Final Report

2013 Statewide Waste Characterization

Minnesota Pollution Control Agency

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2013 Statewide Waste Characterization

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1.0 EXECUTIVE SUMMARY

The Minnesota Pollution Control Agency (MPCA) retained Burns & McDonnell, Inc. in conjunction with MSW Consultants and GRG Analysis, (Project Team) to conduct a Statewide Waste Characterization Study (2013 Study) to assist the MPCA and local governments with their planning efforts associated with managing municipal solid waste.

The Project Team developed a methodology for gathering representative data related to the composition of the mixed municipal solid waste disposed in Minnesota. The methodology included the following steps:

- Determine material categories and definitions;
- Identify and recruit host facilities;
- Develop the sampling and sorting methodology;
- Conduct waste sort events;
- Analyze collected data;
- Complete statistical modeling; and
- Develop the composition results.

The six facilities that agreed to host field sampling and sorting events included the following:

- Lyon County Regional Landfill;
- Hubbard County South Transfer Station;
- Western Lake Superior Sanitary District Transfer Station;
- Elk River Resource Recovery Facility;
- Pine Bend Landfill (Republic/Allied); and
- St. Paul Como Transfer Station (Advanced Disposal).

The above facilities were selected because of their interest in the Study, geographic representativeness of their waste streams, and the varying types of mixed municipal solid waste facilities represented.

A set of fifty (50) material categories was identified for sorting. The definitions of each of these material categories are included in Appendix A for reference.

Provided below in Figure ES-1 are the aggregated statewide waste composition results by primary material category.

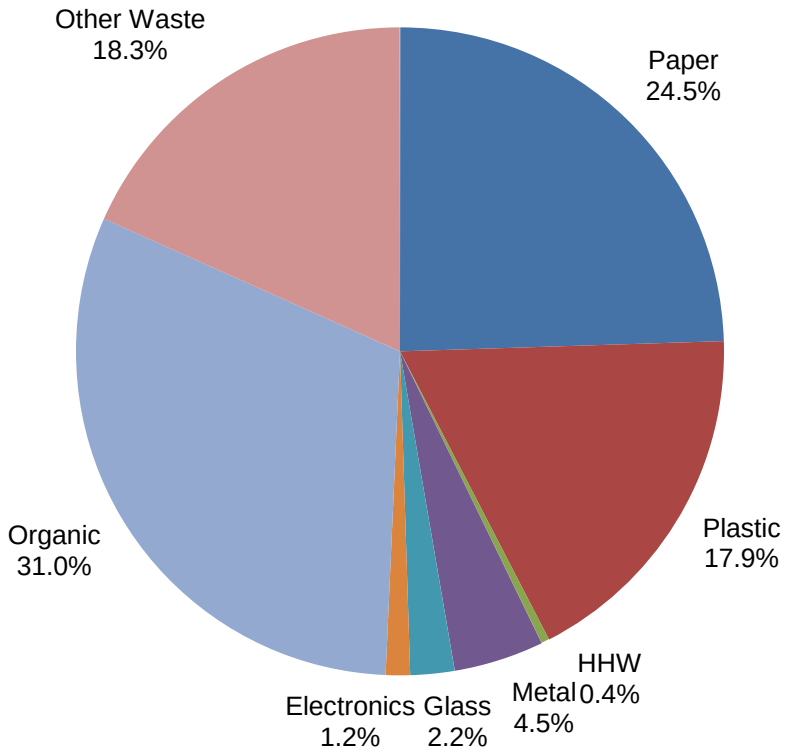

Figure ES-1-1: 2013 Statewide Characterization Results
(mean by weight)

As reflected above the primary categories composing the largest segment of the statewide mixed municipal solid waste stream are Organics and Paper. Table ES-1 characterizes the statewide results providing the mean percentage and the confidence intervals for all 50 material categories.

Table ES-1: Minnesota Statewide Aggregate Composition (by Weight)

Material	Mean	Conf Int. (90%) Lower	Conf Int. (90%) Upper	Material	Mean	Conf Int. (90%) Lower	Conf Int. (90%) Upper
PAPER				**METAL**			
Newsprint (ONP)	1.4%	1.1%	1.7%	Aluminum Beverage Containers	0.4%	0.4%	0.5%
High Grade Office Paper	1.1%	0.7%	1.6%	Other Aluminum	0.7%	0.3%	1.0%
Magazines/Catalogs	0.7%	0.5%	1.0%	Steel/Tin (Ferrous) Containers	0.7%	0.4%	1.0%
Phone Books	0.1%	0.0%	0.3%	Other Metal	2.7%	1.8%	3.5%
Gable Top/Aseptic Containers/Cartons	0.3%	0.2%	0.4%	***Subtotal Metal***	***4.5%***	**3.5%**	**5.4%**
OCC and Kraft Bags	3.7%	3.1%	4.2%				
Boxboard	1.6%	1.4%	1.8%	**GLASS**			
Compostable Paper	9.8%	8.7%	10.8%	Beverage Container Glass	1.3%	0.9%	1.8%
Mixed Recyclable Paper	3.4%	2.8%	4.1%	Glass Containers	0.5%	0.2%	0.8%
Non-Recyclable Paper	2.3%	1.4%	3.2%	Other (Non-Container) Glass	0.4%	0.2%	0.6%
Subtotal Paper	***24.5%***	**22.4%**	**26.5%**	***Subtotal Glass***	***2.2%***	**1.6%**	**2.9%**
PLASTIC				**ELECTRONICS**			
#1 PET Beverage Containers	0.8%	0.7%	0.9%	Laptops	0.0%	0.0%	0.0%
Other PET (e.g. jars and clamshells)	0.5%	0.5%	0.6%	Computer Monitors		*not found*	
HDPE Bottles/Jars	0.5%	0.4%	0.6%	Televisions	0.0%	0.0%	0.1%
Other HDPE	0.6%	0.3%	0.8%	Printers	0.1%	0.0%	0.2%
PVC - #3	0.0%	0.0%	0.1%	All Other Electronic Items	1.1%	0.7%	1.4%
Polystyrene - #6	1.0%	0.8%	1.2%	***Subtotal Electronics***	***1.2%***	**0.8%**	**1.6%**
LDPE (Rigids) - #4	0.1%	0.0%	0.1%				
Polypropylene - #5	0.6%	0.5%	0.7%	**ORGANIC**			
Other #7 Plastics	0.1%	0.0%	0.2%	Yard Waste	2.8%	1.6%	3.9%
PLA & Compostable Plastics	0.0%	0.0%	0.1%	Food Waste	17.8%	15.2%	20.3%
Bag and Film Film Plastic	6.6%	5.9%	7.3%	Wood	5.7%	4.3%	7.2%
Other Plastic (nonpackaging)	7.1%	5.6%	8.6%	Other Organic Material	4.7%	3.8%	5.6%
Subtotal Plastic	***17.9%***	**16.3%**	**19.5%**	***Subtotal Organic***	***31.0%***	**28.4%**	**33.6%**
HHW				**OTHER WASTES**			
Batteries	0.1%	0.0%	0.1%	Mattresses/Box Springs	0.4%	0.0%	0.8%
Mercury Containing Lamps	0.0%	0.0%	0.0%	Appliances & Furniture	3.0%	1.6%	4.3%
Paint Containers	0.2%	0.0%	0.5%	Textiles & Leather	4.7%	3.8%	5.5%
Oil Containers & Filters	0.0%	0.0%	0.0%	Carpet	2.3%	1.5%	3.1%
Smoke Detectors	0.0%	0.0%	0.0%	Sharps and Infectious Waste	0.0%	0.0%	0.0%
Other HHW	0.2%	0.0%	0.4%	Other Not Elsewhere Classified	8.0%	6.1%	9.8%
Subtotal HHW	***0.4%***	**0.0%**	**0.8%**	***Subtotal Other Wastes***	***18.3%***	**15.3%**	**21.2%**

Note: Subtotals for the mean percentages may not equal the sum of the mean percentages due to rounding. Confidence intervals for primary categories and subcategories are calculated independently.

The 2000 Statewide MSW Composition Study (2000 Study) characterized the mixed municipal solid waste stream and used a similar methodology as the 2013 Study. The primary material categories are similar when comparing the two studies with some minor differences in the Problem Materials, HHW, and Other Waste material categories. Provided below are the 2000 Study results depicting the mean by primary material category for comparison to the 2013 Study results.

Table ES-2: Comparison of 2013 to the 2000 Statewide Waste Characterization Results (mean by Weight)

Primary Material Category	2013 Statewide	2000 Statewide
Paper	24.5%	34.3%
Plastic	17.9%	11.4%
Metals	4.5%	5.1%
Glass	2.2%	2.8%
Organic Materials	31.0%	25.7%
Problem Materials/Electronics	1.2%	1.9%
HHW/HW	.4%	0.6%
Other Waste	18.3%	18.3%
TOTAL	100.0%	100.0%
Note: The total may not equal the sum of the material categories due to rounding. The Problem Materials/Electronics, HHW/HW, and Other Waste categories have slightly different material definitions in the 2013 Study as compared to the 2000 Study. The material category of Other Waste includes but is not limited to bulky items, textiles, carpet, and other items not classified in the other categories.		

Using the above results, the Project Team characterized the confidence intervals for the 2000 Study results and compared these with the confidence intervals for the 2013 Study results. Specifically, the percentages of Paper, Plastics, and Organics appear to have a statistically significant difference reflecting a change in the composition of the MSW stream.

Overall, the Project Team has identified potential diversion opportunities based on the largest quantities of recyclable and/or compostable materials estimated to compose the statewide mixed municipal solid waste stream including the following:

- Food waste (519,400);
- Compostable paper (285,400);
- Bag and film plastic (192,600); and
- Wood waste (168,000).

Additional analysis should be undertaken to evaluate the recovered materials markets for each of these materials and other potentially recoverable materials.

2.0 BACKGROUND

2.1 Overview and Objectives

The Minnesota Pollution Control Agency (MPCA) retained Burns & McDonnell, Inc. in conjunction with MSW Consultants and GRG Analysis, (Project Team) to conduct a Statewide Waste Characterization Study (2013 Study) to assist the MPCA and local governments with their planning efforts associated with managing municipal solid waste. The outcomes will be used to assist in measuring the changes in the MSW stream and to identify opportunities for diversion through recycling, composting and other higher use value methods.

The remainder of this report is organized into the following sections: Background, Study Design, Study Results, Diversion Opportunities, and Recommendations. The 2013 Study was conducted using an approach that is consistent with industry best management practices and provides reliable, defensible results.

2.2 Participating Facilities

Specific solid waste facilities were not identified as host sites prior to initiating the Study; however, the MPCA and Project Team agreed that field sorts would be conducted at up to six Minnesota solid waste facilities. The Project Team worked with the MPCA staff upon initiating the Study to target a set of candidate sites that would be representative of the state of Minnesota. The six facilities that agreed to host field sampling and sorting events included the following:

- Lyon County Regional Landfill;
- Hubbard County South Transfer Station;
- Western Lake Superior Sanitary District Transfer Station;
- Elk River Resource Recovery Facility;
- Pine Bend Landfill (Republic/Allied); and
- St. Paul Como Transfer Station (Advanced Disposal).

The above facilities were selected because of their interest in the 2013 Study, geographic representativeness of their waste streams, and the varying types of mixed municipal solid waste facilities represented. Overall, the representatives of each of the host sites were very cooperative and supported the Project Team's efforts to sample and sort the targeted mixed municipal solid waste materials in a timely manner.

3.0 STUDY DESIGN

3.1 Methodology

The Project Team developed a methodology for gathering representative data related to the composition of the mixed municipal solid waste disposed in Minnesota. Unlike the U.S. EPA methodology for MSW characterization, this study focuses on the quantities of MSW disposed, as opposed to generated. The methodology included the following steps:

- Determine material categories and definitions;
- Identify and recruit host facilities;
- Develop the sampling and sorting methodology;
- Conduct waste sort events;
- Analyze collected data;
- Complete statistical modeling; and
- Develop the composition results.

3.1.1 Determine Material Categories and Definitions

The material categories identified for this study were selected based upon discussions with MPCA staff and the Project Team's comprehensive waste composition experience. The objectives of the study directly influence the categories selected for the materials sampling and sorting.

A set of fifty (50) material categories was identified for sorting. The definitions of each of these material categories are included in Appendix A for reference.

The rationale for selecting the various categories included the following:

- The Paper category was divided into nine subcategories to characterize recyclable (including aseptic containers) and non-recyclable paper.
- The Plastics category was divided into eleven subcategories to capture each of the plastic resin types and other non-packaging plastics.
- The Metals category was divided into four categories to include ferrous and non-ferrous containers, as well as non-container scrap.
- The Glass category was divided into beverage, food, and other non-container glass.
- The Electronics category was divided into five categories to capture the growth in the disposal of various types of products.
- The Organics category was divided into six categories including but not limited to PLA/Compostable Plastics and Compostable Paper. Please note that for the Statewide Results

Compostable Paper was excluded from the Organics category and placed in the Paper category and PLA/Compostable Plastics were excluded from the Organics category and placed in the Plastics category.

- The Miscellaneous category was divided into twelve categories. The results for the six HHW categories were characterized separately from the other six miscellaneous categories for comparative purposes. The other six miscellaneous categories included sharps, carpet, textiles, and other types of bulky materials.

The figure below represents how the various material categories were listed on a set of plastic containers for sorting the mixed municipal solid waste.

Figure 3-1: Containers Labeled for Sorting Material Categories

3.1.2 Identify and Recruit Host Facilities

As described in Section 2, six Minnesota mixed municipal solid waste facilities hosted waste sorting and sampling field events. To recruit host sites, a letter was sent from the MPCA and the Project Team to representatives of a set of candidate sites. The letter outlined the benefits of participating in the 2013 Study and the cooperation needed if the facility site chose to host a field sampling and sorting event. The Project Team followed up the letter with additional e-mail correspondence, phone discussions, and face-to-face meetings where applicable. In some instances, the Project Team needed to negotiate with facility representatives the conditions for gaining access to the various sites to conduct the sampling and sorting and the applicable facility transaction data needed to develop a sampling and sorting methodology. Overall, the efforts were successful as representatives from the six solid waste facilities listed in Section 2.2 agreed to host the Project Team to conduct a sampling and sorting event at their respective facility sites.

3.1.3 Develop Sampling and Sorting Methodology

Prior to initiating the sorting event, a Project Team representative conducted a site visit to each of the respective sites. During this assessment, the Project Team's project manager (Project Manager) discussed with facility staff the logistical needs for the waste sort event, the standard operating procedures at the respective facility, customer types, and facility transaction data. A specific location at each respective facility was agreed upon for conducting the sorting event. The proposed approach for selecting vehicles and individual samples for the sorting process was discussed directly with site staff to address the associated logistical issues.

The pre-sort assessment also included a review of facility data. As part of the assessment, the Project Team submitted a written data request to each facility that included, at minimum, a request for the following set of information:

- Daily summary of quantities of mixed municipal solid waste received for each operating day of the week for three weeks;
- Number of vehicles per day, types of vehicles, time of day arriving at facility, and quantities of MSW for each respective vehicle; and
- Annual summary of mixed municipal solid waste received with monthly totals for the most recent calendar year.

This data was used in conjunction with other gathered information via the site assessment to develop the sampling protocol and garner staff support for the study approach.

Upon completing the pre-sort site assessment, a materials sampling protocol was established to obtain consistent and representative waste characterization data. The sampling protocol excluded selecting vehicle loads that could clearly be identified as non-MSW (e.g., industrial waste, dedicated C&D) and/or loads of materials that were diverted from disposal (e.g., dedicated load of yard waste, recyclable materials, white goods, etc.).

Other critical aspects of the sampling and sorting plan related to the materials sort protocol included seasonality and frequency of sampling.

Seasonality

The Project Team and MPCA concluded that seasonal differences in the composition of the MSW stream are not statistically significant based on results from other similar statewide studies. However, it should be noted that the quantities of materials received at solid waste facilities typically do vary seasonally.

Historically, the most seasonably variable material in the MSW stream is yard waste. Because Minnesota has comprehensive yard waste collection and diversion programs in place, the extent of seasonal differences in the MSW composition is estimated to be minimal. As a result, all sampling and sorting was conducted in the summer of 2013, as opposed to collecting data at various times throughout the year.

Frequency of Sampling

The sampling approach taken resulted in an adequate number of representative samples being sorted that provide statistically meaningful results. The approach undertaken at each facility was a three day sorting event during a "typical" week (i.e., a week that did not include a holiday). A total of 30 samples were selected and sorted during each field event.

To select specific vehicles to sample, the Project Team used sampling randomization inherent in the Nth truck approach. The Nth truck approach is based on the number of vehicles expected each day and the number of samples required for the Study to yield statistically sound results. Sample intervals for each generator type were determined by dividing the day's expected number of vehicles by the number of samples needed on that day. For example, if 21 vehicles were expected and three samples were needed, then every seventh vehicle would be selected for sampling. This approach is consistent with the ASTM International Test Standard D 5231-92 (Reapproved 2003).

3.1.4 Conduct Waste Sort Events

The table below depicts the schedule and quantities of mixed municipal solid waste sorted at each of the host sites.

Table 3-1: Sampling and Sorting Field Events

Host Facility	Dates	Quantities Sorted (lbs)
Advanced Disposal St. Paul Transfer Station	August 19th -21st	6,544.5
Elk River Resource Recovery Facility	June 18-20th	6,481.9
Hubbard County South Transfer Station	May 28th – 30th	6,488.5
Lyon County Regional Landfill	May 6th – 8th	6,519.8
Pine Bend Landfill	July 23rd-25th	6,495.3
Western Lake Superior District Transfer Station	May 22nd – 24th	6,557.9
Total		**39,087.8**

The figures below depict the Project Team's efforts at the sampling and sorting events at each of the host sites.

Figure 3-2: Elk River Resource Recovery Facility Sampling and Sorting Event

Figure 3-3: Elk River Resource Recovery Facility

Figure 3-4: Advanced Disposal Transfer Station Sampling and Sorting Event

Figure 3-5: Pine Bend Landfill Sampling and Sorting Event

Figure 3-6: Pine Bend Landfill Mixed Municipal Solid Waste

Figure 3-7: WLSSD Transfer Station

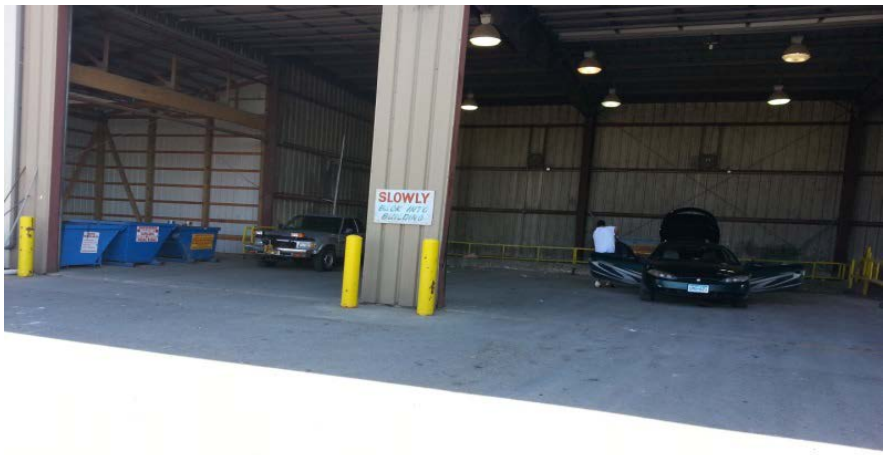

Figure 3-8: Hubbard County South Transfer Station

Figure 3-9: Lyon County Regional Landfill

The methodology for selecting the vehicles to secure waste materials for sampling was based upon the data from the pre-sort site assessment to implement the Nth truck approach. From the randomly selected loads, a minimum of 200 pound samples were taken for sorting into the 50 material categories. Two to three hundred pound samples are considered the appropriate size to provide representative results per accepted industry standards and are consistent with ASTM MSW composition protocol as specified in "Standard Test Method for Determination of Unprocessed Municipal Solid Waste," ASTM D5231.

Prior to sorting at each of the field events, each of the containers labeled with the material categories was weighed to obtain the tare weight of the empty container (see Figure 3-1). When the sorting was completed, the containers were weighed again to obtain the end tare weight of the empty containers to confirm the tare weight. If the tare weights varied, the beginning and end weights were averaged to determine the tare weight for each of the containers used in the analysis.

Each of the selected samples was pre-sorted for any hazardous or infectious wastes. The materials were then sorted by the Project Team's sorting crew into individual containers representing the various 50 material categories. Please note that liquid or food wastes were separated where feasible from any containers or packaging containing liquid or food wastes during the sorting process. Then, each container was weighed to determine the quantity of materials by material type in each sample. These weights were recorded on individual data sheets to document the sorting process. The data was then forwarded to the Project Team's analytical staff for review and analysis.

3.1.5 Analyze Collected Data

Upon completing the sampling and sorting event, the data sheets for each sample were reviewed to ensure the following:

- Individual entries were legible;
- Specific comments on the unusual aspects of the sample were legible and understandable; and
- A minimum of 200 pounds, as recorded on each sample sheet, was sorted for each sample.

The individual material weights recorded on the data sheets and the tare weights of each material's container were used to conduct the statistical analysis. Upon entering the data into the data sheets, the crew supervisor noted any unusual aspects of each sample and the potential source of the loads for additional scrutiny.

Based on our review of the data, we identified a small number of samples that contained more than 50% by weight of one specific material category. Based on this review, we excluded two samples as outliers from the Hubbard County South Transfer Station results. These two samples contained more than 50% yard waste by weight and the Hubbard County staff use their best efforts to direct this material to the composting facility at the transfer station, as opposed to loading this material for transfer for disposal. As a result, the Hubbard County South Transfer Station results are based on 28 samples. All of the other individual facility results are based on the sampling and sorting of 30 samples at their respective facilities.

3.1.6 Complete Statistical Modeling

All of the data from the sorting events were entered into the Project Team's specially-designed, waste composition statistical model (Model). The Model statistically manipulates the data to calculate the mean and the 90% confidence intervals for individual material categories for each sorting event and in the aggregate. The Model also is structured to assist in identifying where specific samples could be considered statistical outliers.

The mean represents the mathematical average or average percent of material composing the MSW stream by weight. The confidence interval is an expression of accuracy. It provides the upper and lower limits of the "actual" mean for all the MSW received at the participating facility based upon the sorting and sampling observations of the sampled materials. For example, the 90% confidence interval represents that there is a 90% level of confidence that the true population mean falls within the upper and lower bounds of the confidence interval. The 90% confidence interval is the generally accepted industry standard for solid waste composition studies. In general, the more samples that are sorted, the narrower the confidence interval becomes for a given level of confidence. Therefore, the narrower the confidence intervals, generally, the less variability in the data.

Overall, the outputs of the Model provide multiple measures for evaluating the results. It is critical when comparing the composition results that the confidence intervals, along with the mean percentages are considered.

4.0 STUDY RESULTS

4.1 Calculating the Statewide Results

This Study is intended to provide an estimate of the statewide aggregate mixed municipal solid waste composition for Minnesota. This section provides statewide waste generation data and discusses the methods used by the Project Team to aggregate composition results from the six facilities that hosted the sorting events. The individual facility results are included in Appendix B. Additionally, this section comments on the applicability of two additional waste composition studies performed at Resource Recovery Facilities in the Twin City Metropolitan Area. A table depicting the comparison of these studies to the 2013 statewide results is included in Appendix B.

MPCA staff provided 2012 county-level data on the quantity of wastes disposed and recycled. Disposal quantities were found to correlate with county-level population. For further analysis, the Project Team categorized each county in the state in two ways:

- **Metro Area vs. Greater Minnesota:** There are seven counties in the Twin Cities Metropolitan area. All remaining counties are considered to be "Greater Minnesota."
- **Urban/Suburban vs. Rural:** For each county, the Project Team considered the demographics and assigned each county as being either "Urban/Suburban" for the more densely populated counties, or "Rural" for less densely populated areas.

The Project Team then compared self-reported disposal data by the respective host facilities to the disposal data provided by the MPCA. The self-reported disposal data were very similar to the MPCA data with the MPCA data within 2% of the overall total for the host facilities. The Project Team used the MPCA-reported data for purposes of the analysis.

Table 4-1 below summarizes the disposal quantities in 2012 at each of the six host facilities as reported by the MPCA.

Table 4-1: 2012 MSW Disposal Quantities

Facility	Tons
Hubbard County South Transfer Station	9,974
Lyon County Regional Landfill	36,582
Great River Energy (Elk River RDF)	243,896
Pine Bend Landfill	259,953
WLSSD Transfer Station	66,182
Advanced Disposal St. Paul Transfer Station	131,513
Total	**748,100**

The MPCA provided the Project Team with estimates of the quantities of MSW generated, recycled, diverted and disposed by County and statewide. Table 4-2 compares the distribution of MSW between the Metropolitan and Greater Minnesota regions for both the state as a whole, as well as for the host facilities. As shown, the Project Team sorted from facilities representing approximately 40% of the total estimated MSW generated in the Metropolitan Area, approximately 8.5% for Greater Minnesota, but more than 25% of the total MSW disposed statewide.

Table 4-2: Comparison of Statewide Region MSW Disposal to Host Facilities

	Statewide		Host Facilities		Statewide Representativeness
	Tons	Percent	Percent	Tons	Percent
Metro	1,591,220	54.5%	84.9%	635,362	39.9%
Outstate	1,330,825	45.5%	15.1%	112,738	8.5%
Totals	**2,922,045**	**100.0%**	**100.0%**	**748,100**	**25.6%**
Note: The tons may not equal the statewide total tons multiplied by the respective mean percentages due to rounding of the mean percentages.					

The primary objective of the Study was to develop a statewide characterization, as opposed to regional characterizations. Based on this objective, the Project Team considered the most representative approach for aggregating facility-specific results into a statewide estimate was to use the host facilities split as reflected below.

Table 4-3: Statewide Weighting Factors

	Tons	Percent
Metropolitan Area (84.9%)		
Great River Energy (Elk River RDF)	243,896	38.4%
Pine Bend Landfill	259,953	40.9%
Advanced Disposal St. Paul Transfer Station	131,513	20.7%
Subtotal	635,362	100.0%
Greater Minnesota (15.1%)		
Hubbard County South Transfer Station	9,974	8.8%
Lyon County Regional Landfill	36,582	32.4%
WLSSD Transfer Station	66,182	58.7%
Subtotal	112,738	100.0%
Note: The tons may not equal the subtotal tons multiplied by the respective mean percentages due to rounding of the mean percentages.		

To move forward with developing the statewide composition results, a set of definitions are provided to ensure consistency in the understanding of the statistical measures used in this report.

Mean – The mean is calculated as the average composition of each material category (or primary material category) expressed as a percentage of the total amount of material within that sample set.

Confidence intervals – The lower and upper confidence intervals indicate the likelihood that the population mean (i.e., the composition of the entire waste stream) falls close to the sample mean (i.e., the samples analyzed in the 2013 Study). For comparison with other studies, and in accordance with industry standards, the lower and upper bounds throughout this report have been calculated at a 90 percent level of confidence. The 90 percent confidence intervals define the upper and lower bounds for which we can be 90 percent confident that the particular material category's mean value will fall. If the confidence intervals are "wide" for a material category, it means there was greater variability of that material between samples. Note that the standard deviation was not presented in this Study.

Tonnage – The tonnage for each material category is provided in the statewide waste composition tables in Section 5. The tonnage was calculated by applying the mean to the total quantities disposed. For example, old newspaper represents 44,400 tons and is calculated by applying the mean of 1.38% to the total of 2.922,045 tons disposed on a statewide basis.

It is important to note that the same statistical principles were applied in performing the composition calculations. In general, statistical principles dictate that approximately 30 samples are adequate to characterize a targeted waste stream, excluding results by generator type. Consequently, it is possible to obtain representative, reliable overall composition results.

4.2 Statewide MSW Composition

The aggregated statewide composition includes mixed municipal solid waste disposed and excludes industrial processed wastes, sludges, and dedicated loads of C&D debris received at the respective host facilities. The C&D materials that are included in the 2013 Study were commingled with MSW in the loads of mixed MSW received at the respective host facilities.

Provided below in Table 4-4 and Figure 4-1 are the aggregated statewide waste composition results by primary material category.

Table 4-4: Statewide Composition by Material Category

(Mean Composition by Weight)

Primary Material Category	Statewide
Paper	24.5%
Plastic	17.9%
HHW	0.4%
Metal	4.5%
Glass	2.2%
Electronics	1.2%
Organic	31.0%
Other Waste	18.3%
TOTAL	100.0%

Note: The total may not equal the sum of the material categories due to rounding. The material category of Other Waste includes but is not limited to bulky items, textiles, carpet, and other items not classified in the other categories.

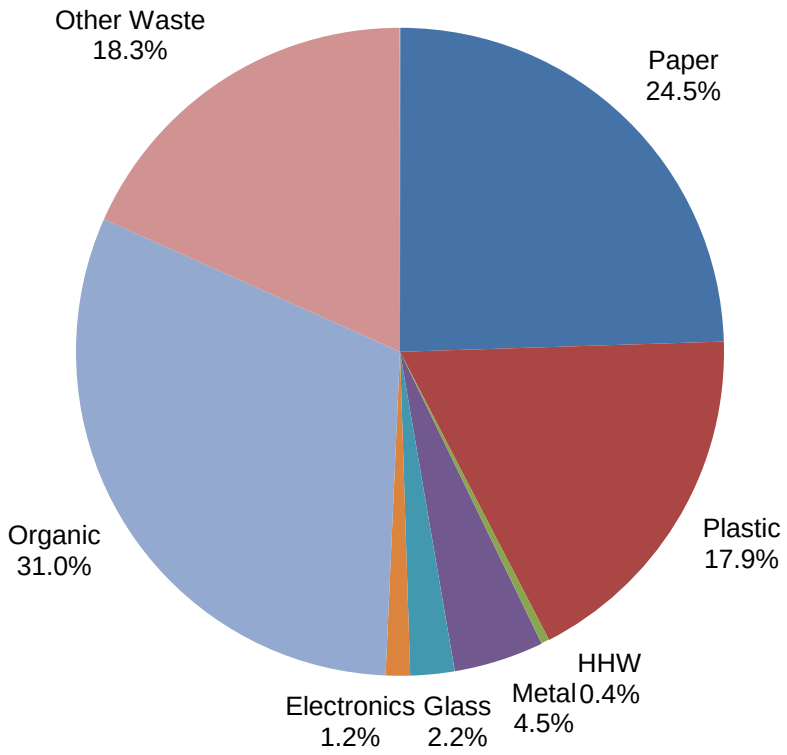

Figure 4-1: 2013 Statewide Characterization Results

(by weight)

As reflected above the primary categories composing the largest segment of the statewide mixed municipal solid waste stream are Organics and Paper. Provided below is a table representing the statewide results for all 50 material categories. The table provides both the mean percentage and the confidence intervals.

Table 4-5: Minnesota Statewide Aggregate Composition (by Weight)

Material	Mean	Conf Int. (90%) Lower	Conf Int. (90%) Upper	Material	Mean	Conf Int. (90%) Lower	Conf Int. (90%) Upper
PAPER				**METAL**			
Newsprint (ONP)	1.4%	1.1%	1.7%	Aluminum Beverage Containers	0.4%	0.4%	0.5%
High Grade Office Paper	1.1%	0.7%	1.6%	Other Aluminum	0.7%	0.3%	1.0%
Magazines/Catalogs	0.7%	0.5%	1.0%	Steel/Tin (Ferrous) Containers	0.7%	0.4%	1.0%
Phone Books	0.1%	0.0%	0.3%	Other Metal	2.7%	1.8%	3.5%
Gable Top/Aseptic Containers/Cartons	0.3%	0.2%	0.4%	***Subtotal Metal***	***4.5%***	**3.5%**	**5.4%**
OCC and Kraft Bags	3.7%	3.1%	4.2%				
Boxboard	1.6%	1.4%	1.8%	**GLASS**			
Compostable Paper	9.8%	8.7%	10.8%	Beverage Container Glass	1.3%	0.9%	1.8%
Mixed Recyclable Paper	3.4%	2.8%	4.1%	Glass Containers	0.5%	0.2%	0.8%
Non-Recyclable Paper	2.3%	1.4%	3.2%	Other (Non-Container) Glass	0.4%	0.2%	0.6%
Subtotal Paper	***24.5%***	**22.4%**	**26.5%**	***Subtotal Glass***	***2.2%***	**1.6%**	**2.9%**
PLASTIC				**ELECTRONICS**			
#1 PET Beverage Containers	0.8%	0.7%	0.9%	Laptops	0.0%	0.0%	0.0%
Other PET (e.g. jars and clamshells)	0.5%	0.5%	0.6%	Computer Monitors		*not found*	
HDPE Bottles/Jars	0.5%	0.4%	0.6%	Televisions	0.0%	0.0%	0.1%
Other HDPE	0.6%	0.3%	0.8%	Printers	0.1%	0.0%	0.2%
PVC - #3	0.0%	0.0%	0.1%	All Other Electronic Items	1.1%	0.7%	1.4%
Polystyrene - #6	1.0%	0.8%	1.2%	***Subtotal Electronics***	***1.2%***	**0.8%**	**1.6%**
LDPE (Rigids) - #4	0.1%	0.0%	0.1%				
Polypropylene - #5	0.6%	0.5%	0.7%	**ORGANIC**			
Other #7 Plastics	0.1%	0.0%	0.2%	Yard Waste	2.8%	1.6%	3.9%
PLA & Compostable Plastics	0.0%	0.0%	0.1%	Food Waste	17.8%	15.2%	20.3%
Bag and Film Film Plastic	6.6%	5.9%	7.3%	Wood	5.7%	4.3%	7.2%
Other Plastic (nonpackaging)	7.1%	5.6%	8.6%	Other Organic Material	4.7%	3.8%	5.6%
Subtotal Plastic	***17.9%***	**16.3%**	**19.5%**	***Subtotal Organic***	***31.0%***	**28.4%**	**33.6%**
HHW				**OTHER WASTES**			
Batteries	0.1%	0.0%	0.1%	Mattresses/Box Springs	0.4%	0.0%	0.8%
Mercury Containing Lamps	0.0%	0.0%	0.0%	Appliances & Furniture	3.0%	1.6%	4.3%
Paint Containers	0.2%	0.0%	0.5%	Textiles & Leather	4.7%	3.8%	5.5%
Oil Containers & Filters	0.0%	0.0%	0.0%	Carpet	2.3%	1.5%	3.1%
Smoke Detectors	0.0%	0.0%	0.0%	Sharps and Infectious Waste	0.0%	0.0%	0.0%
Other HHW	0.2%	0.0%	0.4%	Other Not Elsewhere Classified	8.0%	6.1%	9.8%
Subtotal HHW	***0.4%***	**0.0%**	**0.8%**	***Subtotal Other Wastes***	***18.3%***	**15.3%**	**21.2%**

Note: Subtotals for the mean percentages may not equal the sum of the mean percentages due to rounding. Confidence intervals for primary categories and subcategories are calculated independently.

4.3 Comparison of 2013 Results to Other Recent Studies

This section compares the results of two recently completed characterization studies with the 2013 statewide results depicted above. In 2012, waste composition studies were conducted at the Newport Resource Recovery Facility and at the Hennepin Energy Resource Company (HERC) Facility.

The Project Team conducted a comparison of these studies by normalizing results across all three studies to align material categories. While many categories aligned relatively well, in some instances it was necessary to consolidate two or more categories. A table comparing the results by material categories is included in Appendix B for reference, along with an explanation of the mapping of the material categories for purposes of performing the comparison.

Overall, the Project Team makes the following observations:

- Broadly, the composition of MSW across the three studies is consistent. Metals and Glass are similar across all studies, as are many grades of paper and several container recyclables.
- Although the 2013 statewide results appear to contain a lower fraction of Electronics and Small Appliances, the difference may be a result of the different material category definitions.
- The HERC study contained a higher fraction of Paper, and lower fraction of Plastic and Metal compared to the other two studies.
- Very small amounts of HHW were reflected in the results for all three studies.

The Project Team considers the findings of this comparative analysis to be reasonable considering the statewide results study design.

4.4 Comparison of 2013 and 2000 Statewide Composition Results

The 2000 Statewide MSW Composition Study (2000 Study) characterized the mixed municipal solid waste stream and used a similar methodology as the 2013 Study. Multiple sites were selected for sampling and sorting events with a one season sort conducted using the Nth truck method for vehicle selection and sampling. The primary material categories are similar when comparing the two studies with some minor differences in the Problem Materials, HHW, and Other Waste material categories. Provided below are the 2000 statewide results depicting the mean by primary material category for comparison to the 2013 Study results.

Table 4-6: Comparison of 2013 to the 2000 Statewide Waste Characterization Results (by Weight)

Primary Material Category	2013 Statewide	2000 Statewide
Paper	24.5%	34.3%
Plastic	17.9%	11.4%
Metals	4.5%	5.1%
Glass	2.2%	2.8%
Organic Materials	31.0%	25.7%
Problem Materials/Electronics	1.2%	1.9%
HHW/HW	.4%	0.6%
Other Waste	18.3%	18.3%

Notes: The total may not equal the sum of the material categories due to rounding. The Problem Materials/Electronics, HHW/HW, and Other Waste categories have slightly different material definitions in the 2013 Study as compared to the 2000 Study. The material category of Other Waste includes but is not limited to bulky items, textiles, carpet, and other items not classified in the other categories.

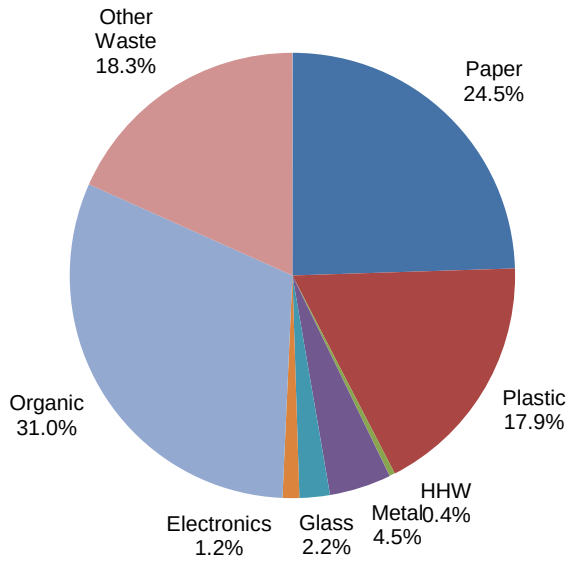

Figure 4-2: 2013 Statewide Waste Characterization Results (by weight)

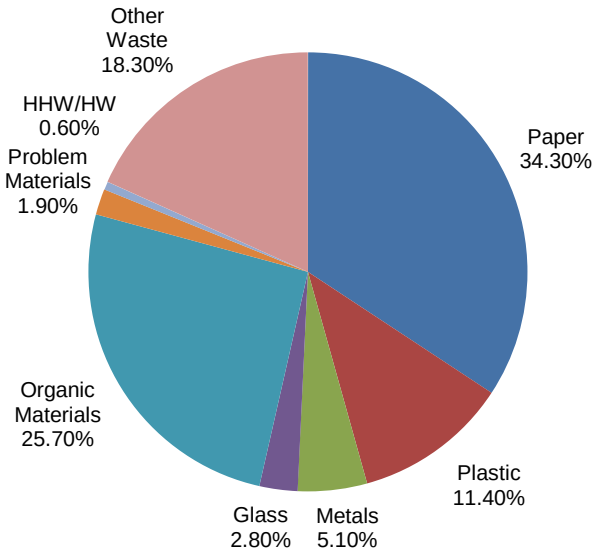

Figure 4-3: 2000 Statewide Waste Characterization Results (by weight)

Using the above results, we have characterized the means and confidence intervals for the 2000 Study results compared with the 2013 Study results to illustrate differences. The purpose of the comparison is to identify material categories where the percentage of the mixed municipal solid waste stream reflects statistically significant difference between 2013 and 2000 results. If there is no overlap between the two sets of confidence intervals, then the percentage of the mixed municipal solid waste stream composed by these categories has changed. As reflected below, the percentages of Paper, Plastics, and Organics appear

to have a statistically significant difference. Specifically, in the Paper primary material category, the subcategories of old newspaper, old corrugated containers, and magazines reflected a statistically significant difference with a smaller percentage composing the waste stream for each of these material categories in the 2013 Study results as compared to the 2000 Study results. In the Plastics primary category, film plastic reflected a statistically significant difference with a larger percentage composing the waste stream for this material category in the 2013 Study results as compared to the 2000 Study results. In the Organics primary category, food waste reflected a statistically significant difference with a larger percentage composing the waste stream for this material category in the 2013 Study results as compared to the 2000 Study results. More detailed analysis is needed to compare the remainder of the material categories.

Table 4-7: 2000 compared to 2013 Statewide Waste Characterization Results

Material Category	2000 Mean Composition	90% Confidence Interval		2013 Mean Composition	90% Confidence Interval		Statistically Significant Difference
		Lower	Upper		Lower	Upper	
Paper	34.3%	32.4%	36.5%	24.5%	22.4%	26.5%	✓
Plastic	11.4%	10.6%	12.3%	17.9%	16.3%	19.5%	✓
Metals	5.1%	4.6%	5.8%	4.5%	3.5%	5.4%	
Glass	2.8%	2.5%	3.2%	2.2%	1.6%	2.9%	
Organic Materials	25.7%	24.1%	27.8%	31.0%	28.4%	33.6%	✓
Problem Materials/ Electronics	1.9%	1.5%	2.4%	1.2%	0.8%	1.6%	
HHW/HW	0.6%	0.5%	0.8%	0.4%	0.0%	0.8%	
Other Waste	18.3%	16.8%	20.2%	18.3%	15.3%	21.2%	

Note: The total may not equal the sum of the material categories due to rounding. The Problem Materials/Electronics, HHW/HW, and Other Waste categories have slightly different material definitions in the 2000 Study as compared to the 2013 Study.

4.5 Conclusions

Based upon the analysis and results described above, the 2013 Study results are statistically defensible with reasonably narrow confidence intervals (lower and upper) for the primary material categories. Minnesota's mixed municipal solid waste stream on a statewide basis appears to have changed since the last statewide study was completed in 2000 with growth in the proportion of the waste steam composed of plastics and organics and a reduction in the proportion composed of paper.

5.0 DIVERSION OPPORTUNITIES

The next step in conducting the analysis was to apply the mean percentages for each material category to the total quantities of mixed municipal solid waste disposed statewide. This calculation provides an estimate of the quantities of materials in tons per year disposed for each material category. Table 5-1 below depicts these results.

Table 5-1: 2012 Statewide Material Quantities (tons)

2012 Statewide Quantities =	2,922,045 tons				
Material	**Mean**	**Tons**	**Material**	**Mean**	**Tons**
PAPER			**METAL**		
Newsprint (ONP)	1.4%	40,400	Aluminum Beverage Containers	0.4%	12,200
High Grade Office Paper	1.1%	33,500	Other Aluminum	0.7%	19,000
Magazines/Catalogs	0.7%	21,500	Steel/Tin (Ferrous) Containers	0.7%	21,100
Phone Books	0.1%	3,900	Other Metal	2.7%	77,900
Gable Top/Aseptic Containers/Cartons	0.3%	9,000	***Subtotal Metal***	***4.5%***	***130,200***
OCC and Kraft Bags	3.7%	106,700			
Boxboard	1.6%	45,900	**GLASS**		
Compostable Paper	9.8%	285,400	Beverage Container Glass	1.3%	38,900
Mixed Recyclable Paper	3.4%	100,400	Glass Containers	0.5%	14,500
Non-Recyclable Paper	2.3%	67,900	Other (Non-Container) Glass	0.4%	12,200
Subtotal Paper	***24.5%***	***714,600***	***Subtotal Glass***	***2.2%***	***65,600***
PLASTIC			**ELECTRONICS**		
#1 PET Beverage Containers	0.8%	23,200	Laptops	0.0%	70
Other PET (e.g. jars and clamshells)	0.5%	15,400	Computer Monitors	NA	NA
HDPE Bottles/Jars	0.5%	14,800	Televisions	0.0%	1,400
Other HDPE	0.6%	16,100	Printers	0.1%	2,100
PVC - #3	0.0%	1,100	All Other Electronic Items	1.1%	31,500
Polystyrene - #6	1.0%	28,900	***Subtotal Electronics***	***1.2%***	***35,070***
LDPE (Rigids) - #4	0.1%	1,700			
Polypropylene - #5	0.6%	17,200	**ORGANIC**		
Other #7 Plastics	0.1%	2,800	Yard Waste	2.8%	81,500
PLA & Compostable Plastics	0.0%	700	Food Waste	17.8%	519,400
Bag and Film Film Plastic	6.6%	192,600	Wood	5.7%	168,000
Other Plastic (nonpackaging)	7.1%	208,300	Other Organic Material	4.7%	137,900
Subtotal Plastic	***17.9%***	***522,800***	***Subtotal Organic***	***31.0%***	***906,800***
HHW			**OTHER WASTES**		
Batteries	0.1%	1,500	Mattresses/Box Springs	0.4%	10,800
Mercury Containing Lamps	0.0%	1	Appliances & Furniture	3.0%	87,400
Paint Containers	0.2%	6,600	Textiles & Leather	4.7%	135,900
Oil Containers & Filters	0.0%	100	Carpet	2.3%	67,300
Smoke Detectors	0.0%	4	Sharps and Infectious Waste	0.0%	200
Other HHW	0.2%	4,400	Other Not Elsewhere Classified	8.0%	233,000
Subtotal HHW	***0.4%***	***12,605***	***Subtotal Other Wastes***	***18.3%***	***534,600***

Notes: The tons by material category may not equal the statewide tons multiplied by the respective material category mean percentage due to rounding of the mean percentages. Those material categories with 0% mean reflect negligible quantities on a statewide basis because the statistical confidence intervals include 0%.

Based on the above results, there are potential opportunities for additional materials diversion from disposal. Overall, the Project Team has identified potential diversion opportunities based on the largest quantities of recyclable and/or compostable materials estimated to compose the statewide mixed municipal solid waste stream including the following:

- Food waste (519,400);
- Compostable paper (285,400);
- Bag and film plastic (192,600); and
- Wood waste (168,000).

Additional analysis should be undertaken to evaluate the recovered materials markets for each of these materials and other potentially recoverable materials.

6.0 RECOMMENDATIONS

The 2013 Statewide Waste Characterization Study was completed within a five month timeframe from May through September of 2013. It involved field sorts at six different Minnesota solid waste facilities. Three were located in the Twin City Metropolitan Area and three in Greater Minnesota. No specific generator based (e.g. residential, commercial, institutional) characterizations were completed as part of the 2013 Study. The previous statewide waste characterization was completed in calendar year 2000. Overall, the 2013 statewide composition study used a study design consistent with industry best management practices and provided reliable, defensible results.

The Project Team recommends that the MPCA consider conducting the following:

- **Additional field sorts at Greater Minnesota solid waste facilities.**

  Because of the diversity of solid waste facility types, demographics, and business/industry mix in Greater Minnesota, the Project Team recommends gathering additional field data to develop a regional waste composition for Greater Minnesota.

- **Commercial generator-based (business, industry, institutions) waste sorts.**

  Material recovery opportunities with commercial, industrial, institutional generators vary considerably by generator type. Conducting waste assessments at the point of generation for various groups of generators (e.g. schools, offices, restaurants) would foster identifying specific materials recovery opportunities.

- **Statewide waste composition studies every 5 years and, at minimum, every 10 years.**

  The mixed municipal solid waste stream changes over time. Changes in consumer product packaging and product manufacturing technologies represent just two factors that influence the types and amounts of materials disposed. As a result, conducting periodic statewide studies are recommended to measure the changes in the mixed MSW stream to provide an opportunity for the MPCA and local governments to align their solid waste programs with these changes.

APPENDIX A - STUDY DESIGN SUPPORTING DOCUMENTATION

Minnesota Statewide Waste Characterization Study (2013)

Material Categories' Definitions

Paper

Newsprint (ONP) – printed groundwood newsprint, including glossy advertisements and inserts typically found in newspapers.

High Grade Office Paper – high grade continuous form computer paper, white paper including bond, photocopy and notebook paper, and colored ledger paper primarily found in offices.

Key points:

If high grade paper is wet, it should still go into this category because it is assumed to have become wet after being discarded.

Examples:

Computer paper, index cards, computer cards, notebook paper, xerographic and typing paper, tablets (yellow and with clear glue binding), manila file folders, white register receipts, non-glossy fax paper.

Magazines/Catalogs – magazines, catalogs, promotional materials printed on glossy paper; does not include telephone directories or books.

Phone Books – telephone directories

Gable Top and Aseptic Containers/Cartons - Poly-coated packaging lined with an aluminum layer for some soy milk, fruit drinks, soups, etc. Commonly used in food and pharmaceutical storage. Packages often have folded down square corners.

Old Corrugated Cardboard (OCC) and Paper Bags - cardboard with a wavy core and not contaminated with other materials such as wax or plastic coating. Includes brown paper (Kraft) bags.

Boxboard - Uncoated box board primarily used for boxes (such as cereal boxes and egg cartons),

Mixed Recyclable Paper – paper that would be included in residential "mixed mail", not including compostable paper and the grades identified above.

Examples:

Envelopes, tissue roll cores, books, pizza boxes (includes small quantities of food scraps), brightly colored paper, calendars, "junk" mail, tablets with colored glue bindings.

Non-Recyclable Paper – Plastic or metal coated paper (excluding gable top and aseptic containers/cartons).

Key points:

If the sorter is 99% sure that the generator intended to reuse the paper in such a way that it became contaminated for recycling, put that paper into this category (e.g., paper used to dispose of chewing gum, paper sprayed with paint).

If it would take an effort to make the paper recyclable, put it into this category.

Plastic

PET Beverage Containers – clear and colored plastic beverage containers composed of polyethylene terephthalate.

Key points:

Look for the label "1" on the bottom.

Other PET (e.g. jars and clamshells) – non-beverage containers/bottles for such products as shampoo, toiletries, peanut butter and mayonnaise.

HDPE Bottles/Jars – natural and pigmented, high-density polyethylene bottles and jars

Key points:

Look for the label "2" on the bottom.

Examples:
Clear or colored bottles for dairy products, detergent, windshield fluid, motor oil, fabric softener, antifreeze, bleach.

Other HDPE - non-container #2 plastics

PVC - #3 plastics such as cooking oil bottles, plumbing pipes, and a few other item.

Polystyrene - #6 plastics packaging

LDPE (Rigids) - #4 plastics rigid packaging (excludes bags and wrap)

Polypropylene - #5 plastics packaging including but not limited to yogurt cups/tubs

Other #7 Plastics - #7 plastics such as reusable water bottles

Bag and Film Film Plastic – clear or light-colored plastic bags, grocery bags, and film plastic used for stretch wrapping pallets or other products, shrink wrap.

Other Plastic (nonpackaging) – anything plastic that is not identifiable as one of the categories above.

Examples:

Molded toys, clothes hangers, cleaning tools, plastic hoses, drinking straws, plastic cards.

Metals

Aluminum Beverage Containers – All beverage containers made from aluminum used for soft drinks, water, beer, fruit juice, sports drink, or other drinkable liquids.

Other Aluminum – non-beverage container aluminum scrap.

Steel/Tin (Ferrous) Containers – Food and beverage cans and containers composed primarily of iron.

Other Metal - all other non-container ferrous and non-ferrous (excluding aluminum) metal scrap (e.g. steel, brass, copper).

Examples:

Clothes hangers, sheet metal products, pipes, metal scraps.

Glass

Beverage Container Glass – clear, green, brown, and blue glass beverage containers.

Glass Containers - clear, green, brown, and blue glass non-beverage containers (e.g. food containers).

Other (Non-Container) Glass – all glass that was not originally a food or beverage container, including plate glass, ceramics, glass plates, cooking utensils, ash trays, mirrors, and fragments.

Key points:

If the glass is broken and not 100% identifiable as food or beverage glass, it belongs in Non-Container Glass.

Electronics

Laptops – self explanatory
Computer Monitors – self explanatory
Televisions – self explanatory
Printers – self explanatory
All Other Electronic Items – such as video games, cell phones, DVD players and other electronics.

Organic Materials

Yard Waste – woody and non-woody plant material.

Examples:

Grass, leaves, weeds, cut flowers, twigs, brush, and branches.

Food Waste – putrescibles such as food preparation waste, food scraps, spoiled food, kitchen wastes, liquid food wastes, waste parts from butchered animals, and dead animals.

PLA & Compostable Plastics – plastics made from renewable resources such as corn starch based materials.

Compostable Paper - Paper products including wax-coated paper, napkins, paper towels, frozen food packaging, tissues, paper plates, cups, and pizza boxes (excludes aseptic packaging).

Wood – treated and untreated lumber and other wood products

Other Organic Material – any organic material not classified by this category, including diapers, cotton balls, feminine hygiene products, hair, etc.

Miscellaneous

Batteries – lead acid, all household (rechargeable and non-rechargeable), and button batteries.
Mercury Containing Lamps – CFLs and others identified as containing mercury.
Paint Containers – oil and latex paint.
Oil containers and filters – self explanatory
Smoke Detectors – self explanatory
Other HHW – other products characterized as toxic, corrosive, flammable, ignitable, radioactive, poisonous, or reactive. (e.g. solvents, pesticides, antifreeze)

Sharps and Infectious Waste – hypodermic needles and any "red bag" material.

Mattresses/box springs – self explanatory

Appliances and furniture - products or appliances with electric cord or battery power source, including but not limited to small kitchen and bathroom appliances (toasters, hair dryers, etc.), radios; wood, metal, and plastic furniture;

Textiles and Leather – clothing, bedding, curtains, blankets, other cloth material, and leather goods.

Carpet – carpet and carpet padding

Other - Any materials not fitting into the other categories listed above including but not limited to construction and demolition materials, rubber, and fines.

STATEWIDE WASTE COMPOSITION HEALTH AND SAFETY PLAN

THIS SAFETY PLAN WILL BE AVAILABLE ON-SITE FOR USE AND INSPECTION.

1.0 INTRODUCTION

To minimize risk to employees and workers involved in waste composition studies, a comprehensive environmental health and safety program has been developed by Burns & McDonnell. This program provides policy and guidance information, methods - both required and recommended - for conducting field work, and procedures to be followed in case of an emergency.

The health and safety policy provides the basic framework for dealing with hazardous components, including the safe conduct of waste composition studies. This program provides guidance to project managers, subcontractors, crew supervisors and the sorting crew.

OBJECTIVE OF THIS PLAN

The personal safety and health of each staff person is the first consideration of Burns & McDonnell. The prevention of occupationally-induced injuries and illnesses is of such importance it will be given priority over all considerations during the performance of sorting activities. To the greatest degree possible, Burns & McDonnell will provide all training and physical facilities necessary for maintaining the personal safety and health of all staff members.

Along with this commitment, it is the responsibility of each and every staff person to contribute to his or her own and fellow worker's health and safety by learning and exercising safe work practices and complying with all requirements of this health and safety plan.

APPLICABILITY

This health and safety plan outlines and explains the various equipment, procedures and rules designed to maintain staff s' safety and health during this study. Failure of staff to follow any one of the rules set forth in this health and safety plan may be grounds for immediate dismissal. Unsafe practices or behavior will not be tolerated.

STANDARD OPERATING PROCEDURES

The basic procedure for sorters is to identify different materials in a garbage sample that has been placed on a waist-high sorting table and to place the materials in nearby, appropriately labeled, containers. Before receiving the waste on the table, it will have been examined by the site supervisor (or an appropriately trained assistant) for household hazardous, hazardous, and infectious waste. After the material is sorted into the containers, the supervisor or an assistant will weigh the containers. After the containers are emptied, the next sample will be brought to the table and the sorting will begin again.

SITE LAYOUT DESCRIPTION

The waste sorting will take place at a waste handling or disposal facility that has previously agreed to host such sorting. The host facility is independent from Burns & McDonnell, and may be owned and/or operated by third parties. Consequently, there is no consistent site layout for conducting the sort.

Rather, the sort supervisor will work with host facility management to identify a suitably spacious work area that is protected from heavy vehicle traffic and other heavy machinery. A work area of 20'x20' will be set aside for each sorting crew, with additional space for queuing samples to be sorted.

LOCATION OF SAFETY EQUIPMENT

The following items will be located near the sorting tables for immediate access:

- One 10# ABC Dry Chemical Fire Extinguisher
- Protective Clothing
- First Aid Kit
- Portable Eyewash
- Potable Water Supply

COMMUNICATIONS

During the sort, sorters will wear dust masks that inhibit communication by voice. Additionally, sorters will be wearing unfamiliar and uniform clothing making identification difficult. Because of these factors, extra care should be taken in moving about and in moving the garbage and containers, in walking behind someone, stepping over objects, etc. Names should be written boldly on the Tyvek units. Greater effort is required to communicate and sorters should consider it important to take the time to walk over and speak to someone or use hand signals in order to keep the work area safe.

2.0 EMPLOYEES AND PERSONAL PROTECTIVE EQUIPMENT (PPE)

SORTERS AND WORK ZONES

Based upon the amount of hazardous safety training and responsibility assumed for the study, various tasks are assigned to workers.

SITE SUPERVISOR

The site supervisor will typically be a Burns & McDonnell employee, although it is possible that a subconsultant may serve in this role after having the appropriate training. This person is also the site safety officer and the emergency coordinator. The site supervisor will be overseeing the entire work area and will be responsible for presorting the waste samples for hazards before the sample is categorized by the sorters. The sorters may not approach the areas where unexamined waste samples are being stored. In the event of a spill of hazardous material from a sample, the supervisor is responsible for cleanup of the spill or for calling the appropriate authorities. In the event of a medical emergency, the supervisor will accompany the victim to the hospital. The

supervisor is also responsible for dismissing those individuals whose conduct is considered to be unsafe.

EMERGENCY PROCEDURES

The facilities that host these sorting events have previously developed emergency procedures in place. It is the responsibility of the site supervisor to be aware of these emergency procedures, and to communicate these procedures to all other project team members. In the event of a medical or other emergency, the site supervisor is responsible for assuring a proper response to the emergency.

CREW CHIEF

The crew chief is directly responsible for the conduct of the sorters in the immediate work area. The crew chief manages the loading, sorting, and weighing of each sample. The crew chief will assist the site supervisor as necessary throughout the study.

SORTERS

Sorters may be employees of Burns & McDonnell, or third party subconsultants or hired through agencies. These employees will sort and categorize the waste being sampled. In order to make the job as comfortable and safe as possible, a number of procedures and work locations will be defined. Sorters will be required to wear appropriate protective clothing. Once material gets to the sorting work area, it is not necessary to wear a half-face mask. Sorters will be limited to working only in the vicinity of the sort tables and taking breaks in a pre-determined area.

NEED FOR PERSONAL PROTECTIVE CLOTHING

Municipal solid waste is not considered to be hazardous material by definition. Nevertheless, it may contain items and substances that could be encountered in close range, picked up by hand, or may have leaked from a broken container and mixed with other waste materials. These conditions could result in situations that are potentially hazardous to the health of the sorters conducting the study. For these reasons, it is essential for each sorter to wear personal protective clothing. Not wearing these clothing items while working at the sort table may be grounds for immediate dismissal. Protective clothing is listed below.

- Hard hats where needed - e.g., existence of overhead hazards
- Safety glasses or goggles (or prescription safety glasses)
- Dust masks
- White Tyvek full-piece suit or cotton coveralls with a rubber apron and sleeve protectors: the suit's sleeves should be tucked inside the gloves so the ends of the sleeves don't drag in the waste
- Nitrile gloves or equivalent
- Steel-toed boots
- Reflective vests

HAZARD ASSESSMENT – MUNICIPAL WASTE

Municipal waste represents a mixture of wastes originating from households and businesses. As such, there is a potential for such waste to contain a variety of hazardous constituents. Overall, the main hazards of municipal waste can be broken down into four categories as follows:

1. Radiological
   The probability of encountering radiological constituents in municipal trash is relatively low given the high degree to which radionuclides and sealed radiation sources are regulated in the United States by the Nuclear Regulatory Commission and other agencies. Nevertheless, there is a potential for improperly disposed of radionuclides or sealed radiation sources to enter the municipal waste stream and expose waste handlers. Alpha and beta radiation sources represent primarily an internal radiation hazard, causing damage if inhaled or ingested. Gamma sources represent an external radiation hazard given the ability of gamma radiation to penetrate the skin and irradiate internal organs. Radionuclides and sealed radiation sources may be recognized by associated labeling (e.g. a radiation trifoil) or their physical form (e.g., small, metallic pellets of cesium, etc.). Waste handlers should remain alert for such waste materials and be instructed to segregate suspicious materials to a safe holding area where a qualified entity can examine and dispose of it.
2. Chemical
   Municipal waste may contain a variety of corrosive, flammable, reactive or toxic materials which may have been improperly disposed of or which may represent normal constituents of industrial or consumer products. These materials can often be recognized through their appearance (e.g., liquid or powder), unusual odor, or release of vapors/fumes. Use of barrier personal protective equipment (e.g., impermeable gloves and safety glasses), good ventilation and proper bodily hygiene practices are critical for minimizing waste handler exposure to potential chemical constituents in municipal waste.
3. Biological
   Biological wastes may take the form of discarded diapers, wound dressings, syringes or any other materials potentially contaminated with human or animal waste/bodily fluids. These materials can often be recognized by their general appearance (e.g., blood, fecal material, bandage material, linens) and potentially by associated labeling (e.g., biological waste). The best protection against contacting biological waste is the use of barrier personal protection equipment and use of proper garbage handling techniques to minimize risk of contacting such waste.
4. Physical
   Municipal waste may contain broken glass, sharp metal, needles and other debris capable of causing cuts, eye injuries and other injuries of a traumatic nature. Precautions for preventing physical injuries are similar to those that prevent other types of hazardous exposures and include the use of barrier personal protective equipment and tools to sort through the trash instead of hand sorting.

ROUTES OF ENTRY IN CONTAMINATION

Personal protective clothing guards the “routes of entry” from materials hazardous to human health. The ways that hazardous materials can enter the body are by ingesting them, breathing them in, contact with the skin, eyes or mucous membranes, or by injecting them (through contact

with broken glass, nails, syringes, etc.). The two most common routes of exposure, which will be encountered during the sort, are through the skin (through a cut or abrasion), including the mucous membranes in the eyes, nose, and mouth, and through inhalation. Tyvek suits and nitrile gloves will cover hands and arms; eyes and nose will be shielded by glasses and a mask. The mask will also shield against the inhalation of any airborne material. The mask and protective clothing will help to keep one safe from any hazardous materials which may be encountered; however, caution and safe work practices will have to be given priority during the entire time of the sort. No contact lenses may be worn since chemicals could be trapped behind them if there were a spill or release. Any facial hair — beard, sideburns, or large mustache — that will interfere with the seal of the mask against the face must be removed.

PRESORTING PROTECTION

Different levels of protection are required for different study activities, depending on the potential for exposure. In addition to the personal protective clothing listed previously for sorters, presorting the waste samples for hazardous, household hazardous, and infectious waste requires the wearing of a combination organic vapor, acid gas and high efficiency particulate air filter cartridge. The person presorting the waste must receive additional safety training and be capable of wearing the additional respiratory protection.

GARBAGE HANDLING

Sorting and categorizing waste requires that it be picked up with the hands. Nitrile gloves or equivalent (tear resistant) with optional cotton liners shall be used to protect the skin from dirt and potential hazards, however they will not protect against sharp materials, which could likely be in the waste. To avoid being cut or receiving a puncture wound, always pick items from the surface of the piled garbage. Sorters should never plunge hands into the pile or use their hands to push or pull a large amount of waste around. Garbage that cannot be fully seen should not be picked up. Pick up one item at a time, trying not to disturb others. It is more important to take the time to maintain the safety of oneself and those working near than to rush through the process.

Moving the waste to the containers used for categorizing and weighing the garbage should be done with care. Sorters should station themselves at a single position near a table and sort for the family of materials identified on the barrels nearest their location. Don’t grab a handful of like materials and run around the table to the barrels behind other workers. Materials in other families should be passed to fellow workers near those barrels. Workers should restrain themselves from tossing or throwing material, despite the temptation to do so, especially when bored.

Repeated errors in the handling of garbage — for example, plunging the hands unseen into garbage or throwing materials across the table into barrels — constitutes unsafe conduct and may be grounds for dismissal.

The primary rule for handling garbage is to never make contact with an area of the garbage that cannot be visually assessed prior to making contact. The following bullets highlight proper and improper procedures for garbage handling:

DO use tools (shovels, rakes, hand trowels) to handle waste
DON’T use hands or feet to punch or kick garbage material;

DO lift bags by the loose plastic flap at the top of the bag
DON'T lift a bag from underneath;

DO open bags and boxes from the top and dump out their contents before attempting to sort waste
DON'T reach into the bag or box to pull out material;

DO use consistent, controlled motions when handling garbage to minimize splattering or spreading the waste
DON'T throw, toss, or violently contact garbage at any time.

DO pay attention and look before handling garbage
DON'T get careless.

SPILLS

In the unlikely event of a spill or a release of a hazardous substance, the site supervisor will alert host facility management and all sorting activity will stop until appropriate clean-up measures have been taken.

FIRST AID PROCEDURES

BLOODBORNE PATHOGENS

Injuries involving cuts and puncture wounds can potentially offer an entry-point for bloodborne pathogens, such as those carrying Hepatitis and HIV. Every cut and puncture wound should be treated and the following steps should be taken by the Crew Chief:

1. Using sterile gloves, immediately clean the wound with antiseptic and wrap in gauze;
2. Place the needle or object causing the wound in a plastic bag;
3. If, in the judgment of the Crew Chief, the wound caused by a hypodermic needle or a metal object poses a health or safety risk to the worker, the worker will be taken to the nearest hospital or clinic for treatment;
4. Notify the site owner/operator, the Employment Agency (if the patient is a temporary worker), and the Project Manager, who in turn should alert the Safety Manager; and the Global Practice Manager; and
5. Document the incident on an accident report form and submit the completed form to the Safety Manager.

Similar steps should be taken if the worker has been exposed to potentially hazardous material and shows abnormal or unusual symptoms.

The following are First Aid procedures for conditions caused by hot and cold temperature extremes that may be aggravated by required personal protective equipment:

HEAT EXHAUSTION

Caused by: Prolonged hot spell, excessive exposure, physical exertion.

Symptoms: Profuse sweating, weakness, dizziness, and sometimes heat cramps; skin is cold and pale, clammy with sweat; pulse is thready and blood pressure is low. Body temperature is normal or subnormal. Vomiting may occur. Unconsciousness is rare.

First Aid: Move to a cooler environment immediately. Provide rest and a cool drink of water or beverage like Gatorade. Seek medical attention if symptoms are severe.

HEAT STROKE (HEAT COLLAPSE)
WARNING: CAN BE FATAL

Caused by: Failure of the body to regulate its temperature because of excessively warm weather and physical exertion has depleted it of fluids needed to perspire.

Symptoms: 1. Weakness, dizziness, nausea, headache, heat cramps, heat exhaustion, excessive sweating, skin flushed and pink.

2. Sweating stops (usually) and body temperature rises sharply. Delirium or coma is common; skin changes from pink to ashen or purplish.

First Aid: Immediate medical care is needed; heat stroke is very serious. The body must be cooled soon. Provide victim with cool water to drink if conscious. Move the victim to a cooler place, remove protective clothing, and bathe in cold water. Use extreme care and frequently check ABCs (airway, breathing, and circulation) if the person is unconscious.

FROST NIP/BITE

Caused by: Cold air temperatures (especially if there is a wind) freezing the skin. Most often the exposed skin on the face, nose and ears is affected, but prolonged cold may affect the hands and feet also.

Symptoms: 1. A reddening of the skin.

2. The area will blanch or whiten, and there will be a stinging sensation. Frostbite should not be allowed to proceed beyond this stage. Seek a warm location immediately.

3. The area will become white, with a waxy appearance at this point and will go numb. Tissue damage can occur at this point and, if ignored, gangrene may set in.

First Aid: Get indoors or to a warmer place immediately. Treat the frostbitten area with lukewarm water (103 to 107 degrees Fahrenheit); don't use hot water and absolutely do not rub the area with snow. If warm water isn't available, wrap the affected area in a warm, dry cloth. Drink a warm liquid. Do not smoke or drink because both act to constrict blood vessels and will inhibit circulation in the area. If the frostbitten area blisters, do not break them; see a doctor soon to check for infection.

LIKELIHOOD OF HEAT AND COLD STRESS

Because many studies take place inside a minimally heated area, environmental factors are an important consideration in worker health and safety. Additionally, the personal protective clothing required for the study can aggravate situations caused by uncomfortable weather. All sorters conducting the sort must wear long pants under their Tyvek coveralls. A large Tyvek suit will be worn over warm layers of clothing. Enough sorters should be hired that frequent breaks are possible in the event of extremely hot or cold weather. A work/rest schedule should be

adapted to weather conditions. Also water coolers and beverages should be provided throughout the sort.

ROUTINE DECONTAMINATION

"Decontamination" is a procedure for removing, or "doffing" the personal protective equipment in a specified order to prevent the spread of contaminants. During breaks and at lunch, it is important to remove the equipment so as not to inhale or consume contaminants on the gear. Following is the proper sequence that should be used for removing protective clothing:

1. Scrape or brush off any dirt from steel-toed boots. In winter, store in a warm room or take them home to dry overnight; if liners are worn, be sure they dry overnight.
2. Remove nitrile gloves while keeping the inner cotton gloves on. This is a good time to examine the nitrile gloves for any holes or tears. Replace the gloves with a new pair if any holes or tears are found. Always throw gloves away at the end of each day and begin with new ones the following day.
3. Carefully remove the Tyvek suit, keeping the outside of the suit away from the skin and from the inside of the suit. (You may need to take your boots off to do this.) If the suit is extremely dirty or torn, replace it with a new suit. Turn the dirty Tyvek suit inside out so no one else is exposed to the contamination and discard it. Make sure the clean suit has been marked with your name before returning to work.
4. Remove hard hat. Brush off any dirt or dust. Store in box.
5. Remove safety glasses/goggles. Inspect, clean if necessary, and store.
6. Remove dust mask. Place the dust mask in a labeled plastic bag during lunchtime or at the end of the day so the carbon is not further depleted by continuing to absorb water vapor from the air. Take care not to deform the mask or to introduce contaminants to the inside of the mask.
7. Remove cotton inner gloves and place them in a small plastic bag to protect them from contaminants.
8. Wash hands and face with soap and water before eating, drinking, chewing gum or smoking. No eating, drinking, gum chewing, or smoking will be allowed in the sort area. Shower as soon as possible upon reaching home.

3.0 RESPIRATORY PROTECTION PLAN

INTRODUCTION

During a waste composition study, sorters may be exposed to a variety of airborne health hazards. Again, municipal solid waste is not defined as a hazardous waste, but there is always the chance that a dangerous item may have been discarded indiscriminately and could show up on a worktable. Protecting against this small chance is absolutely necessary. The staff assigned to wear a mask—which is primarily the site supervisor—must receive training and fit-testing prior to use. The following policy sets forth a respiratory protection program that is designed to help insure the greatest possible protection for staff.

General Limitations for Wearing Masks

There may be some resistance to wearing a mask, as it will take a little more effort to breathe through the mask than it normally does.

Contact lenses may not be worn with the mask while working because of potential chemical exposure and chance that vapors could be trapped behind the lens. In addition, masks cannot be worn by persons with a beard or other facial hair such as sideburns or mustache that would interfere with the mask's seal to the face.

Warning Properties

Gases or vapors usually have warning properties, which include odor, eye irritation or respiratory irritation. When these properties are detected while wearing a well fitted mask, the condition is known as "breakthrough" and the mask should be replaced. If breathing through the mask becomes inordinately difficult, the dust filter has become clogged and a new mask should be selected and fit-tested.

As a rule, the respirator cartridges should be changed every 8 hours, as the warning properties of chemicals cannot be relied upon and due to the unknown nature of contaminants in trash, the best way to preserve health and safety is to keep the cartridges fresh.

Fit-Testing

Fit-testing is the process of fitting a particular mask to an individual's face and checking to be sure inhalations are being pulled through the mask and not from gaps around the edges of the mask. Pulling air from gaps around the edges of the mask would not provide proper respiratory protection and could result in the individual breathing in some contaminants.

All Beck employees will undergo fit-testing and training as required by 29 CFR 1910.134 prior to performing work with a respirator and be checked annually thereafter.

Mask Maintenance and Storage

Mask maintenance includes inspecting and storing masks. Masks should be inspected for dirt, tears, holes, and worn headbands. If the mask is dirty or becoming difficult to breathe through, it should be discarded and the staff person should be fit-tested for a new mask.

Storage of masks is an important aspect. If the mask is in good condition, it should be placed in a tightly-sealed plastic bag to keep air from the charcoal insert. Care should be taken to not deform the mask as this will ruin its fit to the individual. If they are stored in a box at the end of the day, be sure the masks are placed in single layer, face up.

4.0 GENERAL SAFTEY PROCEDURES

Site Control

It is important to remember that personnel involved in conducting the waste composition study are guests of the facility. This also applies to personnel who may be part-time sorters of the county or facility and who are familiar with the facility and other sorters. While the waste composition study is being conducted, sorters and the supervisor must abide by the rules outlined in this health and safety plan, no matter how familiar the site or other drivers or operators are.

Parking areas, work areas, and designated paths to water outlets, break areas, outhouses, etc. will be identified and all sorters must remain in these areas. Keep in mind that the operators of the large trucks and machinery are not accustomed to a group of people working on the ground at the facility. Vehicles are often moving quickly. Heavy machinery operators often move in reverse with limited vision. Noise levels around these machines may be very high. It is imperative sorters remain in designated areas and do not wander, scavenge, or explore, no matter how tempting or harmless the action may seem. Also be alert to machines entering areas designated for sorters whose operators may not see you. Be alert at all times! A brief meeting is held at the end of each day to discuss procedures, ideas, and problems and to make sure everyone is accounted for and on their way home safely.

Areas will be designated where protective equipment may be partially or completely doffed, sorters may wash up and where food and beverages may be consumed. Absolutely no consumption of food or drinks, gum-chewing, or smoking will be allowed in the sorting area.

Always inform the site coordinator of any condition or activity you find unsafe.

PRESORTING

Sorters hired to sort and categorize the waste samples will be wearing a level of protective clothing and equipment, which will not allow them to work with an unexamined sample of solid waste. The site supervisor or another adequately trained staff member will presort the waste sample, looking for hazardous, household hazardous, or infectious waste before it may be shoveled onto the sort table. If unsorted waste samples are brought into the sorting building, sorters should stay near the sort tables and not sort the waste until told it is ready.

APPENDIX B - INDIVIDUAL FACILITY RESULTS

Advance Disposal St Paul Transfer Station - 2013 Waste Composition Results

Material	Mean	Conf Int. (90%) Lower	Conf Int. (90%) Upper
PAPER	**26.2%**	**21.3%**	**31.1%**
1 Newsprint (ONP)	2.3%	1.4%	3.2%
2 High Grade Office Paper	2.1%	0.7%	3.5%
3 Magazines/Catalogs	1.0%	0.2%	1.8%
4 Phone Books		*not found*	
5 Gable Top/Aseptic Containers/Cartons	0.2%	0.1%	0.4%
6 OCC and Kraft Bags	3.5%	2.2%	4.8%
7 Boxboard	1.1%	0.9%	1.4%
8 Compostable Paper	9.5%	7.3%	11.6%
9 Mixed Recyclable Paper	3.2%	2.1%	4.3%
10 Non-Recyclable Paper	3.2%	0.7%	5.7%
PLASTIC	**14.6%**	**12.8%**	**16.5%**
11 #1 PET Beverage Containers	0.9%	0.5%	1.3%
12 Other PET (e.g. jars and clamshells)	0.4%	0.3%	0.5%
13 HDPE Bottles/Jars	0.3%	0.2%	0.4%
14 Other HDPE	0.6%	0.1%	1.0%
15 PVC - #3	0.0%	0.0%	0.0%
16 Polystyrene - #6	1.4%	1.0%	1.9%
17 LDPE (Rigids) - #4	0.0%	0.0%	0.0%
18 Polypropylene - #5	0.5%	0.3%	0.6%
19 Other #7 Plastics	0.1%	0.0%	0.2%
20 PLA & Compostable Plastics	0.1%	0.0%	0.3%
21 Bag and Film Film Plastic	5.0%	4.2%	5.9%
22 Other Plastic (nonpackaging)	5.3%	4.0%	6.5%
HHW	**0.1%**	**0.0%**	**0.2%**
23 Batteries	0.0%	0.0%	0.0%
24 Mercury Containing Lamps		*not found*	
25 Paint Containers	0.1%	0.0%	0.2%
26 Oil Containers & Filters		*not found*	
27 Smoke Detectors		*not found*	
28 Other HHW	0.0%	0.0%	0.0%

Material	Mean	Conf Int. (90%) Lower	Conf Int. (90%) Upper
METAL	**4.6%**	**3.1%**	**6.1%**
29 Aluminum Beverage Containers	0.5%	0.4%	0.6%
30 Other Aluminum	1.6%	0.4%	2.9%
31 Steel/Tin (Ferrous) Containers	0.6%	0.3%	0.9%
32 Other Metal	1.9%	1.1%	2.7%
GLASS	**2.9%**	**1.5%**	**4.4%**
33 Beverage Container Glass	2.3%	0.9%	3.7%
34 Glass Containers	0.4%	0.2%	0.7%
35 Other (Non-Container) Glass	0.2%	0.0%	0.5%
ELECTRONICS	**1.4%**	**0.7%**	**2.1%**
36 Laptops		*not found*	
37 Computer Monitors		*not found*	
38 Televisions	0.2%	0.0%	0.6%
39 Printers	0.4%	0.0%	0.8%
40 All Other Electronic Items	0.8%	0.5%	1.2%
ORGANIC	**30.7%**	**25.4%**	**36.0%**
41 Yard Waste	1.1%	0.3%	2.0%
42 Food Waste	19.0%	13.7%	24.3%
43 Wood	5.3%	3.0%	7.5%
44 Other Organic Material	5.3%	3.4%	7.2%
OTHER WASTES	**19.4%**	**12.2%**	**26.7%**
45 Mattresses/Box Springs	0.9%	0.0%	2.2%
46 Appliances & Furniture	5.3%	2.3%	8.3%
47 Textiles & Leather	4.2%	2.6%	5.7%
48 Carpet	1.8%	0.3%	3.3%
49 Sharps and Infectious Waste	0.0%	0.0%	0.0%
50 Other Not Elsewhere Classified	7.3%	3.4%	11.2%
Total	**100.0%**		
No. of Samples	***30***		

Elk River Resource Recovery Facility - 2013 Waste Composition Results

	Material	Mean	Conf Int. (90%) Lower	Conf Int. (90%) Upper
PAPER		**24.3%**	**22.3%**	**26.4%**
1	Newsprint (ONP)	1.4%	1.0%	1.8%
2	High Grade Office Paper	0.7%	0.5%	1.0%
3	Magazines/Catalogs	0.7%	0.5%	0.9%
4	Phone Books	0.4%	0.0%	0.8%
5	Gable Top/Aseptic Containers/Cartons	0.4%	0.2%	0.5%
6	OCC and Kraft Bags	3.3%	2.7%	3.9%
7	Boxboard	1.8%	1.4%	2.2%
8	Compostable Paper	11.4%	9.8%	12.9%
9	Mixed Recyclable Paper	2.8%	2.3%	3.3%
10	Non-Recyclable Paper	1.5%	1.1%	1.8%
PLASTIC		**17.8%**	**15.7%**	**19.9%**
11	#1 PET Beverage Containers	0.8%	0.7%	0.9%
12	Other PET (e.g. jars and clamshells)	0.6%	0.5%	0.8%
13	HDPE Bottles/Jars	0.6%	0.5%	0.8%
14	Other HDPE	0.4%	0.1%	0.7%
15	PVC - #3	0.1%	0.0%	0.1%
16	Polystyrene - #6	1.3%	0.9%	1.6%
17	LDPE (Rigids) - #4	0.0%	0.0%	0.0%
18	Polypropylene - #5	0.7%	0.5%	0.8%
19	Other #7 Plastics	0.1%	0.0%	0.1%
20	PLA & Compostable Plastics		*not found*	
21	Bag and Film Film Plastic	7.2%	6.0%	8.5%
22	Other Plastic (nonpackaging)	6.1%	4.3%	7.8%
HHW		**1.1%**	**0.0%**	**2.2%**
23	Batteries	0.1%	0.0%	0.1%
24	Mercury Containing Lamps		*not found*	
25	Paint Containers	0.6%	0.0%	1.6%
26	Oil Containers & Filters		*not found*	
27	Smoke Detectors		*not found*	
28	Other HHW	0.4%	0.0%	0.9%
METAL		**5.9%**	**3.5%**	**8.4%**
29	Aluminum Beverage Containers	0.4%	0.3%	0.5%
30	Other Aluminum	0.5%	0.3%	0.6%
31	Steel/Tin (Ferrous) Containers	1.1%	0.3%	2.0%
32	Other Metal	3.9%	1.5%	6.3%
GLASS		**1.8%**	**1.1%**	**2.5%**
33	Beverage Container Glass	1.4%	0.7%	2.0%
34	Glass Containers	0.2%	0.1%	0.3%
35	Other (Non-Container) Glass	0.3%	0.1%	0.4%
ELECTRONICS		**1.1%**	**0.6%**	**1.6%**
36	Laptops		*not found*	
37	Computer Monitors		*not found*	
38	Televisions		*not found*	
39	Printers		*not found*	
40	All Other Electronic Items	1.1%	0.6%	1.6%
ORGANIC		**33.9%**	**29.8%**	**38.0%**
41	Yard Waste	4.4%	1.8%	7.0%
42	Food Waste	18.5%	14.6%	22.5%
43	Wood	6.3%	3.2%	9.5%
44	Other Organic Material	4.6%	3.1%	6.1%
OTHER WASTES		**14.1%**	**11.6%**	**16.6%**
45	Mattresses/Box Springs		*not found*	
46	Appliances & Furniture	1.0%	0.3%	1.6%
47	Textiles & Leather	3.8%	2.6%	5.0%
48	Carpet	2.5%	1.0%	4.0%
49	Sharps and Infectious Waste	0.0%	0.0%	0.0%
50	Other Not Elsewhere Classified	6.8%	4.8%	8.8%
	Total	**100.0%**		
	No. of Samples	*30*		

Hubbard County South Transfer Station - 2013 Waste Composition Results

	Material	Mean	Conf Int. (90%) Lower	Conf Int. (90%) Upper
PAPER		**27.2%**	**24.0%**	**30.4%**
1	Newsprint (ONP)	1.5%	1.1%	1.8%
2	High Grade Office Paper	1.1%	0.6%	1.6%
3	Magazines/Catalogs	1.3%	0.7%	1.8%
4	Phone Books	0.0%	0.0%	0.1%
5	Gable Top/Aseptic Containers/Cartons	0.3%	0.2%	0.4%
6	OCC and Kraft Bags	3.4%	1.9%	4.9%
7	Boxboard	2.9%	2.5%	3.2%
8	Compostable Paper	9.8%	8.5%	11.0%
9	Mixed Recyclable Paper	3.7%	2.9%	4.4%
10	Non-Recyclable Paper	3.3%	0.6%	6.1%
PLASTIC		**16.3%**	**14.8%**	**17.8%**
11	#1 PET Beverage Containers	1.3%	1.0%	1.5%
12	Other PET (e.g. jars and clamshells)	0.6%	0.5%	0.6%
13	HDPE Bottles/Jars	1.0%	0.8%	1.2%
14	Other HDPE	1.0%	0.0%	2.3%
15	PVC - #3	0.1%	0.0%	0.1%
16	Polystyrene - #6	1.1%	0.7%	1.5%
17	LDPE (Rigids) - #4	0.1%	0.0%	0.3%
18	Polypropylene - #5	0.6%	0.5%	0.7%
19	Other #7 Plastics	0.1%	0.0%	0.1%
20	PLA & Compostable Plastics		*not found*	
21	Bag and Film Film Plastic	6.8%	6.0%	7.6%
22	Other Plastic (nonpackaging)	3.7%	3.1%	4.3%
HHW		**0.3%**	**0.2%**	**0.4%**
23	Batteries	0.2%	0.1%	0.2%
24	Mercury Containing Lamps	0.0%	0.0%	0.0%
25	Paint Containers	0.0%	0.0%	0.0%
26	Oil Containers & Filters	0.1%	0.0%	0.1%
27	Smoke Detectors	0.0%	0.0%	0.0%
28	Other HHW	0.0%	0.0%	0.1%

	Material	Mean	Conf Int. (90%) Lower	Conf Int. (90%) Upper
METAL		**4.2%**	**3.4%**	**4.9%**
29	Aluminum Beverage Containers	1.0%	0.8%	1.2%
30	Other Aluminum	0.5%	0.4%	0.7%
31	Steel/Tin (Ferrous) Containers	1.0%	0.7%	1.2%
32	Other Metal	1.7%	1.0%	2.3%
GLASS		**4.8%**	**3.6%**	**6.0%**
33	Beverage Container Glass	3.5%	2.5%	4.5%
34	Glass Containers	0.7%	0.5%	0.9%
35	Other (Non-Container) Glass	0.7%	0.5%	0.9%
ELECTRONICS		**1.0%**	**0.7%**	**1.4%**
36	Laptops		*not found*	
37	Computer Monitors		*not found*	
38	Televisions		*not found*	
39	Printers	0.0%	0.0%	0.1%
40	All Other Electronic Items	1.0%	0.6%	1.4%
ORGANIC		**36.5%**	**33.7%**	**39.4%**
41	Yard Waste	6.8%	4.2%	9.5%
42	Food Waste	21.7%	18.6%	24.8%
43	Wood	2.5%	1.0%	4.0%
44	Other Organic Material	5.5%	3.8%	7.2%
OTHER WASTES		**9.7%**	**7.2%**	**12.1%**
45	Mattresses/Box Springs		*not found*	
46	Appliances & Furniture	0.2%	0.0%	0.5%
47	Textiles & Leather	2.6%	2.0%	3.3%
48	Carpet	1.6%	0.0%	3.2%
49	Sharps and Infectious Waste	0.0%	0.0%	0.0%
50	Other Not Elsewhere Classified	5.2%	3.1%	7.3%
	Total	**100.0%**		
	No. of Samples	***28***		

Lyon County Regional Landfill - 2013 Waste Composition Results

	Material	Mean	Conf Int. (90%) Lower	Upper
PAPER		**22.7%**	**19.6%**	**25.7%**
1	Newsprint (ONP)	1.5%	1.0%	2.0%
2	High Grade Office Paper	1.3%	0.7%	1.9%
3	Magazines/Catalogs	0.8%	0.5%	1.1%
4	Phone Books	0.0%	0.0%	0.1%
5	Gable Top/Aseptic Containers/Cartons	0.6%	0.3%	0.9%
6	OCC and Kraft Bags	3.2%	2.3%	4.1%
7	Boxboard	2.6%	2.1%	3.1%
8	Compostable Paper	8.2%	6.7%	9.8%
9	Mixed Recyclable Paper	3.0%	2.2%	3.8%
10	Non-Recyclable Paper	1.5%	1.0%	1.9%
PLASTIC		**17.7%**	**15.7%**	**19.7%**
11	#1 PET Beverage Containers	0.8%	0.6%	1.1%
12	Other PET (e.g. jars and clamshells)	0.5%	0.4%	0.6%
13	HDPE Bottles/Jars	0.6%	0.5%	0.8%
14	Other HDPE	0.7%	0.3%	1.1%
15	PVC - #3	0.1%	0.0%	0.1%
16	Polystyrene - #6	1.4%	0.6%	2.3%
17	LDPE (Rigids) - #4	0.1%	0.0%	0.3%
18	Polypropylene - #5	0.7%	0.3%	1.1%
19	Other #7 Plastics	0.0%	0.0%	0.0%
20	PLA & Compostable Plastics		*not found*	
21	Bag and Film Film Plastic	6.3%	5.3%	7.4%
22	Other Plastic (nonpackaging)	6.3%	5.2%	7.5%
HHW		**0.3%**	**0.0%**	**0.5%**
23	Batteries	0.1%	0.0%	0.1%
24	Mercury Containing Lamps		*not found*	
25	Paint Containers	0.1%	0.0%	0.2%
26	Oil Containers & Filters		*not found*	
27	Smoke Detectors		*not found*	
28	Other HHW	0.1%	0.0%	0.3%

	Material	Mean	Conf Int. (90%) Lower	Upper
METAL		**3.9%**	**3.1%**	**4.8%**
29	Aluminum Beverage Containers	0.5%	0.4%	0.6%
30	Other Aluminum	0.5%	0.2%	0.7%
31	Steel/Tin (Ferrous) Containers	0.7%	0.5%	0.9%
32	Other Metal	2.2%	1.4%	3.1%
GLASS		**3.0%**	**0.4%**	**5.6%**
33	Beverage Container Glass	0.8%	0.5%	1.2%
34	Glass Containers	0.4%	0.3%	0.6%
35	Other (Non-Container) Glass	1.7%	0.0%	4.2%
ELECTRONICS		**1.3%**	**0.7%**	**1.8%**
36	Laptops	0.0%	0.0%	0.1%
37	Computer Monitors		*not found*	
38	Televisions	0.1%	0.0%	0.4%
39	Printers	0.1%	0.0%	0.3%
40	All Other Electronic Items	0.9%	0.5%	1.4%
ORGANIC		**30.9%**	**26.5%**	**35.3%**
41	Yard Waste	1.8%	1.0%	2.6%
42	Food Waste	15.6%	11.9%	19.3%
43	Wood	6.6%	3.1%	10.0%
44	Other Organic Material	7.0%	4.4%	9.6%
OTHER WASTES		**20.2%**	**14.5%**	**26.0%**
45	Mattresses/Box Springs		*not found*	
46	Appliances & Furniture	2.7%	1.1%	4.4%
47	Textiles & Leather	5.7%	3.9%	7.4%
48	Carpet	1.5%	0.4%	2.6%
49	Sharps and Infectious Waste		*not found*	
50	Other Not Elsewhere Classified	10.4%	6.0%	14.7%
	Total	**100.0%**		
	No. of Samples	***30***		

Pine Bend Landfill - 2013 Waste Composition Results

	Material	Mean	Conf Int. (90%) Lower	Upper
PAPER		**23.3%**	**19.9%**	**26.6%**
1	Newsprint (ONP)	0.9%	0.6%	1.1%
2	High Grade Office Paper	1.1%	0.6%	1.5%
3	Magazines/Catalogs	0.6%	0.4%	0.8%
4	Phone Books		*not found*	
5	Gable Top/Aseptic Containers/Cartons	0.2%	0.2%	0.3%
6	OCC and Kraft Bags	4.6%	3.5%	5.6%
7	Boxboard	1.3%	1.0%	1.6%
8	Compostable Paper	8.1%	6.6%	9.5%
9	Mixed Recyclable Paper	3.6%	2.2%	5.1%
10	Non-Recyclable Paper	2.9%	1.4%	4.4%
PLASTIC		**20.0%**	**16.5%**	**23.6%**
11	#1 PET Beverage Containers	0.7%	0.5%	0.8%
12	Other PET (e.g. jars and clamshells)	0.4%	0.3%	0.6%
13	HDPE Bottles/Jars	0.4%	0.3%	0.5%
14	Other HDPE	0.7%	0.2%	1.2%
15	PVC - #3	0.0%	0.0%	0.0%
16	Polystyrene - #6	0.5%	0.4%	0.5%
17	LDPE (Rigids) - #4	0.1%	0.0%	0.3%
18	Polypropylene - #5	0.5%	0.4%	0.7%
19	Other #7 Plastics	0.0%	0.0%	0.0%
20	PLA & Compostable Plastics	0.0%	0.0%	0.0%
21	Bag and Film Film Plastic	6.9%	5.8%	8.1%
22	Other Plastic (nonpackaging)	9.7%	5.9%	13.6%
HHW		**0.0%**	**0.0%**	**0.1%**
23	Batteries	0.0%	0.0%	0.0%
24	Mercury Containing Lamps		*not found*	
25	Paint Containers		*not found*	
26	Oil Containers & Filters		*not found*	
27	Smoke Detectors		*not found*	
28	Other HHW	0.0%	0.0%	0.0%

	Material	Mean	Conf Int. (90%) Lower	Upper
METAL		**3.2%**	**2.4%**	**4.0%**
29	Aluminum Beverage Containers	0.3%	0.2%	0.4%
30	Other Aluminum	0.2%	0.2%	0.3%
31	Steel/Tin (Ferrous) Containers	0.3%	0.3%	0.4%
32	Other Metal	2.3%	1.6%	3.0%
GLASS		**2.0%**	**1.0%**	**3.0%**
33	Beverage Container Glass	0.8%	0.5%	1.0%
34	Glass Containers	0.8%	0.0%	1.7%
35	Other (Non-Container) Glass	0.4%	0.1%	0.8%
ELECTRONICS		**1.2%**	**0.4%**	**2.1%**
36	Laptops		*not found*	
37	Computer Monitors		*not found*	
38	Televisions		*not found*	
39	Printers		*not found*	
40	All Other Electronic Items	1.2%	0.4%	2.1%
ORGANIC		**28.4%**	**24.3%**	**32.5%**
41	Yard Waste	2.4%	0.7%	4.1%
42	Food Waste	16.2%	12.0%	20.3%
43	Wood	5.9%	3.6%	8.2%
44	Other Organic Material	3.9%	2.7%	5.1%
OTHER WASTES		**21.9%**	**17.5%**	**26.3%**
45	Mattresses/Box Springs	0.6%	0.0%	1.6%
46	Appliances & Furniture	3.8%	0.5%	7.1%
47	Textiles & Leather	5.3%	4.1%	6.5%
48	Carpet	2.5%	1.2%	3.8%
49	Sharps and Infectious Waste	0.0%	0.0%	0.0%
50	Other Not Elsewhere Classified	9.7%	6.4%	12.9%
	Total	**100.0%**		
	No. of Samples	*30*		

Western Lake Superior Sanitary District - 2013 Waste Composition Results

	Material	Mean	Conf Int. (90%) Lower	Conf Int. (90%) Upper
PAPER		**26.7%**	**23.8%**	**29.6%**
1	Newsprint (ONP)	1.4%	1.0%	1.9%
2	High Grade Office Paper	1.0%	0.7%	1.3%
3	Magazines/Catalogs	0.7%	0.5%	0.9%
4	Phone Books	0.1%	0.0%	0.2%
5	Gable Top/Aseptic Containers/Cartons	0.4%	0.3%	0.5%
6	OCC and Kraft Bags	1.8%	1.4%	2.3%
7	Boxboard	1.9%	1.5%	2.2%
8	Compostable Paper	12.0%	10.4%	13.5%
9	Mixed Recyclable Paper	5.7%	4.4%	7.0%
10	Non-Recyclable Paper	1.7%	1.3%	2.1%
PLASTIC		**16.7%**	**15.0%**	**18.4%**
11	#1 PET Beverage Containers	1.0%	0.8%	1.2%
12	Other PET (e.g. jars and clamshells)	0.7%	0.6%	0.8%
13	HDPE Bottles/Jars	0.6%	0.4%	0.9%
14	Other HDPE	0.3%	0.1%	0.5%
15	PVC - #3	0.1%	0.0%	0.1%
16	Polystyrene - #6	1.0%	0.8%	1.2%
17	LDPE (Rigids) - #4	0.0%	0.0%	0.0%
18	Polypropylene - #5	0.7%	0.6%	0.9%
19	Other #7 Plastics	0.6%	0.0%	1.5%
20	PLA & Compostable Plastics	0.0%	0.0%	0.0%
21	Bag and Film Film Plastic	6.1%	5.3%	7.0%
22	Other Plastic (nonpackaging)	5.5%	3.8%	7.2%
HHW		**0.3%**	**0.1%**	**0.6%**
23	Batteries	0.1%	0.0%	0.2%
24	Mercury Containing Lamps		*not found*	
25	Paint Containers		*not found*	
26	Oil Containers & Filters	0.0%	0.0%	0.1%
27	Smoke Detectors		*not found*	
28	Other HHW	0.2%	0.0%	0.5%
METAL		**3.9%**	**3.0%**	**4.9%**
29	Aluminum Beverage Containers	0.5%	0.2%	0.7%
30	Other Aluminum	1.0%	0.5%	1.5%
31	Steel/Tin (Ferrous) Containers	0.9%	0.4%	1.3%
32	Other Metal	1.6%	1.0%	2.2%
GLASS		**2.8%**	**1.9%**	**3.6%**
33	Beverage Container Glass	1.5%	0.8%	2.2%
34	Glass Containers	0.7%	0.5%	0.8%
35	Other (Non-Container) Glass	0.6%	0.3%	0.8%
ELECTRONICS		**1.0%**	**0.5%**	**1.5%**
36	Laptops	0.0%	0.0%	0.0%
37	Computer Monitors		*not found*	
38	Televisions		*not found*	
39	Printers	0.0%	0.0%	0.0%
40	All Other Electronic Items	1.0%	0.5%	1.5%
ORGANIC		**30.8%**	**27.3%**	**34.3%**
41	Yard Waste	1.7%	0.4%	2.9%
42	Food Waste	19.5%	16.3%	22.7%
43	Wood	3.8%	1.6%	6.1%
44	Other Organic Material	5.8%	4.4%	7.2%
OTHER WASTES		**17.7%**	**14.0%**	**21.4%**
45	Mattresses/Box Springs		*not found*	
46	Appliances & Furniture	3.2%	1.0%	5.5%
47	Textiles & Leather	6.1%	4.5%	7.8%
48	Carpet	2.3%	0.8%	3.8%
49	Sharps and Infectious Waste	0.0%	0.0%	0.0%
50	Other Not Elsewhere Classified	6.1%	4.1%	8.0%
	Total	**100.0%**		
	No. of Samples	***30***		

Comparison of 2013 Statewide Results with Other Recent Studies

	Mean Composition		
Material	2013 Statewide	2012 Newport	2012 HERC
Paper	**24.5%**	**23.1%**	**30.6%**
Newsprint (ONP)	1.4%	1.6%	1.9%
High Grade Office Paper	1.1%	1.0%	2.0%
Magazines/Catalogs	0.7%	0.7%	1.0%
Old Corrugated Cardboard (OCC) and Paper Bags	3.7%	2.8%	4.0%
Mixed Recyclable Paper	5.4%	5.2%	5.8%
Non-recyclable Paper	12.1%	12.0%	15.9%
Plastic	**17.9%**	**17.1%**	**14.8%**
#1 PET Beverage Containers	0.8%	1.5%	1.4%
HDPE Bottles/Jars	0.5%	0.8%	0.8%
Bag and Film Film Plastic	6.6%	5.7%	6.0%
Other Plastic	10.0%	9.1%	6.8%
Metal	**4.5%**	**5.0%**	**3.6%**
Aluminum Beverage Containers	0.4%	0.7%	0.5%
Steel/Tin (Ferrous) Containers	0.7%	0.6%	2.0%
Other Metal	3.3%	3.7%	1.1%
Glass	**2.2%**	**2.6%**	**2.5%**
Container Glass	1.8%	2.2%	2.1%
Other (Non-Container) Glass	0.4%	0.4%	0.4%
Electronics & Small Appliances	**1.2%**	**3.5%**	**2.2%**
Organics	**31.0%**	**28.2%**	**32.0%**
Yard Waste	2.8%	3.4%	3.5%
Food Waste	17.8%	14.6%	17.5%
Wood	5.7%	6.0%	4.3%
Other Organic Material	4.7%	4.3%	6.7%
HHW	**0.4%**	**0.1%**	**0.0%**
Other Waste	**18.3%**	**20.2%**	**14.3%**
Mattresses/Furniture/Appliances	3.4%	2.7%	3.9%
Textiles & Leather	4.7%	6.7%	3.5%
Other Wastes	10.3%	10.8%	6.9%
GRAND TOTAL	**100.0%**	**100.0%**	**100.0%**
Number of Samples	*180*	*30*	*50*

The subcategories for Electronics and HHW are excluded because they differ.

The totals/subtotals may not equal the sum of the material categories due to rounding.

Material Category Mapping

Material Group	Mapped Categories	Categories in Studies Under Comparison		
		MN State-wide	Newport	HERC
Paper	Newspaper	✓	✓	✓
	High Grade Office Paper	✓	✓	✓
	Magazines/Catalogs	✓	✓	✓
	Old Corrugated Cardboard/ Kraft Bags	✓	✓	✓
	Mixed Recyclable Paper	Phone Books Gable Top/Aseptic Cartons Boxboard Mixed Recyclable Paper	✓	Phone Books Cartons/Aseptic Packaging Boxboard/Paperboard Mixed Paper
	Non-Recyclable Paper	Compostable Paper Non-Recyclable Paper	✓	Food-Soiled Paper, Compostable Food Service Ware & Other Compostable Items Other Paper
Plastic	#1 PET Bottles	#1 PET Beverage Containers	#1 PET Bottles	#1 PET Bottles
	#2 HDPE Bottles/Jars	HDPE Bottles/Jars	#2 HDPE Bottles	#2 HDPE Bottles
	Bag and Film Film Plastic	Bag and Film Film Plastic	Film/Wrap/Bags	Bags & Film Plastic
	Other Plastic	Other PET (e.g. jars and clamshells) Other HDPE PVC - #3 Polystyrene - #6 LDPE (Rigids) - #4 Polypropylene - #5 Other #7 Plastics PLA & Compostable Plastics Other Plastic (nonpackaging)	Other Containers Other Non-containers	#1 PET Injection-Molded Containers #3 PVC #2 (non-bottles), #4, and #5 Bottles & Containers Other Rigid Plastics All Other Plastics
Metal	Aluminum Beverage Containers	✓	✓	✓
	Steel/Tin (Ferrous) Containers	Steel/Tin (Ferrous) Containers	Ferrous Food and Beverage Containers	Ferrous Metals
	Other Metal	Other Aluminum Other Metal	Other Non- Ferrous Scrap Other Ferrous Metal	Aluminum Scrap Metal Other Non-Ferrous Metals
Glass	Container Glass	Beverage Container Glass Glass Containers	✓	Food & Beverage Container Glass
	Non-Container Glass	✓	✓	✓

Material Category Mapping

Material Group	Mapped Categories	Categories in Studies Under Comparison		
		MN State-wide	Newport	HERC
Electronics	Electronics	Computer Monitors Televisions Laptops Printers All Other Electronic Items	Computer Monitors Televisions All Computer Equipment and Peripherals Other Electrical & Household Appliances Cell Phones Other Electronics	Electronics with CRTs Electronics w/o CRTs Small Household Appliances
Organics	Yard Waste	✓	✓	✓
	Food Waste	✓	✓	✓
	Wood	✓	Non-Treated Wood Treated Wood	✓
	Other Organic Material	✓	Diapers Other Organics	✓
HHW	HHW	Batteries Mercury Containing Lamps Paint Containers Sharps and Infectious Waste Other HHW Oil Containers & Filters Smoke Detectors	Lead Acid Batteries Other Batteries Mercury Containing Products Paints and Solvents Sharp and Infectious Waste Other HHW Pesticides, Herbicides, Fungicides Household Cleaners Automotive Products	HHW
Other Wastes	Mattresses/Furniture/ Appliances	Mattresses/Box Springs Appliances & Furniture	Mattresses Furniture	Bulky Waste Major Appliances
	Textiles & Leather	✓	✓	✓
	Other Wastes	Carpet Other	Carpet All C&D Debris Rubber Other Inorganics	C&D Tires/Rubber Other Inorganics Materials Fines

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