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Construction and Demolition Materials Composition Study
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Contributors/acknowledgements

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- Dem-Con Landfill and C&D Recycling Facilities – Shakopee
- East Central Solid Waste Commission C&D Landfill – Mora
- Itasca County Landfill – Grand Rapids
- Olmsted County Kalmar Landfill – Rochester
- Pilgrim Landfill – Mankato
- Polk County Landfill – Crookston
- Tom Kraemer Demolition Landfill – Cold Spring

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Acronyms and definitions

Acronyms

C&D: Construction and Demolition
EPA: U.S. Environmental Protection Agency
HDPE: High Density Polyethylene (commonly referred to as #2 plastics)
HVAC: Heating, Venting, and Air Conditioning
MPCA: Minnesota Pollution Control Agency
MSW: Municipal solid waste
MMSW: Mixed municipal solid waste
OCC: Old Corrugated Cardboard/Containers
QA/QC: Quality Assurance/Quality Control
R/C: Remainder and Composite

Definitions

Commercial materials: Materials generated from business, institutional, or other non-residential structure building projects
C&D materials: Materials resulting from construction, renovation, deconstruction, and/or demolition; for purposes of this report materials are limited to those defined in Appendix A
Construction materials: Materials resulting from new structure construction
Demolition materials: Materials generating from the tear-down of structures and buildings
Greater Minnesota: Region encompassing the 80 counties not included in the Metro region
Metro: Region encompassing Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington Counties
Mixed municipal solid waste: Garbage, refuse, and other solid waste from residential, commercial, industrial, and community activities that the generator of the waste aggregates for collection; does not include auto hulks, street sweepings, ash, construction debris, mining waste, sludges, tree and agricultural wastes, tires, lead acid batteries, motor and vehicle fluids and filters, and other materials collected, processed, and disposed of as separate waste streams
Municipal Solid Waste: Combination of Mixed Municipal Solid Waste and recyclable materials, managed at solid waste land disposal facilities
Non-C&D materials: Materials resulting from activities not included in residential or commercial categories, but containing materials consistent with these sectors (pallets, rock, wood, etc.)
Processing: The treatment of waste after collection and before disposal; processing includes but is not limited to reduction, storage, separation, exchange, resource recovery, physical, chemical, or biological modification, and transfer from one waste facility to another
Recyclable materials: Materials that are separated from mixed municipal solid waste for the purpose of recycling or composting, including paper, glass, plastics, metals, automobile oil, batteries, source-separated compostable materials, and sole source food waste streams that are managed through biodegradation processes. Refuse-derived fuel or other material that is destroyed by incineration is not a recyclable material.

Renovation materials: Materials resulting from remodeling or repair jobs, including roof replacements

Residential materials: Materials generated from housing structure building projects

Solid waste land disposal facility: A facility used to dispose of solid waste in or on the land ("facility")
Executive summary

In an effort to identify opportunities for reducing the environmental impacts of the State of Minnesota’s building sector, the Minnesota Pollution Control Agency (MPCA) conducted a study on the generation and composition of construction and demolition (C&D) materials originating in Minnesota and disposed of at permitted solid waste facilities with C&D disposal areas, typically C&D landfills. The goal of this report is to gain a stronger understanding of the material categories and prevalence of those materials within the C&D waste stream. 1

A total of 375 loads, or 1,699 tons of C&D debris were surveyed at seven facilities across the state for this report, which included both the landfill and processing areas at one facility, Dem-Con Recovery and Recycling. The three material categories that made up the largest percentage of the total waste composition are: Concrete (21.8%), Roofing Shingles (19.3%), and Dirt/Sand/Rock/Gravel (13.4%), as seen in Figure 1. Combined, these categories represent over 54% of statewide C&D waste.

The results and analysis completed in this study help the MPCA look at how different materials are being wasted, which is useful in determining how to improve building material management strategies for recycling and reuse. For instance, are there replacement materials that would have a smaller environmental footprint from a material life cycle perspective? Are there materials that would be more durable and have a longer life before disposal? What reuse and recycling markets are strong in Minnesota or surrounding states? What markets need support and expansion, and how can Minnesota diversify markets to make them more stable? Answering these questions will allow the MPCA to define program strategies and identify priorities to most effectively prevent building material waste and identify alternative management methods to keep materials in use as long as possible before disposal.

Figure 1. Aggregate statewide C&D waste composition, 2019
Introduction

Background

The state of Minnesota has over 120 facilities that accept C&D debris for disposal, including Class I, Class II, and Class III C&D landfills (as defined in the “Facility Classification” section of the 2005 Demolition Landfill Guidance Document), transfer stations, and C&D recycling facilities (MPCA, 2005). The MPCA issues solid waste permits for facilities that accept C&D debris for disposal and for each facility that monitors the surrounding groundwater, the MPCA requires an annual report be submitted describing the groundwater quality for that year. As outlined in the Groundwater Impacts of Unlined Construction and Demolition Debris Landfilling report, disposal of C&D waste in Class I unlined landfills is known to cause higher concentrations of contaminants of concern above the allowable drinking water standards as defined by the Minnesota Department of Health (MPCA, 2019). The groundwater findings from this report led to the establishment of two stakeholder groups, advising the MPCA on statewide opportunities for improving the protection of groundwater near C&D landfills and opportunities for increasing sustainable building and material management.

The U.S. Environmental Protection Agency (EPA) estimates 569 million tons of C&D debris were generated in the United States in 2017, which is more than twice the amount of municipal solid waste (MSW) generated in the same year (EPA, 2020). In order to determine the amount of C&D debris generated in Minnesota, the MPCA used annual reports from permitted solid waste facilities which includes the types and amounts of waste managed. While the MPCA additionally collects detailed MSW generation data from counties, the same level of granularity isn't required for C&D data. Furthermore, while the state of Minnesota’s efforts to reduce MSW generation and recycle more residential waste have grown, the same prioritization hasn’t historically been given to the reuse and recycling of C&D materials. The MPCA estimates that about 20% of C&D material is currently recycled, despite many constituents in the C&D waste stream having more potential for reuse and recycling. At this point, the MPCA has limited formal data on C&D material handled outside the solid waste stream.

This study aims to fill the gaps in information for C&D material and waste management in the state of Minnesota, and help inform future decision-making processes for Minnesota’s building material management system. The research included characterization studies at facilities across the state, including locations in both the Metro and Greater Minnesota regions.

Objectives

The MPCA identified the following objectives for the statewide C&D study:

- Provide data on the composition of C&D waste in Minnesota, noting any differences between Greater Minnesota and the Metro regions.
- Investigate C&D material generation and management practices based on C&D landfill reports.
- Detail seasonal differences in the composition of C&D waste.
Methodology

Demographic regions

This study was conducted to gather information on the C&D waste stream from representative sites in two regions of Minnesota:

- **Metro**: The seven-county region that covers Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington Counties.
- **Greater Minnesota**: The remaining 80 counties outside the seven-county Metro region.

Throughout this report, results are presented separately by region and in the statewide aggregate.

C&D waste disposal

Minnesota requires solid waste management facilities to report the amount of materials handled and disposed of at the facility to the MPCA in their solid waste annual report, a requirement of Minn. R. 7035.2585. Table 1 summarizes the reported statewide quantities of C&D materials disposed in 2019 by region of origin.

Table 1. C&D waste disposed in Minnesota by region of origin

<table>
<thead>
<tr>
<th>Region</th>
<th>Tons of C&amp;D disposed</th>
<th>Percent of total C&amp;D disposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater Minnesota</td>
<td>499,699</td>
<td>32.6%</td>
</tr>
<tr>
<td>Metro</td>
<td>1,034,427</td>
<td>67.4%</td>
</tr>
<tr>
<td>Total</td>
<td>1,534,127</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

The composition of C&D materials being disposed in Minnesota is roughly one third from Greater Minnesota and two-thirds from the Metro.

Study design – visual characterization

Host facilities and schedule

In the state of Minnesota, there are 126 permitted solid waste facilities with C&D disposal areas on-site. Nine of these facilities are located within the Metro region, with the remaining 117 in Greater Minnesota. Transfer facilities may also handle C&D materials, but aren’t included in these counts. In order to be selected for visual load surveying for this C&D composition analysis, facilities needed to:

- Accept a sufficient quantity of materials to justify a full day of visual surveying.
- Have a scale available in order to weigh each load.
- Have adequate space on their tip floor and working space to safely host the project.
- Have the ability and willingness to periodically spread out a tipped load for better viewing the interior of the piles.
- Have access to scale data through on-site communications (radio, cell phone) if loads are not given a ticket as they enter.

This study also specifically focused on assessing multiple Class I landfills. These landfills are not lined and are therefore limited to only accepting C&D materials, compared to Class II and III that may also accept other wastes, as defined in 2005 Demolition Landfill Guidance document (MPCA, 2005). Prior to this composition analysis, the MPCA conducted its study on the groundwater impacts of unlined C&D...
landfilling at Class I landfills as well, and therefore wanted to document the types of materials entering these facilities (MPCA, 2019). Figure 2 provides a map of the facilities that hosted the field data collection for characterizing C&D loads.

Figure 2. Map of facilities hosting field data collection by season

The visual surveying of C&D loads occurred over two seasons in 2019: Summer (June 3-7) and Fall (October 7-11). Most of the facilities were visited by a single enumerator who performed the visual surveys; however, two enumerators started each season at Dem-Con’s facility to initiate data collection and calibrate their processes. The enumerators then traveled independently to the remaining facilities to complete single day collections for the remainder of the week. Table 2 provides the specific dates that field activities occurred at each facility.

It should be noted that the characterization of C&D material at Dem-Con, the only Class III landfill, included both loads destined for landfill and loads diverted to an on-site C&D processing area. The reason both disposed and processed loads were characterized is there is not extensive C&D recycling capacity elsewhere in Minnesota, and little mixed C&D is typically delivered to processing facilities.
Therefore, in most areas of the state, all of the C&D arriving at landfills would be expected to be land disposed.

Table 2. Detailed field activities by facility. Includes region the facility is located and specific dates that field activities occurred.

<table>
<thead>
<tr>
<th>Demographic Region</th>
<th>Facility</th>
<th>Disposal Area Classification</th>
<th>Summer 2019</th>
<th>Fall 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro</td>
<td>Dem-Con Recovery &amp; Recycling</td>
<td>Class I, II, III</td>
<td>June 3-5</td>
<td>Oct. 7-9</td>
</tr>
<tr>
<td></td>
<td>TK Demolition Disposal LLC (TKI)</td>
<td>Class I</td>
<td>June 5</td>
<td>Oct. 9</td>
</tr>
<tr>
<td>Greater MN</td>
<td>Olmsted County Kalmar Landfill</td>
<td>Class I</td>
<td>June 6</td>
<td>October 10</td>
</tr>
<tr>
<td>Greater MN</td>
<td>Itasca County Demolition Landfill/MSW Transfer Station</td>
<td>Class I</td>
<td>June 6</td>
<td>October 10</td>
</tr>
<tr>
<td>Greater MN</td>
<td>Pilgrim Demolition Landfill</td>
<td>Class I</td>
<td>June 7</td>
<td>October 11</td>
</tr>
<tr>
<td>Greater MN</td>
<td>Polk County Sanitary Landfill</td>
<td>Class I</td>
<td>June 7</td>
<td>N/A</td>
</tr>
<tr>
<td>Greater MN</td>
<td>East Central Solid Waste Commission (ECSWC)</td>
<td>Class I</td>
<td>N/A</td>
<td>October 11</td>
</tr>
</tbody>
</table>

During the last day of the Fall data collection, a winter storm prevented field work at the Polk County Landfill. The East Central Solid Waste Commission (ECSWC) landfill in Mora replaced the Polk County Landfill in order to prevent the loss of an additional day of data collection; however, the change of location created limitations for the comparison of results from the Summer to Fall data collection.

Not all host facilities routinely use a truck scale for C&D loads. For example, the ECSWC Landfill scale mixed municipal solid waste (MMSW) loads but not C&D loads. Additionally, several of the other facilities did not routinely scale in all C&D loads, but in order to maximize the number of loads surveyed, some composition estimates were made for loads without corresponding scale weights.

Of the 434 loads surveyed at the seven host facilities, 59 did not get scaled due to the following circumstances:

- Small hauler loads at the Itasca County facility are not scaled, and few large-volume loads of C&D come to this facility. Seven large-volume loads were scaled at the demolition disposal area and 38 small-hauler unscaled loads were visually-surveyed at the drop-off area.
- During the Summer data collection, the hauler of one of the surveyed loads at the Pilgrim Demolition Landfill left the facility without scaling out.
- During the Fall data collection, Dem-Con experienced high traffic flow. Their rate options allow customers to elect to pay a flat fee per cubic yard on certain material types, thereby bypassing the scale on exit and alleviating traffic delays. Thirteen of the 150 loads surveyed at Dem-Con in the Fall data collection were unscaled, flat fee loads.
- During the Fall data collection, one load at TKI was hauled by a private hauler who paid by volume rather than weight. All other loads were hauled by TKI trucks and drivers, and were able to scale in and provide empty tare weights for load weight calculation.
- Vehicles delivering material to the ECSWC Landfill C&D disposal area do not scale out as a matter of standard practice.
At the conclusion of the survey, the MPCA opted to exclude from the analysis the loads that did not have a corresponding scale weight because the derived weight of these composition estimates could not be calibrated against actual scale weights.

Load collection targets

The targeted number of loads to be characterized per day by each enumerator at each facility was 25 loads. However, truck traffic volumes, daily delivery patterns, inclement weather, inconsistent enumerator documentation, and seasonal/regional delivery variations prevented the achievement of this target. Table 3 details the planned load assessment according to the number of days scheduled at each facility, along with the actual loads assessed. It also shows the number of samples calibrated against actual scale weights. These 375 samples were ultimately used as the basis for the composition analysis.

**Table 3. Sampling plan**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Planned samples</th>
<th>Actual samples- Summer June 3-7, 2019</th>
<th>Actual samples- Fall October 7-11, 2019</th>
<th>Total samples</th>
<th>Total scaled samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dem-Con Recovery &amp; Recycling</td>
<td>250</td>
<td>82</td>
<td>150</td>
<td>232</td>
<td>219</td>
</tr>
<tr>
<td>TK Demolition Disposal LLC</td>
<td>50</td>
<td>29</td>
<td>30</td>
<td>59</td>
<td>58</td>
</tr>
<tr>
<td>Olmsted County Kalmar Landfill</td>
<td>50</td>
<td>3</td>
<td>13</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Itasca County Demolition Landfill/MSW Transfer Station</td>
<td>50</td>
<td>23</td>
<td>22</td>
<td>45</td>
<td>7</td>
</tr>
<tr>
<td>Pilgrim Demolition Landfill</td>
<td>50</td>
<td>29</td>
<td>17</td>
<td>46</td>
<td>45</td>
</tr>
<tr>
<td>Polk County Sanitary Landfill</td>
<td>50</td>
<td>30</td>
<td>NA</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>East Central Solid Waste Commission</td>
<td>0</td>
<td>NA</td>
<td>6</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>500</strong></td>
<td><strong>196</strong></td>
<td><strong>238</strong></td>
<td><strong>434</strong></td>
<td><strong>375</strong></td>
</tr>
</tbody>
</table>

Material categories

Specific material categories and subcategories used for this characterization study were approved by the MPCA. A variance between the Summer and Fall data collection included the addition of Insulation and Rubber Products for material subcategories. During the Summer data collection, it became clear these materials made up a significant portion of the loads and would benefit from their own material subcategories, as opposed to being included in remainder and composite (R/C) and Other C&D. For the Summer dataset, Insulation and Rubber Products could not be broken out of the R/C and Other C&D subcategory and were estimated as 0% when calculating the confidence intervals. Detailed definitions for the characterization categories are included in Appendix A.

Sample selection and collection process

When possible, MSW Consultants relied on random selection of inbound loads of C&D debris for the visual characterization. MSW Consultants deployed one or two experienced professional staff
(depending on the facility and day) to coordinate with scale house staff, facility supervisors, tip area spotters, and inbound drivers to select loads for surveying. The system varied by facility, as proximity to the scale, varying traffic flows, and facility operations were taken into consideration. Equipment operators provided assistance in spreading the loads as requested so the interior of the loads could be observed when they weren’t fully visible while offloading. On most occasions the driver of the targeted vehicle was instructed to spread the load out during the tipping process and staff could observe as it unloaded.

MSW Consultants believes the selection of loads was entirely random, although at some facilities where truck traffic was light, every load was characterized. At other facilities with heavier inbound traffic, surveying progressed at a steady pace throughout the day with the next available delivery being selected after each preceding load was characterized.

**Generator sectors and types**

As drivers neared the tip area, they were interviewed about their load. First, a brief explanation was provided to each driver regarding the purpose of the study. If the load contained C&D waste, they were asked if it originated from a residential or commercial job site. Drivers also indicated whether their loads were coming from construction, renovation, demolition, or a combination of these categories. While the scope of this study included materials from road and bridge construction and demolition projects, during the data collection there weren’t loads from these projects observed.

**Visual characterization**

Visual surveying of a load of C&D waste involves recording the truck and load dimensions, followed by the observation of the major material components in the tipped load. The basic steps to visual surveying include:

1. Measuring and recording the type of vehicle, dimensions or capacity (ex. 30-yard roll-off) of the incoming load prior to tipping, and, if possible, estimating the percent fullness of the vehicle.
2. Observing the load tipping. With a larger load, one deemed too large to tip in a single pile and assess all materials, the vehicle driver spreads out the load as it tips. When feasible, the enumerator stands at a safe distance to the side and rear of the offloading vehicle to observe the offloading, noting items falling within the load that may be covered. Load operators spread out materials that aren’t visible on occasion. These activities assist the visual assessment by making it easier to discern dense materials such as block, brick, and dirt that tend to sink to the bottom of the pile.
3. Marking the major material categories during a first pass around the tipped load, while estimating the percentage of the load made up of these major materials by volume.
4. Noting the subcategories contained in each major material category during a second pass around the tipped load, while estimating the percentage of the major material category made up of the material subcategories by volume. For example, subcategories of Clean Wood include Untreated Dimensional Lumber, Untreated Engineered Wood, and Wood Pallets/Crates/Spoools.
5. Confirming the estimated percentages of all categories and subcategories add up to 100%, and confirming the estimated yardage of material categories is realistic, given the overall load or container dimensions and volume.
6. Entering percentages into MSW Consultants’ proprietary tablet-based application to apply material density values to the volume estimates in order to get a real-time conversion from volume to weight-based composition. The total estimated weight based on the visual composition is then
compared to the scaled weight of the load. If the estimated weight is not within a 10% margin of error of the actual scale weight, the application prompts the enumerators to reassess their evaluation.

At every permitted solid waste facility with a C&D disposal area that scaled C&D loads, MSW Consultants obtained actual weights of surveyed loads so visual estimates were compared to and adjusted, if needed, to accurately reflect the load weight. For the previously described unscaled loads, the visual estimate was not calibrated against a known load weight. Because of this, the unscaled loads were removed from the study calculations.

MSW Consultants compiled material densities from various published sources and has also modified certain material densities based on their body of related project work. A table of the baseline density factors embossed in the application can be found in Appendix B.

The application allows the enumerator to adjust density factors depending on the observed compactness or saturation of each individual constituent. For example, overlapping dimensional lumber that contains noticeable airspace may have the density factor adjusted down. Stacked, flattened cardboard boxes or plywood sheets with no noticeable airspace may have the density adjusted up. Although this feature exists, enumerators are not typically adjusting the density factors on a regular basis as other aspects of the volumetric estimate would also need adjusting.

**Data management and quality control**

To ensure data accuracy and integrity, the study adhered to the following quality assurance and quality control (QA/QC) procedures:

- Assigning a unique combination sample number, identifying the facility of origin, and noting the date and time of each sample prior to recording the material category and subcategory composition for each sample.
- Designing the data entry databases to create a standard for vehicle types, types of materials, recording of weight, etc. to prevent out-of-range values from being recorded.

At the conclusion of the Summer and Fall field data collections, the composition data entered into the database was analyzed to determine the estimated weight in pounds and estimated mean percent associated with each material in the loads. The mean composition, as well as a confidence interval, was calculated at a 90% level of confidence.

The steps for visual volumetric survey data analysis include:

1. Converting the volumetric estimates of each surveyed load to weight-based estimates, using density factors. MSW Consultants accumulated the density factors from industry resources and supplemented them with real-world densities obtained in other material characterization studies.
2. Determining the sample mean composition for each material category once visual sample data is converted to estimate weights, by (i) summing the weight of each material in each surveyed load, (ii) summing the total weight of all surveyed loads, and (iii) dividing the first value by the second value to determine the percent-by-weight composition.
3. Comparing the calculated load weights (determined during the visual assessment step) against the actual reported weights as presented on the ticketing information obtained for each load.

Determination of the 90% confidence interval was achieved using bootstrapping, a statistical technique that uses resampling. Resampling is the method of drawing repeated samples from the original data samples, where all samples have equal chance of being selected and can be selected more than once. Resampling achieves an estimate of the possible range of values for the sample statistic. In this study, all
material weights and associated sample weights were resampled, expanding the original sampled data by creating 1,000 hypothetical additional sorts (assuming the original sampled data are unbiased and representative of C&D waste). Resampling with replacement in this scenario allowed the sampled composition data to be selected again each time a new hypothetical sample was selected (i.e. in dataset \( s_1 \) represented in Figure 3, Sample 1 was selected twice since after the first time it was selected, it was replaced and still available to be selected again). These additional material compositions are then sorted from smallest to largest, and the 95\(^{th}\) and 5\(^{th}\) percentiles are selected to create the 90\% confidence interval for the estimated composition percent. Figure 3 shows how the bootstrapping process is used to create the confidence intervals, and the R code used to perform the calculations is presented in Appendix C.

**Figure 3. Illustration of bootstrapping to calculate the 90\% confidence interval for a specific summary statistic**

![Diagram of bootstrapping process](image)

Bootstrapping works well when there are a large number of samples and the samples were selected to be representative of the population at large. It has the added benefit of being a non-parametric method which means no additional assumptions (e.g. data are normally distributed) are needed to estimate the 90\% confidence interval.
C&D characterization

This section provides data about the composition of the C&D waste stream received at permitted solid waste facilities with C&D disposal areas or recovery processing facilities. Detailed state-level results are shown in the following sections, and results by participating facilities that authorized their release are provided in Appendix D.

Table 4 provides a high-level summary of the loads broken down by season (Summer and Fall) and by load type. The overall amount of material originating from Construction loads stays constant between the seasons, while the percent of Demolition loads drops and Renovation increases from Summer to Fall.

Table 4. Amount of material generated by project type for each season

<table>
<thead>
<tr>
<th>Load Type</th>
<th>Summer</th>
<th>Fall</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>18.8%</td>
<td>18.0%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Demolition</td>
<td>49.7%</td>
<td>28.7%</td>
<td>39.0%</td>
</tr>
<tr>
<td>Mixed C&amp;D</td>
<td>2.4%</td>
<td>1.7%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Non C&amp;D</td>
<td>0.0%</td>
<td>2.7%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Renovation</td>
<td>29.2%</td>
<td>48.9%</td>
<td>39.1%</td>
</tr>
</tbody>
</table>

Table 5 adds an additional layer to Table 4 by including Region, comparing the amount of material by project type from season to season within Greater Minnesota as compared to the Metro region. Between both the Metro and Greater Minnesota there is an increase in the amount of material sorted that originated from Renovation loads and a decrease in Demolition. This change is more pronounced in the Metro than Greater Minnesota region, where the amount generated by Construction loads also decreases between seasons.

Table 5. Amount of material generated by project type for each season by region

<table>
<thead>
<tr>
<th>Region</th>
<th>Load Type</th>
<th>Summer</th>
<th>Fall</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater Minnesota</td>
<td>Construction</td>
<td>10.0%</td>
<td>8.5%</td>
<td>9.4%</td>
</tr>
<tr>
<td></td>
<td>Demolition</td>
<td>62.9%</td>
<td>55.5%</td>
<td>60.0%</td>
</tr>
<tr>
<td></td>
<td>Mixed C&amp;D</td>
<td>4.3%</td>
<td>3.0%</td>
<td>3.8%</td>
</tr>
<tr>
<td></td>
<td>Non C&amp;D</td>
<td>0.0%</td>
<td>4.7%</td>
<td>1.9%</td>
</tr>
<tr>
<td></td>
<td>Renovation</td>
<td>22.8%</td>
<td>28.3%</td>
<td>24.9%</td>
</tr>
<tr>
<td>Greater Minnesota Total</td>
<td></td>
<td>55.9%</td>
<td>35.0%</td>
<td>45.3%</td>
</tr>
<tr>
<td>Metro Area</td>
<td>Construction</td>
<td>29.9%</td>
<td>23.2%</td>
<td>25.8%</td>
</tr>
<tr>
<td></td>
<td>Demolition</td>
<td>32.9%</td>
<td>14.3%</td>
<td>21.7%</td>
</tr>
<tr>
<td></td>
<td>Mixed C&amp;D</td>
<td>0.0%</td>
<td>1.0%</td>
<td>0.6%</td>
</tr>
<tr>
<td></td>
<td>Non C&amp;D</td>
<td>0.0%</td>
<td>1.6%</td>
<td>1.0%</td>
</tr>
<tr>
<td></td>
<td>Renovation</td>
<td>37.3%</td>
<td>59.9%</td>
<td>50.9%</td>
</tr>
<tr>
<td>Metro Area Total</td>
<td></td>
<td>44.1%</td>
<td>65.0%</td>
<td>54.7%</td>
</tr>
</tbody>
</table>
Aggregate statewide results

A total of 375 loads, weighing 1,699 tons, were surveyed from across the state. Figure 4 shows the composition of the 1,699 tons of C&D scaled waste that were surveyed, broken into the eleven most prevalent material categories. The three material categories that made up the largest percentage of the total waste composition, included Concrete (21.8%), Roofing Shingles (19.3%), and Dirt/Sand/Rock/Gravel (13.4%). Combined these three categories represent over 54% of statewide C&D waste materials.

Wood accounts for 15.5%, when combining the two wood categories (Treated/Painted/Processed Wood and Clean Wood). The wood categories were tracked separately for the study because they have different end markets; however, it’s interesting to note how large of a combined category wood is in the overall composition. Excluding MSW (1.3%) and General C&D (10.5%), the remaining materials categories, Gypsum Board, Brick, and Plastics, represent 18.1% of the total. Gypsum Board and Brick are the two largest categories in this subset, at approximately 8% and 7% respectively. Both of these materials have some markets for either reuse or recycling. Gypsum board is ground down and added into clay soils to increase drainage in some states, and bricks can often be reused.

**Figure 4. Aggregate statewide C&D waste composition**

Table 6 provides a detailed statistical profile of aggregate statewide C&D waste. For each material category and subcategory, the mean percent of the statewide total and the 90% confidence bounds are shown.
Table 6. Minnesota statewide aggregate composition by weight with 90% confidence intervals

<table>
<thead>
<tr>
<th>Material</th>
<th>Mean</th>
<th>Lower</th>
<th>Upper</th>
<th>Material</th>
<th>Mean</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>21.8%</td>
<td>18.4%</td>
<td>25.5%</td>
<td>Gypsum Board</td>
<td>8.1%</td>
<td>6.6%</td>
<td>9.8%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>19.3%</td>
<td>16.3%</td>
<td>22.9%</td>
<td>Clean</td>
<td>4.5%</td>
<td>3.3%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Brick</td>
<td>7.2%</td>
<td>5.0%</td>
<td>9.6%</td>
<td>Painted</td>
<td>3.7%</td>
<td>2.8%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Dirt/Sand/Rock/Gravel</td>
<td>13.4%</td>
<td>10.7%</td>
<td>16.3%</td>
<td>Untreated Dimen. Lumber</td>
<td>2.3%</td>
<td>1.7%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Dirt/Sand</td>
<td>6.5%</td>
<td>4.9%</td>
<td>8.4%</td>
<td>Untreated Eng. Wood</td>
<td>2.9%</td>
<td>2.3%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>6.5%</td>
<td>4.3%</td>
<td>8.9%</td>
<td>Wood Pallets/ Crates/Spools</td>
<td>2.0%</td>
<td>1.6%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Yard Waste</td>
<td>0.4%</td>
<td>0.2%</td>
<td>0.8%</td>
<td>Metal</td>
<td>2.5%</td>
<td>2.0%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Clean Wood</td>
<td>7.2%</td>
<td>6.1%</td>
<td>8.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>10.5%</td>
<td>8.4%</td>
<td>12.8%</td>
<td>Composite Metal (wires)</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.2%</td>
<td>Ferrous Scrap</td>
<td>1.4%</td>
<td>1.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Asbestos</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>Non-Ferrous Metal</td>
<td>1.0%</td>
<td>0.8%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Asphalt</td>
<td>2.1%</td>
<td>0.6%</td>
<td>3.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>0.4%</td>
<td>0.3%</td>
<td>0.6%</td>
<td>MSW</td>
<td>1.3%</td>
<td>1.0%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>Bulky Items (inc. mattresses)</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixture</td>
<td>1.2%</td>
<td>0.6%</td>
<td>1.8%</td>
<td>E-Waste</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.3%</td>
<td>MMSW</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.3%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>Other Paper</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Insulation</td>
<td>0.4%</td>
<td>0.2%</td>
<td>0.7%</td>
<td>R/C and Other Glass</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>Tires</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.2%</td>
<td>Uncoated OCC – Recyclable</td>
<td>0.7%</td>
<td>0.5%</td>
<td>0.9%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>5.4%</td>
<td>4.3%</td>
<td>6.9%</td>
<td>Plastics</td>
<td>0.3%</td>
<td>0.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Rubber Products</td>
<td>0.3%</td>
<td>0.1%</td>
<td>0.5%</td>
<td>Film Plastic (Comm./Indus.)</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>Durable Plastic Items</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>8.3%</td>
<td>7.0%</td>
<td>9.8%</td>
<td>HDPE Buckets</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>7.2%</td>
<td>5.9%</td>
<td>8.5%</td>
<td>Plastic Furniture</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>0.6%</td>
<td>0.3%</td>
<td>0.9%</td>
<td>R/C and Other Plastic</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>0.5%</td>
<td>0.3%</td>
<td>0.8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5 shows the top 10 most prevalent individual constituents in the aggregate C&D waste stream. Concrete and Roofing Shingles remain the most prevalent individual materials. Brick and Painted/Stained Wood are the next most prevalent, despite being less than half of the percent amount of Concrete and Roofing Shingles. Dirt/Sand and Rock/Gravel make up a large amount as individual materials, especially when considering these materials can be used on-site for fill or landscaping if uncontaminated.
Figure 5. Top 10 most prevalent materials in aggregate surveyed C&D materials

Composition by region

Figure 6 compares the composition of C&D waste disposal by demographic region. Of the 375 load samples, 219 loads (58.4%) were completed at Metro facilities and 156 loads (41.6%) were completed at Greater Minnesota facilities.

C&D loads disposed at Metro facilities contained significantly more Roofing Shingles and significantly less Concrete by weight when compared to Greater Minnesota C&D facilities. The hypothesis for this variance is that disposal tipping fees may be higher in the Metro region, along with more outlets for recycling of concrete as aggregate on project sites, instead of disposing at a facility. During the Fall data
collection, several facilities reported multiple hailstorms occurring over the summer that may have increased the rate of roofing replacement in both the Metro and Greater Minnesota regions. Weather events can have a notable impact on the composition of materials in the C&D waste stream.

Figure 7 shows the top 10 most prevalent individual materials by demographic region, further highlighting the previously noted variances.

Figure 7. Comparison of top 10 most prevalent materials by demographic region

Table 7 and Table 8 provide detailed statistical profiles of C&D waste in Greater Minnesota and Metro regions, respectively.

Table 7. Greater Minnesota aggregate material composition by weight with 90% confidence intervals

<table>
<thead>
<tr>
<th>Material</th>
<th>Conf. Int. (90%)</th>
<th>Conf. Int. (90%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>30.8%</td>
<td>25.0%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>10.2%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Brick</td>
<td>11.4%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>9.3%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>4.7%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Dirt/Sand/Rock/Gravel</td>
<td>14.6%</td>
<td>11.2%</td>
</tr>
<tr>
<td>Yard Waste</td>
<td>0.6%</td>
<td>0.1%</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>9.5%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Metal</td>
<td>2.6%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Appliances</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Composite Metal (wires)</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Composite Metal (wires)</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Asbestos</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Non-Ferrous Metal</td>
<td>1.3%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Material</td>
<td>Mean</td>
<td>Lower</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>Asphalt</td>
<td>1.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixtures</td>
<td>1.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>0.2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Insulation</td>
<td>0.6%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>6.1%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Rubber Products</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>8.3%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>7.7%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>0.2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>0.4%</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Table 8. Metro aggregate material composition by weight with 90% confidence intervals

<table>
<thead>
<tr>
<th>Material</th>
<th>Mean</th>
<th>Lower</th>
<th>Upper</th>
<th>Material</th>
<th>Mean</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>14.6%</td>
<td>10.4%</td>
<td>18.9%</td>
<td>Gypsum Board</td>
<td>9.4%</td>
<td>6.8%</td>
<td>11.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Clean</td>
<td>6.2%</td>
<td>4.1%</td>
<td>8.4%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>26.7%</td>
<td>21.6%</td>
<td>31.4%</td>
<td>Painted</td>
<td>3.2%</td>
<td>2.1%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Brick</td>
<td>3.9%</td>
<td>1.9%</td>
<td>6.2%</td>
<td>Clean Wood</td>
<td>9.0%</td>
<td>7.3%</td>
<td>10.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Untreated Dimen. Lumber</td>
<td>2.9%</td>
<td>2.0%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Dirt/Sand/Rock/Gravel</td>
<td>12.4%</td>
<td>8.5%</td>
<td>16.8%</td>
<td>Untreated Eng. Wood</td>
<td>3.8%</td>
<td>2.9%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Dirt/Sand</td>
<td>4.3%</td>
<td>2.7%</td>
<td>6.4%</td>
<td>Wood Pallets/ Crates/Spools</td>
<td>2.3%</td>
<td>1.7%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>7.9%</td>
<td>4.0%</td>
<td>11.8%</td>
<td>Metal</td>
<td>2.4%</td>
<td>1.6%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Yard Waste</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.4%</td>
<td>Appliances</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>11.4%</td>
<td>8.1%</td>
<td>15.0%</td>
<td>Composite Metal (wires)</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.2%</td>
<td>Ferrous Scrap</td>
<td>1.6%</td>
<td>0.9%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Asbestos</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>Non-Ferrous Metal</td>
<td>0.8%</td>
<td>0.5%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Asphalt</td>
<td>3.1%</td>
<td>0.5%</td>
<td>6.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>0.7%</td>
<td>0.5%</td>
<td>0.9%</td>
<td>MSW</td>
<td>1.7%</td>
<td>1.4%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>Bulky Items</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Ceramics/Porcelain</td>
<td>1.3%</td>
<td>0.4%</td>
<td>2.3%</td>
<td>E-Waste</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Fixture</td>
<td>0.3%</td>
<td>0.1%</td>
<td>0.4%</td>
<td>MMSW</td>
<td>0.3%</td>
<td>0.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>Other Paper</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Insulation</td>
<td>0.3%</td>
<td>0.2%</td>
<td>0.4%</td>
<td>R/C and Other Glass</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>Tires</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.4%</td>
<td>Uncoated OCC – Recyclable</td>
<td>0.9%</td>
<td>0.7%</td>
<td>1.2%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>4.9%</td>
<td>3.4%</td>
<td>6.8%</td>
<td>Plastics</td>
<td>0.4%</td>
<td>0.3%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Rubber Products</td>
<td>0.4%</td>
<td>0.1%</td>
<td>0.8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>Durable Plastic Items</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>8.3%</td>
<td>6.4%</td>
<td>10.3%</td>
<td>Film Plastic (Comm./Indus.)</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>6.7%</td>
<td>5.1%</td>
<td>8.5%</td>
<td>HDPE Buckets</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>0.9%</td>
<td>0.5%</td>
<td>1.4%</td>
<td>Plastic Furniture</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>0.6%</td>
<td>0.3%</td>
<td>1.1%</td>
<td>R/C and Other Plastic</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Table 9 shows the estimated material tonnages generated statewide and within both regions, using the generation numbers displayed in Table 1.

Table 9. Estimated weight of material (in lbs.) using C&D disposal amounts statewide and regional (Greater Minnesota and Metro)

<table>
<thead>
<tr>
<th>Material</th>
<th>All MN</th>
<th>Greater MN</th>
<th>Metro</th>
<th>Material</th>
<th>All MN</th>
<th>Greater MN</th>
<th>Metro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>334,967</td>
<td>153,725</td>
<td>150,872</td>
<td>Gypsum Board Clean</td>
<td>125,026</td>
<td>33,203</td>
<td>96,942</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>296,129</td>
<td>51,145</td>
<td>275,825</td>
<td>Painted</td>
<td>56,646</td>
<td>21,560</td>
<td>32,970</td>
</tr>
<tr>
<td>Brick</td>
<td>111,080</td>
<td>56,897</td>
<td>40,082</td>
<td>Clean Wood Untreated Dimen. Lumber</td>
<td>35,449</td>
<td>7,820</td>
<td>28,151</td>
</tr>
<tr>
<td>Dirt/Sand</td>
<td>100,244</td>
<td>46,469</td>
<td>44,370</td>
<td>Wood Pallets/Crates/Spools</td>
<td>30,839</td>
<td>8,324</td>
<td>22,515</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>99,163</td>
<td>23,483</td>
<td>83,682</td>
<td>Metal Appliances</td>
<td>37,706</td>
<td>12,814</td>
<td>24,530</td>
</tr>
<tr>
<td>Yard Waste</td>
<td>6,496</td>
<td>3,201</td>
<td>2,556</td>
<td></td>
<td>93</td>
<td>54</td>
<td>24</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>161,800</td>
<td>47,567</td>
<td>117,729</td>
<td>Composite Metal (wires)</td>
<td>416</td>
<td>204</td>
<td>165</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
<td>--------</td>
<td>---------</td>
<td>------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>1,820</td>
<td>889</td>
<td>729</td>
<td>Ferrous Scrap</td>
<td>21,882</td>
<td>6,148</td>
<td>16,400</td>
</tr>
<tr>
<td>Asbestos</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Non-Ferrous Metal</td>
<td>15,315</td>
<td>6,408</td>
<td>7,941</td>
</tr>
<tr>
<td>Asphalt</td>
<td>32,473</td>
<td>4,779</td>
<td>31,641</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>6,891</td>
<td>697</td>
<td>7,247</td>
<td>MSW</td>
<td>19,421</td>
<td>3,466</td>
<td>17,902</td>
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<tr>
<td>Carpet Padding</td>
<td>901</td>
<td>79</td>
<td>968</td>
<td>Bulky Items (inc. mattresses)</td>
<td>2,372</td>
<td>442</td>
<td>2,154</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixture</td>
<td>18,628</td>
<td>5,774</td>
<td>13,055</td>
<td>E-Waste</td>
<td>292</td>
<td>35</td>
<td>298</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>3,438</td>
<td>833</td>
<td>2,801</td>
<td>MMSW</td>
<td>3,195</td>
<td>390</td>
<td>3,247</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>189</td>
<td>49</td>
<td>147</td>
<td>Other Paper</td>
<td>1,847</td>
<td>127</td>
<td>2,042</td>
</tr>
<tr>
<td>Insulation</td>
<td>6,535</td>
<td>2,854</td>
<td>3,187</td>
<td>R/C and Other Glass</td>
<td>1,292</td>
<td>366</td>
<td>964</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>1,071</td>
<td>331</td>
<td>754</td>
<td>Tires</td>
<td>20</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>2,502</td>
<td>492</td>
<td>2,229</td>
<td>Uncoated OCC – Recyclable</td>
<td>10,404</td>
<td>2,106</td>
<td>9,172</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>83,285</td>
<td>30,440</td>
<td>50,591</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber Products</td>
<td>4,021</td>
<td>329</td>
<td>4,360</td>
<td>Plastics</td>
<td>4,548</td>
<td>1,039</td>
<td>3,810</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>46</td>
<td>21</td>
<td>21</td>
<td>Durable Plastic Items</td>
<td>832</td>
<td>108</td>
<td>835</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>126,825</td>
<td>41,353</td>
<td>85,442</td>
<td>HDPE Buckets</td>
<td>226</td>
<td>40</td>
<td>208</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>109,914</td>
<td>38,434</td>
<td>69,689</td>
<td>Plastic Furniture</td>
<td>21</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>8,985</td>
<td>1,000</td>
<td>9,296</td>
<td>R/C and Other Plastic</td>
<td>1,758</td>
<td>618</td>
<td>1,108</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>7,926</td>
<td>1,920</td>
<td>6,456</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Composition by generation type**

Of the 375 loads documented in this study, 84 loads (22.4%) were generated from Construction projects, 94 loads (25.1%) were generated from Demolition projects, 183 loads (48.8%) were from Renovation projects, and 14 loads (3.7%) were either Mixed Loads or Non-C&D loads. Figure 8 compares the composition of surveyed C&D waste by generator type and highlights the material categories that are most prevalent for each.
Observations include:

- Unlike Demolition and Renovation loads, Construction loads did not tend to favor any one material type, but more than 50% of Gypsum Board and MSW were sourced from Construction loads. Demolition loads contained the most Concrete, Brick, Dirt/Sand, and Rock/Gravel. This is reasonable given these materials often become mixed together with other debris during the demolition process, and therefore become more difficult to separate and divert from disposal.

- Renovation loads contained the greatest percentage of Roofing Material, and was also the most common material sorted as a part of the total material make-up for this generator type. This is expected given all re-roofing project loads were classified as Renovation during this study.

- Mixed Generator and Non-C&D loads also included a significant number of loads that contained recyclable materials (materials that have a strong market for re-manufacturing) such as Metal and Plastics and often came from transfer stations.

Figure 9 shows the top 10 most prevalent individual materials by generator type. Study findings indicate the generator type influences the prevalence of materials disposed. Initiatives to increase diversion of C&D materials from disposal through reuse and recycling should recognize these differences and develop unique programs targeted to each generator type. For instance, contractors trying to recover concrete from demolition jobs or clean gypsum from construction sites could provide a separate dumpster on-site. The closer to the source the material is separated, the higher the likelihood that material can be reused or recycled.
Composition by season

Of the 375 sample loads, 196 loads (45%) were completed in the Summer data collection, and 238 loads (55%) were completed in the Fall data collection. Figure 10 compares the composition of aggregate statewide C&D composition by season. As previously noted, reported statewide hailstorms at the end of the summer may have resulted in increased loads with roof renovation materials in the Fall data collection. As Table 4 shows, the increased Renovation project loads vs Demolition project loads likely explain the difference in Concrete vs Roofing shingles from season to season.
Figure 40. Summer vs Fall material composition

Figure 11 shows the top 10 most prevalent individual materials by season. During the Summer, loads were observed from several large demolition projects, and during the Fall, roofing loads were most prevalent.

Figure 51. Comparison of top 10 most prevalent materials by season

While most material category percentages remained consistent between the Summer and Fall collections (noted in Table 10), the incidence of Concrete and Roofing Shingles essentially reversed, likely due to the type of project activity occurring. As noted in the Methodology, Insulation and Rubber
were two material categories added for the Fall data collection that had previously been included in the R/C and Other C&D material category during the Summer data collection. There are variances in materials from season to season because of the variation of work contractors do throughout the year. One contractor indicated to MPCA staff that contractors are often booked far in advance for demolition/construction jobs, and start those earlier in the summer and work more on renovation-based projects later in the year.

### Table 10. Summer vs Fall Material Composition

<table>
<thead>
<tr>
<th>Material</th>
<th>Summer</th>
<th>Fall</th>
<th>Diff</th>
<th>Material</th>
<th>Summer</th>
<th>Fall</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>31.5%</td>
<td>12.6%</td>
<td>18.8%</td>
<td>Gypsum Board</td>
<td>8.5%</td>
<td>7.8%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>10.4%</td>
<td>27.8%</td>
<td>-17.4%</td>
<td>Painted</td>
<td>4.17%</td>
<td>3.23%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Brick</td>
<td>5.6%</td>
<td>8.8%</td>
<td>-3.1%</td>
<td>Clean Wood</td>
<td>8.2%</td>
<td>6.3%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Dirt/Sand/ Rock/Gravel</td>
<td>12.9%</td>
<td>14.0%</td>
<td>-1.1%</td>
<td>Untreated Dimen. Lumber</td>
<td>3.34%</td>
<td>1.33%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Dirt/Sand</td>
<td>5.39%</td>
<td>7.63%</td>
<td>-2.2%</td>
<td>Un-treated Eng. Wood</td>
<td>2.82%</td>
<td>2.97%</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>6.88%</td>
<td>6.06%</td>
<td>0.8%</td>
<td>Wood Pallets/ Crates/Spools</td>
<td>2.05%</td>
<td>1.97%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Yard Waste</td>
<td>0.58%</td>
<td>0.28%</td>
<td>0.3%</td>
<td>Metal</td>
<td>3.3%</td>
<td>1.7%</td>
<td>1.6%</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>10.5%</td>
<td>10.6%</td>
<td>0.0%</td>
<td>Appliances</td>
<td>0.00%</td>
<td>0.01%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.22%</td>
<td>0.02%</td>
<td>0.2%</td>
<td>Ferrous Scrap</td>
<td>1.75%</td>
<td>1.12%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Asbestos</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.0%</td>
<td>Non-Ferrous Metal</td>
<td>1.50%</td>
<td>0.52%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Asphalt</td>
<td>1.92%</td>
<td>2.31%</td>
<td>-0.4%</td>
<td>Appliances</td>
<td>0.00%</td>
<td>0.01%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Carpet</td>
<td>0.44%</td>
<td>0.46%</td>
<td>0.0%</td>
<td>MSW</td>
<td>1.4%</td>
<td>1.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.06%</td>
<td>0.05%</td>
<td>0.0%</td>
<td>Bulky items (inc. mattresses)</td>
<td>0.12%</td>
<td>0.19%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixture</td>
<td>0.54%</td>
<td>1.85%</td>
<td>-1.3%</td>
<td>E-Waste</td>
<td>0.03%</td>
<td>0.00%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>0.21%</td>
<td>0.24%</td>
<td>0.0%</td>
<td>MMSW</td>
<td>0.23%</td>
<td>0.19%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.0%</td>
<td>Other Paper</td>
<td>0.19%</td>
<td>0.05%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Insulation</td>
<td>0.00%</td>
<td>0.83%</td>
<td>-0.8%</td>
<td>R/C and Other Glass</td>
<td>0.05%</td>
<td>0.12%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.09%</td>
<td>0.05%</td>
<td>0.0%</td>
<td>Tires</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>0.07%</td>
<td>0.25%</td>
<td>-0.2%</td>
<td>Uncoated OCC - Recyclable</td>
<td>0.74%</td>
<td>0.62%</td>
<td>0.1%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>6.96%</td>
<td>3.97%</td>
<td>3.0%</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber Products</td>
<td>0.00%</td>
<td>0.51%</td>
<td>-0.5%</td>
<td>Plastics</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.0%</td>
<td>Durable Plastic Items</td>
<td>0.05%</td>
<td>0.06%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated/Painted/ Processed Wood</td>
<td>7.4%</td>
<td>9.1%</td>
<td>-1.6%</td>
<td>Film Plastic (Comm./Indus.)</td>
<td>0.11%</td>
<td>0.12%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>6.62%</td>
<td>7.68%</td>
<td>-1.1%</td>
<td>Plastic Furniture</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>0.30%</td>
<td>0.86%</td>
<td>-0.6%</td>
<td>R/C &amp; Other Plastic</td>
<td>0.13%</td>
<td>0.10%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>0.51%</td>
<td>0.52%</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

Summary

In surveying 434 loads and completing additional analysis to confirm confidence intervals for the datasets, this report serves as a good foundation for documenting the composition of disposed C&D material originating in Minnesota. Collecting field data across the state’s permitted solid waste facilities with C&D disposal areas (and one processing facility) captured representative samples from both Greater Minnesota and the Metro region. Although the study would benefit from expanding field data collection to additional disposal facilities across the state, in both metro and non-metro facility locations, there is no evidence to suggest the existing data is biased or representational of C&D waste in Minnesota. Useful comparisons were made when analyzing data between two seasons and multiple load generators (Construction, Demolition, Renovation, and Mixed/Non-C&D); however, because this study is a snapshot in time, it doesn’t account for all of the complex variations with C&D generation, material reuse and recycling, and disposal across the state.

Compared to the majority of available C&D characterization studies in public literature over the past ten years, this research effort used a tablet-based application with built-in logic-checking and density conversions to enable real-time comparison of the enumerator’s visual estimate with the actual scale weight of surveyed loads. The composition estimates are therefore assumed to be more consistent from load to load. Given the expense and operational impacts associated with manual sorting of C&D waste, the methodology used for this study was a successful balance of accuracy and cost-effectiveness, while minimizing the impact to host disposal facilities’ operations.

Recommendations

Routinely update Minnesota statewide C&D composition research: A comprehensive analysis of Minnesota’s C&D materials in the disposal stream provides insight to the overall management of materials in this sector. The MPCA has historically performed statewide MMSW characterization studies, and this study expands the dataset to include C&D materials. In order to document change over time and track progress through different initiatives, C&D composition studies should be conducted at least as frequently as MMSW characterization studies. Given the homogenous loads that can be delivered to C&D landfills, such as roll-offs of roofing shingles or concrete, it is important to do routine composition studies so these individual loads of specific materials do not skew composition results, especially when loads may be tied to either seasonally-specific construction and demolition projects with seasonally-driven material composition.

Increase facility participation in future studies: Should the MPCA conduct future waste characterization studies, it is recommended that additional C&D disposal facilities in the Metro region of the state be recruited to participate in field data collection, ensuring a more accurate representation of the statewide waste stream. This study by design focused on Class I C&D landfills. Future studies should also look at capturing waste characterization data from additional Class II and Class III C&D sites, as well as processing areas.

Conduct statewide C&D facility “at the gate” surveys: While Minnesota Rules require facilities to report C&D material quantities, a gap exists with providing more granular details on the generation of C&D materials, as indicated by some loads containing wastes not classified as C&D waste. Future studies would benefit from “at the gate” surveys at a large subset of the state’s C&D disposal facilities to document the breakdown of Construction, Demolition, Renovation, and Mixed/Non-C&D loads.

Gate
surveys are conducted by identifying all vehicles entering a facility throughout the day, noting the type of materials, the weight or volume, and the originating generator class. This information captures all load types (C&D, MMSW, special waste, etc.) and gives perspective on the overall statewide waste stream.

**Create a robust and thorough contractor, hauler, and retailer survey:** Based on current practices, it appears there are notable reuse and recycling efforts already occurring in Minnesota. Surveying is needed to verify this assumption further, and strengthen the statewide data quantifying the amount of materials being reused and recycled, identifying which markets are the strongest and weakest, and confirming what support is needed to scale these efforts.

**Implement statewide reuse or recycling requirements:** Recognition is growing across the United States about the environmental benefits of deconstructing buildings instead of demolishing them in order to extend the usable life of existing materials. Implementing statewide reuse and recycling requirements and/or deconstruction ordinances at a local level can help create consistency and establish necessary support systems for this transition. Requirements could reduce the barriers that currently make it difficult to deconstruct or separate materials for recycling at the site. As part of an ordinance, a contractor would have to allow for extra time to deconstruct and capture materials, leveling the playing field for this more sustainable practice. Examples of other factors needed to shift building and material management practices include, but aren’t limited to, creating deconstruction and demolition certifications, providing incentives for material reuse and recycling, and securing adequate material sorting and storage spaces on job sites.

**References**


Appendix A: Material categories

**Brick:** Includes all types of fire-clay brick and cinder blocks (concrete/ash cinder building block).

**Concrete:** Includes concrete with or without rebar attached. Examples include building foundations, concrete paving, and poured concrete structures.

**Clean Wood:**
- **Untreated Dimensional Lumber:** Includes non-treated processed wood for building, manufacturing, landscaping, and packaging. Examples include dimensional lumber, lumber cutoffs, wood scraps, and wood siding. May contain nails or other trace contaminants.
- **Untreated Eng. Wood:** Includes plywood (layers of wood glued together), oriented strandboard (OSB) (a layered, mat-formed panel product made of strands, flakes, or wafers sliced from small diameter, round wood logs, and bonded under heat and pressure), and medium density fiber (MDF) and particle board (manufactured lumber sheeting made of glued wood fibers or particles).
- **Wood Pallets/Crates/Spools:** Includes wood pallets, crates and spools used for shipping or storage of goods, whether painted, unpainted, or made of engineered lumber.

**Dirt/Sand/Rock/Gravel:**
- **Dirt/Sand:** Includes materials made of dirt or sand. This category is often left over from land clearing activities.
- **Rock/Gravel:** Includes pathway gravel and other natural or mechanically crushed aggregate materials.
- **Yard Waste:** Includes plant material from any public or private landscapes. Examples include leaves, grass clippings, sea weed, plants, prunings, shrubs, limbs, logs, and stumps generated by removing vegetation from public or private land by mechanical or manual means.

**General C&D:**
- **Acoustic Tiling:** Includes synthetic or natural fiber tiles and panels used for finishing ceilings, restricting air, and/or improving aesthetics and sound control.
- **Asbestos:** Includes building materials containing asbestos fibrous content, a hazardous heat-resistant material. Asbestos was used in insulation, piping, wallboard, and other structural components until the 1970s.
- **Asphalt:** Includes asphalt paving materials, set or unset.
- **Carpet:** Includes flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material.
- **Carpet Padding:** Includes plastic, foam, felt, or other material used under carpet to provide insulation and padding.
- **Ceramics/Porcelain Fixture:** Includes fixtures such as toilets, sinks, and bathtubs made of ceramic material.
- **Flat Glass:** Includes flat pieces of glass, such as windows.
- **HVAC Ducting:** Includes conduits or passages to deliver and remove air, made from a variety of materials such as galvanized steel, aluminum, plastic, or fiberglass.
- **Insulation:** Includes materials used for weather or sound barrier, typically fiberglass or cellulose materials in various forms such as long strips/bats, wallboards, expanded foam, and small blown-in particles.
- **Plastic Piping**: Includes piping used for utilities or other heavy-duty applications made of plastic materials.

- **Plastic Siding/Decking**: Includes plastic materials used for siding on buildings or building decks.

- **R/C and Other C&D**: Includes C&D debris that is difficult to identify and separate into categories. Also includes composite fixtures/countertops, various wall and flooring materials with backings, and miscellaneous C&D materials.

- **Rubber Products**: Includes finished products and scrap materials made of natural and synthetic rubber, such as matting/tarps, inner tubes (not tires), rubber hoses, foam rubber, granules or powder. Includes rubber gloves and footwear (if predominately rubber).

- **Tyvek Building Wrap**: Includes specialized Tyvek wrap used to protect buildings from wind or moisture intrusion.

**Gypsum Board:**

- **Clean**: Includes clean (i.e. unpainted) interior wall covering made of a sheet of gypsum sandwiched between paper layers. Clean boards can be used or unused, broken or whole sheets, drywall, plasterboard, Gyproc, and wallboard.

- **Painted**: Includes interior wall covering made of a sheet of gypsum sandwiched between paper layers which has been painted, wallpapered, or otherwise altered from the clean product. Painted boards can be used or unused, broken or whole sheets, drywall, plasterboard, Gyproc, and wallboard.

**Metal:**

- **Appliances**: Includes household machines that use electricity and, in some cases, Freon. Examples include refrigerators, stoves, washers, dryers, freezers, and dishwashers.

- **Composite Metal (wires)**: Includes wiring that may or may not be encased in other materials, used for various applications (electrical, telecommunications, etc.).

- **Ferrous Scrap**: Includes ferrous and alloyed ferrous scrap materials originating from residential, commercial, or institutional sources that are attracted to a magnet. Includes rebar, empty paint cans, and HVAC ducting (galvanized and ungalvanized).

- **Non-Ferrous Metal**: Includes non-magnetic metals such as aluminum, brass, bronze, silver, lead copper, zinc, and stainless steel.

**Municipal solid waste:**

- **Bulky Items (inc. mattresses)**: Includes large, hard-to-handle items that are not defined separately. Examples include composite furniture, mattresses, box springs, and base components.

- **E-Waste**: Includes computers, monitors, printers, televisions, stereos, VCRs, DVD players, etc.

- **MMSW**: Includes household and job site waste that is bagged or loose, and consists primarily of municipal solid waste. Examples include beverage containers, food wastes, and other refuse generated on construction sites by Non-C&D activities or deposited by third parties in collection containers.

- **Other Paper**: Includes multi-page bound paper items (glued or stapled), made of glossy coated paper. This paper is usually slick, smooth to the touch, and reflects light. Examples include glossy magazines, catalogs, brochures, and pamphlets. Does not include newspaper inserts.

- **R/C and Other Glass**: Includes materials made of glass that are not flat, and may be combined with other materials, such as metal or wood. Examples include bottles, decorative glass building blocks, ceramics, mirrors, etc.
• **Tires**: Includes all synthetic, natural rubber, pneumatic, or solid core tires.

• **Uncoated OCC - Recyclable**: Includes corrugated boxes or paper bags made from Kraft paper with a wavy center layer sandwiched between two outer layers without wax coating on the inside or outside. Examples of corrugated boxes include cardboard shipping containers and moving boxes, computer packaging cartons, and sheets/pieces of boxes and cartons. Does not include chipboard. Examples of Kraft paper include paper grocery bags, un-soiled fast food bags, department store bags, and heavyweight sheets of packing paper.

**Plastics:**

• **Durable Plastic Items**: Includes items made of sturdy plastic materials.

• **Film Plastic (Comm./Indus.):** Includes any recyclable polyethylene (high density, low density, linear low density) film plastic, including sheet plastic, shrink wrap, and some tarps.

• **HDPE Buckets**: Includes high density polyethylene buckets.

• **Plastic Furniture**: Includes furniture made of plastic materials.

• **R/C and Other Plastic**: Includes all other plastic materials such as plastic bottles, jars and containers, rigid plastic components, expanded foam plastics, and non-recyclable film plastics.

**Roofing Shingles:**

• Includes asphalt shingles and tar roofing paper. Does not include wood or metal roofing material.

**Treated/Painted/Processed Wood:**

• **Painted/Stained Wood**: Includes wood that has an external coating applied. Examples include painted or stained dimensional lumber, lumber cutoffs, wood scraps, wood shake roofing, and wood siding.

• **Treated Wood**: Includes wood that has had an external coating applied, been pressure treated, chemically treated (with copper, etc.), or treated with creosote. Examples include railroad ties, marine timbers and pilings, landscape timbers, and telephone poles.

• **Wood Furniture**: Includes household and office furniture manufactured of mostly wood. Includes chairs, tables, sofas, bookcases, cabinets, doors, desks, etc.
## Appendix B: Volume-to-weight conversion factors

<table>
<thead>
<tr>
<th>Category</th>
<th>Recyclable Materials</th>
<th>Volume</th>
<th>Units</th>
<th>Min.</th>
<th>Avg.</th>
<th>Max.</th>
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<td>Uncompacted</td>
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<td>Yard</td>
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<td>MSW - Multifamily uncompacted</td>
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<td>Cubic Yard</td>
<td>95</td>
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<td>21</td>
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<td></td>
<td>Bulky Items (including mattresses)</td>
<td></td>
<td>Cubic Yard</td>
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<td>Municipal Solid Waste</td>
<td>Compacted - MMSW Small Landfill with Best Management Practices</td>
<td>1</td>
<td>Cubic Yard</td>
<td>1,200</td>
<td>1,700</td>
<td>1,450</td>
<td>17</td>
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<td>1,700</td>
<td>2,000</td>
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<td>Compacted - MMSW Very Large Landfill with Best Management and Cover Practices, Combined MMSW/Industrial/and other solid waste, or/and Leachate Recirculation</td>
<td>1</td>
<td>Cubic Yard</td>
<td>2,000</td>
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<td>773</td>
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<td>Cubic Yard</td>
<td>773</td>
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<td>Other Asphalt Roofing</td>
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<td></td>
<td>Wood</td>
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<td>Clean Dimensional Lumber</td>
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<td>Clean Engineered Wood</td>
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<td>268</td>
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<td>Category</td>
<td>Recyclable Materials</td>
<td>Volume</td>
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</tbody>
</table>
Sources


8. Great Forest. Volume to Weight Conversion Ratios for Commercial Office Waste in New York City. January 2013. Primary data; Commingled; large commercial properties (500,000 sq. ft – 1m sq. ft) in the New York metropolitan area.


15. Minnesota Pollution Control Agency. Data provided by professional composter. 2015. Source separated organics - food scraps, nonrecyclable paper (paper plates/towels/etc) and compostable plastics.

16. Minnesota Department of Administration 2015 hauler records (excludes organics).
20. Florida Dept of Environmental Protection http://www.dep.state.fl.us/waste/categories/recycling/cd/canddmain.htm
21. CalRecycle. 2014 Generator-Based Characterization of Commercial Sector Disposal and Diversion in California. September 10, 2015. Organics - putrescible material hauled by a contracted third party to a permitted facility mainly engaged in producing compost or mulch, or in anaerobic digestion of organics. Minor mechanical separation of contaminants or recyclable materials may occur at the facility prior to composting or digestion.
Appendix C: Code for calculating bootstrapped confidence intervals

library(tidyverse)
library(readxl)
library(janitor)
library(lubridate)
library(data.table)

#location for the output
file_loc <- "X:/EA/P2/Waste Reduction/C&D initiative/2019-2021 SBG work/C&D waste study contract/Waste study data/Combined data/"

#Location of the season 1 raw data on your computer
#Season 1 has been updated to include Rubber Products and Insulation
#as they were not measured directly in Season 1, all entries are 0 lbs
s1_file_loc <- 'X:/EA/P2/Waste Reduction/C&D initiative/2019-2021 SBG work/C&D waste study contract/Waste study data/Waste Comp Sort_Season 1/Raw Data Season 1-v3.xlsx'

#Reading in the main body of the data - material by weights for
#all samples, ignoring header as that will be read separately
s1 <- read_excel(s1_file_loc,
sheet = 'Season 1-v2',
col_names = c('Group', 'Code', 'Material', 1:196),
range = 'A12:GQ55') %>%
data.table()

#Turns the data from wide to long so that it can be joined easily
to season 2
s1_melt <- melt(s1, id.vars = c('Group', 'Code', 'Material'),
variable.name = 'Sample #', value.name = 'lbs',
variable.factor = FALSE)

#reading in the header information which includes Location, Origin,
#Hauler Type, Load Type, Load Scale Weight, Truck Type,
#Generator Type, Enumerator

```r
declare_libraries()

demand_analysis <- read_excel(demand_analysis_file, sheet = 'Season 1-v2', col_names = FALSE, na = c('', 'N/A'), range = 'C1:GQ10')
```

#Transposing the header information,
#first column contains the column names
```r
demand_analysis_t <- data.table::transpose(demand_analysis, make.names = 1)
```

#Joining header information to the material weights
```r
demand_analysis <- inner_join(demand_analysis_melt, demand_analysis_t, by = "Sample #")
```

#Create season variable for later analysis
```r
demand_analysis <- mutate(demand_analysis, Season = 'Season 1') %>% select(-Code)
```

#Location of the season 2 raw data on your computer
```r
demand_analysis_file_loc <- 'X:/EA/P2/Waste Reduction/C&D initiative/2019-2021 SBG work/C&D waste study contract/Waste study data/Waste Comp Sort_Season 2/Copy of Raw Data Season2.xlsx'
```

#Reading in the main body of the data - material by weights for #all samples, ignoring header as that will be read separately
```r
demand_analysis_melt <- read_excel(demand_analysis_file_loc, sheet = 'Season 2', col_names = c('Group', 'Code', 'Material', 1:238), range = 'A12:IG55') %>%
data.table()
```

#Turns the data from wide to long so that it can be joined easily #to season 1
```r
demand_analysis_melt <- melt(demand_analysis_melt, id_vars = c('Group', 'Code', 'Material'), variable.name = 'Sample #', value.name = 'lbs')
```

#reading in the header information which includes Location, Origin, #Hauler Type, Load Type, Load Scale Weight, Truck Type,
# Generator Type, Enumerator

`location_s2 <- read_excel(s2_file_loc,
  sheet = 'Season 2', col_names = FALSE,
  na = c("", "N/A"),
  range = 'C1:IG10')`

# Transposing the header information

`location_s2_t <- data.table:::transpose(location_s2, make.names = 1)`

# Ensuring that both season 1 and season 2 have the same variable names

`names(location_s2_t) <- names(location_s1_t)`

# Joining header information to the material weights

`s2 <- inner_join(s2_melt, location_s2_t, by = "Sample #")`

# Create season variable for later analysis

`s2 <- mutate(s2, Season = 'Season 2') %>%
  select(-Code)`

# Union of s1 and s2, correct Material names from Season to Season,
# create a unique sample id combining sample # and Season

`combined <- bind_rows(s1,s2) %>%
  mutate(Material = ifelse(Material == "Other C&D",
                       "R/C and Other C&D",
                       Material),
         unique_id = paste(Season, `Sample #`, sep = "_"))`

# Create dataset of total sample weights for each sample

`sample_weights <- combined %>%
  group_by(unique_id) %>%
  summarise(sample_weights = sum(lbs))`

`categories <- read_csv(paste0(file_loc, "Categories_by_Material.csv"))`

# Join the categories to the total dataset and
# join total sample weights for each sample
#filter out all Load Scale Weights that are not measured
total <- left_join(combined, categories, by = "Material") %>%
  left_join(sample_weights, by = "unique_id") %>%
  filter(`Load Scale Weight` > 0)

#set seed for reproducibility
set.seed(20201020)

#function for calculating the composition of material
comp <- function(data){
  sum(data$lbs)/sum(data$sample_weights)
}

#Function for creation of 90% confidence intervals
#using bootstrap methodology
bootstrap_ci <- function(data, n = 1000){
  reps <- replicate(n, data[sample(1:nrow(data), replace = TRUE),],
    simplify = F)
  ratio <- sapply(reps, comp)
  return(tibble(mean = comp(data),
    ci_lower = quantile(ratio, 0.05),
    ci_upper = quantile(ratio, .95)))
}

statewide <- total %>%
  group_by(Category, Material) %>%
  group_modify(~bootstrap_ci(.x, n = 1000))

statewide_category <- total %>%
  filter(`Load Scale Weight` > 0) %>%
  group_by(unique_id, Category) %>%
  summarise(lbs = sum(lbs)) %>%
  left_join(sample_weights, by = 'unique_id') %>%
  group_by(Category) %>>
```r
group_modify(~bootstrap_ci(.x, n = 1000))

region <- total %>%
  group_by(Origin, Category, Material) %>%
  group_modify(~bootstrap_ci(.x, n = 1000))

region_category <- total %>%
  filter(`Load Scale Weight` > 0) %>%
  group_by(unique_id, Origin, Category) %>%
  summarise(lbs = sum(lbs)) %>%
  left_join(sample_weights, by = 'unique_id') %>%
  group_by(Origin, Category) %>%
  group_modify(~bootstrap_ci(.x, n = 1000))

facility <- combined %>%
  left_join(categories, by = "Material") %>%
  left_join(sample_weights, by = "unique_id") %>%
  group_by(Origin, Location, Category, Material) %>%
  summarise(lbs = sum(lbs), total = sum(sample_weights),
            composition = sum(lbs)/sum(sample_weights))
```
Appendix D: Characterization results per facility

The following tables are the detailed results for each facility which granted permission for their individual results to be published. The results include the tonnage of each material sorted at the facility and the estimated composition for the total. Non-scaled samples are also included in the estimates per facility but they are not included in the statewide or regional estimates. The raw data is available on request from the MPCA.

*Note: the Dem-Con Recovery & Recycling is split into two tables as the sort was performed at two locations at the facility, the landfill area and the material recovery facility.

Table 11. Dem-Con Landfill (Shakopee) detailed facility results by Material

<table>
<thead>
<tr>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>136.6</td>
<td>14.8%</td>
<td>Gypsum Board</td>
<td>72.5</td>
<td>7.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gypsum Wallboard - Clean</td>
<td>43.6</td>
<td>4.7%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>286.4</td>
<td>31.0%</td>
<td>Gypsum Wallboard - Painted</td>
<td>28.9</td>
<td>3.1%</td>
</tr>
<tr>
<td>Brick</td>
<td>37.5</td>
<td>4.1%</td>
<td>Clean Wood</td>
<td>68.1</td>
<td>7.4%</td>
</tr>
<tr>
<td>Dirt/Sand/Rock/Gravel</td>
<td>107.6</td>
<td>11.7%</td>
<td>Untreated Dimen. Lumber</td>
<td>23.1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Dirt/Sand</td>
<td>35.3</td>
<td>3.8%</td>
<td>Wood Pallets/Crates/Spools</td>
<td>17.9</td>
<td>1.9%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>70.4</td>
<td>7.6%</td>
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</tr>
<tr>
<td>Yard Waste</td>
<td>1.9</td>
<td>0.2%</td>
<td>Metal</td>
<td>20.5</td>
<td>2.2%</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>106.4</td>
<td>11.5%</td>
<td>Composite Metal (wires)</td>
<td>0.1</td>
<td>0.0%</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.7</td>
<td>0.1%</td>
<td>Ferrous Scrap</td>
<td>14.0</td>
<td>1.5%</td>
</tr>
<tr>
<td>Asbestos*</td>
<td>0.0</td>
<td>0.0%</td>
<td>Non-Ferrous Metal</td>
<td>6.4</td>
<td>0.7%</td>
</tr>
<tr>
<td>Asphalt</td>
<td>28.7</td>
<td>3.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>5.6</td>
<td>0.6%</td>
<td>MSW</td>
<td>12.5</td>
<td>1.4%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.8</td>
<td>0.1%</td>
<td>Bulky Items (inc. mattresses)</td>
<td>1.7</td>
<td>0.2%</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixture</td>
<td>10.7</td>
<td>1.2%</td>
<td>E-Waste</td>
<td>0.3</td>
<td>0.0%</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>2.2</td>
<td>0.2%</td>
<td>MMSW</td>
<td>2.3</td>
<td>0.3%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.1</td>
<td>0.0%</td>
<td>Other Paper</td>
<td>1.1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Insulation</td>
<td>3.0</td>
<td>0.3%</td>
<td>R/C and Other Glass</td>
<td>0.5</td>
<td>0.1%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.6</td>
<td>0.1%</td>
<td>Tires</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>1.7</td>
<td>0.2%</td>
<td>Uncoated OCC - Recyclable</td>
<td>6.6</td>
<td>0.7%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>45.6</td>
<td>4.9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber Products</td>
<td>6.7</td>
<td>0.7%</td>
<td>Plastics</td>
<td>2.9</td>
<td>0.3%</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.0</td>
<td>0.0%</td>
<td>Durable Plastic Items</td>
<td>0.6</td>
<td>0.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Film Plastic (Comm./Indus.)</td>
<td>1.3</td>
<td>0.1%</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>72.0</td>
<td>7.8%</td>
<td>HDPE Buckets</td>
<td>0.1</td>
<td>0.0%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>60.9</td>
<td>6.6%</td>
<td>Plastic Furniture</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>7.7</td>
<td>0.8%</td>
<td>R/C and Other Plastic</td>
<td>0.9</td>
<td>0.1%</td>
</tr>
<tr>
<td>Wood Furniture* **</td>
<td>3.3</td>
<td>0.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Scaled Loads</td>
<td>193</td>
<td></td>
<td>Scaled Tons Surveyed</td>
<td>861</td>
<td></td>
</tr>
<tr>
<td>Number of Estimated Loads</td>
<td>13</td>
<td></td>
<td>Estimated Tons Surveyed</td>
<td>62</td>
<td></td>
</tr>
</tbody>
</table>

*Pursuant to an approved Industrial Solid Waste Management Plan (ISWMP).

**This facility can accept built-in furniture, not loose furniture. This category reflects wooden building type materials attached to other materials, torn from structures, etc.
Visual characterization was conducted on tipped loads. Following classification, facility staff removed anything within the load that was unacceptable to be disposed there.

Table 12. Dem-Con Material Recovery Facility (Shakopee) detailed facility results by Material

<table>
<thead>
<tr>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>4.7</td>
<td>6.1%</td>
<td>Gypsum Board</td>
<td>15.8</td>
<td>20.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gypsum Wallboard - Clean</td>
<td>14.4</td>
<td>18.7%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>1.6</td>
<td>2.1%</td>
<td>Gypsum Wallboard - Painted</td>
<td>1.4</td>
<td>1.9%</td>
</tr>
<tr>
<td>Brick</td>
<td>1.8</td>
<td>2.3%</td>
<td>Clean Wood</td>
<td>19.0</td>
<td>24.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Untreated Dimen. Lumber</td>
<td>5.4</td>
<td>7.0%</td>
</tr>
<tr>
<td>Dirt/Sand/Rock/Gravel</td>
<td>9.0</td>
<td>11.7%</td>
<td>Untreated Eng. Wood</td>
<td>9.9</td>
<td>12.9%</td>
</tr>
<tr>
<td>Dirt/Sand</td>
<td>4.9</td>
<td>6.4%</td>
<td>Wood Pallets/Crates/Spools</td>
<td>3.7</td>
<td>4.8%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>3.6</td>
<td>4.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yard Waste</td>
<td>0.5</td>
<td>0.6%</td>
<td>Metal</td>
<td>2.1</td>
<td>2.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Appliances</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>10.1</td>
<td>13.2%</td>
<td>Composite Metal (wires)</td>
<td>0.0</td>
<td>0.1%</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.0</td>
<td>0.0%</td>
<td>Ferrous Scrap</td>
<td>1.1</td>
<td>1.4%</td>
</tr>
<tr>
<td>Asbestos*</td>
<td>0.0</td>
<td>0.0%</td>
<td>Non-Ferrous Metal</td>
<td>1.0</td>
<td>1.2%</td>
</tr>
<tr>
<td>Asphalt</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>1.0</td>
<td>1.3%</td>
<td>MSW</td>
<td>3.9</td>
<td>5.1%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.0</td>
<td>0.1%</td>
<td>Bulky Items (inc. mattresses)</td>
<td>0.3</td>
<td>0.3%</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixture</td>
<td>1.2</td>
<td>1.6%</td>
<td>E-Waste</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>0.3</td>
<td>0.4%</td>
<td>MMSW</td>
<td>0.7</td>
<td>0.9%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.0</td>
<td>0.0%</td>
<td>Other Paper</td>
<td>0.8</td>
<td>1.0%</td>
</tr>
<tr>
<td>Insulation</td>
<td>0.1</td>
<td>0.1%</td>
<td>R/C and Other Glass</td>
<td>0.3</td>
<td>0.4%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.1</td>
<td>0.1%</td>
<td>Tires</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>0.4</td>
<td>0.5%</td>
<td>Uncoated OCC - Recyclable</td>
<td>1.8</td>
<td>2.4%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>7.1</td>
<td>9.3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber Products</td>
<td>0.0</td>
<td>0.0%</td>
<td>Plastics</td>
<td>0.6</td>
<td>0.8%</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.0</td>
<td>0.0%</td>
<td>Durable Plastic Items</td>
<td>0.1</td>
<td>0.2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Film Plastic (Comm./Indus.)</td>
<td>0.2</td>
<td>0.3%</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>8.1</td>
<td>10.6%</td>
<td>HDPE Buckets</td>
<td>0.1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>4.9</td>
<td>6.4%</td>
<td>Plastic Furniture</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>0.7</td>
<td>0.9%</td>
<td>R/C and Other Plastic</td>
<td>0.1</td>
<td>0.2%</td>
</tr>
<tr>
<td>Wood Furniture*</td>
<td>2.5</td>
<td>3.3%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Pursuant to an approved ISWMP.

**This facility can accept built-in furniture, not loose furniture. This category reflects wooden building type materials attached to other materials, torn from structures, etc.

Visual characterization was conducted on tipped loads. Following classification, facility staff removed anything within the load that was unacceptable to be disposed there.
Table 13. East Central Solid Waste Commission detailed facility results by Material

<table>
<thead>
<tr>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>0.1</td>
<td>1.4%</td>
<td>Gypsum Board</td>
<td>1.2</td>
<td>13.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gypsum Wallboard - Clean</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>7.4</td>
<td>82.2%</td>
<td>Gypsum Wallboard - Painted</td>
<td>1.2</td>
<td>13.4%</td>
</tr>
<tr>
<td>Brick</td>
<td>0.0</td>
<td>0.0%</td>
<td>Clean Wood</td>
<td>0.0</td>
<td>0.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Untreated Dimen. Lumber</td>
<td>0.0</td>
<td>0.2%</td>
</tr>
<tr>
<td>Dirt/Sand/Rock/Gravel</td>
<td>0.0</td>
<td>0.1%</td>
<td>Untreated Eng. Wood</td>
<td>0.0</td>
<td>0.1%</td>
</tr>
<tr>
<td>Dirt/Sand</td>
<td>0.0</td>
<td>0.0%</td>
<td>Wood Pallets/Crates/Spools</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yard Waste</td>
<td>0.0</td>
<td>0.1%</td>
<td>Metal</td>
<td>0.0</td>
<td>0.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Appliances</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>0.2</td>
<td>2.1%</td>
<td>Composite Metal (wires)</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.0</td>
<td>0.0%</td>
<td>Ferrous Scrap</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Asbestos*</td>
<td>0.0</td>
<td>0.0%</td>
<td>Non-Ferrous Metal</td>
<td>0.0</td>
<td>0.1%</td>
</tr>
<tr>
<td>Asphalt</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>0.0</td>
<td>0.0%</td>
<td>MSW</td>
<td>0.0</td>
<td>0.2%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.0</td>
<td>0.0%</td>
<td>Bulky Items (inc. mattresses)</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixture</td>
<td>0.1</td>
<td>0.7%</td>
<td>E-Waste</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>0.0</td>
<td>0.0%</td>
<td>MMSW</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.0</td>
<td>0.0%</td>
<td>Other Paper</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Insulation</td>
<td>0.0</td>
<td>0.0%</td>
<td>R/C and Other Glass</td>
<td>0.0</td>
<td>0.2%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.0</td>
<td>0.0%</td>
<td>Tires</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>0.0</td>
<td>0.0%</td>
<td>Uncoated OCC - Recyclable</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>0.1</td>
<td>1.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber Products</td>
<td>0.0</td>
<td>0.0%</td>
<td>Plastics</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.0</td>
<td>0.0%</td>
<td>Durable Plastic Items</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Film Plastic (Comm./Indus.)</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>0.0</td>
<td>0.2%</td>
<td>HDPE Buckets</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>0.0</td>
<td>0.2%</td>
<td>Plastic Furniture</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>0.0</td>
<td>0.0%</td>
<td>R/C and Other Plastic</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Scaled Loads</td>
<td>0</td>
<td></td>
<td>Number of Estimated Loads</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Scaled Tons Surveyed</td>
<td>0</td>
<td></td>
<td>Estimated Tons Surveyed</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

*Pursuant to an approved ISWMP.

Visual characterization was conducted on tipped loads. Following classification, facility staff removed anything within the load that was unacceptable to be disposed there.
### Table 14. Itasca County Demolition Landfill/MSW Transfer Station detailed facility results by Material

<table>
<thead>
<tr>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>2.5</td>
<td>4.4%</td>
<td>Gypsum Board</td>
<td>5.7</td>
<td>9.9%</td>
</tr>
<tr>
<td>Gypsum Wallboard - Clean</td>
<td>2.0</td>
<td>3.5%</td>
<td>Gypsum Wallboard - Painted</td>
<td>3.7</td>
<td>6.3%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>22.3</td>
<td>38.7%</td>
<td>Clean Wood</td>
<td>4.3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Untreated Dimen. Lumber</td>
<td>1.6</td>
<td>2.7%</td>
<td>Untreated Eng. Wood</td>
<td>1.6</td>
<td>2.8%</td>
</tr>
<tr>
<td>Dirt/Sand/Rock/Gravel</td>
<td>0.5</td>
<td>0.9%</td>
<td>Wood Pallets/Crates/Spools</td>
<td>1.1</td>
<td>2.0%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>0.4</td>
<td>0.7%</td>
<td>Painted</td>
<td>9.4</td>
<td>16.3%</td>
</tr>
<tr>
<td>Yard Waste</td>
<td>0.1</td>
<td>0.2%</td>
<td>Metal</td>
<td>3.1</td>
<td>5.4%</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>6.2</td>
<td>10.8%</td>
<td>Appliances</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.0</td>
<td>0.1%</td>
<td>Ferrous Scrap</td>
<td>1.4</td>
<td>2.4%</td>
</tr>
<tr>
<td>Asbestos*</td>
<td>0.0</td>
<td>0.0%</td>
<td>Non-Ferrous Metal</td>
<td>1.7</td>
<td>3.0%</td>
</tr>
<tr>
<td>Asphalt</td>
<td>0.0</td>
<td>0.0%</td>
<td>MSW</td>
<td>0.8</td>
<td>1.3%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.0</td>
<td>0.0%</td>
<td>Bulky Items (inc. mattresses)</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixture</td>
<td>2.1</td>
<td>3.6%</td>
<td>E-Waste</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>0.2</td>
<td>0.3%</td>
<td>MMSW</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.0</td>
<td>0.0%</td>
<td>Other Paper</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Insulation</td>
<td>1.5</td>
<td>2.7%</td>
<td>R/C and Other Glass</td>
<td>0.8</td>
<td>1.3%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.0</td>
<td>0.0%</td>
<td>Tires</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>0.1</td>
<td>0.2%</td>
<td>Uncoated OCC - Recyclable</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>2.1</td>
<td>3.7%</td>
<td>Plastics</td>
<td>0.2</td>
<td>0.3%</td>
</tr>
<tr>
<td>Rubber Products</td>
<td>0.1</td>
<td>0.2%</td>
<td>Durable Plastic Items</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.0</td>
<td>0.0%</td>
<td>Film Plastic (Comm./Indus.)</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>9.9</td>
<td>17.2%</td>
<td>HDPE Buckets</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>9.4</td>
<td>16.3%</td>
<td>Plastic Furniture</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>0.1</td>
<td>0.1%</td>
<td>R/C and Other Plastic</td>
<td>0.2</td>
<td>0.3%</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>0.4</td>
<td>0.8%</td>
<td>MSW</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

*Pursuant to an approved ISWMP.

Visual characterization was conducted on tipped loads. Following classification, facility staff removed anything within the load that was unacceptable to be disposed there.
Table 15. Olmsted County Kalmar Landfill detailed facility results by Material

<table>
<thead>
<tr>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>26.3</td>
<td>20.9%</td>
<td>Gypsum Board</td>
<td>1.8</td>
<td>1.4%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>6.2</td>
<td>4.9%</td>
<td>Gypsum Wallboard - Clean</td>
<td>1.0</td>
<td>0.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gypsum Wallboard - Painted</td>
<td>0.8</td>
<td>0.7%</td>
</tr>
<tr>
<td>Brick</td>
<td>41.3</td>
<td>32.8%</td>
<td>Clean Wood</td>
<td>0.7</td>
<td>0.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Untreated Dimen. Lumber</td>
<td>0.1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Dirt/Sand/Rock/Gravel</td>
<td>22.0</td>
<td>17.5%</td>
<td>Untreated Eng. Wood</td>
<td>0.5</td>
<td>0.4%</td>
</tr>
<tr>
<td>Dirt/Sand</td>
<td>12.0</td>
<td>9.5%</td>
<td>Wood Pallets/Crates/Spools</td>
<td>0.1</td>
<td>0.0%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>10.1</td>
<td>8.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yard Waste</td>
<td>0.0</td>
<td>0.0%</td>
<td>Metal</td>
<td>2.9</td>
<td>2.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Appliances</td>
<td>0.1</td>
<td>0.1%</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>21.1</td>
<td>16.8%</td>
<td>Composite Metal (wires)</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.0</td>
<td>0.0%</td>
<td>Forest Products</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ferrous Scrap</td>
<td>1.5</td>
<td>1.2%</td>
</tr>
<tr>
<td>Asbestos*</td>
<td>0.0</td>
<td>0.0%</td>
<td>Non-Ferrous Metal</td>
<td>1.4</td>
<td>1.1%</td>
</tr>
<tr>
<td>Asphalt</td>
<td>6.1</td>
<td>4.9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>0.0</td>
<td>0.0%</td>
<td>MSW</td>
<td>0.2</td>
<td>0.2%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.0</td>
<td>0.0%</td>
<td>Bulky Items (inc. mattresses)</td>
<td>0.2</td>
<td>0.1%</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixture</td>
<td>4.8</td>
<td>3.8%</td>
<td>E-Waste</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>0.1</td>
<td>0.1%</td>
<td>MMSW</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.0</td>
<td>0.0%</td>
<td>Other Paper</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Insulation</td>
<td>0.1</td>
<td>0.1%</td>
<td>R/C and Other Glass</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.0</td>
<td>0.0%</td>
<td>Tires</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>0.0</td>
<td>0.0%</td>
<td>Uncoated OCC - Recyclable</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>9.6</td>
<td>7.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber Products</td>
<td>0.4</td>
<td>0.3%</td>
<td>Plastics</td>
<td>0.1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.0</td>
<td>0.0%</td>
<td>Durable Plastic Items</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Film Plastic (Comm./Indus.)</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>3.2</td>
<td>2.5%</td>
<td>HDPE Buckets</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>3.0</td>
<td>2.4%</td>
<td>Plastic Furniture</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>0.1</td>
<td>0.1%</td>
<td>R/C and Other Plastic</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Scaled Loads</td>
<td>16</td>
<td></td>
<td>Scaled Tons Surveyed</td>
<td>126</td>
<td></td>
</tr>
<tr>
<td>Number of Estimated Loads</td>
<td>0</td>
<td></td>
<td>Estimated Tons Surveyed</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*Pursuant to an approved ISWMP.

Visual characterization was conducted on tipped loads. Following classification, facility staff removed anything within the load that was unacceptable to be disposed there.
## Table 16. Polk County Sanitary Landfill detailed facility results by Material

<table>
<thead>
<tr>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>156.5</td>
<td>56.4%</td>
<td>Gypsum Board</td>
<td>9.7</td>
<td>3.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gypsum Wallboard - Clean</td>
<td>1.6</td>
<td>0.6%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>2.2</td>
<td>0.8%</td>
<td>Gypsum Wallboard - Painted</td>
<td>8.1</td>
<td>2.9%</td>
</tr>
<tr>
<td>Brick</td>
<td>25.5</td>
<td>9.2%</td>
<td>Clean Wood</td>
<td>3.8</td>
<td>1.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Untreated Dimen. Lumber</td>
<td>2.5</td>
<td>0.9%</td>
</tr>
<tr>
<td>Dirt/Sand/Rock/Gravel</td>
<td>37.4</td>
<td>13.5%</td>
<td>Untreated Eng. Wood</td>
<td>0.5</td>
<td>0.2%</td>
</tr>
<tr>
<td>Dirt/Sand</td>
<td>27.7</td>
<td>10.0%</td>
<td>Wood Pallets/Crates/Spools</td>
<td>0.8</td>
<td>0.3%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>5.8</td>
<td>2.1%</td>
<td>Yard Waste</td>
<td>3.9</td>
<td>1.4%</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>25.0</td>
<td>9.0%</td>
<td>Metal</td>
<td>7.8</td>
<td>2.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Appliances</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.5</td>
<td>0.2%</td>
<td>Composite Metal (wires)</td>
<td>0.2</td>
<td>0.1%</td>
</tr>
<tr>
<td>Asbestos*</td>
<td>0.0</td>
<td>0.0%</td>
<td>Ferrous Scrap</td>
<td>1.8</td>
<td>0.6%</td>
</tr>
<tr>
<td>Asphalt</td>
<td>0.2</td>
<td>0.1%</td>
<td>Non-Ferrous Metal</td>
<td>5.8</td>
<td>2.1%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.0</td>
<td>0.0%</td>
<td>Bulky Items (inc. mattresses)</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixture</td>
<td>0.2</td>
<td>0.1%</td>
<td>E-Waste</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>0.2</td>
<td>0.1%</td>
<td>MMSW</td>
<td>0.1</td>
<td>0.0%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.0</td>
<td>0.0%</td>
<td>Other Paper</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Insulation</td>
<td>0.0</td>
<td>0.0%</td>
<td>R/C and Other Glass</td>
<td>0.1</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.0</td>
<td>0.0%</td>
<td>Tires</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>0.1</td>
<td>0.1%</td>
<td>Uncoated OCC - Recyclable</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>23.6</td>
<td>8.5%</td>
<td>Film Plastic (Comm./Indus.)</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Rubber Products</td>
<td>0.0</td>
<td>0.0%</td>
<td>Plastics</td>
<td>0.5</td>
<td>0.2%</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.0</td>
<td>0.0%</td>
<td>Durable Plastic Items</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>9.0</td>
<td>3.3%</td>
<td>HDPE Buckets</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>8.7</td>
<td>3.1%</td>
<td>Plastic Furniture</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>0.0</td>
<td>0.0%</td>
<td>R/C and Other Plastic</td>
<td>0.5</td>
<td>0.2%</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>0.3</td>
<td>0.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Pursuant to an approved ISWMP.

Visual characterization was conducted on tipped loads. Following classification, facility staff removed anything within the load that was unacceptable to be disposed there.
Table 17. TK Demolition Disposal LLC detailed facility results by Material

<table>
<thead>
<tr>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
<th>Material</th>
<th>Tons</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>28.4</td>
<td>13.2%</td>
<td>Gypsum Board</td>
<td>34.4</td>
<td>15.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gypsum Wallboard - Clean</td>
<td>12.6</td>
<td>5.9%</td>
</tr>
<tr>
<td>Roofing Shingles</td>
<td>23.3</td>
<td>10.8%</td>
<td>Gypsum Wallboard - Painted</td>
<td>21.8</td>
<td>10.1%</td>
</tr>
<tr>
<td>Brick</td>
<td>15.6</td>
<td>7.2%</td>
<td>Clean Wood</td>
<td>27.4</td>
<td>12.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Untreated Dimen. Lumber</td>
<td>7.7</td>
<td>3.5%</td>
</tr>
<tr>
<td>Dirt/Sand/Rock/Gravel</td>
<td>21.9</td>
<td>10.2%</td>
<td>Untreated Eng. Wood</td>
<td>10.1</td>
<td>4.7%</td>
</tr>
<tr>
<td>Dirt/Sand</td>
<td>3.8</td>
<td>1.8%</td>
<td>Wood Pallets/Crates/Spools</td>
<td>9.6</td>
<td>4.5%</td>
</tr>
<tr>
<td>Rock/Gravel</td>
<td>17.4</td>
<td>8.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yard Waste</td>
<td>0.8</td>
<td>0.3%</td>
<td>Metal</td>
<td>5.6</td>
<td>2.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Appliance's</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>General C&amp;D</td>
<td>15.6</td>
<td>7.2%</td>
<td>Composite Metal (wires)</td>
<td>0.1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Acoustic Tiling</td>
<td>0.8</td>
<td>0.4%</td>
<td>Ferrous Scrap</td>
<td>3.7</td>
<td>1.7%</td>
</tr>
<tr>
<td>Asbestos*</td>
<td>0.0</td>
<td>0.0%</td>
<td>Non-Ferrous Metal</td>
<td>1.8</td>
<td>0.8%</td>
</tr>
<tr>
<td>Asphalt</td>
<td>0.9</td>
<td>0.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>0.9</td>
<td>0.4%</td>
<td>MSW</td>
<td>4.3</td>
<td>2.0%</td>
</tr>
<tr>
<td>Carpet Padding</td>
<td>0.1</td>
<td>0.1%</td>
<td>Bulky Items (inc. mattresses)</td>
<td>0.5</td>
<td>0.2%</td>
</tr>
<tr>
<td>Ceramics/Porcelain Fixture</td>
<td>2.2</td>
<td>1.0%</td>
<td>E-Waste</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>0.6</td>
<td>0.3%</td>
<td>MMSW</td>
<td>0.6</td>
<td>0.3%</td>
</tr>
<tr>
<td>HVAC Ducting</td>
<td>0.0</td>
<td>0.0%</td>
<td>Other Paper</td>
<td>0.1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Insulation</td>
<td>1.6</td>
<td>0.8%</td>
<td>R/C and Other Glass</td>
<td>0.1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Plastic Piping</td>
<td>0.2</td>
<td>0.1%</td>
<td>Tires</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Plastic Siding/Decking</td>
<td>0.4</td>
<td>0.2%</td>
<td>Uncoated OCC - Recyclable</td>
<td>3.0</td>
<td>1.4%</td>
</tr>
<tr>
<td>R/C and Other C&amp;D</td>
<td>7.8</td>
<td>3.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber Products</td>
<td>0.0</td>
<td>0.0%</td>
<td>Plastics</td>
<td>0.8</td>
<td>0.4%</td>
</tr>
<tr>
<td>Tyvek Building Wrap</td>
<td>0.0</td>
<td>0.0%</td>
<td>Durable Plastic Items</td>
<td>0.1</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Film Plastic (Comm./Indus.)</td>
<td>0.3</td>
<td>0.2%</td>
</tr>
<tr>
<td>Treated/Painted/Processed Wood</td>
<td>38.5</td>
<td>17.8%</td>
<td>HDPE Buckets</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Painted/Stained Wood</td>
<td>35.2</td>
<td>16.3%</td>
<td>Plastic Furniture</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Treated Wood</td>
<td>1.6</td>
<td>0.8%</td>
<td>R/C and Other Plastic</td>
<td>0.4</td>
<td>0.2%</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>1.7</td>
<td>0.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Scaled Loads</td>
<td>58</td>
<td></td>
<td>Scaled Tons Surveyed</td>
<td>211</td>
<td></td>
</tr>
<tr>
<td>Number of Estimated Loads</td>
<td>1</td>
<td></td>
<td>Estimated Tons Surveyed</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

*Pursuant to an approved ISWMP.

Visual characterization was conducted on tipped loads. Following classification, facility staff removed anything within the load that was unacceptable to be disposed there.