



# LBA ASSOCIATES

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## MEMORANDUM

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**TO:** Mike Lutz

**COMPANY:** Denver Department of Transportation & Infrastructure

**DATE:** June 30, 2021

**RE:** Denver Recycling Composition Study

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This memorandum summarizes results from the Denver Recyclables Composition Study (RCS) conducted for Denver's Department of Transportation & Infrastructure (DOTI). The work was completed by LBA Associates and Kessler Consulting between June 20 and 22, 2021 at the City's Cherry Creek Transfer Station (CCTS).

### General

All samples were taken from loads of single-stream recyclables identified by DOTI staff and delivered by DOTI solid waste operators from residential routes. Thirty loads from all quadrants of the city were sampled, although most loads were from the east (the CCTS is located in the southeast corner of Denver).

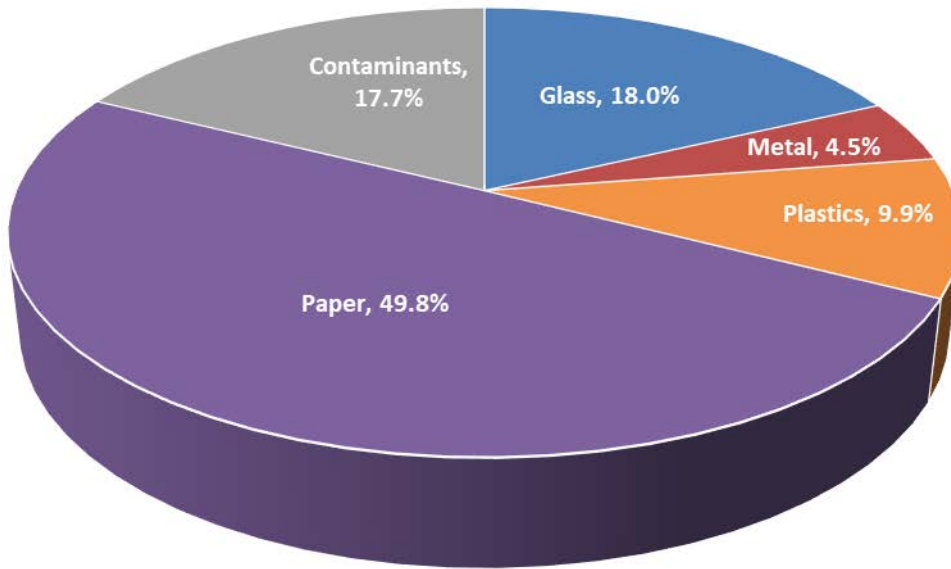
Quadrant	Number of Loads Samples
Northwest	3
Northeast	16
Southeast	9
Southwest	2

The RCS methodology generally followed the waste composition protocol developed and used for the 2016/2017 residential audit and the 2019 commercial audit. The list of recyclables sorted was amended by DOTI staff to meet their future processing parameters.

### Results

The following results represent the loads sampled during the week of June 20, 2021. Variabilities associated with load targeting, collections, routing and CCTS delivery are not addressed by this study.

All results are presented as percent by weight and are an aggregation of all 30 samples. Figures 1 and 2 (on pages 2 and 3) illustrate the composition of recyclables by category and material, respectively. Tabulated findings are provided in Appendix A.



**Figure 1 – Recyclables Composition by Categories**

Key observations from the 2021 RCS include:

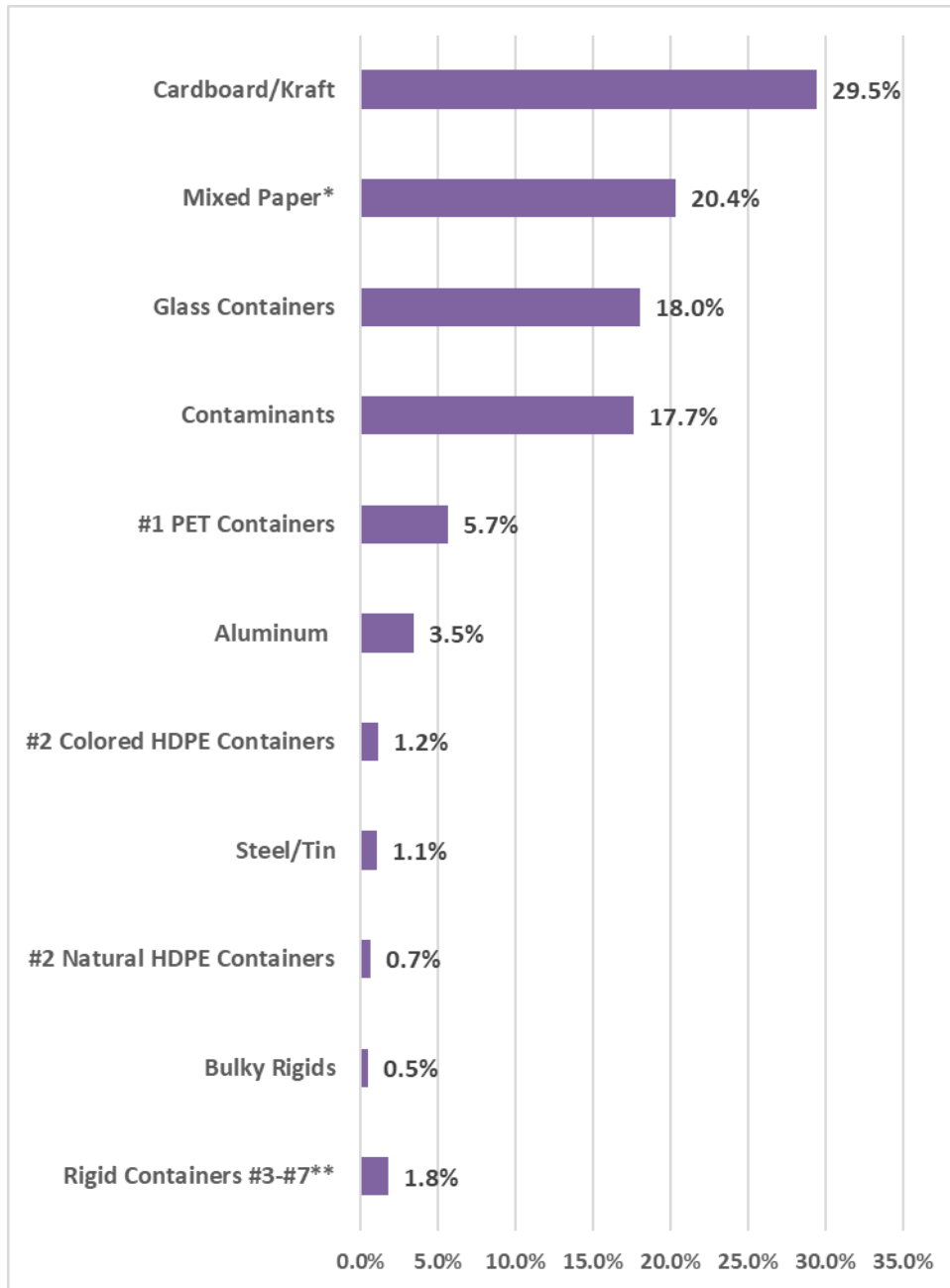
1. Three materials were observed to make up nearly 68% of the single-stream samples;
  - Cardboard and Kraft paper
  - Mixed paper
  - Glass containers
2. At 17.7%, contamination is the fourth largest material stream measured (Figures 3 and 4 on page 4 include photographs) – this measurement represents a notable increase from the 2016/2017 sort’s contamination level of 9.9%<sup>1</sup>. While many types of non-recyclables were observed, the high quantity of glass was a major contributor despite sort efforts to screen out pieces that were larger than one-half inch.

It was noted that nine of the 30 samples included greater than 20% contamination and five had more than 30%. Based on the information provided by DOTI and the limited number of samples, however, no clear pattern of contamination could be tied to specific neighborhoods.

3. Aseptic and to-go paper cups continue to be measured in approximately the same low quantity as in previous years.
4. Not all single-use plastics and Styrofoam were specifically measured in the RCS – however, plastic clamshells (made largely from #5 but from other resins as well) were common. Condiments, utensils and Styrofoam, however, were not frequently observed. Numerous plastic bags were found both to contain recyclables and as a direct contaminant.
5. A comparison against the 2016/2017 RCS results is challenging given the differences in contamination measured during each sort. Cardboard/Kraft, PET containers and aluminum appeared to be present in

<sup>1</sup> “2016/2017 Trash & Recycling Composition Results,” prepared for Denver Solid Waste Management by LBA Associates, May 2017. Note that materials sorted in 2016/2017 varied from those sorted in 2021 and comparisons should be made judiciously.

higher sample percentages in 2021 – while the non-cardboard paper stream was notably less. These relative changes may partially off-set the impact of higher contamination.



\* Mixed paper included aseptics and paper to-go cups  
 \*\* Rigid containers #3-#7 included #5 polypropylene containers  
 See Appendix A for additional details

**Figure 2 – Recyclables Composition by Individual Materials**

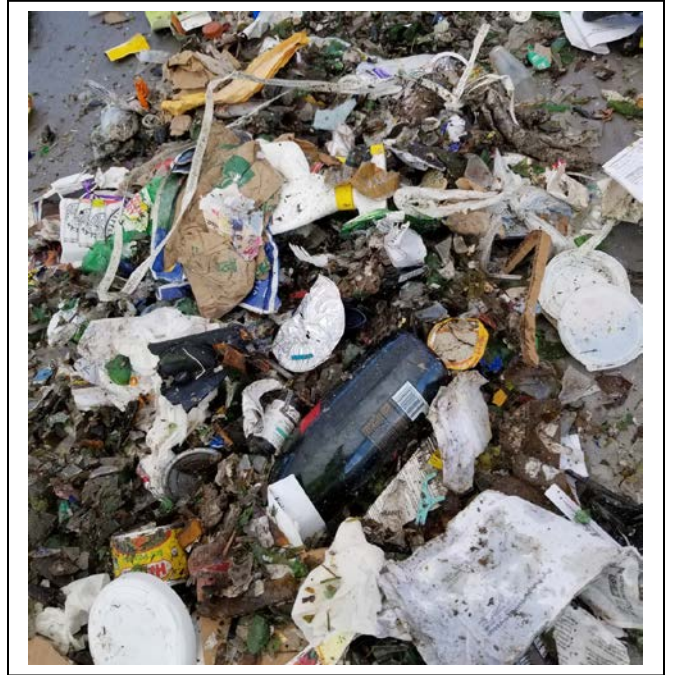


Figure 3 – Glass in Unsorted Samples



Figure 4 – Contamination in Sorted Samples

Appendix A  
Aggregated Recyclables Composition

	Weighted Average	90% Confidence Interval	
		Lower Bounds	Upper Bounds
Cardboard/Kraft	29.5%	26.3%	32.6%
Mixed Paper	19.8%	17.5%	22.0%
To-Go Cups	0.1%	0.0%	0.1%
Aseptic Containers	0.5%	0.4%	0.6%
#1 PET Containers	5.7%	4.9%	6.5%
#2 Natural HDPE Containers	0.7%	0.6%	0.9%
#2 Colored HDPE Containers	1.2%	1.0%	1.5%
#5 PP Containers	1.4%	1.1%	1.7%
Rigid Containers #3-#7	0.4%	0.3%	0.5%
Bulky Rigids	0.5%	0.3%	0.7%
Aluminum	3.5%	2.9%	4.0%
Steel/Tin	1.1%	0.9%	1.3%
Glass Containers	18.0%	14.3%	21.8%
Contaminants	17.7%	14.3%	21.1%
	<b>100.0%</b>		