



2010 WASTE COMPOSITION STUDY

Prepared for:
BOULDER COUNTY RESOURCE
CONSERVATION DIVISION

Final Report
December 29, 2010

MSWCONSULTANTS



ACKNOWLEDGEMENTS

The Project Team of MidAtlantic Solid Waste Consultants (MSW Consultants) and Cascadia Consulting Group would like to thank the management and participating operations staff of the following transfer station, landfill, and private waste collection companies that hosted field data collection events for their assistance during various stages of this project.

- ◆ Lisa Friend, Sustainability Planner, Boulder County Commissioners' Office;
- ◆ Hilary Collins, Assistant Manager, Boulder County Resource Conservation Division;
- ◆ Charles Kamenides, Operations Manager, City of Longmont;
- ◆ Gary Horton, General Manager, Western Disposal Transfer Station;
- ◆ Larry Shea, Operations Manager, Western Disposal Waste Collection;
- ◆ Jeff Burrier, District Manager, Waste Connections, Erie Landfill;
- ◆ Chris Gronquist, Operations Manager, Waste Connections, Erie Landfill;
- ◆ Scott McDonald, Operations Manager, McDonald Farms.

Additionally, the Project Team would like to thank all of the active municipal solid waste (MSW) public and private haulers, all of which were contacted and surveyed to provide disposal data that was used to both formulate the sampling plan for the field work, and to accurately aggregate the resulting waste composition data. We would also like to thank City of Longmont for providing loads of segregated multi-family wastes to be sampled and sorted at the Erie Landfill.

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ACKNOWLEDGEMENTS

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ES. EXECUTIVE SUMMARY

ES 1. INTRODUCTION

Boulder County has long been at the forefront of progressive waste management and recycling. To better understand the opportunities available for increasing recycling and diversion of wastes in Boulder County, the County retained the Project Team of MidAtlantic Solid Waste Consultants (MSW Consultants) and Cascadia Consulting Group (Cascadia) to conduct a statistically representative analysis of the County's disposed waste stream. This study sought to meet the following objectives:

- ◆ Quantify the amount of disposed wastes generated in Boulder County, in total and by generator sector.
- ◆ Estimate and compare the composition of wastes from individual generator sectors as well as in the aggregate.
- ◆ Provide feedback to recycling and solid waste planners in the County and within incorporated municipalities about the efficacy of existing recycling programs so that those programs can maintain or increase their effectiveness.
- ◆ Identify materials that represent future opportunities for increasing diversion in Boulder County.
- ◆ Establish a baseline so that future waste composition studies can be performed to inform the County as it makes its way towards its zero waste goal.

For solid waste and recycling planners, it is important to differentiate between the sources of wastes so that recycling and diversion programs can be properly targeted. This study defines the following sub-streams of MSW that were targeted for separate sampling and analysis:

- ◆ **Single Family Residential:** Waste generated in single family households.
- ◆ **Multi-family Residential:** Waste generated in multi-family apartments and condominiums.
- ◆ **Industrial, Commercial and Institutional (ICI):** Waste generated by industrial, commercial, institutional, and other non-residential sources.
- ◆ **Construction and Demolition (C&D):** Wastes generated as a result of construction, renovation, and demolition activities.

The study also separately obtained and analyzed samples of wastes disposed at the County's foothill transfer station sites.

ES 2. OVERVIEW OF RESULTS

Table ES-1 summarizes the estimated quantity of materials generated in Boulder County that require disposal in a landfill. This information was compiled from a combination of County reports, hauler interviews, and extrapolation of waste generation based on unit generation rates. As shown, Boulder County generated almost 221,000 tons of material that was delivered to a local transfer station or landfill for disposal.

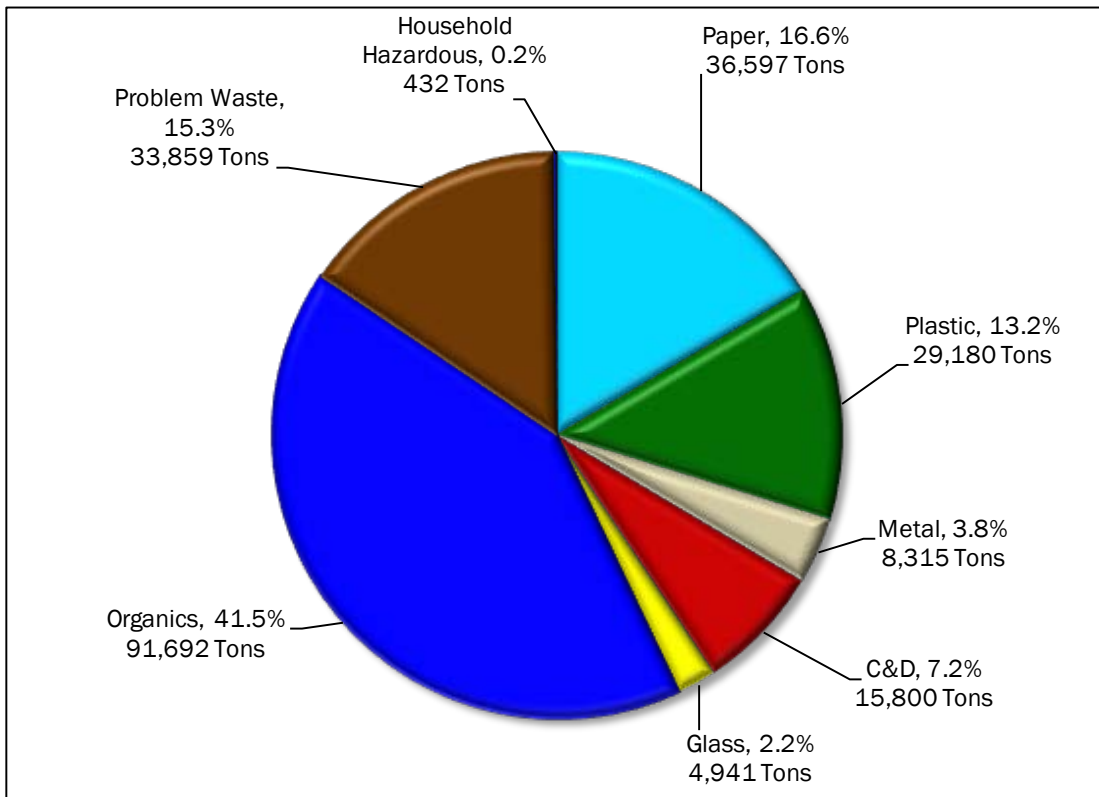
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Table ES-1 Estimated Countywide MSW Disposal by Generator Sector

| Generator Sector | Tons | Percent |
|--|----------------|---------------|
| Residential | 102,963 | 46.6% |
| Industrial, Commercial and Institutional (ICI) | 117,228 | 53.1% |
| Mountain Drop Boxes | 626 | 0.3% |
| Total MSW | 220,817 | 100.0% |

Figure ES-1 shows the breakdown of major material groups for the aggregate Boulder County waste stream (encompassing residential and ICI wastes, but excluding C&D). Results are shown in estimated percent composition disposed. As shown, Organics is far and away the largest material group, followed by Paper, Problem Waste, and Plastic.

Figure ES-1 Boulder County MSW Composition, 2010



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Table ES-2 shows the five most prevalent individual material categories disposed by residential, ICI, and C&D generating sectors. The percent composition is shown in the table.

Table ES-2 Top 5 Most Prevalent Material Categories

| Ranking | Residential | ICI | C&D |
|----------------|------------------------------|-----------------------------|--------------------------------------|
| 1 | Food Waste (13.1%) | Food Waste (14.9%) | Rock/Concrete/Brick (27.5%) |
| 2 | Mixed Yard Waste (12.9%) | Compostable Paper (7.1%) | Asphalt Shingles (19.1%) |
| 3 | Textiles/Leather (7.7%) | Corrugated Cardboard (6.7%) | Painted/Stained/Treated Wood (12.7%) |
| 4 | Furniture/Bulky Items (6.9%) | Other Rigid Plastics (6.2%) | Dirt/Sand (10.2%) |
| 5 | Other Rigid Plastics (6.5%) | Other plastic Film (4.4%) | Demo/Painted Drywall (8.8%) |
| Top 5 | 47.1% | 39.2% | 78.3% |

Full results for the County as a whole, as well as for individual generator sectors, is contained in the full report.

EXECUTIVE SUMMARY

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1. INTRODUCTION

1.1. BACKGROUND

Boulder County has long been at the forefront of progressive waste management and recycling. In November 2005 the Board of County Commissioners passed a resolution seeking to achieve Zero Waste (or “darn near”) by 2025. Doing so will require an acute focus on changing an entire mindset from waste management to materials management.

To aggressively pursue a zero waste goal, it is critical to understand the amount and composition of the waste stream that is currently being disposed. If wastes are to be turned into resources, it is imperative to know what those resources are. Anecdotal information and available market data suggest that recent history – including the economic downturn in late 2008 and 2009, disruption in the markets for recyclable materials, a crash in the housing and construction market, and the continued changes in product packaging and consumption trends, to name examples – appear to have impacted both waste volume and composition on a national and local scale.

The County retained the Project Team of MidAtlantic Solid Waste Consultants (MSW Consultants) and Cascadia Consulting Group (Cascadia) to conduct a statistically representative analysis of the County’s disposed waste stream. This study sought to meet the following objectives:

- ◆ Quantify the amount of disposed wastes generated in Boulder County, in total and by generator sector.
- ◆ Estimate and compare the composition of wastes from individual generator sectors as well as in the aggregate.
- ◆ Provide feedback to recycling and solid waste planners in the County and within incorporated municipalities about the efficacy of existing recycling programs so that those programs can maintain or increase their effectiveness.
- ◆ Identify materials that represent future opportunities for increasing diversion in Boulder County.
- ◆ Establish a baseline so that future waste composition studies can be performed to inform the County as it makes its way towards its zero waste goal.

1.2. OVERVIEW OF COUNTY WASTE MANAGEMENT SYSTEM

The U.S. Census Bureau indicates a county-wide population of almost 300,000, with approximately two-thirds residing in the cities of Boulder and Longmont. There are a total of 10 incorporated cities and towns in the County, as well as unincorporated area that is spread around the population centers and up into the foothills of the Rocky Mountains.

Solid waste collection and disposal within the County is performed by 19 or more collection companies (and public operations), as well as through citizen self-haul in the rural areas. The cities of Lafayette and Louisville contract for residential waste collection; Longmont provides

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public collection services to its residents. Additionally, the City of Boulder is predominantly served by Western Disposal, which also owns the in-county transfer station. However, residential collection in the rest of the County, as well as all commercial collection, is provided via open market. While the County receives reports from haulers on collected quantities, these data are provided in the aggregate and do not inform about waste generation by generator sector or by municipality.

Boulder County and its municipalities are aggressive recyclers. Curbside recycling is offered in most of the municipalities, and the County provides a network of drop-off centers for use by residents and small businesses for recycling containers, paper, and yard waste (residents only). Pay-as-you-throw (PAYT) rates are standard in several municipalities. Boulder County owns a recycling processing center where single stream materials are delivered for sortation and sale to markets. The County offers resources to its residents about hard-to-recycle items through a local non-profit organization.

Boulder County's disposed wastes are currently delivered to at least four disposal facilities. However, significant fractions of wastes are delivered to the Western Disposal Transfer Station in the City of Boulder, as well as direct haul to Waste Connection Denver Regional Erie Landfill in Erie, Colorado. Boulder County wastes also end up at the Larimer County Landfill, BFI Foothills Landfill, and Front Range Landfill.

1.3. REPORT ORGANIZATION

The remainder of this report presents the methodology and results of the Boulder County waste composition study. The report is divided into the following sections:

- ◆ **Methodology:** This section provides an overview of waste generation and disposal data available from County reports and supplemented with direct surveys, and provides the detailed sampling plan that was developed to govern the study process and to provide statistically defensible data. This section also summarizes the field data collection methods and analytical methods applied in the study.
- ◆ **Results:** Detailed results about the composition of the County's landfilled waste are presented in this section. Results are presented in both tabular and graphical format to highlight findings of interest. Results are presented in the aggregate and by generator sector.
- ◆ **Appendices:** Supplemental data and field data collection forms are contained in several appendices. Specific appendices include detailed material category definitions for MSW and C&D waste, and field data forms.

2. METHODOLOGY

2.1. INTRODUCTION

Boulder County, Colorado engaged the Project Team of MidAtlantic Solid Waste Consultants (MSW Consultants) and Cascadia Consulting Group (Cascadia) to conduct a waste composition study of Boulder County wastes.

The Project Team submitted a full proposal and approach for conducting a baseline study of waste composition within Boulder County. The Project Team's full approach, including sampling plan development, sampling procedures, field data collection methods, and statistical analysis, was contained in the original proposal. It has been summarized in this section, along with the results of subsequent hauler surveys and waste generation research that was conducted to develop specific sampling targets at the host disposal facilities within and adjacent to Boulder County.

2.2. WASTE GENERATOR SECTORS

This project analyzed the composition of the County's aggregate waste stream, as well as individually from the following generator sectors:

- ◆ **Single Family Residential:** Waste generated in single family households.
- ◆ **Multi-family Residential:** Waste generated in multi-family apartments and condominiums.
- ◆ **Industrial, Commercial and Institutional (ICI):** Waste generated by industrial, commercial, institutional, and other non-residential source.
- ◆ **Construction and Demolition (C&D):** Wastes generated as a result of construction, renovation, and demolition activities.

The study also separately obtained and analyzed samples of wastes disposed at the County's foothill transfer station sites.

2.3. BOULDER COUNTY WASTE GENERATION AND DISPOSAL

In order to aggregate the results of the waste composition analysis for each of the generator sectors, it is necessary to derive waste generation and waste disposal, both in total and by generator sector. Boulder County has previously expended effort to document its waste generation rate as part of its zero waste planning efforts. Table 2-1 summarizes the three waste generation estimates contained in a March 2009 report that attempted to model waste generation.¹ This report concluded that the best estimate of County waste generation was 344,532 tons, shown in the middle row of the table.

¹ Boulder County Zero Waste Model, Skumatz Economic Research Associates, March 2009.

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Table 2-1 Boulder County Waste Generation

| Source | lbs/ person/ day | Annual Tons Generated |
|--|------------------|-----------------------|
| U.S. EPA | 4.62 | 241,538 |
| Skumatz Economic Research Associates | 6.59 | 344,532 |
| Colorado Dept. of Health and Environment | 11.6 | 606,459 |

Source: Boulder County Zero Waste Model, March 2009.

However, this study did not provide breakdowns of generation by generator sector (residential, ICI), nor did the study compile whether wastes were being disposed, composted, recycled, or otherwise processed or diverted. Subsequent analysis by Boulder County, summarized in the County's Zero Waste Action Plan,² estimate the County's recycling rate at 35 percent. However, no prior data is available on the breakdown by generator sector.

To overcome this data limitation, Project Team member Cascadia conducted a survey of County haulers for the purpose of estimating the quantities of waste collected by generator sector and by geographic origin (i.e., municipalities and Boulder County unincorporated areas). Permitted haulers are required to submit disposal reports to the County on an annual basis as a condition of their permit. This information is considered confidential. However, the Project Team was able to review the confidential disposal data, supplemented with direct phone calls to various haulers, as a basis for deriving a representative waste generation and disposal estimates.

Despite good participation by haulers, the confidential hauler reports did not provide 100 percent coverage of all wastes collected in the County. Consequently, the Project Team reviewed the implied residential generation rate from several municipalities based on hauler reports in order to determine an appropriate residential generation rate. In all cases, the resulting estimate of residential waste disposal was higher than the sum of the quantities reported by haulers. This is to be expected because not all haulers reported.

Because of the wide variety of commercial businesses there is no comparable unit generation rate for the Industrial, Commercial and Institutional (ICI) sector. Accordingly, the Project Team estimated ICI waste generation by scaling up the ICI disposal quantities reported in the hauler survey in the same proportion as the residential wastes were scaled up based on the residential waste disposal rates.

The outcome of this exercise, and the implied waste generation and disposal by generator sector, is provided below.

2.3.1 WASTE GENERATION AND DISPOSAL BASED ON LONGMONT REPORTS

The City of Longmont was able to provide both residential quantities collected as well as the number of housing units served, which means that the reported generation rate is highly

² Boulder County Zero Waste Action Plan Final Draft, December 2010.

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defensible. However, Longmont does not provide a curbside collection service for yard waste and organics, unlike some other municipalities and County unincorporated areas. This suggests that use of the Longmont data may slightly overestimate disposed waste quantities. Table 2-2 shows the derived waste generation using the City of Longmont residential generation estimates. As shown, this yields almost identical generation as predicted in the City’s zero waste model report in Table 2-1.

Table 2-2 Estimated Countywide MSW Generation and Disposal by Generator Sector Based on Reported Longmont Data

| Generator Sector | Tons | Percent |
|---|----------------|---------------|
| Residential | 102,963 | 46.6% |
| Industrial, Commercial and Institutional (ICI) | 117,228 | 53.1% |
| Mountain Drop Boxes | 626 | 0.3% |
| Total Disposed MSW | 220,817 | 100.0% |
| <i>Recycling Rate (Zero Waste Action Plan)</i> | 35% | |
| <i>Implied Waste Generation</i> | 339,718 | |

2.3.2 WASTE GENERATION AND DISPOSAL BASED ON CITY OF BOULDER AND LOUISVILLE ESTIMATES

The Project Team was able to derive reasonably accurate estimates of waste disposal quantities from the City of Boulder and from the City of Louisville. These municipalities offer curbside organics collection, as well as single stream recycling and weekly refuse collection. However, it was necessary to estimate the number of households generating these quantities. Table 2-3 summarizes the derived waste generation and disposal estimates based on City of Boulder and Louisville data. As shown in this table, waste generation and disposal was found to be somewhat lower using these assumptions.

Table 2-3 Estimated Countywide MSW Generation and Disposal by Generator Sector Based on Hauler Report Assumptions from the Cities of Boulder and Louisville

| Generator Sector | Tons | Percent |
|---|----------------|---------------|
| Residential | 88,973 | 46.6% |
| Industrial, Commercial and Institutional (ICI) | 101,383 | 53.1% |
| Mountain Drop Boxes | 626 | 0.3% |
| Total MSW | 190,982 | 100.0% |
| <i>Recycling Rate (Zero Waste Action Plan)</i> | 35% | |
| <i>Implied Waste Generation</i> | 293,818 | |

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2.3.3 WASTE GENERATION AND DISPOSAL USED IN THIS REPORT

The Project Team believes that there are merits to using either the Longmont data or the City of Boulder and Louisville estimates to justify aggregate waste generation and disposal in Boulder County. The resulting projections for residential and ICI waste disposal reasonably reflect the quantity of wastes being disposed. Further, the Mountain Box quantities are directly reported by the County and are therefore accurate.

Because the Longmont generation derivation was based on verified reports of quantities and units served, the Project Team has applied waste composition results to these quantities of wastes disposed, for the purpose of estimating the quantity of disposed material in the waste stream. The resulting disposal estimates may be slightly high for the County as a whole, but are very reasonable in the context of prior County-sponsored studies on waste generation. The final weighting factors and waste disposal quantities used in the remainder of this report are shown in Table 2-4.

2-4 Countywide MSW Disposal Used in This Report

| Generator Sector | Tons | Percent |
|--|----------------|----------------|
| Residential | 102,963 | 46.6% |
| Industrial, Commercial and Institutional (ICI) | 117,228 | 53.1% |
| Mountain Drop Boxes | 626 | 0.3% |
| Total MSW | 220,817 | 100.0% |

As a final comment, it is important to note that it was not possible to obtain defensible estimates of the quantity of construction and demolition (C&D) debris generated and disposed in Boulder County. For this reason, only the composition of C&D is reported. Because of this, aggregate waste composition therefore includes only municipal solid wastes (MSW), but does not attempt to combine C&D debris.

2.4. MATERIAL CATEGORIES

The list of material categories was developed based on a draft list included in the County's RFP. Appendix A contains the material categories and associated definitions used for the manually sorted samples obtained for this project.

The Project Team's approach relies on manual sorting for residential and commercial wastes, and visual surveying for C&D debris. Because of the visual surveying process and because C&D wastes typically have a different mix of commonly-occurring materials, Appendix A also shows the abbreviated list of material categories and associated definitions for visual surveying of C&D wastes. Note that there is a catch-all category in the C&D list called "Mixed MSW." This category was used to record bagged and loose wastes that are often discarded in C&D wastes at *de minimus* levels.

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2.5. SEASONALITY AND HOST FACILITIES

The 2010 Study included two four-day seasonal sampling and sorting events, which were held at Western Disposal's transfer station in Boulder and at the privately-owned Erie Landfill. Table 2-5 summarizes the specific seasonal sampling and sorting schedule.

Table 2-5 Field Data Collection Schedule

| Day of Week | Summer Season: July 12 - 15 | Winter Season: Oct 26 - 29 |
|--------------------|--|---------------------------------------|
| Monday | Western Disposal TS | N/A |
| Tuesday | Western Disposal TS | Erie Landfill |
| Wednesday | Western Disposal TS | Erie Landfill |
| Thursday | Erie Landfill | Western Disposal TS |
| Friday | N/A | Western Disposal TS |
| Saturday | N/A | Western Disposal TS |

As shown in the table, the winter season field data collection event required an additional day of sampling and sorting because of high winds at the outset of the data collection event. Despite weather-related delays, samples were successfully obtained across all six days of the work week and at both of the host disposal facilities that were found to receive the majority of wastes generated in the County.

2.6. SAMPLING TARGETS

The Project Team relied on the results of the hauler survey to develop daily sampling targets at each facility during each season. The Project Team worked with individual haulers to identify the date and time of delivery for targeted loads. In most cases, loads were scheduled to be delivered to one of the two host facilities and were obtained upon regular delivery. However, several haulers – including the City of Longmont – dispatched trucks to the Erie Landfill specifically in support of this project.

Table 2-6 summarizes the planned versus actual distribution of samples by generator sector. As shown, the Project Team successfully obtained the targeted number of samples, and was generally able to achieve the targeted sample distribution. The Project Team believes that the samples obtained provide a representative snapshot of the wastes disposed in Boulder County.

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Table 2-6 Planned vs. Actual Distribution Samples

| Generator Sector | | Proposed Manually Sorted Samples | Actual Manually Sorted | Proposed Visually Surveyed Samples | Actual Visually Surveyed Samples |
|------------------|-------------------------|----------------------------------|------------------------|------------------------------------|----------------------------------|
| 1 | Single Family | 25 | 26 | 0 | 0 |
| 2 | Multi-family | 10 | 8 | 0 | 0 |
| 3 | Commercial | 35 | 36 | 0 | 0 |
| 4 | Foothill Transfer Sites | 10 | 10 | 0 | 0 |
| 5 | C&D | 0 | 0 | 30 | 37 |
| Total | | 80 | 80 | 30 | 37 |

2.7. FIELD DATA COLLECTION PROCEDURES

This section describes in detail the steps that were performed in the field to successfully acquire, sort, weigh, and discard manually sorted samples.

2.7.1 STAFFING AND SORTER TRAINING PLAN

The Project Team managed and conducted all refuse sampling, sorting, and visual surveying required throughout the study. Specifically, field data collection team included the following individuals:

- ◆ **Field Supervisor:** MSW Consultants provided a Field Supervisor. The Field Supervisor's lead responsibility was for planning each sampling and sorting event, and for interacting with the facility personnel whose cooperation was needed throughout the field data collection. The Field Supervisor generally led the sampling selection process and oversaw the physical taking of the 200-250 pound samples. The Field Supervisor was ultimately responsible for the successful completion of the project. The Field Supervisor also made visual surveys of the targeted C&D loads as time permitted at each host facility.
- ◆ **Crew Chief:** MSW Consultants provided a Crew Chief. The Crew Chief was the second professional staff person. The Crew Chief was responsible for managing the manual sorting area, including crew management, sorting productivity and accuracy, data recording, work site health and safety, and cleaning up at the end of the day.
- ◆ **Sorting Labor:** MSW Consultants contracted locally-based light industrial temporary workers to serve as sorting labor. Training and oversight was provided by the MSW Consultants field operations management staff above.

As a final note, MSW Consultants maintained the guidelines in the Safety and Health Plan that was submitted in the proposal which governs our conduct of waste characterization studies.

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2.7.2 LOAD SELECTION

Daily routes were pre-selected at each facility each day for most waste substreams. C&D loads were systematically selected.

The Field Supervisor interviewed the drivers of selected loads to confirm the geographic origin and type of waste, as well as any other pertinent data. This information was noted on the vehicle selection form, along with a unique identifying number associated with that vehicle on that day. A copy of the weight ticket (if available) for each vehicle was obtained for every incoming truck selected for sampling and sorting.³

2.7.3 TAKING RANDOM SAMPLES FOR MANUAL SORTING

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

Figure 2-1 Example of a Grab Sample Staged for Manual Sorting



Once the area of the tipped load was selected, the Field Supervisor coordinated with a facility-provided loader operator to take a “grab” sample of wastes from that point in the tipped load. The loader operator removed a sample of waste that exceeded the targeted sample weight, and placed the grab sample in a secure area to await sorting. This is shown in Figure 2-1.

It should be notes that only one sample was obtained from single family residential and ICI truckloads.

Either one or two samples were taken from the foothill transfer site drop boxes. At the two host disposal facilities, the Project Team arranged with Western Disposal and the City of Longmont to have segregated loads of multi-family wastes delivered for sampling and sorting. Because these loads were specially arranged, the Project Team acquired two grab samples from each load. Because of unforeseen weather challenges during the second season, one of the pre-arranged multi-family loads could not be delivered.

³ Some haulers delivering C&D to the Western Disposal Transfer Station operated under a “flat rate” charge agreement with the facility. These C&D loads were charged by volume rather than weight. For these loads, the field supervisor noted the cubic yardage of the container and the weight was calculated based upon industry standard C&D density estimates.

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Refuse samples were deposited on a tarp or paved surface designated to receive samples. Each was labeled by its identifying number using a white board. The white board for sample identification stayed with the sample until sorting and weigh out was completed.

2.7.4 MANUAL SORTING

Once each sample was acquired, the material was manually sorted into the prescribed component categories. Plastic 20-gallon bins with sealed bottoms were used to contain the separated components. A picture of the sorting table and bins is shown in Figure 2-2.

Figure 2-2 Sort Table and Bins



Sorters were asked to specialize in certain material groups, with someone handling the paper categories, another the plastics, another the glass and metals, and so on. In this way, sorters became highly knowledgeable in a short period of time as to the definitions of individual material categories.

The Crew Chief monitored the bins as each sample was sorted, rejecting materials that were improperly classified. Open bins allowed the Crew Chief to see the material at all times. The Crew Chief also verified the purity of each component during the weigh-out (discussed below). The materials were sorted to particle size of 2-inches or less by hand, until no more than a small amount of homogeneous fine material (“mixed residue”) remained. This layer of mixed 2-inch-minus material was be allocated to the appropriate categories based on the best judgment of the Crew Chief—most often a combination of Other Paper, Other Organics, or Food Waste. Particles falling through a half inch screen were swept into a Fines category.

2.7.5 VISUAL SURVEYING OF C&D LOADS

C&D debris is by nature very different in composition compared to residential and commercial waste collected in compacting vehicles. Where residential and commercial waste loads consist of waste from dozens (commercial) or hundreds (residential) generators, and since most particles are relatively small (less than 12 inches), physical grab sampling and sorting is both practical from an operations standpoint and is also statistically appropriate.

However, C&D debris is very different. C&D typically contains large items that are difficult to “grab” and manually sort, such as drywall, dimensional lumber, and a number of bulky items. Furthermore, grabs of C&D waste frequently miss the densest items in the load – concrete, brick, block and dirt – which sink to the bottom center of the tipped load. Even a 300 pound grab of a C&D load may not come close to representing the full contents of the load.

Since the mid 1990s, the solid waste industry has studied various methods for characterizing C&D debris, and has generally found that visual surveying of C&D loads provides the best combination of accuracy and cost effectiveness to enable a statistically meaningful number of samples to be collected.

2. METHODOLOGY

The Project Team's protocol for characterizing C&D loads entailed visual surveying of the entire load of C&D. Visual surveying of a load of C&D waste involves detailed volumetric measurements of the truck and load dimensions, followed by the systematic observation of the major material components in the tipped load. The basic steps to visual surveying were:

1. Measure the dimensions of the incoming load prior to tipping and estimate the percent full of the vehicle.
2. Tip the load. If it is a large load, and if possible, have a loader spread out the material so that it is possible to discern dense materials such as block, brick, and dirt that tend to sink to the bottom of the pile.
3. Make a first pass around the load marking the major material categories that are present in the load—cardboard, drywall, dimensional lumber, etc. Estimate the percentage of the load made up of these major materials. If possible, estimate the yardage associated with this material.
4. Make a second pass around the load, noting the secondary material categories contained in the load. Estimate the percentage of the load made up of these materials. If possible, estimate the yardage associated with this material.
5. Validate that the estimated percentages sum to 100 percent, and that the estimated yardage of major material categories is realistic given the overall truck dimensions and volume.

2.8. DATA RECORDING

The MSW Team believes that the weigh-out and data recording process is the most critical process of the sort. The Crew Chief was singularly responsible for overseeing all weighing and data recording of each sample. Once each sample had been sorted, the weigh-out was performed. Each bin containing sorted materials from the just-completed samples was carried over to a digital scale provided by the Project Team. Sorting laborers assisted with carrying and weighing the bins of sorted material, the Crew Chief recorded all data.

The Crew Chief used a waste composition data sheet to record the composition weights, as well as to record other observed or empirical information. Each data sheet containing the sorted weights of each sample were matched up against the Field Supervisor's sample sheet to assure accurate tracking of the samples each day.

The Project Team designed a customized database to manage the data from waste sorting, and the Crew Chief entered the data from the waste sample tally sheets to assure that all handwriting could be deciphered. Entered data was subjected to quality control queries, and any anomalies were resolved against the hand-written information on the sample tally sheets or supervisor's sheet. Specific steps taken to ensure the integrity of data during entry and analysis included:

- ◆ Verifying that data forms were obtained for each day the data collection crew was in the field.
- ◆ Having the data collection crew keep copies of all forms while the originals were shipped to the office.
- ◆ Random checks of the computer-entered data against the paper form, to verify that all numbers were entered and to look for any systematic or random mistakes.

2. METHODOLOGY

- ◆ Encoding the composition analysis formulae into a routine that can be applied consistently to different data sets. (This minimizes errors that could arise from mistyping formulae, etc.)

2.9. STATISTICAL METHODS

Using tested statistical procedures, Project Team member Cascadia developed detailed estimates of waste composition and quantities for each generator sector to statistically represent the County's waste stream.

The statistical confidence interval was calculated for each generator sector and in total. The approach used for calculating the mean weight estimates and the confidence intervals is described below. Confidence intervals were calculated at 90 percent.

Composition estimates represent the ratio of the material's weight to the total material for each noted material component in a particular segment of the waste stream. They are derived by summing each component's weight across all of the relevant samples and dividing by the sum of the total weight of waste/recyclables, as shown in the following equation:

$$r_j = \frac{\sum_i c_{ij}}{\sum_i w_i}$$

where:

c = weight of particular material component

w = sum of all component weights

for i = 1 to n, where n = number of selected samples

for j = 1 to m, where m = number of material components

The confidence interval for this estimate is derived in two steps. First, the variance around the estimate is calculated, accounting for the fact that the ratio includes two random variables (the component and total sample weights). The variance of the ratio estimator equation follows:

$$\hat{V}_{r_j} = \left(\frac{1}{n}\right) \cdot \left(\frac{1}{\bar{w}^2}\right) \cdot \left(\frac{\sum_i (c_{ij} - r_j w_i)^2}{n-1}\right) \quad \text{where} \quad \bar{w} = \frac{\sum_i w_i}{n}$$

Second, confidence intervals at the 90% confidence level are calculated for a component's mean as follows:

$$r_j \pm \left(t \cdot \sqrt{\hat{V}_{r_j}}\right)$$

where

t = the value of the t-statistic corresponding to a 90 percent confidence level.

2. METHODOLOGY

As a final step, the County-wide composition of waste was calculated as the weighted average of the various generator sectors that were individually analyzed. Weighting factors are shown in Table 2-1.

2. METHODOLOGY

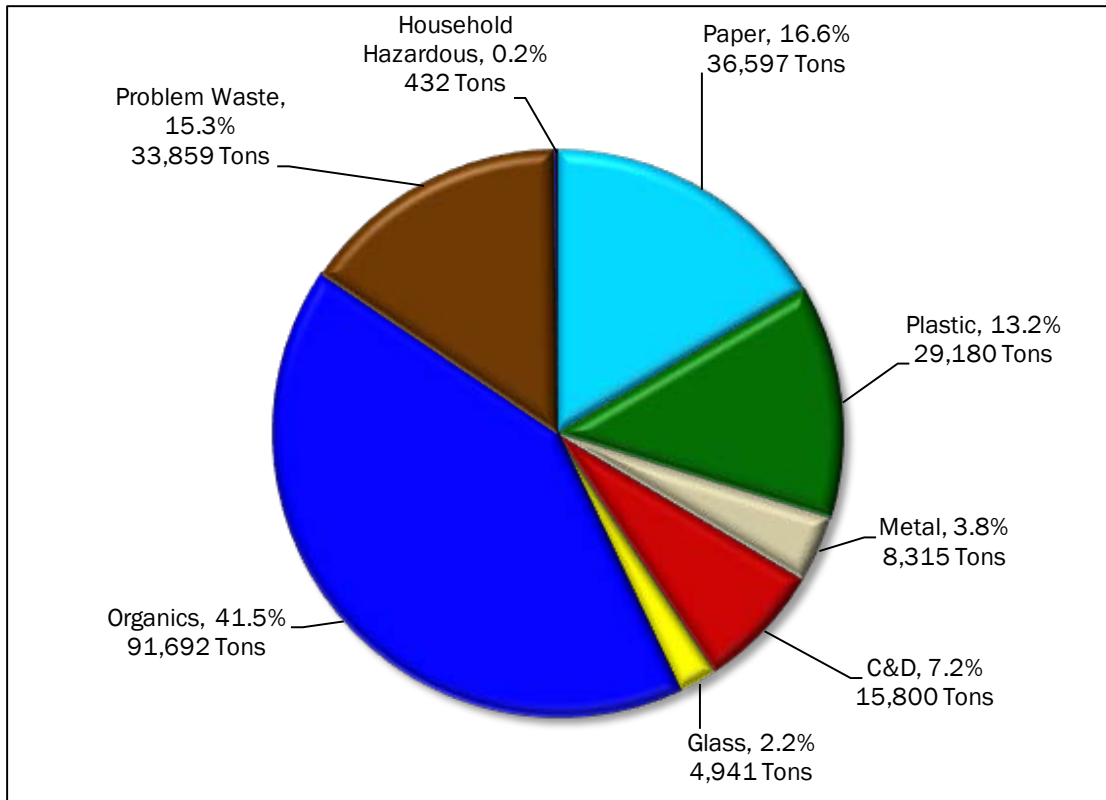
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3. RESULTS

3.1. BOULDER COUNTY MSW COMPOSITION

Figure 3-1 shows the breakdown of major material groups for the aggregate countywide municipal solid waste stream (encompassing residential, ICI, and mountain box wastes). Results are shown both in percentage terms as well as the estimated mean tons disposed. As shown, Organics is far and away the largest material group, followed by Paper, Problem Waste, and Plastic.

Figure 3-1 Boulder County MSW Composition, 2010



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Figure 3-2 shows the top 10 most prevalent material categories in the Boulder County MSW stream. Not surprisingly, Food Waste is the single most prevalent category. However, it is of interest that there appears to be significant fractions of yard wastes (including leaves) and compostable and recyclable papers still in disposed wastes.

Figure 3-2 Top 10 Most Prevalent Material Categories in Boulder County MSW

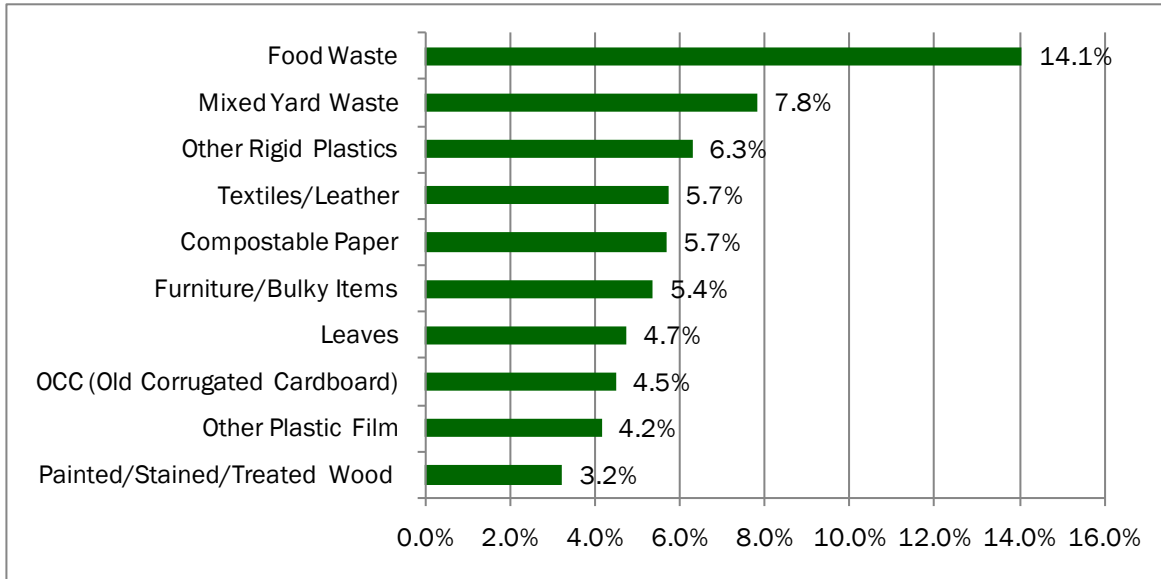


Table 3-1 on the following page provides a detailed statistical profile of Boulder County's disposed MSW stream. For each material category, the estimated disposed tons, mean percent, and lower and upper confidence intervals are shown. Confidence intervals are calculated at a 90 percent level of confidence.

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Table 3-1 Boulder County Detailed MSW Composition

| Material | + / - | | Est. Tons | Material | + / - | | Est. Tons |
|-------------------------------------|--------------|------|------------------|---|---------------|------|------------------|
| Paper | 16.6% | | 36,597 | Glass | 2.2% | | 4,941 |
| Newsprint | 0.8% | 0.2% | 1,769 | Glass Bottles and Jars | 1.9% | 0.6% | 4,103 |
| High Grade Office Paper | 0.8% | 0.4% | 1,824 | Other Glass | 0.4% | 0.2% | 838 |
| Shredded Paper | 0.3% | 0.2% | 632 | | | | |
| OCC (Old Corrugated Cardboard) | 4.5% | 1.2% | 9,908 | Organics | 41.5% | | 91,692 |
| Magazines/Catalogs | 0.9% | 0.3% | 2,091 | Mixed Yard Waste including Small Branches | 7.8% | 2.5% | 17,271 |
| Recyclable Mixed Paper | 2.1% | 0.3% | 4,642 | Branches/Limbs and Stumps >6" Diameter | 1.3% | 0.6% | 2,765 |
| Polycoated/Aseptic Containers | 0.1% | 0.0% | 278 | Leaves | 4.7% | 1.6% | 10,471 |
| Compostable Paper | 5.7% | 0.8% | 12,559 | Food Waste | 14.1% | 1.7% | 31,055 |
| Unrecyclable Mixed Paper | 1.3% | 0.3% | 2,895 | Other Untreated Wood | 0.5% | 0.4% | 1,100 |
| | | | | Textiles/Leather | 5.7% | 1.5% | 12,666 |
| Plastic | 13.2% | | 29,180 | Fines/Dirt | 2.9% | 0.7% | 6,318 |
| #1 PET Bottles/Jars | 0.5% | 0.1% | 997 | Pallets | 2.2% | 1.4% | 4,769 |
| #2 HDPE Bottles/Jars | 0.4% | 0.1% | 908 | Other Organics | 2.4% | 0.6% | 5,277 |
| Bottles #3-7 | 0.1% | 0.0% | 194 | | | | |
| Other Plastic Containers <3 Gallons | 0.2% | 0.1% | 479 | Problem Waste | 15.3% | | 33,859 |
| Large Plastic Containers >3 Gallons | 0.3% | 0.2% | 732 | Large Electronics (Plug-in) | 2.2% | 1.0% | 4,874 |
| Plastic Retail Bags | 0.4% | 0.1% | 781 | Small Electronics (Rechargeable) | 0.2% | 0.2% | 468 |
| Other Plastic Film | 4.2% | 0.6% | 9,169 | Small Appliances | 0.7% | 0.5% | 1,506 |
| Expanded Polystyrene | 0.9% | 0.5% | 2,019 | Diapers/Sanitary Products | 1.7% | 0.4% | 3,728 |
| Other Rigid Plastics | 6.3% | 1.3% | 13,901 | Carpet/Padding | 3.2% | 1.9% | 7,019 |
| | | | | Batteries | 0.2% | 0.2% | 482 |
| Metal | 3.8% | | 8,315 | Rubber | 0.7% | 0.2% | 1,524 |
| Aluminum Containers | 0.3% | 0.1% | 570 | Tires | 0.9% | 0.7% | 1,981 |
| Aluminum Foil & Trays | 0.2% | 0.1% | 369 | Furniture/Bulky Items | 5.4% | 2.0% | 11,868 |
| Ferrous Containers | 0.5% | 0.1% | 1,097 | Other Inorganics | 0.2% | 0.1% | 410 |
| Other Ferrous | 1.7% | 0.7% | 3,852 | | | | |
| Other Non-Ferrous | 0.9% | 0.4% | 1,948 | Household Hazardous Waste (HHW) | 0.2% | | 432 |
| White Goods | 0.2% | 0.4% | 479 | Fluorescent Tubes and Bulbs | 0.0% | 0.0% | 12 |
| | | | | Pharmaceuticals and Syringes | 0.0% | 0.0% | 35 |
| C&D | 7.2% | | 15,800 | Oil-based Paint & Finishes | 0.0% | 0.0% | 0 |
| Aggregate/Concrete/Asphalt/Ceramics | 0.5% | 0.4% | 1,176 | Latex Paint & Finishes | 0.0% | 0.0% | 35 |
| Asphalt Shingles | 0.0% | 0.0% | 60 | Pesticides | 0.0% | 0.0% | 0 |
| Painted/Stained/Treated Wood | 3.2% | 1.2% | 7,155 | Automotive Fluids | 0.0% | 0.1% | 87 |
| Clean Dimensional Lumber | 1.7% | 1.0% | 3,749 | Other Household Hazardous Waste | 0.1% | 0.1% | 263 |
| Clean/New Drywall | 0.2% | 0.2% | 349 | | | | |
| Demo/Painted Drywall | 0.5% | 0.5% | 1,031 | Totals | 100.0% | | 220,817 |
| Other C&D | 1.0% | 0.5% | 2,279 | Sample Count | 80 | | |

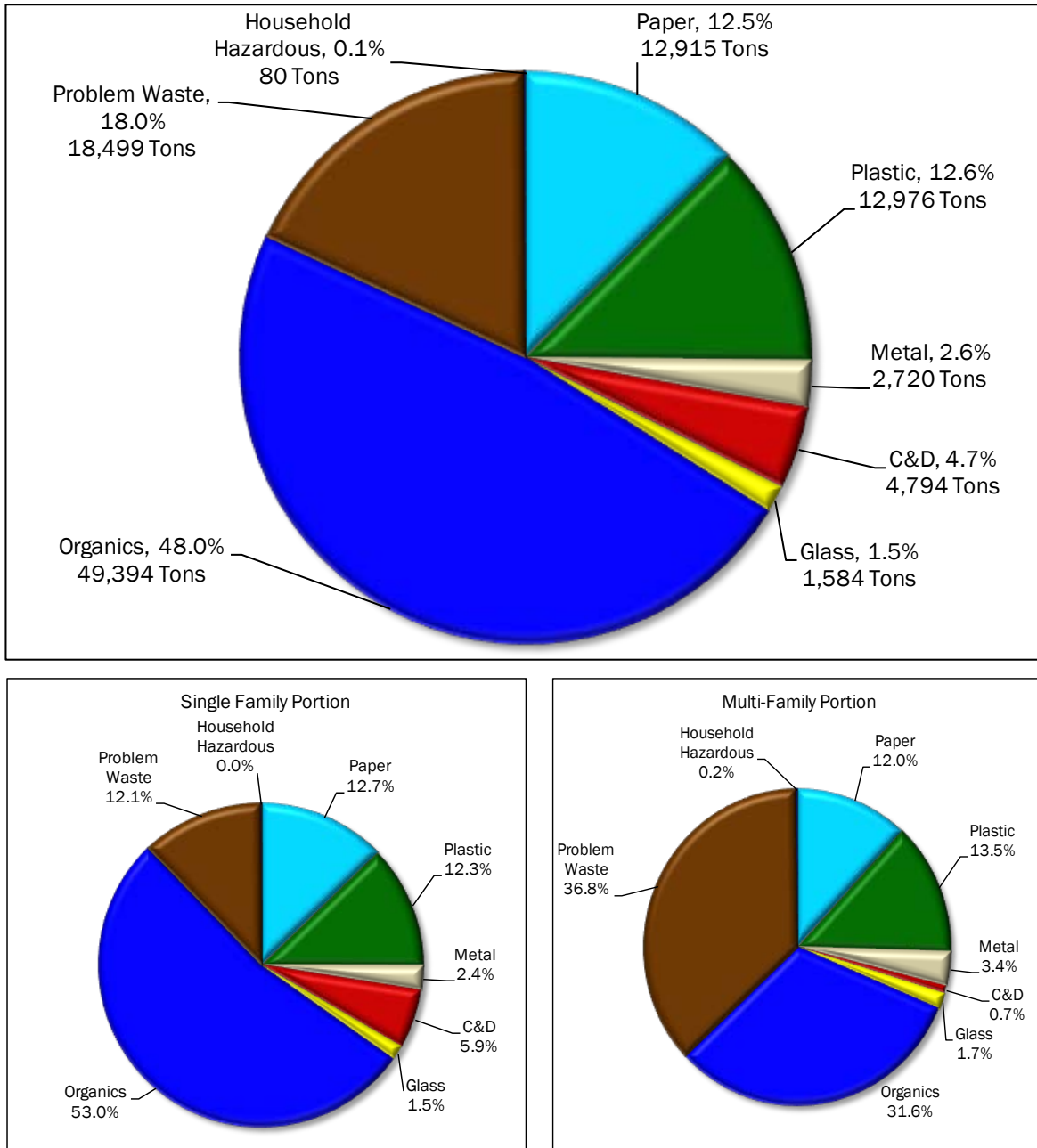
Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

3. RESULTS

3.2. RESIDENTIAL MSW COMPOSITION

Figure 3-3 presents the breakdown of residential wastes. The top pie chart shows results for all residential wastes (i.e., single family and multi-family). The bottom pie charts split out the composition of single family wastes and multi-family wastes so that the reader can see the difference in the two substreams. Because the majority of residential wastes are generated by single family households, the single family composition dominates multi-family in the overall residential waste stream.

Figure 3-3 Boulder County Residential Waste Composition, 2010



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As shown in Figure 3-3, Organics make up almost half of residential wastes. However, the single family profile and the multi-family profiles are significantly different. Organics dominate single family wastes, but in the multi-family waste stream, Problem Materials are the single largest material group. Figure 3-4 shows the top 10 most prevalent material categories in Residential waste. Food waste, yard waste, and leaves are large contributors.

Figure 3-4 Top 10 Most Prevalent Material Categories in Residential Waste

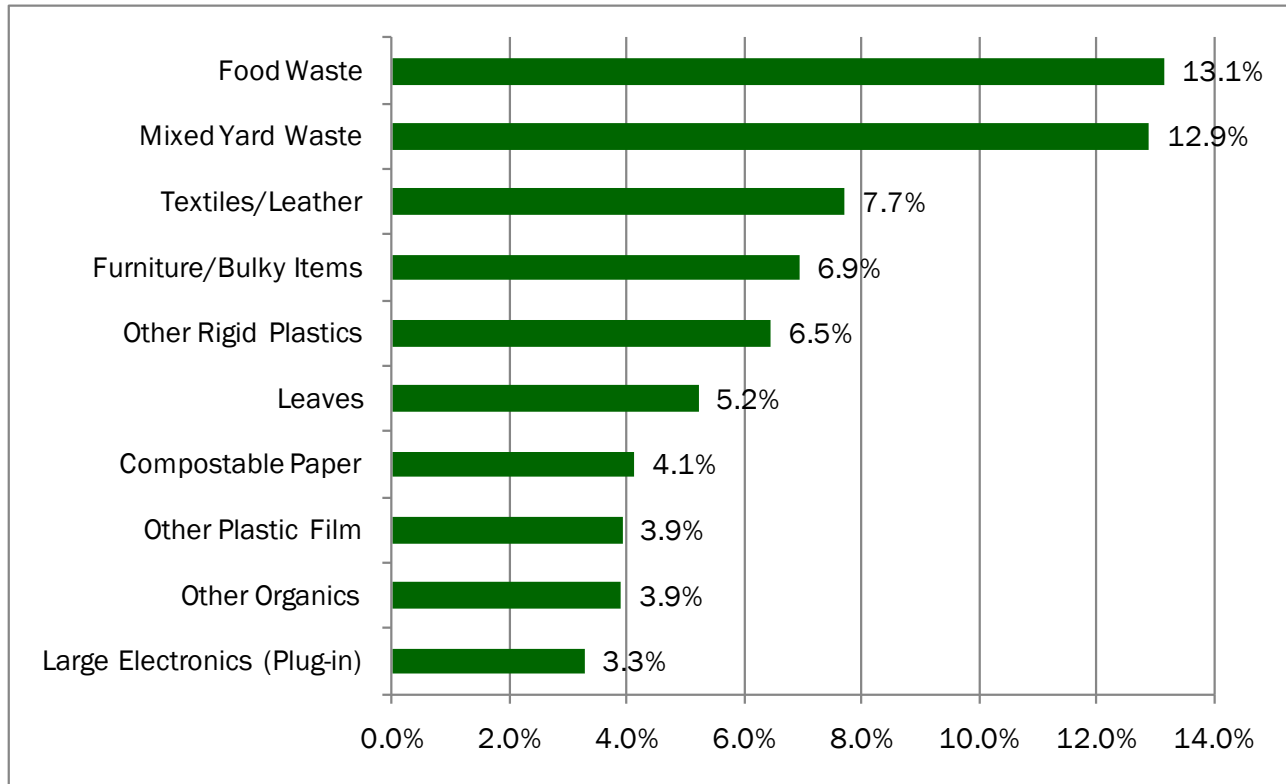


Table 3-2 compares the 10 most prevalent materials in disposed single family and multi-family wastes. This table highlights the significant differences between single family and multi-family materials. Of particular interest are the large fraction of bulky items, furniture, and small appliances in multi-family wastes. The following notable observations are made about multi-family wastes:

- ◆ Two of the eight multi-family samples contained television sets, which are categorized as Large Electronics. In both samples, the televisions weighed 30 pounds or more; which caused the relatively high reported fraction of Large Electronics in the multi-family results.
- ◆ Three of the eight multi-family samples contained a significant quantity of leaves, which caused the relatively high percentage of this material.

The Project Team notes that these findings suggest that further investigation would be informative, as the relatively low sample size (eight samples) does not provide the level of representativeness that would be needed to better analyze the prevalence of these materials in multi-family wastes. However, the fact that two televisions were found in multi-family

3. RESULTS

samples, as well as a significantly higher fraction of furniture and bulky items, suggests that the multi-family waste stream is significantly different from single family wastes.

Table 3-2 Comparison of Top Ten Materials in the Single Family and Multi-Family Waste

| Single Family MSW | % | Multi-Family MSW | % |
|--------------------------|--------------|-----------------------------|--------------|
| Mixed Yard Waste | 16.6% | Furniture/Bulky Items | 18.9% |
| Food Waste | 14.6% | Large Electronics (Plug-in) | 9.0% |
| Textiles/Leather | 7.5% | Food Waste | 8.4% |
| Other Rigid Plastics | 5.9% | Textiles/Leather | 8.3% |
| Leaves | 4.3% | Other Rigid Plastics | 8.2% |
| Compostable Paper | 4.2% | Leaves | 8.1% |
| Other Plastic Film | 4.1% | Corrugated Cardboard | 4.4% |
| Other Organics | 4.0% | Compostable Paper | 4.0% |
| Diapers/Sanitary | 3.2% | Small Appliances | 3.7% |
| Furniture/Bulky Items | 3.2% | Other Organics | 3.5% |
| | 67.6% | | 76.4% |

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Table 3-3 provides a detailed statistical profile of the County's Residential waste stream.

Table 3-3 2010 Detailed Residential Waste Composition

| Material | Est. Percent | + / - | Est. Tons | Material | Est. Percent | + / - | Est. Tons |
|-------------------------------------|--------------|-------|---------------|---|---------------|-------|----------------|
| Paper | 12.5% | | 12,915 | Glass | 1.5% | | 1,584 |
| Newsprint | 0.9% | 0.4% | 934 | Glass Bottles and Jars | 1.2% | 0.3% | 1,280 |
| High Grade Office Paper | 0.6% | 0.5% | 586 | Other Glass | 0.3% | 0.1% | 304 |
| Shredded Paper | 0.4% | 0.3% | 409 | | | | |
| OCC (Old Corrugated Cardboard) | 2.0% | 1.4% | 2,017 | Organics | 48.0% | | 49,394 |
| Magazines/Catalogs | 1.0% | 0.5% | 997 | Mixed Yard Waste including Small Branches | 12.9% | 4.8% | 13,284 |
| Recyclable Mixed Paper | 2.1% | 0.3% | 2,136 | Branches/Limbs and Stumps >6" Diameter | 1.6% | 0.9% | 1,624 |
| Polycoated/Aseptic Containers | 0.1% | 0.0% | 141 | Leaves | 5.2% | 2.2% | 5,366 |
| Compostable Paper | 4.1% | 0.5% | 4,253 | Food Waste | 13.1% | 1.9% | 13,539 |
| Unrecyclable Mixed Paper | 1.4% | 0.5% | 1,442 | Other Untreated Wood | 0.6% | 0.9% | 622 |
| | | | | Textiles/Leather | 7.7% | 1.9% | 7,932 |
| Plastic | 12.6% | | 12,976 | Fines/Dirt | 2.6% | 0.6% | 2,629 |
| #1 PET Bottles/Jars | 0.4% | 0.1% | 426 | Pallets | 0.4% | 0.5% | 376 |
| #2 HDPE Bottles/Jars | 0.4% | 0.1% | 371 | Other Organics | 3.9% | 1.1% | 4,022 |
| Bottles #3-7 | 0.1% | 0.1% | 126 | | | | |
| Other Plastic Containers <3 Gallons | 0.2% | 0.1% | 191 | Problem Waste | 18.0% | | 18,499 |
| Large Plastic Containers >3 Gallons | 0.3% | 0.2% | 282 | Large Electronics (Plug-in) | 3.3% | 1.9% | 3,376 |
| Plastic Retail Bags | 0.4% | 0.1% | 422 | Small Electronics (Rechargeable) | 0.4% | 0.4% | 385 |
| Other Plastic Film | 3.9% | 0.9% | 4,032 | Small Appliances | 1.2% | 0.9% | 1,217 |
| Expanded Polystyrene | 0.5% | 0.3% | 482 | Diapers/Sanitary Products | 2.9% | 0.8% | 2,989 |
| Other Rigid Plastics | 6.5% | 1.5% | 6,644 | Carpet/Padding | 2.2% | 1.4% | 2,249 |
| | | | | Batteries | 0.1% | 0.1% | 111 |
| Metal | 2.6% | | 2,720 | Rubber | 0.4% | 0.2% | 363 |
| Aluminum Containers | 0.3% | 0.1% | 270 | Tires | 0.5% | 0.5% | 547 |
| Aluminum Foil & Trays | 0.1% | 0.0% | 92 | Furniture/Bulky Items | 6.9% | 3.4% | 7,143 |
| Ferrous Containers | 0.6% | 0.1% | 589 | Other Inorganics | 0.1% | 0.1% | 120 |
| Other Ferrous | 1.0% | 0.9% | 1,069 | | | | |
| Other Non-Ferrous | 0.2% | 0.3% | 223 | Household Hazardous Waste (HHW) | 0.1% | | 80 |
| White Goods | 0.5% | 0.8% | 477 | Fluorescent Tubes and Bulbs | 0.0% | 0.0% | 4 |
| | | | | Pharmaceuticals and Syringes | 0.0% | 0.0% | 30 |
| C&D | 4.7% | | 4,794 | Oil-based Paint & Finishes | 0.0% | 0.0% | 0 |
| Aggregate/Concrete/Asphalt/Ceramics | 0.9% | 0.9% | 964 | Latex Paint & Finishes | 0.0% | 0.0% | 0 |
| Asphalt Shingles | 0.0% | 0.0% | 32 | Pesticides | 0.0% | 0.0% | 0 |
| Painted/Stained/Treated Wood | 1.9% | 0.9% | 1,993 | Automotive Fluids | 0.0% | 0.0% | 0 |
| Clean Dimensional Lumber | 0.7% | 0.6% | 694 | Other Household Hazardous Waste | 0.0% | 0.0% | 46 |
| Clean/New Drywall | 0.3% | 0.5% | 349 | | | | |
| Demo/Painted Drywall | 0.0% | 0.0% | 12 | Totals | 100.0% | | 102,963 |
| Other C&D | 0.7% | 0.5% | 750 | Sample Count | 34 | | |

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

3. RESULTS

Table 3-4 compares the single family and multi-family waste stream composition.

Table 3-4 2010 Comparison of Single Family and Multi-Family Waste Composition

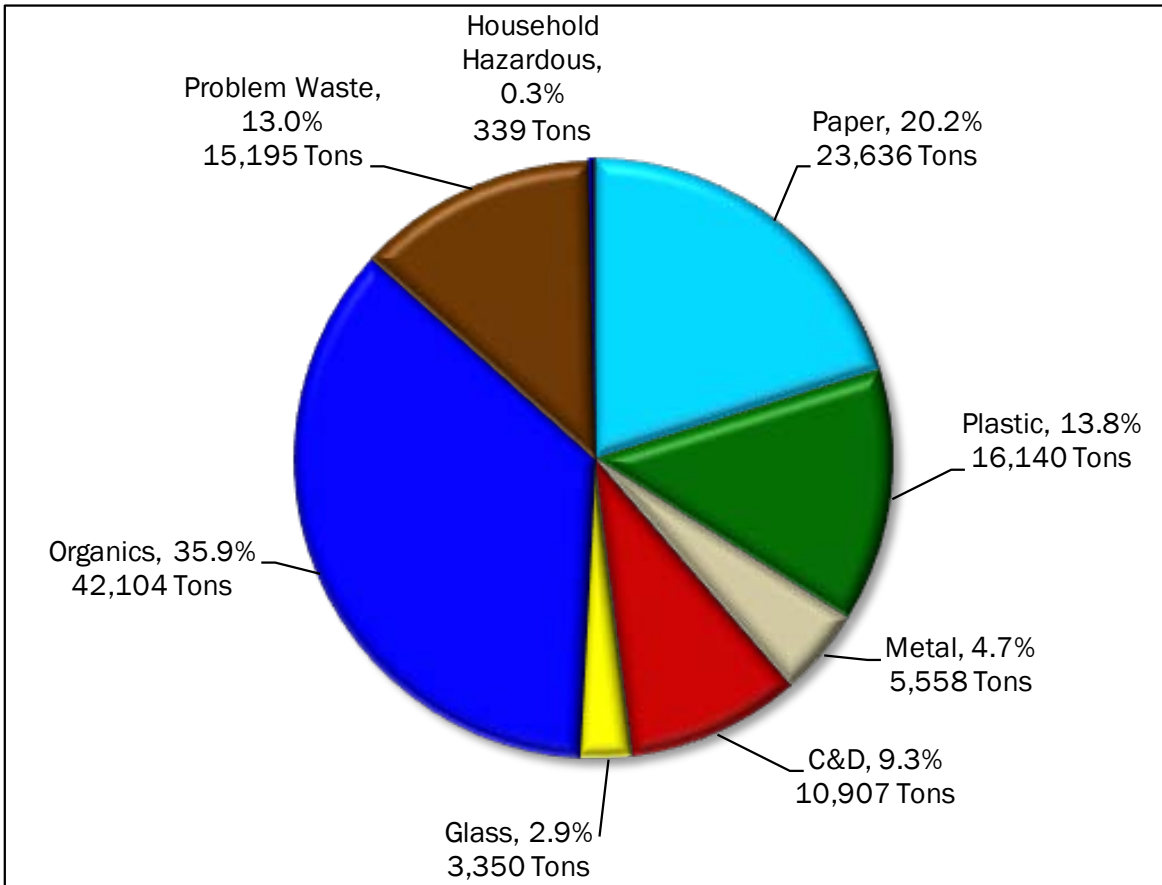
| Material | Single Family | | Multi-Family | | Material | Single Family | | Multi-Family | |
|-------------------------------------|------------------|------------------|------------------|------------------|---|------------------|------------------|------------------|------------------|
| | Est. Percent +/- | Est. Percent +/- | Est. Percent +/- | Est. Percent +/- | | Est. Percent +/- | Est. Percent +/- | Est. Percent +/- | Est. Percent +/- |
| Paper | 12.7% | | 12.0% | | Glass | 1.5% | | 1.7% | |
| Newsprint | 1.0% | 0.4% | 0.7% | 0.7% | Glass Bottles and Jars | 1.2% | 0.3% | 1.3% | 0.7% |
| High Grade Office Paper | 0.7% | 0.6% | 0.1% | 0.1% | Other Glass | 0.3% | 0.1% | 0.4% | 0.4% |
| Shredded Paper | 0.5% | 0.4% | 0.0% | 0.0% | | | | | |
| OCC (Old Corrugated Cardboard) | 1.2% | 0.8% | 4.4% | 5.4% | Organics | 53.0% | | 31.6% | |
| Magazines/Catalogs | 1.2% | 0.7% | 0.3% | 0.2% | Mixed Yard Waste including Small Branches | 16.6% | 5.8% | 1.1% | 1.8% |
| Recyclable Mixed Paper | 2.2% | 0.4% | 1.7% | 0.6% | Branches/Limbs and Stumps >6" Diameter | 2.0% | 1.1% | 0.1% | 0.1% |
| Polycoated/Aseptic Containers | 0.1% | 0.0% | 0.1% | 0.1% | Leaves | 4.3% | 1.9% | 8.1% | 7.2% |
| Compostable Paper | 4.2% | 0.5% | 4.0% | 0.9% | Food Waste | 14.6% | 2.2% | 8.4% | 2.4% |
| Unrecyclable Mixed Paper | 1.6% | 0.6% | 0.7% | 0.5% | Other Untreated Wood | 0.8% | 1.2% | 0.0% | 0.0% |
| | | | | | Textiles/Leather | 7.5% | 2.3% | 8.3% | 3.5% |
| Plastic | 12.3% | | 13.5% | | Fines/Dirt | 2.7% | 0.7% | 2.0% | 1.4% |
| #1 PET Bottles/Jars | 0.4% | 0.1% | 0.6% | 0.5% | Pallets | 0.5% | 0.6% | 0.0% | 0.0% |
| #2 HDPE Bottles/Jars | 0.4% | 0.2% | 0.3% | 0.2% | Other Organics | 4.0% | 1.3% | 3.5% | 2.4% |
| Bottles #3-7 | 0.1% | 0.1% | 0.1% | 0.1% | | | | | |
| Other Plastic Containers <3 Gallons | 0.2% | 0.1% | 0.1% | 0.1% | Problem Waste | 12.1% | | 36.8% | |
| Large Plastic Containers >3 Gallons | 0.3% | 0.3% | 0.1% | 0.1% | Large Electronics (Plug-in) | 1.5% | 1.5% | 9.0% | 5.1% |
| Plastic Retail Bags | 0.4% | 0.1% | 0.3% | 0.2% | Small Electronics (Rechargeable) | 0.5% | 0.5% | 0.0% | 0.0% |
| Other Plastic Film | 4.1% | 1.0% | 3.5% | 1.8% | Small Appliances | 0.4% | 0.5% | 3.7% | 3.4% |
| Expanded Polystyrene | 0.5% | 0.4% | 0.3% | 0.2% | Diapers/Sanitary Products | 3.2% | 1.1% | 1.8% | 0.9% |
| Other Rigid Plastics | 5.9% | 1.7% | 8.2% | 3.1% | Carpet/Padding | 2.1% | 1.6% | 2.5% | 3.0% |
| | | | | | Batteries | 0.1% | 0.1% | 0.0% | 0.0% |
| Metal | 2.4% | | 3.4% | | Rubber | 0.3% | 0.1% | 0.6% | 0.6% |
| Aluminum Containers | 0.2% | 0.1% | 0.4% | 0.2% | Tires | 0.6% | 0.6% | 0.4% | 0.6% |
| Aluminum Foil & Trays | 0.1% | 0.0% | 0.1% | 0.1% | Furniture/Bulky Items | 3.2% | 3.0% | 18.9% | 7.7% |
| Ferrous Containers | 0.5% | 0.2% | 0.7% | 0.3% | Other Inorganics | 0.1% | 0.1% | 0.0% | 0.0% |
| Other Ferrous | 1.3% | 1.2% | 0.2% | 0.1% | | | | | |
| Other Non-Ferrous | 0.3% | 0.3% | 0.1% | 0.0% | Household Hazardous Waste (HHW) | 0.0% | | 0.2% | |
| White Goods | 0.0% | 0.0% | 2.0% | 3.2% | Fluorescent Tubes and Bulbs | 0.0% | 0.0% | 0.0% | 0.0% |
| | | | | | Pharmaceuticals and Syringes | 0.0% | 0.0% | 0.0% | 0.0% |
| C&D | 5.9% | | 0.7% | | Oil-based Paint & Finishes | 0.0% | 0.0% | 0.0% | 0.0% |
| Aggregate/Concrete/Asphalt/Ceramics | 1.2% | 1.1% | 0.1% | 0.1% | Latex Paint & Finishes | 0.0% | 0.0% | 0.0% | 0.0% |
| Asphalt Shingles | 0.0% | 0.0% | 0.1% | 0.1% | Pesticides | 0.0% | 0.0% | 0.0% | 0.0% |
| Painted/Stained/Treated Wood | 2.5% | 1.2% | 0.2% | 0.4% | Automotive Fluids | 0.0% | 0.0% | 0.0% | 0.0% |
| Clean Dimensional Lumber | 0.9% | 0.8% | 0.0% | 0.0% | Other Household Hazardous Waste | 0.0% | 0.0% | 0.2% | 0.2% |
| Clean/New Drywall | 0.4% | 0.7% | 0.1% | 0.1% | | | | | |
| Demo/Painted Drywall | 0.0% | 0.0% | 0.0% | 0.0% | | | | | |
| Other C&D | 0.9% | 0.6% | 0.3% | 0.3% | Totals | 100.0% | | 100.0% | |

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

3.3. ICI WASTE COMPOSITION

Figure 3-5 presents the breakdown of ICI wastes by material group. The largest material group in the ICI sector was found to be Organics, followed by Paper, Plastics and Problem Waste.

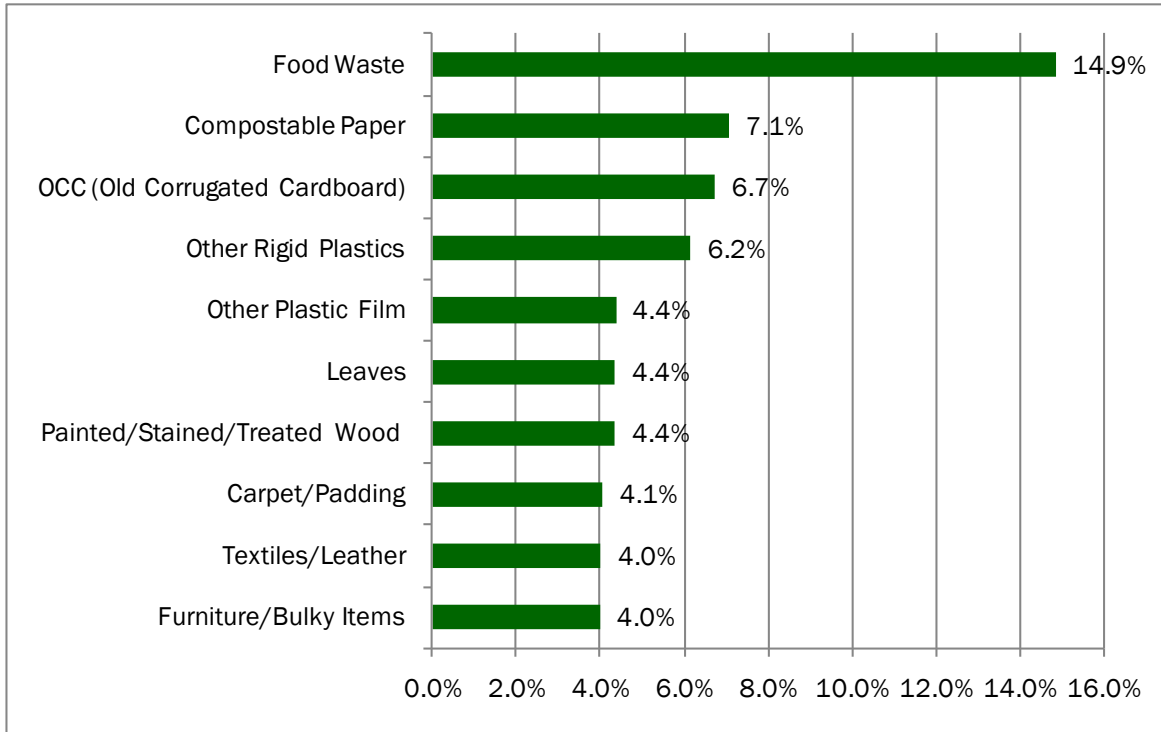
Figure 3-5 Boulder County ICI Waste Composition, 2010



3. RESULTS

Figure 3-6 compares the 10 most prevalent materials in disposed ICI waste. As in residential waste, food scraps are the most prevalent single item. However, compostable paper and corrugated cardboard are more prevalent in ICI waste compared to residential waste.

Figure 3-6 Top 10 Most Prevalent Material Categories in ICI Waste



3. RESULTS

Table 3-5 provides a detailed statistical profile of the County's ICI waste stream.

Table 3-5 2010 Detailed ICI Waste Composition

| Material | Est. Percent | + / - | Est. Tons | Material | Est. Percent | + / - | Est. Tons |
|-------------------------------------|---------------------|--------------|------------------|---|---------------------|--------------|------------------|
| Paper | 20.2% | | 23,636 | Glass | 2.9% | | 3,350 |
| Newsprint | 0.7% | 0.2% | 828 | Glass Bottles and Jars | 2.4% | 1.2% | 2,822 |
| High Grade Office Paper | 1.1% | 0.7% | 1,238 | Other Glass | 0.5% | 0.4% | 528 |
| Shredded Paper | 0.2% | 0.2% | 223 | | | | |
| OCC (Old Corrugated Cardboard) | 6.7% | 1.8% | 7,889 | Organics | 35.9% | | 42,104 |
| Magazines/Catalogs | 0.9% | 0.3% | 1,091 | Mixed Yard Waste including Small Branches | 3.4% | 2.1% | 3,956 |
| Recyclable Mixed Paper | 2.1% | 0.5% | 2,498 | Branches/Limbs and Stumps >6" Diameter | 1.0% | 0.7% | 1,140 |
| Polycoated/Aseptic Containers | 0.1% | 0.0% | 135 | Leaves | 4.4% | 2.4% | 5,105 |
| Compostable Paper | 7.1% | 1.4% | 8,287 | Food Waste | 14.9% | 2.8% | 17,415 |
| Unrecyclable Mixed Paper | 1.2% | 0.5% | 1,445 | Other Untreated Wood | 0.4% | 0.3% | 460 |
| | | | | Textiles/Leather | 4.0% | 2.2% | 4,714 |
| Plastic | 13.8% | | 16,140 | Fines/Dirt | 3.1% | 1.1% | 3,685 |
| #1 PET Bottles/Jars | 0.5% | 0.2% | 569 | Pallets | 3.7% | 2.6% | 4,381 |
| #2 HDPE Bottles/Jars | 0.5% | 0.1% | 535 | Other Organics | 1.1% | 0.3% | 1,249 |
| Bottles #3-7 | 0.1% | 0.0% | 67 | | | | |
| Other Plastic Containers <3 Gallons | 0.2% | 0.1% | 288 | Problem Waste | 13.0% | | 15,195 |
| Large Plastic Containers >3 Gallons | 0.4% | 0.3% | 450 | Large Electronics (Plug-in) | 1.2% | 0.9% | 1,445 |
| Plastic Retail Bags | 0.3% | 0.2% | 358 | Small Electronics (Rechargeable) | 0.1% | 0.1% | 75 |
| Other Plastic Film | 4.4% | 0.7% | 5,119 | Small Appliances | 0.2% | 0.2% | 286 |
| Expanded Polystyrene | 1.3% | 0.8% | 1,535 | Diapers/Sanitary Products | 0.6% | 0.3% | 722 |
| Other Rigid Plastics | 6.2% | 2.1% | 7,220 | Carpet/Padding | 4.1% | 3.4% | 4,762 |
| | | | | Batteries | 0.3% | 0.3% | 369 |
| Metal | 4.7% | | 5,558 | Rubber | 1.0% | 0.4% | 1,156 |
| Aluminum Containers | 0.3% | 0.1% | 299 | Tires | 1.2% | 1.2% | 1,422 |
| Aluminum Foil & Trays | 0.2% | 0.2% | 277 | Furniture/Bulky Items | 4.0% | 2.2% | 4,683 |
| Ferrous Containers | 0.4% | 0.2% | 504 | Other Inorganics | 0.2% | 0.2% | 274 |
| Other Ferrous | 2.4% | 1.0% | 2,778 | | | | |
| Other Non-Ferrous | 1.4% | 0.7% | 1,700 | Household Hazardous Waste (HHW) | 0.3% | | 339 |
| White Goods | 0.0% | 0.0% | 0 | Fluorescent Tubes and Bulbs | 0.0% | 0.0% | 8 |
| | | | | Pharmaceuticals and Syringes | 0.0% | 0.0% | 4 |
| C&D | 9.3% | | 10,907 | Oil-based Paint & Finishes | 0.0% | 0.0% | 0 |
| Aggregate/Concrete/Asphalt/Ceramics | 0.2% | 0.1% | 212 | Latex Paint & Finishes | 0.0% | 0.0% | 35 |
| Asphalt Shingles | 0.0% | 0.0% | 25 | Pesticides | 0.0% | 0.0% | 0 |
| Painted/Stained/Treated Wood | 4.4% | 2.2% | 5,102 | Automotive Fluids | 0.1% | 0.1% | 87 |
| Clean Dimensional Lumber | 2.6% | 1.8% | 3,045 | Other Household Hazardous Waste | 0.2% | 0.2% | 205 |
| Clean/New Drywall | 0.0% | 0.0% | 0 | | | | |
| Demo/Painted Drywall | 0.9% | 0.9% | 1,019 | Totals | 100.0% | | 117,228 |
| Other C&D | 1.3% | 0.9% | 1,504 | Sample Count | 36 | | |

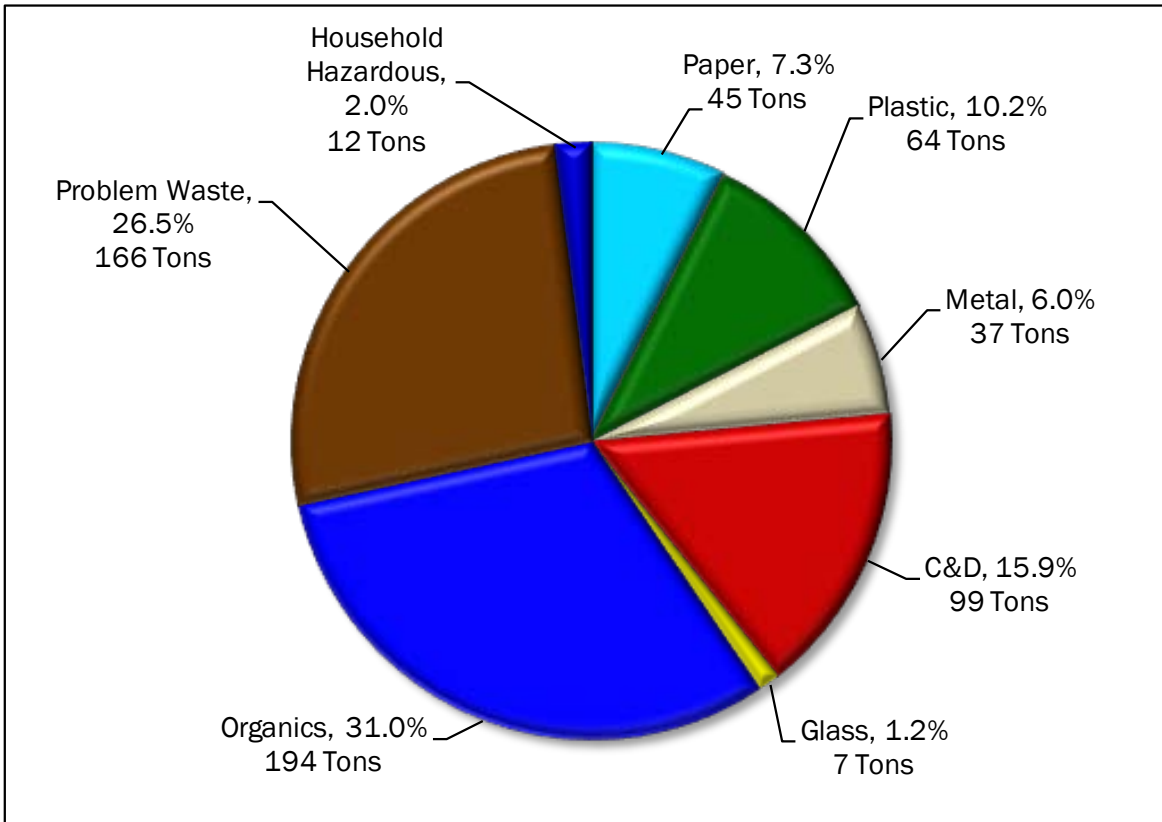
Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

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3.4. COUNTY DROP-BOX WASTE

Figure 3-7 presents the breakdown of wastes collected at the Foothill Transfer sites. As shown, the waste that is deposited at these sites has significantly different composition from other residential and ICI wastes in Boulder County.

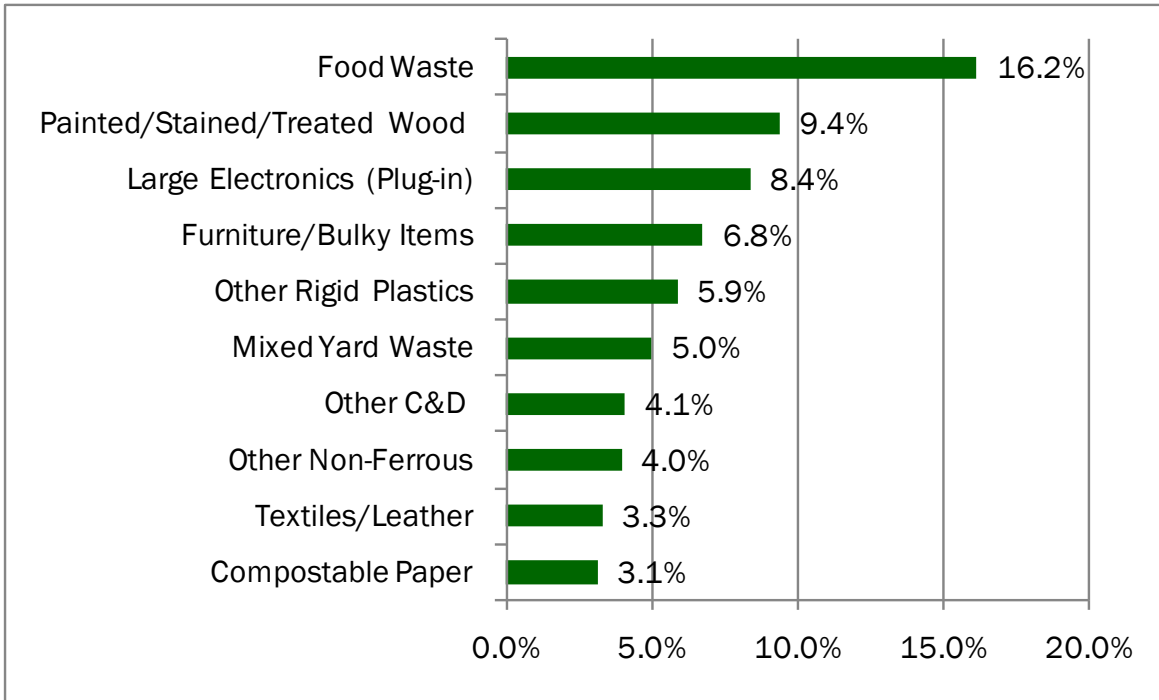
Figure 3-7 Boulder County Foothill Transfer Site Waste Composition, 2010



3. RESULTS

Figure 3-8 summarizes the 10 most prevalent materials from Foothill Transfer Sites. While Food Waste is once again the most prevalent item, a number of C&D-related material categories were also found in large fractions.

Figure 3-8 Top 10 Most Prevalent Material Categories in County Drop-box Waste



It should be noted that one of the Foothill Transfer Site samples contained two large electronic items that collectively totaled 58 pounds. An insufficient number of samples were obtained from Foothill Transfer Sites to discern if this sample was an outlier, and further investigation would be needed to determine the prevalence of large electronics.

3. RESULTS

Table 3-6 provides a detailed statistical profile of the County's Foothill Transfer Site waste.

Table 3-6 2010 Detailed Foothill Transfer Site Waste Composition

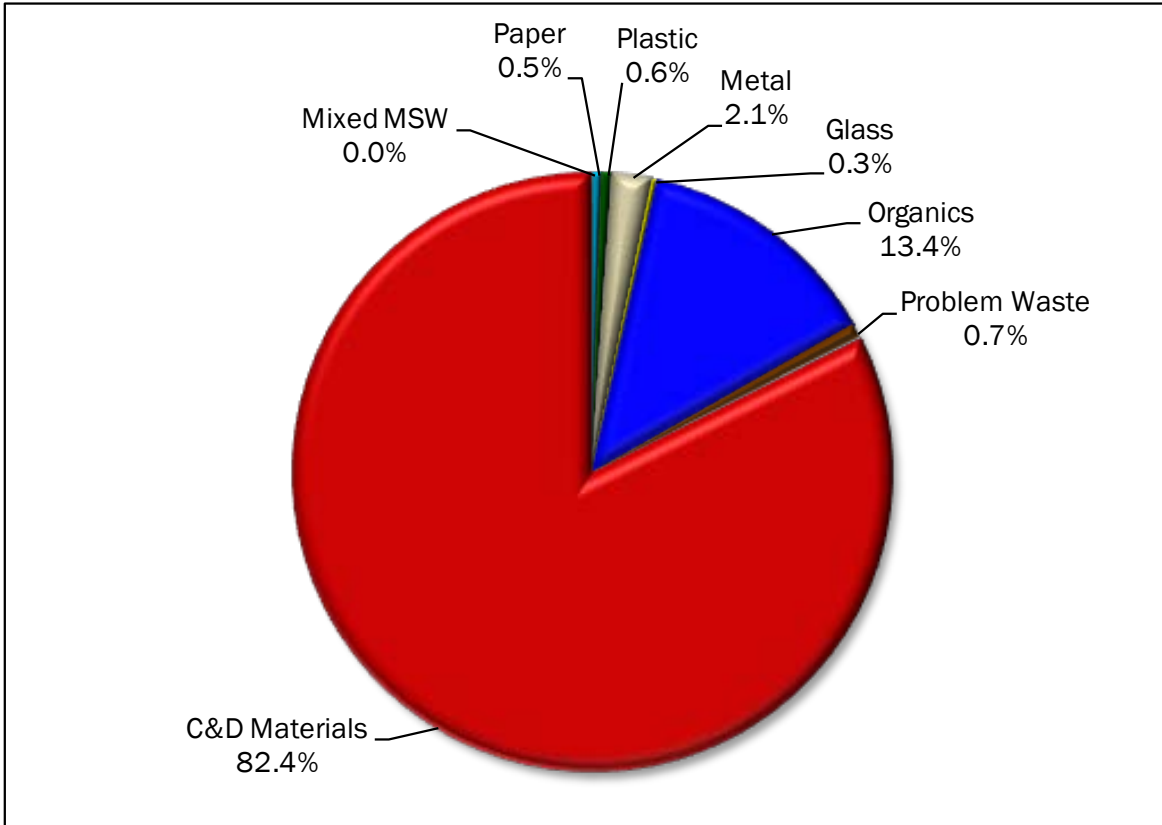
| Material | Est. Percent | + / - | Est. Tons | Material | Est. Percent | + / - | Est. Tons |
|-------------------------------------|---------------------|--------------|------------------|---|---------------------|--------------|------------------|
| Paper | 7.3% | | 45 | Glass | 1.2% | | 7 |
| Newsprint | 1.0% | 0.5% | 7 | Glass Bottles and Jars | 0.2% | 0.2% | 2 |
| High Grade Office Paper | 0.0% | 0.0% | 0 | Other Glass | 0.9% | 0.7% | 6 |
| Shredded Paper | 0.0% | 0.0% | 0 | | | | |
| OCC (Old Corrugated Cardboard) | 0.2% | 0.3% | 1 | Organics | 31.0% | | 194 |
| Magazines/Catalogs | 0.4% | 0.6% | 2 | Mixed Yard Waste including Small Branches | 5.0% | 0.4% | 31 |
| Recyclable Mixed Paper | 1.1% | 0.2% | 7 | Branches/Limbs and Stumps >6" Diameter | 0.0% | 0.0% | 0 |
| Polycoated/Aseptic Containers | 0.2% | 0.2% | 1 | Leaves | 0.0% | 0.0% | 0 |
| Compostable Paper | 3.1% | 0.6% | 20 | Food Waste | 16.2% | 1.2% | 101 |
| Unrecyclable Mixed Paper | 1.2% | 1.4% | 8 | Other Untreated Wood | 2.8% | 4.6% | 18 |
| | | | | Textiles/Leather | 3.3% | 1.8% | 21 |
| Plastic | 10.2% | | 64 | Fines/Dirt | 0.7% | 0.7% | 5 |
| #1 PET Bottles/Jars | 0.3% | 0.1% | 2 | Pallets | 2.0% | 2.4% | 12 |
| #2 HDPE Bottles/Jars | 0.3% | 0.2% | 2 | Other Organics | 1.0% | 0.0% | 6 |
| Bottles #3-7 | 0.2% | 0.0% | 1 | | | | |
| Other Plastic Containers <3 Gallons | 0.1% | 0.1% | 1 | Problem Waste | 26.5% | | 166 |
| Large Plastic Containers >3 Gallons | 0.0% | 0.0% | 0 | Large Electronics (Plug-in) | 8.4% | 12.0% | 52 |
| Plastic Retail Bags | 0.2% | 0.1% | 2 | Small Electronics (Rechargeable) | 1.2% | 1.7% | 7 |
| Other Plastic Film | 2.8% | 0.8% | 18 | Small Appliances | 0.5% | 0.3% | 3 |
| Expanded Polystyrene | 0.4% | 0.1% | 2 | Diapers/Sanitary Products | 2.8% | 2.5% | 17 |
| Other Rigid Plastics | 5.9% | 0.6% | 37 | Carpet/Padding | 1.2% | 1.8% | 7 |
| | | | | Batteries | 0.3% | 0.2% | 2 |
| Metal | 6.0% | | 37 | Rubber | 0.8% | 0.6% | 5 |
| Aluminum Containers | 0.2% | 0.3% | 1 | Tires | 2.0% | 3.4% | 13 |
| Aluminum Foil & Trays | 0.1% | 0.0% | 1 | Furniture/Bulky Items | 6.8% | 1.8% | 42 |
| Ferrous Containers | 0.6% | 0.8% | 4 | Other Inorganics | 2.6% | 3.7% | 16 |
| Other Ferrous | 0.8% | 0.8% | 5 | | | | |
| Other Non-Ferrous | 4.0% | 4.5% | 25 | Household Hazardous Waste (HHW) | 2.0% | | 12 |
| White Goods | 0.3% | 0.5% | 2 | Fluorescent Tubes and Bulbs | 0.0% | 0.0% | 0 |
| | | | | Pharmaceuticals and Syringes | 0.0% | 0.0% | 0 |
| C&D | 15.9% | | 99 | Oil-based Paint & Finishes | 0.0% | 0.0% | 0 |
| Aggregate/Concrete/Asphalt/Ceramics | 0.2% | 0.3% | 1 | Latex Paint & Finishes | 0.0% | 0.0% | 0 |
| Asphalt Shingles | 0.5% | 0.8% | 3 | Pesticides | 0.0% | 0.0% | 0 |
| Painted/Stained/Treated Wood | 9.4% | 6.9% | 59 | Automotive Fluids | 0.0% | 0.0% | 0 |
| Clean Dimensional Lumber | 1.7% | 0.7% | 11 | Other Household Hazardous Waste | 1.9% | 3.0% | 12 |
| Clean/New Drywall | 0.0% | 0.0% | 0 | | | | |
| Demo/Painted Drywall | 0.0% | 0.0% | 0 | | | | |
| Other C&D | 4.1% | 4.6% | 26 | Totals | 100.0% | | 626 |
| | | | | Sample Count | 10 | | |

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

3.5. C&D WASTE COMPOSITION

Figure 3-9 presents the breakdown of C&D waste by material group. Unsurprisingly, C&D materials make up over 82 percent of C&D waste, with Organics contributing most of the remainder.

Figure 3-9 C&D Waste Composition, 2010



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Figure 3-10 compares the 10 most prevalent materials in disposed C&D waste. Rock/Concrete, Asphalt Shingles, Painted/Stained Wood and Drywall are the most prevalent items.

Figure 3-10 Top 10 Most Prevalent Material Categories in C&D Waste

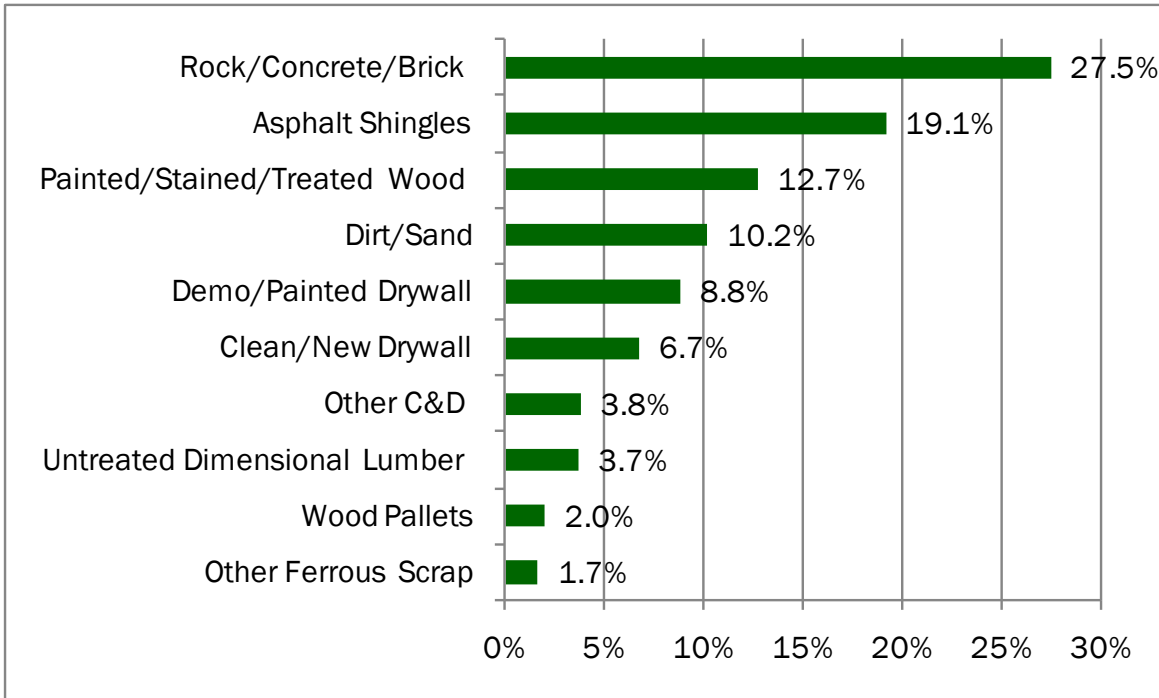


Table 3-6 provides a detailed statistical profile of the County’s C&D waste stream.

Table 3-7 2010 Detailed C&D Waste Composition

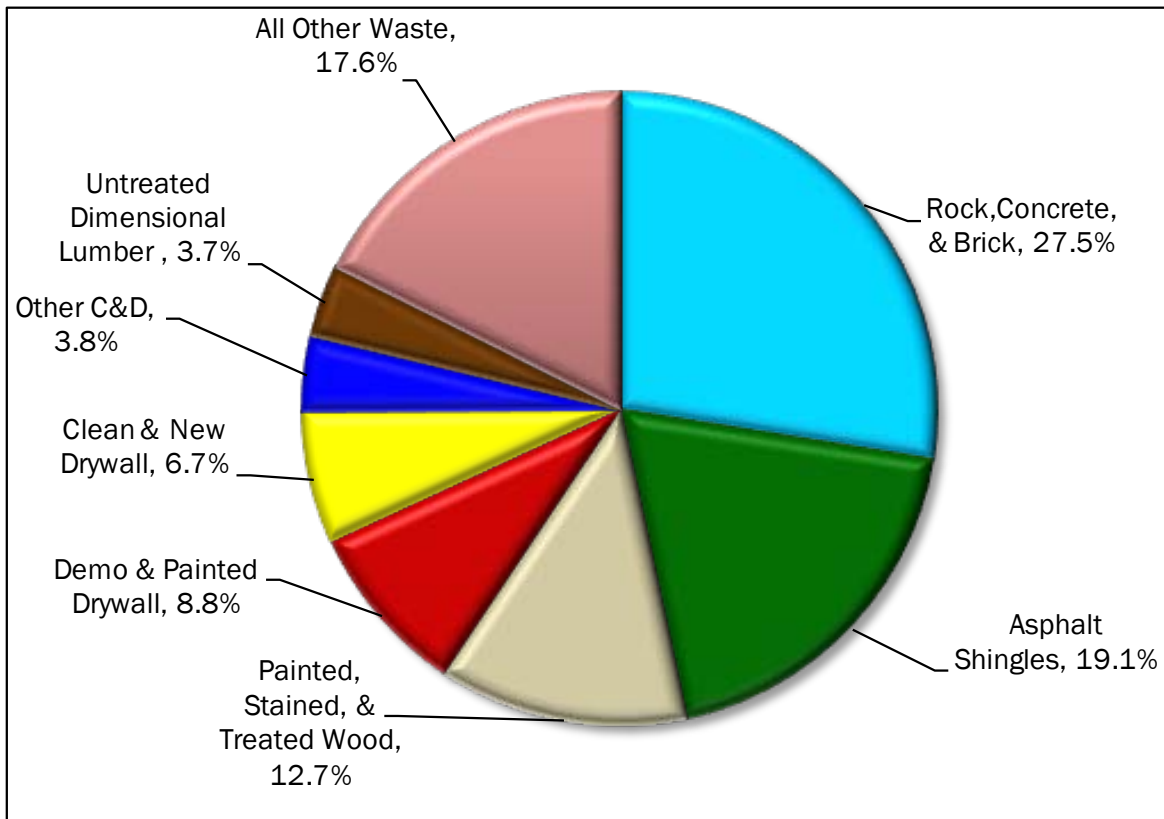
| Material | Est. Percent | + / - | Est. Tons | Material | Est. Percent | + / - | Est. Tons |
|-------------------------|--------------|-------|---------------|------------------------------|---------------|-------------|---------------|
| Paper | 0.5% | | 381 | Problem Waste | 0.7% | | 559 |
| Uncoated OCC-Recyclable | 0.1% | 0.0% | 51 | Electronics | 0.0% | 0.0% | 0 |
| Other Paper | 0.4% | 0.4% | 329 | Small Appliances | 0.3% | 0.5% | 240 |
| Plastic | 0.6% | | 424 | Carpet/Padding | 0.3% | 0.3% | 250 |
| PET Bottles-Beverage | 0.0% | 0.0% | 1 | Batteries | 0.0% | 0.0% | 0 |
| Film Packaging | 0.0% | 0.0% | 25 | Tires | 0.0% | 0.0% | 0 |
| Other Plastic | 0.5% | 0.4% | 398 | Furniture/Bulky Items | 0.1% | 0.1% | 70 |
| Metal | 2.1% | | 1,615 | Fluorescent Light Bulbs | 0.0% | 0.0% | 0 |
| Aluminum Containers | 0.0% | 0.0% | 4 | Household Hazardous Waste | 0.0% | 0.0% | 0 |
| Other Ferrous Scrap | 1.7% | 1.7% | 1,254 | C&D Materials | 82.4% | | 62,442 |
| Non-ferrous Metal | 0.4% | 0.4% | 325 | Rock/Concrete/Brick | 27.5% | 19.4% | 20,861 |
| White Goods | 0.0% | 0.1% | 32 | Asphalt Shingles | 19.1% | 11.5% | 14,499 |
| Glass | 0.3% | | 226 | Painted/Stained/Treated Wood | 12.7% | 7.3% | 9,624 |
| Glass Bottles and Jars | 0.0% | 0.0% | 0 | Untreated Dimensional Lumber | 3.7% | 2.1% | 2,792 |
| Glass | 0.3% | 0.4% | 226 | Clean/New Drywall | 6.7% | 5.8% | 5,111 |
| Organics | 13.4% | | 10,130 | Demo/Painted Drywall | 8.8% | 6.5% | 6,670 |
| Yard Waste | 1.2% | 1.4% | 905 | Other C&D | 3.8% | 3.0% | 2,885 |
| Wood Pallets | 2.0% | 2.5% | 1,508 | Mixed MSW | 0.0% | 0.0% | 19 |
| Dirt/Sand | 10.2% | 9.2% | 7,716 | Totals | 100.0% | | 75,797 |
| | | | | Sample Count | 37 | | |

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

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Figure 3-11 shows the C&D waste stream subdivided by material groups that are more closely associated with C&D waste.

Figure 3-11 C&D Waste Composition by C&D Material Category



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Table 3-8 shows how individual material categories were combined to create the pie chart in Figure 3-11.

Table 3-8 Mapping of C&D Material Categories to Groups

| Material Group Name | Material Categories Included | Percent |
|-----------------------|---|---------------|
| Metals | All metal categories | 5.7% |
| Organics | All organics categories | 4.3% |
| Wood | All wood categories including wood pallets | 28.1% |
| Concrete/Brick/Block | Concrete/Brick/Block | 13.2% |
| Drywall | Clean and demo drywall | 5.2% |
| Shingles | Shingles | 29.5% |
| Other C&D | Other C&D, ceramics and C&D PVC | 6.8% |
| Bulky Items/Furniture | Bulky items & furniture | 2.2% |
| Carpet/Padding | Carpet & carpet padding | 0.9% |
| Other Waste | All paper, all plastics, all glass, all problem materials, all HHW and textiles | 4.2% |
| Totals | | 100.0% |

Note: Totals may not sum due to rounding discrepancies.

3.6. CONCLUSIONS AND RECOMMENDATIONS

- ◆ **Inaugural Study:** The 2010 Study served as a good first effort for Boulder County to quantify its waste stream and to estimate the composition of disposed wastes. This study provided at least an initial snapshot of residential wastes, including separate profiles for single and multi-family wastes, as well as for ICI, C&D and mountain site drop-box waste.
- ◆ **Availability of Data:** Boulder County appears to have a positive relationship with the private and public haulers that collect wastes in Boulder County, and these haulers were generally cooperative in providing the information needed to plan for and execute this study. However, even with good cooperation, there are gaps in the reported data that were filled based on reasonable estimation techniques. The Project Team especially identifies the C&D waste stream as being in need of a targeted waste generation study, as it was not possible to estimate the quantity of C&D debris generated in the County as part of this study.
- ◆ **Opportunities:** Boulder County is clearly doing a good job recycling traditional fiber and container recyclables, as evidenced by the relatively low fractions of these items in disposed waste. The County continues, however, to have opportunities to divert additional wastes from landfill disposal. Organics – and especially yard wastes – remain in the disposed waste stream in significant quantities. Food waste and compostable paper are also prevalent, which is of particular interest because there are markets for composting

3. RESULTS

these materials commercially in Boulder County. Additionally, the fraction of bulky items and furniture were high enough to suggest that incremental reuse opportunities may exist.

- ◆ **Continue Performing Countywide Studies:** Waste composition studies inform about the overall disposed waste stream for local planners. While results are helpful to compare against other municipalities in Colorado and nationally, time series waste composition data will provide the County with an informative commentary on its ongoing recycling and diversion efforts. The County should continue to perform a similar project over five to 10 year intervals.
- ◆ **Expanded Multi-family Analysis:** The multi-family sampling and sorting performed for this study was helpful in confirming that the disposed waste stream, and therefore the recycling and diversion outreach and programs that are needed, are significantly different for multi-family dwellings in Boulder County. However, the occurrence of several items in the multi-family waste stream – notably, leaves and large electronics – suggest that more study is needed to defensibly determine if these materials are truly occurring in multi-family wastes to the extent shown, or if these samples represent outliers.
- ◆ **Expanded Foothill Transfer Site Analysis:** The Foothill Transfer Site sampling and sorting performed for this study was helpful in confirming that the disposed waste stream at the Transfer Sites is significantly different compared to other waste in Boulder County. However, the occurrence of several items in this waste stream – notably, large electronics, HHW, and bulky items – suggest that more study is needed to defensibly determine if these materials are truly occurring at the drop-sites to the extent shown, or if these samples represent outliers.
- ◆ **Focus on C&D:** The generation and disposal of C&D debris follows its own unique local market drivers. Although this study was able to obtain some samples of C&D that were obtained at two facilities, spanning the County’s geographic region, it was beyond the scope of this study to defensibly document the generation and distribution of C&D debris, and to determine the composition of C&D debris. Boulder County should consider a more focused effort to characterize C&D as the County continues investigating opportunities to enhance overall recycling rates.

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APPENDIX A

MATERIAL DEFINITIONS

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Boulder County Physical Sort Material Definitions

| | No | Material Category | Definition |
|----------------|----|--|---|
| PAPER | 1 | Newsprint | Consists of all paper products printed in daily or weekly newspapers, including inserts. Includes other newsprint. |
| | 2 | High Grade Office Paper | High grade ledger paper, such as typing and copy paper. Computer paper includes outputs from printers that may have green bars. |
| | 3 | Shredded Paper | Low or high grade paper that has been mechanically shredded. |
| | 4 | OCC (Old Corrugated Cardboard) | Paperboard containers consisting of Kraft (brown) linerboard with corrugated (fluted medium) fillings. Includes Kraft paper such as bags or wrapping paper. |
| | 5 | Magazines/Catalogs | Publications which are printed on glossy paper. This does not include magazines, catalogs, etc., which do not consist of glossy paper throughout (e.g., comic books.) |
| | 6 | Mixed Recyclable Paper | All other recyclable paper not covered such as uncoated paperboard, direct mail, molded pulp, phone books, and paperback books. |
| | 7 | Polycoated / Aseptic Containers | Aseptic juice boxes and gable top cartons made of coated paperboard. |
| | 8 | Compostable Paper | Soiled and used fiber such as tissues and paper including OCC that are soiled with food, such as paper plates, paper cups, pizza boxes, popcorn bags and paper towels. Includes wax coated OCC. |
| | 9 | Unrecyclable Paper | All paper that doesn't fit into the categories specified above and items that are primarily paper but include other materials such as plastic or metal. Examples paper or boxboard coated with plastic or metal foil, photographs, laminated paper. |
| PLASTIC | 10 | #1 PET Bottles/Jars | Clear or colored blow molded plastic bottles and jars labeled as #1 PET. Examples include plastic beverage bottles (i.e., bottles with a narrow necks) and plastic jars (open mouth jars) such as peanut butter jars. |
| | 11 | #2 HDPE Bottles/Jars | Natural or pigmented blow molded plastic bottles and jars labeled as #2 HDPE. Examples include plastic detergent bottles (i.e., bottles with a narrow necks) and plastic jars (open mouth jars) such as sanitizing wipes. |
| | 12 | Bottles #3-7 | All plastic bottles labeled 3-7. Examples include amber plastic pill bottles, cosmetic bottles, and all unmarked narrow neck bottles. Includes #7 PLA bottles, even though these bottles may not be accepted by local recycling processors. |
| | 13 | Other Plastic Tubs and Cups <3 Gallons | Tubs, buckets, and packaging cups that are less than 3 gallons (<3) in size. Examples in this category include margarine, cottage cheese, and yogurt tubs, plastic buckets <3 gallons. |
| | 14 | Large Plastic Containers >3 Gallons | Tubs and buckets that are greater than 3 gallons (>3) in size. |
| | 15 | Plastic Retail Bags | Plastic film bags used to transport retail merchandise. Includes retail bags, newspaper sleeves, dry cleaner bags and the like. |
| | 16 | Other Plastic Film | All other plastic film includes garbage bags, shrink wrap, bubble packing film, construction film, agricultural film, and food packaging film such as bread sacks. |

| | No | Material Category | Definition |
|---------|----|----------------------------------|--|
| PLASTIC | 17 | Expanded Polystyrene | Expanded plastic polymer used for protecting items during shipping, storage, or cold or heat. Includes expanded foam trays, packing peanuts, packing blocks, food clamshells, and coolers. |
| | 18 | Other Rigid Plastics | All other rigid plastic not elsewhere classified. Items such as food service, cup lids, toothbrushes, toys, and composite items that are made of 50% or more plastic. May include bioplastics. |
| METAL | 19 | Aluminum Cans | Aluminum beverage and food containers |
| | 20 | Aluminum Foil & Trays | Aluminum foil, trays and pie pans |
| | 21 | Ferrous Containers | Fabricated, magnetizable metal containers such as steel or bimetal designed to hold food or beverage products such as soups, vegetables, pet food and juices. Includes two piece containers with aluminum tops other empty spray cans. |
| | 22 | Other Ferrous | Ferrous and alloyed ferrous scrap materials originated from residential commercial, or institutional sources which are attracted to a magnet. This category includes wire coat hangers auto parts and composite materials that are made of 50% more ferrous. |
| | 23 | Other Non-Ferrous | Non-magnetic metals such as brass, bronze, silver, lead copper, aluminum, zinc and composite non-ferrous materials that are made of 50% or more metal. Items such as insulated wiring or plumbing parts. Stainless steel house wares are also part of this category. |
| | 24 | White Goods | Large household appliances such as refrigerators, stoves, air conditioners, and washing machines. |
| GLASS | 25 | Glass Bottles and Jars | Clear, green, and brown glass food and beverage containers. |
| | 26 | Other Glass | All other glass items such as plate glass such as window and door glass, table-tops; auto glass; heat resistant cookware (Pyrex); pottery; drinking glasses; and. any other glass that was not used for containing food or drinks. |
| ORGANIC | 27 | Mixed Yard Waste including Small | Grass clippings, leaves, flowers, small potted plant roots, and branches less than 2" in diameter. |
| | 28 | Branches, Limbs and Stumps | Branches, limbs and logs greater than 2" in diameter |
| | 29 | Leaves | Leaves from trees and shrubs. Does not include clippings or trimmings. |
| | 30 | Food Waste | Putrescible organic materials which are the by-products of activities connected with the growing, preparation, cooking, processing, or consumption of food by humans or pets. This also includes liquids from beverage contains. |
| | 31 | Non-C&D wood | Any wood other than wood generated in the C&D waste stream. Examples include popsicle sticks, chopsticks, pencils, and household items made of wood. |
| | 32 | Textiles/Leather | Woven natural or manmade fibers used to make items such as clothing, bedding, curtains, blankets, stuffed animals, cotton diapers, other cloth material. Natural animal skin used to make shoes, belts and other leather goods. |
| | 33 | Fines / Dirt | Small fragments that pass through the ¼" sort screen, and miscellaneous fines and dirt. |
| | 34 | Wood Pallets | Wood pallets and crating materials commonly used for industrial and commercial packaging and shipping. |

| | No | Material Category | Definition |
|-------------------------|----|----------------------------------|---|
| ORGANIC | 35 | Other Organics | Organic material that doesn't fit into the categories specified above, and items that are primarily organic but include other materials such as plastic or metal. Examples include cotton balls, hair, Q-tips, wax, soap, kitty litter, animal feces, and animal carcasses. |
| PROBLEM MATERIAL | 36 | Large Electronics (Plug-in) | Any plug-in item that contains a circuit board including, televisions, radio, stereo, computer, and CRT. |
| | 37 | Small Electronics (Rechargeable) | Small Consumer Electronics that are rechargeable or contains a replaceable battery these include cell phones, iPods, PDAs, portable handheld calculators, portable digital assistants or other similar devices. |
| | 38 | Small Appliances | Small household appliances such as fans, vacuum cleaners, irons, electrical kitchen ware, corded hand drills, and hair driers. |
| | 39 | Diapers / Sanitary Products | Diapers and sanitary products. |
| | 40 | Carpet/Padding | Natural or manmade fibers woven to make floor covering or floor covering under laments items such as carpets, rugs or padding from residential or commercial buildings, including carpet backing. |
| | 41 | Batteries | Any type of battery including lead acid (automotive) batteries. Examples include household batteries such as AA, AAA, D, button cell, 9 volt, and rechargeable batteries used for flashlights, small appliances, tools, watches, and hearing aids. |
| | 42 | Rubber | Natural or manmade rubber used to make shoes, hoses, and automobile parts. This category excludes tires. |
| | 43 | Tires | Solid or pneumatic rubber or steel belted tires. Includes motorized vehicle and bicycle tires. |
| | 44 | Furniture/Bulky Items | Chairs, couches, mattresses, desks, and other oversized items made of multiple materials. |
| | 45 | Other Inorganics | All other inorganic items not elsewhere classified |
| HHW | 46 | Fluorescent tubes and bulbs | Fluorescent light tubes and compact light bulbs. This category does not include fixtures. |
| | 47 | Pharmaceuticals and syringes | All prescription and non-prescription medicine, medicated ointments, mouth wash, lancets, and syringes. Does not include items such as ordinary dandruff shampoo or hand lotions. |
| | 48 | Oil-based paint & finishes | Finishes for wood, metal, or other surfaces that have a volatile organic base or solvent. Products such as lacquers, stains, paints, and urethanes. |
| | 49 | Latex paint & finishes | Water based lacquers, stains, paints, and urethanes. |
| | 50 | Pesticides | Poisons used to eradicate pests such as insects, fungus, or vegetative growth. |
| | 51 | Automotive fluids | Used or unused automotive fluids such as motor oil, anti-freeze, brake or hydraulic fluids. |
| | 52 | Other HHW | All other household or commercial products not categorized elsewhere characterized as "toxic", "corrosive", "flammable", "ignitable", "radioactive", "poisonous", and "reactive". Items such as lye, untreated medical waste, oven cleaner, some detergents, and solvents. |

| | No | Material Category | Definition |
|-----|----|--|---|
| C&D | 53 | Aggregate/Concrete/Asphalt/Ceramics/Etc. | Concrete, brick, stones, cut stone, cement, rocks, ceramic tile and fixtures. |
| | 54 | Asphalt Shingles | Asphalt composite shingles and other roofing material made with asphalt. Examples include asphalt shingles and attached roofing tar and tar paper |
| | 55 | Painted/stained/Treated wood | Wood that contains an adhesive, paint, stain, fire retardant, pesticide or preservative. Painted or stained lengths of wood from construction or woodworking activities, particle board, OSB, and plywood. |
| | 56 | Clean dimensional Lumber | Any dimensional lumber which does not contain an adhesive, paint, stain, fire retardant, pesticide or preservative; includes such items as 2x4s, 2x6s, 4x4s, etc. May contains metal items such as screws and nails. |
| | 57 | Clean / New Drywall | Means unpainted or untreated interior wall covering made of a sheet of gypsum sandwiched between paper layers. Examples include unused, broken or whole sheets of sheetrock, drywall, gypsum board, plasterboard, gypsum board, gyproc, and wallboard |
| | 58 | Demo/Painted Drywall | Means painted or treated interior wall covering made of a sheet of gypsum sandwiched between paper layers. Examples include unused, broken or whole sheets of sheetrock, drywall, gypsum board, plasterboard, gypsum board, gyproc, and wallboard |
| | 59 | Other C&D | Material generated from construction and demolition activities. Items such as PVC pipe, HVAC ducting, caulking or adhesive tubes, used paint brushes, ceiling tiles, ash, and other C&D material not elsewhere classified. |

Boulder County C&D Material Categories

| | No. | Visual Material Category | Physical Sort Material Category |
|--------------------------|-----|--------------------------------|---|
| PAPER | 1 | OCC (Old Corrugated Cardboard) | Paperboard containers consisting of Kraft (brown) linerboard with corrugated (fluted medium) fillings. Includes yellow and waxed corrugated boxes and Kraft paper such as bags or wrapping paper. Does not include non-corrugated paperboard products such as cereal, shoe, or gift boxes. |
| | 2 | Other Paper | Consists of all other paper products. |
| PLASTIC | 3 | PET bottles - beverage | Clear or colored blow molded plastic bottles and jars labeled as #1 PET. These can be clear or colored. Examples include plastic beverage bottles (i.e., bottles with a narrow necks) and plastic jars (open mouth jars) such as peanut butter jars. |
| | 4 | Film Plastic | Film plastic wrap, bags, tarps, and other film |
| | 5 | Other plastic | All other plastic. |
| METAL | 6 | Aluminum Containers | Aluminum containers used for holding beverages, or food. |
| | 7 | Ferrous metal | Fabricated, magnetizable metal containers such as steel or bimetal designed to hold food or beverage products such as soups, vegetables, pet food and juices. Includes two piece containers with aluminum tops other empty spray cans. |
| | | | Ferrous and alloyed ferrous scrap materials originated from residential commercial, or institutional sources which are attracted to a magnet. This category includes wire coat hangers auto parts and composite materials that are made of 50% more ferrous. |
| | 8 | Non-ferrous metal | Non-magnetic metals such as brass, bronze, silver, lead copper, aluminum, zinc and composite non-ferrous materials that are made of 50% or more metal. Items such as insulated wiring or plumbing parts. Stainless steel house wares are also part of this category. |
| | 9 | White Goods | Large household appliances such as refrigerators, stoves, air conditioners, and washing machines. |
| GLASS | 10 | Glass Bottles | Clear, green, and brown glass food and beverage containers. |
| | 11 | Other Glass | All other glass items such as plate glass such as window and door glass, table-tops; auto glass; heat resistant cookware (Pyrex); pottery; drinking glasses; and any other glass that was not used for containing food or drinks. |
| ORGANIC | 12 | Yard Waste | Grass clippings, leaves, flowers, small potted plant roots, and branches less than <1/4' in diameter. Branches, limbs and logs greater than 6 (>6) inches in diameter Leaves from trees and shrubs. Does not include clippings or trimmings. |
| | 13 | Wood Pallets | Wood pallets and crating materials commonly used for industrial and commercial packaging and shipping. |
| | 14 | Dirt/Fines | Small fragments that pass through the ¼" sort screen, and miscellaneous fines and dirt. |
| PROBLEM MATERIALS | 15 | Electronics | Any plug-in item that contains a circuit board including, televisions, radio, stereo, computer, and CRT. Small Consumer Electronics that are rechargeable or contains a replaceable battery these include cell phones, iPods, PDAs, portable handheld calculators, portable digital assistants or other similar devices. |
| | 16 | Small Appliances | Small household appliances such as fans, vacuum cleaners, irons, electrical kitchen ware, corded hand drills, and hair driers. |
| | 17 | Carpet/Padding | Natural or manmade fibers woven to make floor covering or floor covering under laments items such as carpets, rugs or padding from residential or commercial buildings, including carpet backing. |

| | No. | Visual Material Category | Physical Sort Material Category |
|--------------------------|-----|------------------------------|--|
| PROBLEM MATERIALS | 18 | Batteries | Any type of battery including lead acid (automotive) batteries. Examples include household batteries such as AA, AAA, D, button cell, 9 volt, and rechargeable batteries used for flashlights, small appliances, tools, watches, and hearing aids. |
| | 19 | Tires | Solid or pneumatic rubber or steel belted tires. |
| | 20 | Furniture/Bulky items | Chairs, couches, mattresses, desks, and other oversized items made of multiple materials. |
| HHW | 21 | Fluorescent Light Bulbs | fluorescent light tubes and compact light bulbs. This category does not include fixtures. |
| | 22 | Household Hazardous Waste | Pharmaceuticals and syringes: All prescription and non-prescription medicine, medicated ointments, mouth wash, lancets, and syringes. Does not include items such as ordinary dandruff shampoo or hand lotions. Oil-based paint & finishes: Finishes for wood, metal, or other surfaces that have a volatile organic base or solvent. Products such as lacquers, stains, paints, and urethanes. Latex paint & finishes: Water based lacquers, stains, paints, and urethanes. Pesticides: Poisons used to eradicate pests such as insects, fungus, or vegetative growth. Automotive fluids: Used or unused automotive fluids such as motor oil, anti-freeze, brake or hydraulic fluids. Household Hazardous Waste means all household or commercial products not categorized elsewhere characterized as "toxic", "corrosive", "flammable", "ignitable", "radioactive", "poisonous", and "reactive". Items such as lye, untreated medical waste, oven cleaner, some detergents, and solvents. |
| C&D | 23 | Rock, concrete, brick | Concrete, brick, stones, cut stone, cement, rocks, ceramic tile and fixtures. |
| | 24 | Asphalt Shingles | Asphalt composite shingles and other roofing material made with asphalt. Examples include asphalt shingles and attached roofing tar and tar paper |
| | 25 | Painted/stained/Treated wood | Wood that contains an adhesive, paint, stain, fire retardant, pesticide or preservative. Painted or stained lengths of wood from construction or woodworking activities, particle board, OSB, and plywood. |
| | 26 | Clean dimensional lumber | Any dimensional lumber which does not contain an adhesive, paint, stain, fire retardant, pesticide or preservative; includes such items as 2x4s, 2x6s, 4x4s, etc. May contains metal items such as screws and nails. |
| | 27 | Clean / New Drywall | Means unpainted or untreated interior wall covering made of a sheet of gypsum sandwiched between paper layers. Examples include unused, broken or whole sheets of sheetrock, drywall, gypsum board, plasterboard, gypsum board, gyproc, and wallboard |
| | 28 | Demo/Painted Drywall | Means painted or treated interior wall covering made of a sheet of gypsum sandwiched between paper layers. Examples include unused, broken or whole sheets of sheetrock, drywall, gypsum board, plasterboard, gypsum board, gyproc, and wallboard |
| | 29 | Other C&D | Material generated from construction and demolition activities. Items such as PVC pipe, HVAC ducting, caulking or adhesive tubes, used paint brushes, ceiling tiles, ash, and other related C&D material. |
| MSW | 30 | Mixed MSW | Bagged waste and/or loose wastes that appear to be mixed residential or commercial waste |

APPENDIX B

FIELD FORMS

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Boulder County Physical Sort Field Supervisor Daily Targeted Samples

Facility: _____

Field Supervisor: _____

| Generator Type | | Total Needed | Truck Type | Estimated Loads Per Day | Total Sampled |
|------------------|-----|--------------|---------------|-------------------------|---------------|
| Single Family | SF | | RL/SL/SH | | |
| Multi-Family | MF | | FL/COMP/OT/SH | | |
| (ICI) | ICI | | FL/COMP/OT/SH | | |
| Transfer Trailer | TT | | TT | | |
| Total | | | | | |

| Sample ID | Type | Date | Time | Hauler | Truck # | Truck Type | Ticket Number | Weight |
|-----------|------|------|------|--------|---------|------------|---------------|--------|
| | | | | | | | | |
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| | | | | | | | | |

Precipitation _____

Notes _____

Boulder County Refuse Sort Field Data Sheet

Sample ID: _____

Crew Chief: _____

Date: _____

Time: _____

Location: _____

| | Material Group | Weight (Circle if net weight) |
|----------------------------|--|-------------------------------|
| PAPER | 1 Newsprint | |
| | 2 High Grade Office Paper | |
| | 3 Shredded Paper | |
| | 4 OCC (Old Corrugated Cardboard) | |
| | 5 Magazines/Catalogs | |
| | 6 Mixed Recyclable Paper | |
| | 7 Polycoated / Aseptic Containers | |
| | 8 Compostable Paper | |
| | 9 Unrecyclable Paper | |
| PLASTICS | 10 #1 PET Bottles/Jars | |
| | 11 #2 HDPE Bottles/Jars | |
| | 12 Bottles #3-7 | |
| | 13 Other Plastic Tubs and Cups <3 Gallons | |
| | 14 Large Plastic Containers >3 Gallons | |
| | 15 Plastic Retail Bags | |
| | 16 Other Plastic Film | |
| | 17 Expanded Polystyrene | |
| | 18 Other Rigid Plastics | |
| METALS | 19 Aluminum Cans | |
| | 20 Aluminum Foil & Trays | |
| | 21 Ferrous Containers | |
| | 22 Other Ferrous | |
| | 23 Other Non-Ferrous | |
| | 24 White Goods | |
| GLASS | 25 Glass Bottles and Jars | |
| | 26 Other Glass | |
| ORGANICS | 27 Mixed Yard Waste including Small Branches | |
| | 28 Branches, Limbs and Stumps | |
| | 29 Leaves | |
| | 30 Food Waste | |
| | 30A Pumpkin Waste | |
| | 31 Non-C&D wood | |
| | 32 Textiles/Leather | |
| | 33 Fines / Dirt | |
| | 34 Wood Pallets | |
| | 35 Other Organics | |
| PROBLEM WASTE | 36 Large Electronics (Plug-in) | |
| | 37 Small Electronics (Rechargeable) | |
| | 38 Small Appliances | |
| | 39 Diapers / Sanitary Products | |
| | 40 Carpet/Padding | |
| | 41 Batteries | |
| | 42 Rubber | |
| | 43 Tires | |
| | 44 Furniture/Bulky Items | |
| | 45 Other Inorganics | |
| HOUSEHOLD HAZARDOUS | 46 Fluorescent tubes and bulbs | |
| | 47 Pharmaceuticals and syringes | |
| | 48 Oil-based paint & finishes | |
| | 49 Latex paint & finishes | |
| | 50 Pesticides | |
| | 51 Automotive fluids | |
| | 52 Other HHW | |
| C&D DEBRIS | 53 Aggregate/Concrete/Asphalt/ Ceramics/Etc. | |
| | 54 Asphalt Shingles | |
| | 55 Painted/stained/Treated wood | |
| | 56 Clean dimensional Lumber | |
| | 57 Clean / New Drywall | |
| | 58 Demo/Painted Drywall | |
| | 59 Other C&D | |

Notes

Boulder County Visual Survey Field Data Sheet

Sample ID: _____

Field Supervisor: _____

Circle Generator Sector

Residential

Non-Residential

Date: _____ Time: _____

| | | |
|----------------------------|--------------|---------------|
| Circle One Activity | Construction | Manufacturing |
| | Renovation | Retail |
| | Demolition | Warehouse |
| | Clean Out | Other: |

Location _____

Hauler: _____

Truck Number _____

Ticket Number _____

Load YRD or Weight _____

Container Dimensions: _____

Container Yardage: _____

Percent Full: _____

Trailer Dimensions: _____

Container Yardage: _____

Percent Full: _____

| | | Material Group | % By Volume | % By Volume |
|--------------------------|---------------------------|------------------------------|-------------|---------------|
| PAPER | 1 | Uncoated OCC - recyclable | | |
| | 2 | Other Paper | | |
| | | | | Subtotal 100% |
| PLASTIC | 3 | PET bottles - beverage | | |
| | 4 | Film Packaging | | |
| | 5 | Other plastic | | |
| | | | | Subtotal 100% |
| METAL | 6 | Aluminum Containers | | |
| | 7 | Other ferrous scrap | | |
| | 8 | Non-ferrous metal | | |
| | 9 | White Goods | | |
| | 9 | White Goods | | |
| | | | | Subtotal 100% |
| GLASS | 10 | Glass Bottles and Jars | | |
| | 11 | Glass | | |
| | | | | Subtotal 100% |
| ORGANIC | 12 | Yard Waste | | |
| | 13 | Dirt/Sand | | |
| | | | | Subtotal 100% |
| PROBLEM MATERIAL | 14 | Electronics | | |
| | 15 | Small Appliances | | |
| | 16 | Carpet/Padding | | |
| | 17 | Batteries | | |
| | 18 | Tires | | |
| | 19 | Furniture/Bulky items | | |
| | 20 | Fluorescent Light Bulbs | | |
| 21 | Household Hazardous Waste | | | |
| | | | | Subtotal 100% |
| C&D MATERIALS | 22 | Rock, concrete, brick | | |
| | 23 | Asphalt Shingles | | |
| | 24 | Painted/stained/Treated wood | | |
| | 25 | Untreated dimensional lumber | | |
| | 26 | Pallets | | |
| | 27 | Usable Durable Items | | |
| | 28 | Unusable Durable Items | | |
| | 29 | Clean / New Drywall | | |
| | 30 | Demo/Painted Drywall | | |
| | 31 | Other C&D | | |
| | | | | Subtotal 100% |
| 38 | Mixed MSW | | | |
| | | | | Subtotal 100% |

| | |
|-------------|--------------|
| 100% | Total |
|-------------|--------------|