detailed Recycling	Composition	from Marina
	Detailed Recycling	Composition	nonn manna

The residual in Marina's recycling stream are 29.2 percent of incoming recyclables which includes 18 percent refuse. **Exhibit 23** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at 7.2 percent. Textiles/Leather represents 4.3 percent and Compostable Paper represents 2.5 percent of materials in SSR.



Exhibit 23. Composition of Residuals from Marina

The residuals varied significantly by sector as presented in **Exhibit 24**, with residential loads having 29.3 percent residuals compared to the commercial load which had 11.2 percent residuals in 2020.

Exhibit 24.	Proportion	of Residuals from	Marina by Sector
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Sector	2020		2019	
Secior	Number of Samples	Contamination	Number of Samples	Contamination
Residential	9	29.3%	6	11.5%
Commercial	1	11.2%	1	92.9%
Mixed Loads	0	NA	3	31.0%
Total	10	27.5%	10	25.5%

### 3.2.4 Pacific Grove

#### **Recycling Composition**

The composition of Pacific Grove's recycling stream by category is presented in **Exhibit 25**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 44.9 percent of the overall recycling stream. Contamination represents the second most prevalent material category at 23.3 percent of the overall recycling stream.



Exhibit 25. Composition of Recyclable Loads from Pacific Grove, 2018 to 2020

A detailed breakdown of Pacific Grove's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 26.** 

	PACIFIC GROVE					
Category	Material Type	Average	Monthly To	ons (90% Co	nfidence)	
category		Composition	Low	Average	High	
	Uncoated Corrugated Cardboard	16.4%	24	29	33	
	White Office Paper	3.5%	4	6	9	
Paper	Mixed Paper	15.4%	24	27	30	
	Paper Board	6.3%	10	11	12	
	Old Newspaper	3.3%	5	6	7	
	PET	2.8%	4	5	6	
	PET Thermoform	1.4%	2	2	3	
	Natural HDPE	1.4%	2	2	3	
Diactic	Pigment HDPE	1.9%	2	3	5	
FIDSUC	Polypropylene #5	1.0%	1	2	2	
	Mixed Plastic #3, 4, 6, 7	0.5%	1	1	1	
	Rigid Plastic	1.6%	2	3	4	
	Film Plastic	1.7%	3	3	3	
Glass	Mixed Glass	16.4%	26	29	31	
	Bi Metal	3.4%	4	6	8	
Metal	Aluminum	1.1%	2	2	2	
	Aluminum - Other	0.4%	<0.5	1	1	
Organics	Organics	1.9%	2	3	4	
Other	HHW	0.3%	<0.5	1	1	
	Batteries	0.0%	<0.5	0	0	
	Medical Waste	0.4%	< 0.5	1	1	
	Manufactured Products	2.6%	3	5	7	
	Polystyrene	0.1%	<0.5	0	0	
	Aseptic Lined Containers	0.6%	1	1	1	
	Refuse	15.7%	25	28	30	
Total		100.0%		175		
Contamina	tion (noted in grey shading above)	23.3% +/- 4.3%	33	41	48	

Exhibit 26.	Detailed Recycling Composition from Pacific Grove
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The residual in Pacific Grove's recycling stream are 24.9 percent of incoming recyclables which includes 15.7 percent refuse. **Exhibit 27** presents the visual characterization of refuse materials in SSR. The most prevalent material is Textiles/Leather at 4.6 percent. Other represents 4.5 percent and OCC represents 2.0 percent of SSR.





Residential loads were targeted for sampling. There were no samples from commercial recycling loads in 2020. In 2019 the samples were split between residential and mixed loads.

Exhibit 28.	Proportion of	Residuals from	Pacific	Grove b	y Sector
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Sector	2020		2019		
360101	Number of Samples	Contamination	Number of Samples	Contamination	
Residential	10	23.3%	5	21.5%	
Commercial	0	NA	0	NA	
Mixed Loads	0	NA	5	19.2%	
Total	10	23.3%	10	20.4%	

### 3.2.5 Pebble Beach

#### **Recycling Composition**

The composition of Pebble Beach's recycling stream by category is presented in **Exhibit 29**. Based on the samples collected, the most prevalent material category, by weight, is Recyclable Paper, representing 44.1 percent of the overall recycling stream. Contamination represents the second most prevalent material category at 23.6 percent.





A detailed breakdown of Pebble Beach's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 30.** 

	PEBBLE BEACH					
Catagory	Material Type	Average	Monthly To	ons (90% Co	nfidence)	
Calegory		Composition	Low	Average	High	
	Uncoated Corrugated Cardboard	14.1%	14	16	17	
	White Office Paper	5.7%	4	6	8	
Paper	Mixed Paper	14.7%	15	16	18	
	Paper Board	4.0%	4	4	5	
	Old Newspaper	5.6%	5	6	7	
	PET	2.8%	3	3	3	
	PET Thermoform	0.9%	1	1	1	
	Natural HDPE	0.6%	1	1	1	
Diactic	Pigment HDPE	0.8%	1	1	1	
FIASIC	Polypropylene #5	1.0%	1	1	1	
	Mixed Plastic #3, 4, 6, 7	0.6%	<0.5	1	1	
	Rigid Plastic	0.9%	1	1	1	
	Film Plastic	1.8%	2	2	2	
Glass	Mixed Glass	20.6%	19	23	26	
	Bi Metal	2.8%	2	3	4	
Metal	Aluminum	1.1%	1	1	1	
	Aluminum - Other	0.2%	< 0.5	0	0	
Organics	Organics	3.0%	2	3	4	
Other	HHW	0.3%	<0.5	0	0	
	Batteries	0.0%	<0.5	0	0	
	Medical Waste	0.3%	< 0.5	0	0	
	Manufactured Products	1.3%	1	1	2	
	Polystyrene	0.1%	<0.5	0	0	
	Aseptic Lined Containers	0.4%	<0.5	0	0	
	Refuse	16.5%	16	18	20	
Total		100.0%		110		
Contaminat	ion (noted in grey shading above)	23.6% +/- 3.6%	22	26	30	

Exhibit 30	Detailed Recycling Composition from Pebble Be	each
LATING 50.	betalled Recycling composition north cobie be	,acri

The residual in Pebble Beach's recycling stream is 24.6 percent of incoming recyclables which includes 16.5 percent refuse. **Exhibit 31** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at 5.44.5 percent. Textiles/Leather represents 3.6 percent and Film Plastic represents 1.7 percent of materials in SSR.





Residential loads were targeted for sampling in 2020. There were no samples from commercial recycling loads. In 2019, there were two samples from mixed loads.

Exhibit 32.	Proportion of Residuals from Pebble Beach by Sec	ctor
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Soctor	2020		2019	
360101	Number of Samples	Contamination	Number of Samples	Contamination
Residential	10	23.6%	8	19.0%
Commercial	0	NA	0	NA
Mixed Loads	0	NA	2	14.7%
Total	10	23.6%	10	18.1%

### 3.2.6 Sand City

#### **Recycling Composition**

The composition of Sand City's recycling stream by category is presented in **Exhibit 33**. Based on the samples collected, the most prevalent material category by percentage is Contamination representing 37 percent of the overall recycling stream. Recyclable Paper represents the second most prevalent material category at 32.6 percent of the overall recycling stream.



Exhibit 33. Composition of Recyclable Loads from Sand City, 2018 to 2020

A detailed breakdown of Sand City's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 34.** 

	SAND CITY					
Catagony	Matorial Type	Average	Monthly To	ons (90% Co	nfidence)	
Category	Material Type	Composition	Low	Average	High	
	Uncoated Corrugated Cardboard	15.7%	1	2	2	
	White Office Paper	3.5%	< 0.5	0	0	
Paper	Mixed Paper	8.0%	1	1	1	
	Paper Board	3.1%	< 0.5	0	0	
	Old Newspaper	2.4%	< 0.5	0	0	
	PET	2.5%	< 0.5	0	0	
	PET Thermoform	0.6%	<0.5	0	0	
	Natural HDPE	1.0%	<0.5	0	0	
Diactic	Pigment HDPE	1.4%	< 0.5	0	0	
Plasiic	Polypropylene #5	0.9%	<0.5	0	0	
	Mixed Plastic #3, 4, 6, 7	0.3%	<0.5	0	0	
	Rigid Plastic	1.0%	<0.5	0	0	
	Film Plastic	2.1%	<0.5	0	0	
Glass	Mixed Glass	17.4%	1	2	2	
	Bi Metal	3.9%	<0.5	0	1	
Metal	Aluminum	1.4%	<0.5	0	0	
	Aluminum - Other	0.2%	<0.5	0	0	
Organics	Organics	4.9%	< 0.5	0	1	
Other	HHW	2.7%	<0.5	0	1	
	Batteries	0.0%	NA	0	NA	
	Medical Waste	0.7%	<0.5	0	0	
	Manufactured Products	4.0%	< 0.5	0	1	
	Polystyrene	0.3%	<0.5	0	0	
	Aseptic Lined Containers	0.4%	<0.5	0	0	
	Refuse	21.8%	2	2	3	
Total		100.0%		10		
Contamina	tion (noted in grey shading above)	37% +/- 6.6%	3	4	4	

"NA indicates that we did not find the material during the field effort.

The residual in Sand City's recycling stream is 38 percent of incoming recyclables which includes 21.8 percent refuse. **Exhibit 35** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at 5.8 percent. Polystyrene represents 4.4 percent and Compostable Paper represents 2.7 percent of materials in SSR.



Exhibit 35. Composition of Residuals from Sand City

The residuals varied significantly by sector as presented in **Exhibit 36**, with commercial loads having 45.1 percent residuals compared to mixed loads which had 34.9 percent residuals in 2020.

Exhibit 36.	Proportion of Residuals from Sand City by Sector

Sactor	2020		2019		
Secio	Number of Samples	Contamination	Number of Samples	Contamination	
Residential	0	NA	4	13.4%	
Commercial	1	45.1%	1	22.1%	
Mixed Loads	4	34.9%	0	NA	
Total	5	37.0%	5	15.2%	

### 3.2.7 Seaside

#### **Recycling Composition**

The composition of Seaside's recycling stream by category is presented in **Exhibit 37**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 43.2 percent of the overall recycling stream. Contamination is the second most prevalent material category representing 30.2 percent of the overall recycling stream.



Exhibit 37. Composition of Recyclable Loads from Seaside, 2018 to 2020

A detailed breakdown of Seaside's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 38.** 

	SEASIDE						
Catagory	Motorial Type	Average	Monthly To	ons (90% Co	nfidence)		
Calegory	Material Type	Composition	Low	Average	High		
	Uncoated Corrugated Cardboard	26.5%	56	70	85		
	White Office Paper	1.7%	3	4	6		
Paper	Mixed Paper	9.0%	21	24	27		
	Paper Board	4.8%	11	13	14		
	Old Newspaper	1.2%	2	3	4		
	PET	2.7%	6	7	8		
	PET Thermoform	1.5%	3	4	5		
	Natural HDPE	1.1%	2	3	3		
Diactia	Pigment HDPE	2.3%	4	6	8		
Plasuc	Polypropylene #5	0.9%	2	2	3		
	Mixed Plastic #3, 4, 6, 7	0.3%	1	1	1		
	Rigid Plastic	2.7%	6	7	9		
	Film Plastic	3.4%	7	9	11		
Glass	Mixed Glass	9.1%	21	24	28		
	Bi Metal	4.7%	10	12	15		
Metal	Aluminum	1.0%	2	3	3		
	Aluminum - Other	0.4%	1	1	1		
Organics	Organics	2.9%	6	8	10		
Other	HHW	0.3%	< 0.5	1	1		
	Batteries	0.0%	< 0.5	0	0		
	Medical Waste	0.5%	1	1	2		
	Manufactured Products	6.3%	10	17	23		
	Polystyrene	0.6%	1	2	3		
	Aseptic Lined Containers	0.5%	1	1	2		
	Refuse	15.7%	36	42	47		
Total		100.0%		265			
Contamina	tion (noted in grey shading above)	30.2% +/- 6.2%	63	80	97		

#### Exhibit 38. Detailed Recycling Composition from Seaside

The residual in Seaside's recycling stream are 32.9 percent of incoming recyclables which includes 15.7 percent refuse. **Exhibit 39** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at 3.7 percent. Textiles/Leather represents 3.4 percent and Textiles/Leather and Compostable Paper each represent 2.5 percent of materials in SSR.



Exhibit 39. Composition of Residuals from Seaside

The residuals varied slightly by sector as presented in **Exhibit 40**, with residential loads having 33.5 percent residuals compared to commercial loads which had 16.9 percent residuals in 2020.

Soctor	2020		2019	
360101	Number of Samples	Contamination	Number of Samples	Contamination
Residential	8	33.5%	6	19.2%
Commercial	2	16.9%	0	NA
Mixed Loads	0	NA	4	16.6%
Total	10	30.2%	10	18.2%

Exhibit 40. Proportion of Residuals from Seaside by Sector

# **3.3** HAULER: MONTEREY CITY DISPOSAL

Monterey City Disposal, Inc. is the hauler for the City of Monterey. In total, SCS completed 10 recycling stream samples from the City of Monterey. Of the material sampled, 80.3 percent is Recyclable and 19.7 percent is Contamination as shown in **Exhibit 41**.

The following section examines the recycling composition by category and material type, the 90% confidence interval, and the visual characterization for the City of Monterey.

# 3.3.1 City of Monterey

### **Recycling Composition**

The composition of Monterey City's recycling stream by category is presented in **Exhibit 41**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 44.4 percent of the overall recycling stream. Recyclable Glass is the second most prevalent material category representing 21.1 percent of the overall recycling stream. Contamination represents 19.7 percent of the overall recycling stream.





A detailed breakdown of Monterey's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 42.** 

	CITY OF N	<b>JONTEREY</b>			
Category	Material Type	Average	Monthly To	ons (90% Co	nfidence)
Category	Iviaterial Type	Composition	Low	Average	High
	Uncoated Corrugated Cardboard	20.5%	32	36	40
	White Office Paper	4.0%	5	7	9
Paper	Mixed Paper	12.1%	17	21	25
	Paper Board	5.4%	8	9	11
	Old Newspaper	2.3%	3	4	5
	PET	2.9%	5	5	6
	PET Thermoform	1.2%	2	2	2
	Natural HDPE	1.5%	2	3	3
Diactic	Pigment HDPE	1.6%	2	3	3
FIDSUC	Polypropylene #5	0.9%	1	2	2
	Mixed Plastic #3, 4, 6, 7	0.6%	1	1	1
	Rigid Plastic	0.9%	1	2	2
	Film Plastic	2.2%	3	4	5
Glass	Mixed Glass	21.1%	32	37	42
	Bi Metal	4.2%	6	7	9
Metal	Aluminum	0.9%	1	2	2
	Aluminum - Other	0.2%	<0.5	0	1
Organics	Organics	1.0%	1	2	2
Other	HHW	0.1%	<0.5	0	0
	Batteries	0.0%	<0.5	0	0
	Medical Waste	0.3%	<0.5	0	1
	Manufactured Products	1.8%	2	3	4
	Polystyrene	0.1%	<0.5	0	0
	Aseptic Lined Containers	0.8%	1	1	2
	Refuse	13.3%	22	23	24
Total		100.0%		175	
Contamina	tion (noted in grey shading above)	19.7% +/- 1.6%	32	34	37

# Exhibit 42. Detailed Recycling Composition from City of Monterey

The residual in Monterey's recycling stream are 20.5 percent of incoming recyclables which includes 13.3 percent refuse. **Exhibit 43** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at 3.9 percent. Compostable Paper represents 2.2 percent and OCC represents 1.6 percent of materials in SSR.



Exhibit 43. Composition of Residuals from City of Monterey

Mixed loads were targeted for sampling in 2020. There were no samples from residential or commercial recycling loads.

Sector	2020		2019	
Seciol	Number of Samples	Contamination	Number of Samples	Contamination
Residential	0	NA	7	19.0%
Commercial	0	NA	0	NA
Mixed Loads	10	19.7%	3	15.3%
Total	10	19.7%	10	17.9%

# 3.4 HAULER: WASTE MANAGEMENT

Waste Management is the hauler for Unincorporated Monterey County and King City. In total, SCS completed 50 recycling stream samples from these areas that Waste Management services. Of the material sampled, 70.1 percent is Recyclable and 29.9 percent is Contamination as shown in **Exhibit 45**.

	Waste Management						
Catogory	Matorial Typo	Average	Monthly To	ons (90% Co	nfidence)		
Category		Composition	Low	Average	High		
	Uncoated Corrugated Cardboard	25.4%	132	380	228		
	White Office Paper	3.2%	16	48	50		
Paper	Mixed Paper	10.6%	85	159	123		
	Paper Board	5.1%	34	76	48		
	Old Newspaper	1.8%	23	27	39		
	PET	2.3%	19	34	27		
	PET Thermoform	0.9%	6	13	13		
	Natural HDPE	1.0%	5	15	10		
Diastia	Pigment HDPE	2.4%	6	36	18		
Plastic	Polypropylene #5	1.2%	6	18	11		
	Mixed Plastic #3, 4, 6, 7	0.3%	1	5	6		
	Rigid Plastic	1.6%	6	24	19		
	Film Plastic	3.2%	16	48	25		
Glass	Mixed Glass	10.2%	115	153	193		
	Bi Metal	2.9%	18	43	40		
Metal	Aluminum	0.7%	7	11	11		
	Aluminum - Other	0.6%	1	8	4		
Organics	Organics	2.7%	15	40	35		
Other	HHW	0.5%	<0.5	7	10		
	Batteries	0.0%	<0.5	0	2		
	Medical Waste	0.5%	<0.5	7	5		
	Manufactured Products	1.4%	8	22	44		
	Polystyrene	0.2%	<0.5	3	4		
	Aseptic Lined Containers	0.4%	3	6	5		
	Refuse	21.1%	130	316	186		
Total		100.0%		1,500			
Contamina	tion (noted in grey shading above)	29.9%	210	448	279		

Exhibit 45. Detailed Recycling Composition of Loads Hauled by Waste Management

The following section examines the recycling composition by category and material type, the 90% confidence interval, and the visual characterization for cities that Waste Management services.

## 3.4.1 Unincorporated Monterey County

#### **Recycling Composition**

The composition of Unincorporated Monterey County's recycling stream by category is presented in **Exhibit 46**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 43.3 percent of the overall recycling stream. Contamination is the second most prevalent material category representing 31.1 percent of the overall recycling stream.

Exhibit 46. Composition of Recyclable Loads from Unincorporated Monterey County, 2018 to 2020



A detailed breakdown of Unincorporated Monterey County's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 47.** 

	UNINCORPORATED	MONTEREY C	OUNTY		
Catogory	Matorial Typo	Average	Monthly To	ons (90% Co	nfidence)
Calegory	Material Type	Composition	Low	Average	High
	Uncoated Corrugated Cardboard	19.9%	257	268	280
	White Office Paper	3.3%	41	45	48
Paper	Mixed Paper	12.3%	160	166	172
	Paper Board	5.6%	74	76	78
	Old Newspaper	2.2%	26	29	32
	PET	2.5%	33	34	35
	PET Thermoform	1.0%	13	14	14
	Natural HDPE	1.0%	13	13	14
Diactic	Pigment HDPE	2.4%	29	32	35
FIASUC	Polypropylene #5	1.0%	13	13	14
	Mixed Plastic #3, 4, 6, 7	0.4%	5	5	5
	Rigid Plastic	1.8%	23	25	26
	Film Plastic	3.5%	44	47	51
Glass	Mixed Glass	10.9%	138	147	155
	Bi Metal	3.2%	41	43	45
Metal	Aluminum	0.8%	11	11	12
	Aluminum - Other	0.7%	8	9	10
Organics	Organics	2.6%	31	35	39
Other	HHW	0.5%	6	7	7
	Batteries	0.0%	< 0.5	0	0
	Medical Waste	0.5%	7	7	8
	Manufactured Products	1.6%	20	22	23
	Polystyrene	0.2%	2	2	3
	Aseptic Lined Containers	0.5%	6	6	6
	Refuse	21.7%	285	293	302
Total		100.0%		1,350	
Contamination (noted in grey shading above) 31.1% +/- 2.8%				420	458

Exhibit 47. Detailed Recycling Composition from Unincorporated Monterey County

The residual in Unincorporated Monterey County's recycling stream are 32.9 percent of incoming recyclables which includes 21.7 percent refuse. **Exhibit 48** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at 7.7 percent. Textiles/Leather represents 3.6 percent and OCC represents 2.5 percent of materials in SSR.



Exhibit 48. Composition of Residuals from Unincorporated Monterey County

The residuals did not vary significantly by sector as presented in **Exhibit 49**, with residential loads having 31.4 percent residuals compared to commercial loads which had 27.4 percent residuals in 2020.

Exhibit 49. Proportion of Residuals from Unincorporated Monterey County by S
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Sector	2020		2019	
Seciol	Number of Samples	Contamination	Number of Samples	Contamination
Residential	37	31.4%	26	22.3%
Commercial	3	27.4%	13	21.9%
Mixed Loads	0	NA	1	30.0%
Total	40	31.1%	40	22.4%

# 3.4.2 King City Commercial Recycling Study Results

#### **Recycling Composition**

The composition of King City's commercial recycling stream by category is presented in **Exhibit 50**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 57.6 percent of the overall recycling stream. Contamination is the second most prevalent material category at 25 percent of the overall recycling stream.



Exhibit 50. Composition of Recyclable Loads from King City, 2018 to 2020

A detailed breakdown of King City's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 51.** 

	KING	G CITY			
Catogory	Matorial Typo	Average	Monthly To	ons (90% Co	nfidence)
Calegoly		Composition	Low	Average	High
	Uncoated Corrugated Cardboard	47.3%	60	71	82
	White Office Paper	2.9%	3	4	6
Paper	Mixed Paper	3.9%	4	6	7
	Paper Board	2.9%	3	4	5
	Old Newspaper	0.5%	<0.5	1	1
	PET	1.2%	1	2	2
	PET Thermoform	0.4%	< 0.5	1	1
	Natural HDPE	1.2%	1	2	3
Diactic	Pigment HDPE	2.5%	2	4	5
FIDSUC	Polypropylene #5	1.9%	1	3	5
	Mixed Plastic #3, 4, 6, 7	0.2%	<0.5	0	0
	Rigid Plastic	0.7%	1	1	1
	Film Plastic	2.0%	2	3	4
Glass	Mixed Glass	7.4%	8	11	14
	Bi Metal	1.5%	2	2	3
Metal	Aluminum	0.3%	<0.5	0	1
	Aluminum - Other	0.2%	< 0.5	0	0
Organics	Organics	2.9%	3	4	6
Other	HHW	0.4%	< 0.5	1	1
	Batteries	0.0%	NA	0	NA
	Medical Waste	0.3%	< 0.5	0	1
	Manufactured Products	0.8%	1	1	2
	Polystyrene	0.1%	< 0.5	0	0
	Aseptic Lined Containers	0.2%	<0.5	0	0
	Refuse	18.4%	22	28	33
Total		100.0%		150	
Contamina	tion (noted in grey shading above)	25% +/- 9%	24	37	51

#### Exhibit 51. Detailed Recycling Composition from King City

"NA indicates that we did not find the material during the field effort.

The residual in King City's recycling stream are 25.7 percent of incoming recyclables which includes 18.4 percent refuse. **Exhibit 52** presents the visual characterization of refuse materials in SSR. The most prevalent material is OCC at 5.8 percent. Textiles/Leather represents 3.1 percent and Other represent 3.0 percent of materials in SSR.





The residuals varied significantly by sector as presented in **Exhibit 53**, with residential loads having 42.9 percent contamination and commercial loads having 20.5 percent residuals in 2020.

Exhibit 53.	Proportion of Residuals from King	City by Sector
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Sector	2020		2019		
360101	Number of Samples	Contamination	Number of Samples	Contamination	
Residential	2	42.9%	0	NA	
Commercial	8	20.5%	8	16.8%	
Mixed Loads	0	NA	2	19.4%	
Total	10	25.0%	10	17.3%	

# 3.5 HAULER: REPUBLIC SERVICES

Republic Services is the hauler for Salinas. In total, SCS completed 50 recycling stream samples from Salinas. Of the material sampled, 65.1 percent is Recyclable and 34.9 percent is contamination as shown in **Exhibit 54**.

The following section examines the recycling composition by category and material type, the 90% confidence interval, and the visual characterization for Salinas.

## 3.5.1 Salinas Recycling Composition

### **Recycling Composition**

The composition of Salinas's recycling stream by category is presented in **Exhibit 54**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 48.2 percent of the overall recycling stream. Contamination is the second most prevalent material category representing 34.9 percent of the overall recycling stream.



Exhibit 54. Composition of Recyclable Loads from Salinas, 2018 to 2020

A detailed breakdown of Salinas's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 55.** 

SALINAS									
Catagory	Material Type	Average	Monthly Tons (90% Confidence)						
Calegory	Materiai Type	Composition	Low	Average	High				
	Uncoated Corrugated Cardboard	31.4%	484	503	521				
	White Office Paper	1.8%	28	29	31				
Paper	Mixed Paper	8.5%	130	135	140				
	Paper Board	4.9%	77	79	82				
	Old Newspaper	1.5%	23	24	25				
	PET	1.3%	21	22	22				
	PET Thermoform	1.3%	19	21	23				
	Natural HDPE	1.3%	19	20	21				
Diantia	Pigment HDPE	1.6%	24	25	26				
Plasuc	Polypropylene #5	0.7%	11	11	12				
	Mixed Plastic #3, 4, 6, 7	0.2%	3	4	4				
	Rigid Plastic	1.6%	24	25	26				
	Film Plastic	2.1%	33	34	35				
Glass	Mixed Glass	4.7%	72	75	77				
	Bi Metal	3.8%	57	61	64				
Metal	Aluminum	0.3%	5	5	6				
	Aluminum - Other	0.2%	4	4	4				
Organics	Organics	3.4%	50	54	58				
Other	HHW	0.5%	8	8	9				
	Batteries	0.0%	< 0.5	0	0				
	Medical Waste	0.3%	5	5	6				
	Manufactured Products	1.9%	28	30	32				
	Polystyrene	0.2%	3	3	3				
	Aseptic Lined Containers	0.3%	5	6	6				
	Refuse	26.1%	408	417	427				
Total		100.0%		1,600					
Contaminat	ion (noted in grey shading above)	34.9% +/- 2.9%	511	558	Contamination (noted in grey shading above) 34.9% +/- 2.9% 511 558 605				

### Exhibit 55. Detailed Recycling Composition from Salinas

The residual in Salinas's recycling stream is 36.4 percent of incoming recyclables which includes 26.1 percent refuse. **Exhibit 56** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at 7.0 percent. Textiles/Leather represents 6.2 percent and OCC represents 3.4 percent of refuse materials in SSR.



Exhibit 56. Composition of Residuals from Salinas

The residuals varied significantly by sector as presented in **Exhibit 57**, with residential loads having 40.1 percent residuals compared to commercial and mixed loads which had 29 and 30.3 percent residuals, respectively in 2020.

Sector	2020		2019		
360101	Number of Samples	Contamination	Number of Samples	Contamination	
Residential	26	40.1%	10	33.8%	
Commercial	22	29.0%	16	20.2%	
Mixed Loads	2	30.3%	24	27.1%	
Total	50	34.9%	50	26.2%	

	Exhibit 57.	Proportion of Residuals from Salinas by Sec	ctor
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# **3.6** HAULER: CITY OF WATSONVILLE PUBLIC WORKS

The City of Watsonville is the hauler for Watsonville. In total, SCS completed 10 recycling stream samples from the City of Watsonville. Of the material sampled, 72.4 percent is Recyclable and 27.6 percent is Contamination as shown in **Exhibit 58**.

The following section examines the recycling composition by category and material type, the 90% confidence interval, and the visual characterization for Watsonville.

### 3.6.1 Watsonville

#### **Recycling Composition**

The composition of Watsonville commercial recycling stream by category is presented in **Exhibit 58**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 48.9 percent of the overall recycling stream. Contamination is the second most prevalent material category representing 27.6 percent of the overall recycling stream.



Exhibit 58. Composition of Recyclable Loads from Watsonville, 2018 to 2020

A detailed breakdown of Watsonville's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 59**.

WATSONVILLE					
Cotogony	Matorial Type	Average	Monthly To	ons (90% Co	nfidence)
Calegory		Composition	Low	Average	High
	Uncoated Corrugated Cardboard	29.4%	26	35	44
	White Office Paper	0.6%	<0.5	1	1
Paper	Mixed Paper	10.5%	10	13	15
	Paper Board	3.9%	4	5	6
	Old Newspaper	4.6%	3	5	8
	PET	1.9%	2	2	3
	PET Thermoform	3.1%	1	4	6
	Natural HDPE	1.1%	1	1	2
Diactio	Pigment HDPE	2.1%	2	3	3
Plasuc	Polypropylene #5	0.7%	1	1	1
	Mixed Plastic #3, 4, 6, 7	0.5%	<0.5	1	1
	Rigid Plastic	1.2%	1	1	2
	Film Plastic	1.7%	2	2	2
Glass	Mixed Glass	7.6%	7	9	11
	Bi Metal	3.7%	3	4	6
Metal	Aluminum	0.5%	<0.5	1	1
	Aluminum - Other	1.1%	1	1	2
Organics	Organics	2.3%	2	3	4
Other	HHW	0.6%	< 0.5	1	1
	Batteries	0.0%	NA	0	NA
	Medical Waste	0.4%	<0.5	0	1
	Manufactured Products	2.9%	2	3	5
	Polystyrene	0.1%	<0.5	0	0
	Aseptic Lined Containers	0.3%	< 0.5	0	1
	Refuse	19.3%	21	23	26
Total		100.0%		120	
Contamina	tion (noted in grey shading above)	27.6% +/- 6.2%	26	33	41

#### Exhibit 59. Detailed Recycling Composition from Watsonville

"NA indicates that we did not find the material during the field effort.

The residual in Watsonville's recycling stream is 28.9 percent of incoming recyclables which includes 19.3 percent refuse. **Exhibit 60** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at 4.5 percent. OCC represents 2.5 percent and Textiles/Leather and Compostable Paper each represent 2.5 percent of refuse materials in SSR.



Exhibit 60. Composition of Residuals from Watsonville

The residuals did not vary significantly by sector as presented in **Exhibit 61**, with residential loads having 28.4 percent residuals compared to commercial loads which had 26.8 percent residuals in 2020.

Sector	2020		2019		
Sector	Number of Samples	Contamination	Number of Samples	Contamination	
Residential	5	28.4%	4	25.1%	
Commercial	5	26.8%	4	12.8%	
Mixed Loads	0	NA	2	18.0%	
Total	10	27.6%	10	18.7%	

Exhibit 61. Proportion of Residuals from Watsonville by Sector

# 3.7 HAULER: RECOLOGY

Recology is the hauler for San Benito County. In total, SCS completed 20 recycling stream samples from San Benito County. Of the material sampled, 66.4 percent is Recyclable and 33.6 percent is Contamination as shown in **Exhibit 62**.

The following section examines the recycling composition by category and material type, the 90% confidence interval, and the visual characterization for San Benito County.

## 3.7.1 San Benito County

### **Recycling Composition**

The composition of San Benito County's recycling stream by category is presented in **Exhibit 62**. Based on the samples collected, the most prevalent material category by percentage is Recyclable Paper, representing 44.9 percent of the overall recycling stream. Contamination is the second most prevalent material category representing 33.6 percent of the overall recycling stream.





A detailed breakdown of San Benito County's recycling stream by material type and associated monthly tonnage is presented in **Exhibit 63.** 

SAN BENITO COUNTY					
Catagory	Matorial Typo	Average	Monthly Tons (90% Confidence)		
Calegory	Material Type	Composition	Low	Average	High
	Uncoated Corrugated Cardboard	27.5%	105	114	124
	White Office Paper	2.1%	7	9	10
Paper	Mixed Paper	8.4%	32	35	38
	Paper Board	5.4%	20	22	25
	Old Newspaper	1.6%	6	7	8
	PET	2.2%	8	9	10
	PET Thermoform	1.0%	4	4	5
	Natural HDPE	1.2%	4	5	5
Diactio	Pigment HDPE	1.6%	6	7	7
Plasuc	Polypropylene #5	1.1%	4	5	5
	Mixed Plastic #3, 4, 6, 7	0.6%	2	2	3
	Rigid Plastic	1.9%	6	8	10
	Film Plastic	4.5%	16	19	21
Glass	Mixed Glass	7.8%	29	33	36
	Bi Metal	3.2%	12	13	15
Metal	Aluminum	0.6%	2	3	3
	Aluminum - Other	0.4%	2	2	2
Organics	Organics	5.4%	20	22	25
Other	HHW	0.3%	1	1	1
	Batteries	0.0%	<0.5	0	0
	Medical Waste	0.5%	2	2	2
	Manufactured Products	1.0%	3	4	5
	Polystyrene	0.2%	1	1	1
	Aseptic Lined Containers	0.7%	2	3	3
	Refuse	21.0%	81	87	93
Total		100.0%		416	
Contaminat	tion (noted in grey shading above)	33.6% +/- 4.4%	121	140	158

### Exhibit 63. Detailed Recycling Composition from San Benito

The residual in San Benito County's recycling stream are 35.5 percent of incoming recyclables which includes 21 percent refuse. **Exhibit 64** presents the visual characterization of refuse materials in SSR. The most prevalent material is Refuse Less than 3-Inches at 6.4 percent. Textiles/Leather represents 2.9 percent and OCC represents 2.4 percent of refuse materials in SSR.





The residuals did not vary significantly by sector as presented in **Exhibit 65**, with residential loads having 33.3 percent residuals compared to commercial loads which had 34 percent residuals in 2020.

Sector	20	2020		2019		
Sector	Number of Samples	Contamination	Number of Samples	Contamination		
Residential	12	33.3%	11	28.0%		
Commercial	8	34.0%	4	8.1%		
Mixed Loads	0	NA	5	33.8%		
Total	20	33.6%	20	25.4%		

Exhibit 65. Proportion of Residuals from San Benito by Sector