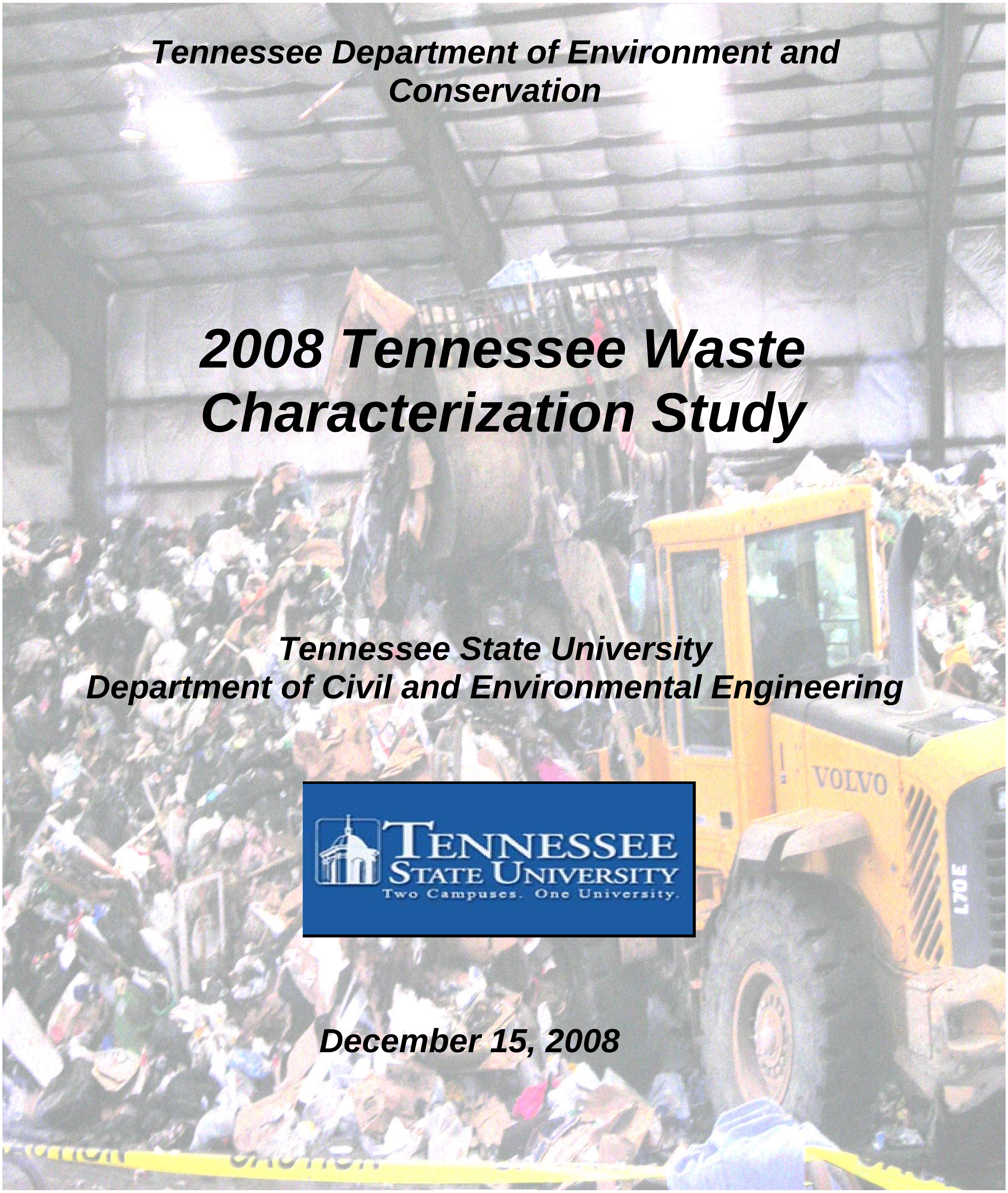
Tennessee Department of Environment and Conservation

2008 Tennessee Waste Characterization Study



Tennessee State University
Department of Civil and Environmental Engineering

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2008 Tennessee Waste Characterization Study

Roger Painter, Ph.D., P.E.
Associate Professor
Civil and Environmental Engineering
Tennessee State University

Valetta Watson
Adjunct Professor
Civil and Environmental Engineering
Tennessee State University

Martha Parks **Administrative Assistant III** **Civil and Environmental Engineering** **Tennessee State University**	**Kendra Smith** **Civil/Environmental Engineering Student** **Civil and Environmental Engineering** **Tennessee State University**
Wendy Leung **Civil/Environmental Engineering Student** **Civil and Environmental Engineering** **Tennessee State University**	**James Talley** **Civil/Environmental Engineering Student** **Civil and Environmental Engineering** **Tennessee State University**
Christopher Mishie **Civil/Environmental Engineering Student** **Civil and Environmental Engineering** **Tennessee State University**	**Mahdi Ahmad** **Civil/Environmental Engineering Student** **Civil and Environmental Engineering** **Tennessee State University**

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Acronyms

ASTM	American Society for Testing and Materials
C&D	Construction and Demolition
CI	Confidence Interval
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
MSW	Municipal Solid Waste
TDEC	Tennessee Department of Environment and Conservation
TSU	Tennessee State University
WARM	USEPA Waste Reduction Model

Executive Summary

TDEC retained Tennessee State University (TSU) to conduct an initial phase municipal solid waste (MSW) characterization study (“2008 Tennessee Solid Waste Study”) to better understand the composition of solid waste being disposed in Tennessee. The field portion of the 2008 Tennessee Solid Waste Study was conducted by TSU by obtaining representative samples of waste being disposed/processed at Cedar Ridge Landfill in Lewisburg, TN and Bi-County Landfill in Montgomery County, TN, The samples were sorted into 64 different material categories, and the weight of each category was recorded. Statistical analysis was then conducted on the sampling results to determine the composition of targeted solid waste streams from the rural areas served by the Cedar Ridge facility and urban areas (Clarksville) served by the Bi-County facility.

The results of the study were compared to national data from the United States Environmental Protection Agency’s (“EPA’s”) publication “Municipal Solid Waste Generation, Recycling, and Disposal in the United States: 2003 Data Tables” and Georgia statewide MSW data from the 2005 Georgia Statewide Waste Characterization Study. See Tables 5.1 and 5.2 below.

In addition to the field sampling portion of the study TDEC asked TSU to assist the agency in its efforts to investigate the feasibility and likely impact of specific material disposal bans. Estimates for parameters needed for cost benefits analysis of specific material disposal bans are shown below in Table 6.2. These parameters will assist TDEC in its efforts to choose what waste components to target with material disposal bans. These parameters will also facilitate TDEC’s efforts to educate the public with regard to environmental impacts of the bans.

Table 5.1 Comparison to US MSW Disposal Stream						
Material Category	Bi-County and Cedar Ridge (%)	US (%)	% Diff (%)	σ (std dev)	90% CI	
					Low (%)	High (%)
Paper	32.09	26.3	18.05	15.70	27.30	36.89
Glass	5.06	6.2	-22.59	6.25	3.15	6.97
Metal	5.73	7.3	-27.33	3.60	4.63	6.83
Plastics	17.08	15.4	9.85	9.28	14.25	19.92
Food Scraps	15.28	16.4	-7.36	11.42	11.79	18.76
Yard Trimmings	6.38	7.6	-19.10	10.13	3.29	9.48
Rubber Leather & Textiles	5.35	9.00	-68.33	6.03	3.51	7.19
Wood	1.34	7.50	-457.67	1.86	0.78	1.91
Other	11.70	4.20	64.10	10.42	8.52	14.88

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Table 5.2 Comparison to Georgia MSW Stream						
Material Category	Bi-County and Cedar Ridge (%)	Georgia Disposal (%)	% Diff (%)	σ (std dev)	90% CI	
					Low (%)	High (%)
Paper	32.09	38.7	-20.59	15.70	27.30	36.89
Glass	5.06	3.7	26.84	6.25	3.15	6.97
Metal	5.73	7.4	-29.08	3.60	4.63	6.83
Plastics	17.08	15.8	7.51	9.28	14.25	19.92
Food Scraps	15.28	12	21.44	11.42	11.79	18.76
Yard Trimmings	6.38	2.7	57.69	10.13	3.29	9.48
Rubber Leather & Textiles	5.35	5.6	-4.74	6.03	3.51	7.19
Wood	1.34	4.4	-227.17	1.86	0.78	1.91
Other	11.70	9.8	16.24	10.42	8.52	14.88

Table 6.2 Estimation of Parameters for Evaluation of Disposal Bans					
Category	**Material Banned**	**Net Diversion Potential[1] tons**	**Greenhouse Gas Reduction[2] (MTCE)[5]**	**Landfill Space Savings[3] yd^3**	**Landfill Capacity Savings[4] $**
Paper					
	Corrugated Cardboard	642,829	601,022	3,214,147	$19,284,884
	Newspaper	223,679	116,467	520,183	$6,710,363
	White Ledger	241,223	377,631	771,912	$7,236,678
	All Paper	**2,144,739**	**2,012,326**	**7,726,940**	**$64,342,180**
Plastic					
	PETE Plastic	136,901	59,384	531,656	$4,107,045
	HDPE Plastic	148,763	58,204	330,585	$4,462,896
	All Plastic	**1,141,686**	**458,249**	**3,112,806**	**$34,250,586**
Organics					
	Food Scraps	1,020,899	244,276	1,361,198	$30,626,959
	Yard Trimmings	298,953	-5,192	1,594,416	$8,968,592
	Leaves and Grass	127,524	-31,454	248,827	$3,825,718
	All Organics	**1,447,376**	**207,630**	**3,204,442**	**$43,421,269**

1 Estimated based on Tennessee MSW disposal in 2005 and combined results from Bi-County and Cedar Ridge
2 Estimated based on net diversion potential using USEPA Waste Reduction Model (WARM), 9/08 revision
3 Estimated based on net diversion potential using USEPA "Standard Volume-to-Weight Conversion Factors
4 Estimated based on net diversion potential and assuming a tipping fee of $30.00
5 Metric Tons Carbon Equivalent1 metric ton carbon equivalent = 3.667 metric tons of CO_2 equivalent.

1.0 Introduction

Municipal solid waste (MSW) characterization and composition studies are essential to proper management of waste for a variety of reasons including the need to estimate material recovery potential and to identify sources of waste component generation. Data generated from waste composition studies are used in several ways, including determining the quantity of material available for recovery, measuring the effectiveness of existing recycling programs, and right-sizing solid waste and recycling facilities.

Due to the cost and level of resources associated with conducting these studies, many states and local jurisdictions opt to use alternative sources of data to estimate the composition of their waste streams. However, alternative data such as national waste generation estimates, or studies based on other states or regions of the country may not accurately represent the local waste stream characteristics in Tennessee. Local characterization studies are essential for a jurisdiction to assess its efforts in implementing solid waste management alternatives. TDEC recognizes the need to provide more accurate waste characterization data that will facilitate the efforts of its jurisdictions to plan for and anticipate the full costs of their waste management programs.

To this end TDEC retained Tennessee State University (TSU) to conduct an initial phase municipal solid waste (MSW) characterization study ("2008 Tennessee Solid Waste Study") to better understand the composition of solid waste being disposed in Tennessee. The field portion of the 2008 Tennessee Solid Waste Study was conducted by TSU by obtaining representative samples of waste being disposed/processed at Cedar Ridge Landfill in Lewisburg, TN and Bi-County Landfill in Montgomery County, TN, The samples were sorted into 64 different material categories, and the weight of each category was recorded. Statistical analysis was then conducted on the sampling results to determine the composition of targeted solid waste streams from the rural areas served by the Cedar Ridge facility and urban areas (Clarksville) served by the Bi-County facility. These results were extrapolated to estimate the composition of as disposed MSW from residential sources in rural and urban areas of the state.

TSU was also charged to use the Tennessee 2008 Solid Waste Study results for developing and refining methodologies for statewide solid waste characterization. Implementation of the sampling methodology presented in this report will provide TDEC with a robust characterization of Tennessee's MSW at a minimum cost and level of resources.

In addition to the field sampling portion of the study TDEC asked TSU to assist the agency in its efforts to investigate the feasibility and likely impact of specific material disposal bans. In this regard, this report also provides specific information about disposal bans on several recyclable MSW components.

Section 2 of this report gives pertinent demographic information about the areas serviced by the Bi-County and Cedar Ridge Facilities. Section 3 presents the specifics regarding the detailed sampling plan for conducting the solid waste characterization study. Section 4 presents the statistical basis for the estimation of MSW composition from sampling data. Section 5 presents the characterization of the MSW streams for the study. In section 5 the sampling results are compared to the national MSW stream and to Georgia's MSW stream based on it's 2005 statewide MSW characterization. Section 5 also presents the results of the extrapolation of the 2008 Tennessee Solid Waste Study to Tennessee's 2005 statewide MSW disposal. Section 6 uses the results from Section 5, "USEPA's Weight –to-Volume Standards", and "USEPA's Waste Reduction Model (WARM) to estimate parameters to assist TDEC efforts to plan and implement solid waste management alternatives including material disposal bans.

2.0 Background

The study actually consists of a set of composition studies of several individual waste sub-streams entering the two disposal facilities. The factors used in the study to define the waste sub-streams included:

- Demographic Concerns (rural vs. urban and residential vs. commercial etc.)
- Seasonal (This study only addresses the warm season (spring/summer)
- Delivery Source(hauler types…This study addressed route trucks for residential and commercial MSW)

Waste sampling was conducted using a stratified random sampling methodology in which waste was sampled from waste sub-streams to develop a waste composition profile for each category. The statistical results were then combined in a way that reflects each category's contribution to the overall waste stream, thus producing overall waste composition information. Strata considered in this study included the geographical region (rural vs. urban, the waste sector (residential, commercial). It is widely held that solid waste characterization and composition studies should be conducted at a minimum twice a year to reflect seasonal variations in the waste stream. This sampling plan addresses the warm weather spring/summer time frame as sampling occurred in the July/August timeframe.

2.1 Waste Source Evaluation

Surveys of waste haulers were conducted at each participating disposal facility on the same days that waste samples were obtained. Information that was obtained through hauler surveys included:

- The type of vehicle (route, compacting drop box, loose drop box or self hauler
- The sector residential, multi-family residential or commercial
- The jurisdiction from which the load originated

Six different "delivery sources" to the landfills were identified for the purposes of the study as follows:

1. Residential route trucks. At least 90% of the waste comes from single-family or multifamily dwellings.
2. Commercial route trucks. No more than 10% of the waste comes from single-family or multifamily dwellings. The rest comes from commercial, government, or other sources.

3. Mixed route trucks. More than 10% of the waste is residential, and more than 10% is commercial or from other non-residential sources.

4. Compacting drop boxes. These are often used by single retail stores and apartment complexes.

5. Loose drop boxes. Excluding loads from Construction and Demolition sources. ***Note:*** *Although this study excludes loads coming from construction and demolition activities, these material types are still present in all the waste streams addressed by this study. For example, the lumber material wood scraps that a residence and business might dispose in a drop-box. These materials were not generated by construction and demolition activities, but they fall under the lumber material type in the construction and demolition material class.*

6. Regular self-haul waste. This usually is waste brought to the disposal site by the household or business that generated the garbage, but also includes waste taken to the disposal site by anyone who is not a commercial garbage hauler.

2.2 Demographic Considerations

One goal of the study was to compare the solid waste streams from urban and rural areas in Tennessee. To accomplish this sampling focused on the rural areas served by the Cedar Ridge Facility and on urban areas served by the Bi-County facility. General demographic information from the 2000 census is provided below. This data suggests that significant differences exist between the demographics of the rural areas served by the Cedar Ridge facility and the city of Clarksville served by the Bi-County facility.

2.2.1 Marshall County Tennessee Demographics

As of the census of 2000, there were 26,767 people, 10,307 households, and 7,472 families residing in Marshall. The population was 71 people per square mile (28/km²). There were 11,181 housing units at an average density of 30 per square mile (12/km²). There were 10,307 households and the average household size was 2.56 and the average family size was 3.02.

The median income for a household in the county was $38,457, and the median income for a family was $45,731. The per capita income for the county was $17,749. About 7.30% of families and 10.00% of the population were below the poverty line, including 10.80% of those under age 18 and 13.10% of 65 or over.

2.2.2 Bedford County Tennessee Demographics

As of the census of 2000, there were 37,586 people, 13,905 households, and 10,345 families residing in the county. The population density was 79 people per square mile (31/km²). There were 14,990 housing units at an average density of 32 per square mile (12/km²). There were 13,905 households and the average household size was 2.67 and the average family size was 3.06.

The median income for a household in the county was $36,729, and the median income for a family was $40,691. The per capita income for the county was $16,698. About 9.70% of families and 13.10% of the population were below the poverty line, including 15.90% of those under age 18 and 17.80% of 65 or over.

2.2.3 City of Clarksville Demographics

As of the census of 2000, there were 103,455 people, 36,969 households, and 26,950 families residing in the city of Clarksville Tennessee. The population density was 1,090.6 people per square mile (421.1/km²). There were 40,041 housing units at an average density of 422.1/sq mi (163.0/km²). There were 36,969 households and the average household size was 2.69 and the average family size was 3.12.

The median income for a household in the city was $37,548, and the median income for a family was $41,421. The per capita income for the city was $16,686. About 8.4% of families and 10.6% of the population were below the poverty line, including 13.8% of those under age 18 and 10.4% of 65 or over.

3.0 Methodology

The composition of generated waste is extremely variable as a consequence of seasonal, demographic, geographic, and local legislation impacts. Waste composition studies are generally planned by local communities or their consultants and conducted by day laborers supervised by professionals. This study was conducted by TSU students supervised by participating faculty. The methodology for conducting solid waste characterization has been developed by the American Society for Testing and Materials (ASTM Designation D523 l-92,(1992)), however the procedures actually employed across the country (and the results obtained) are quite variable. This study will reference the ASTM protocol, solid waste studies conducted for the states of Georgia, Florida, and California as well as guidance documents developed by United States Environmental Protection Agency (USEPA).

In this study the number of waste sorts to conduct for each MSW category was derived strictly based on non-parametric statistical methods and sampling theory. The smallest number of random samples that can bracket the mean of an unknown distribution with a 90 percent confidence interval is five (5) and (while no assumption will be made regarding the nature of the probability distribution of solid waste components) the normal approximation to the binomial distribution is valid (often used) for sample sizes as small as twenty (20). The non-parametric statistical method presented in Section 4 provides a robust mathematical estimate of the mean concentration with 90 percent confidence and is based on a real time observation of the diminishing improvement of the range of the 90 percent confidence interval with additional waste sorts. Table 3.1 presents the number of samples planned for each stratum to be sampled. The actual number of waste sorts and the components examined in each waste sort was adjusted during the sampling based on real time statistical analysis.

3.1 Collecting Random Samples

Each load selected for sampling was tipped into an elongated pile on the ground or the floor of the disposal facility. An imaginary 16-cell grid was superimposed on the tipped load, as depicted in Figure 3.1. The field crew supervisor directed the loader operator to the randomly selected cell in the grid to obtain the waste sample. A minimum of 100 pounds of material from the identified cell was staged near the sorting tables in an area restricted from the operational equipment. A loader was available to transport the material.

The number of cells in the sampling grid was adjusted downward for small loads. For example small loads were divided into fewer than 16 cells to ensure that a sufficient amount of waste (at least 100 pounds per cell) was captured for sampling.

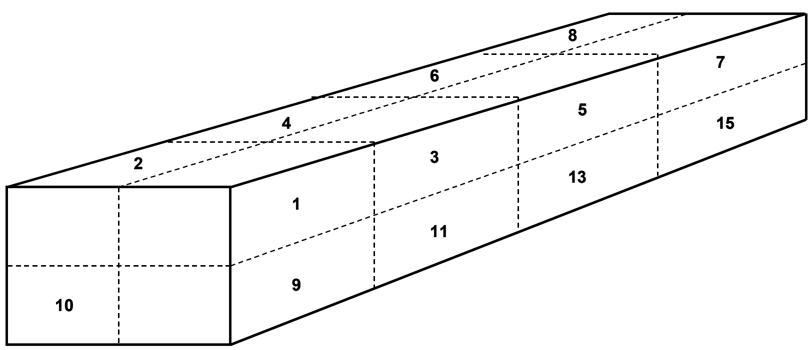

Figure 3.1 Sampling Grid

3.2 Sorting Strategy

The sorting crew sorted the material by hand into the prescribed 64 material types (see Appendix A for a description of the material types). Plastic laundry baskets were used to contain the separated components. The entire solid waste sample was initially sorted into the nine major waste types shown in Table 3.1. The sorting crew members then specialized in types of materials and sorted the major waste types into 64 subcategories according to the subcategories definitions in Appendix A.

The supervisor of the sorting crew monitored the homogeneity of the component baskets as they accumulated, rejecting materials that were improperly classified. Open laundry baskets allowed the supervisor to see the material at all times. The supervisor also verified the purity of each component as it was weighed, before recording the weight on field sheets. The materials were sorted to the greatest reasonable level of detail by hand, until no more than a small amount of homogeneous fine material ("mixed residue") remained. The supervisor recorded composition weights on Sample Tally Sheets. An example "Sample Tally Sheet" is Shown below in Figure 3.2.

Table 3.1 Major Waste Categories

WASTE TYPE	SUB-CATEGORIES
PAPER	11 (1 – 11)
GLASS	6 (12 – 17)
METAL	7 (18 – 24)
ELECTRONICS	4 (25 – 28)
PLASTIC	13 (29 – 41)
ORGANIC	9 (42 – 50)
CONSTRUCTION & DEMOLITION	8 (51 – 58)
SPECIAL WASTE	5 (59 – 63)
MIXED RESIDUE	1 (64)

Sample ID: ________________ **Date:** ________

Measure and record the load volume. (Include trailer dimensions if applicable.)

________ft x ________ft x ________ft & ________ft x ________ft x ________ft

PAPER

Cardboard			
Paper Bags/Kraft			
Newspaper			
White Ledger			
Colored Ledger			
Computer Paper			
Other Office Paper			
Magazines/Catalogs			
Phone Book/Directory			
Other Misc. Paper			
R/C Paper			

GLASS

Clear			
Green			
Brown			
Other Color			
Flat Glass			
R/C Glass			

METAL

Aluminum Cans			
Tin/Steel Cans			
Other Non-Ferrous			
Major Appliances			
Used Oil Filters			
Other Ferrous			
R/C Metal			

PLASTIC

PETE Bottles			
Other PETE			
HDPE Natural Bottles			
HDPE Colored Bottles			
HDPE 5-gallon (Food)			
HDPE 5-gallon (Non-food)			
Other HDPE			
#3-#7 Bottles			
Other #3-#7			
Plastic Trash Bags			
Grocery/Merch. Bags			
Non-bag Packaging Film			
Film Products			
Other Film			
Durable Plastic Items			
R/C Plastic			

E-WASTE

Brown Goods			
Computer-related			
Other Small Consumer			
TV's & Other CRTs			

ORGANIC

Food			
Leaves and Grass			
Prunings & Trimmings			
Branches & Stumps			
Agricultural Crop			
Manures			
Textiles			
Carpet			
R/C Organics			

C&D

Concrete			
Asphalt Paving			
Asphalt Roofing			
Lumber			
Treated Wood Waste			
Gypsum Board			
Rock, Soil, Fines			
R/C C&D			

HHW

Paint			
Vehicle & Equip. Fluids			
Used Oil			
Batteries			
R/C HHW			

SPECIAL

Ash			
Sewage Solids			
Industrial Sludge			
Treated Medical Waste			
Bulky Items			
Tires			
R/C Special Waste			
Mixed Residue			

Check box & make notes if find:

- ☐ Asbestos-containing waste
- ☐ Excessive fines (ie from sand blasting):
- ☐ Solvent-soaked rags
- ☐ Dead animals

Notes on any Hazards:

Figure 3.2 Sample Tally Sheet

4.0 Statistical Analysis of Data

The sampling procedures outlined in ASTM D53 1-92 were referenced during the study but, a rigorous statistical approach was used to determine the number of samples needed and for interpretation of the sampling results.

The composition estimate denoted by x_j represents the ratio of the material's weight to the total sample weight for each noted group. It is derived by summing each material's weight across all of the selected samples and dividing by the sum of the total sample weight, as shown in the following equation:

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

where:

$\sum c$ = weight of particular material

$\sum w$ = sum of all material weights

for i = 1 to n, where n = number of waste sorts

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

A confidence interval of 90% for the estimate of the mean was chosen and the range of the percent concentration of each MSW component about its mean concentration was estimated. Based on non-parametric statistical methods a confidence interval about the median of the percent concentration of a particular component is defined in terms of the order statistic for the random sample from n waste sorts as:

$$P_r\left[Y_i \langle \varepsilon_{\frac{1}{2}} \langle Y_j\right] = \sum_{w=i}^{j=1} \frac{n!}{w!(n-w)!}\left(\frac{1}{2}\right)^n$$ Equation 1

In other words, n waste sorts are conducted to provide discrete values of percent concentration $[X(x_1, x_2, \ldots x_n)]$ for a particular solid waste component. The order statistic is then obtained by ranking the x_i in ascending order to obtain $[Y(y_1, y_2, \ldots y_n)]$. The $\left(\frac{n+1}{2}\right)^{th}$ order statistic $y_{(n+1)/2}$ is a point estimate for the median of the distribution and the confidence interval about the median is given by Equation 1 which is binomially distributed as b(n,1/2) with mean n/2 and variance n/4.

For a given n the confidence interval for the median is calculated between the i^{th} (y_i)and j^{th} (y_j) order statistics. Making the correction for the inequalities in Equation 1 for a continuous distribution and noting that for relatively large n the binomial probability given by Equation 1 can be estimated with probabilities associated with normal distributions gives;

$$P_r\left[(i-0.5)\ \langle\ \varepsilon_{\frac{1}{2}}\ \langle\ (j-0.5)\right]=\sum_{w=i}^{j=1}\frac{n!}{w!(n-w)!}\left(\frac{1}{2}\right)^n=b\left(n,\frac{1}{2}\right)=N\left(\frac{(j-0.5)-\left(n/2\right)}{\sqrt{n/4}}\right)-N\left(\frac{(i-0.5)-\left(n/2\right)}{\sqrt{n/4}}\right)$$

During this study these equations were solved numerically for real time calculation of the range of the 90 percent confidence interval (CI) about the means of the waste components. This approach basically determines the number of waste sorts (n) needed based on reaching the point where only small improvements in the CI are obtained by further sampling. In this method, the required numbers of waste sorts are updated while waste sorting is taking place in the field. Theoretically this approach could result in an iterative process of sampling and recalculation until a desired precision is achieved. However, this scenario is rarely achieved in any field sampling event. Nonetheless this approach (often used in environmental sampling) is the most practical plan for managing a solid waste sampling event.

The estimated 90% confidence limits from equation 1, with increasing numbers of waste sorts for plastics as a primary category, are depicted below in Figure 4.1. Note that the form of Figure 4.1 is dependent upon the order in which the waste sorts were obtained. This (order of sampling) may show initial instability in the trend of CI but as *n* increases, there is stability in the mean and CI.

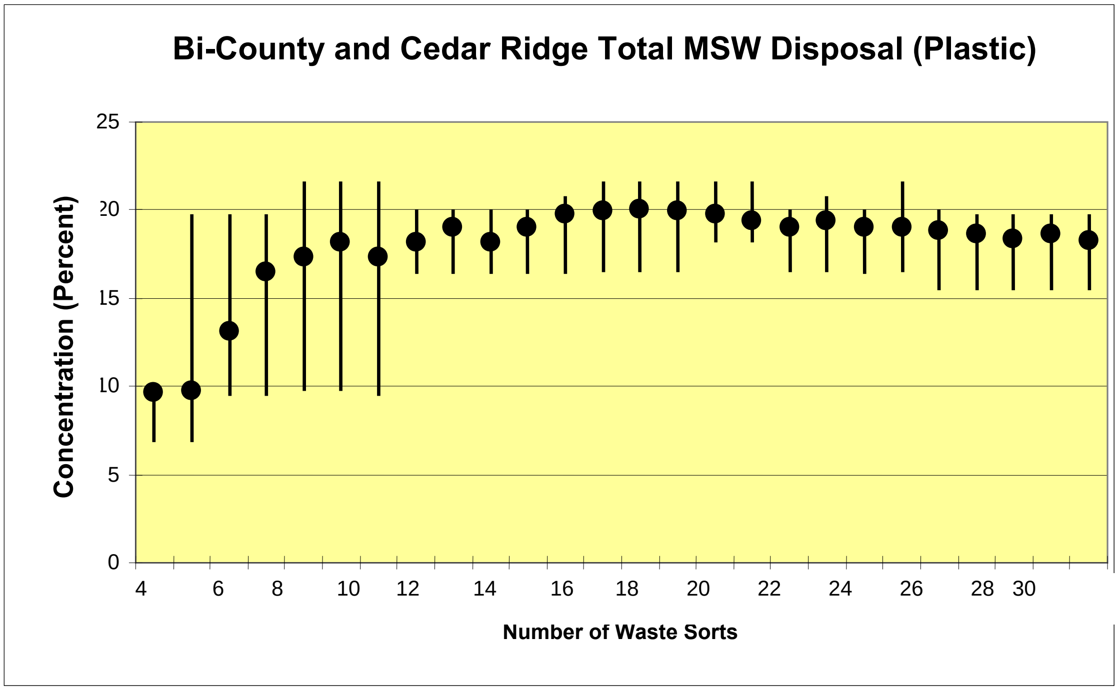

Figure 4-1 90 % Confidence Interval for Plastic Concentration for Total MSW for Bi-County and Cedar Ridge

As demonstrated in Figure 4.1, as the number of waste sorts is increased, there is a decreasing range for the 90% confidence interval (CI), hence indicating greater certainty of the estimate of the true percentage mean with increasing number of waste sorts. If the goal of the sampling effort had been to characterize the plastic component in total MSW disposal, Figure 4.1 indicates that significantly fewer (say half as many) waste sorts were needed for a similar accuracy in estimating the mean. This demonstrates the utility of this approach to minimize cost and needed resources while proving adequate accuracy. As a further illustration, Figure 4.2 depicts the same information for a subcategory of the data in Figure 4.1 and Figure 4.3 a subcategory of Figure 4.2.

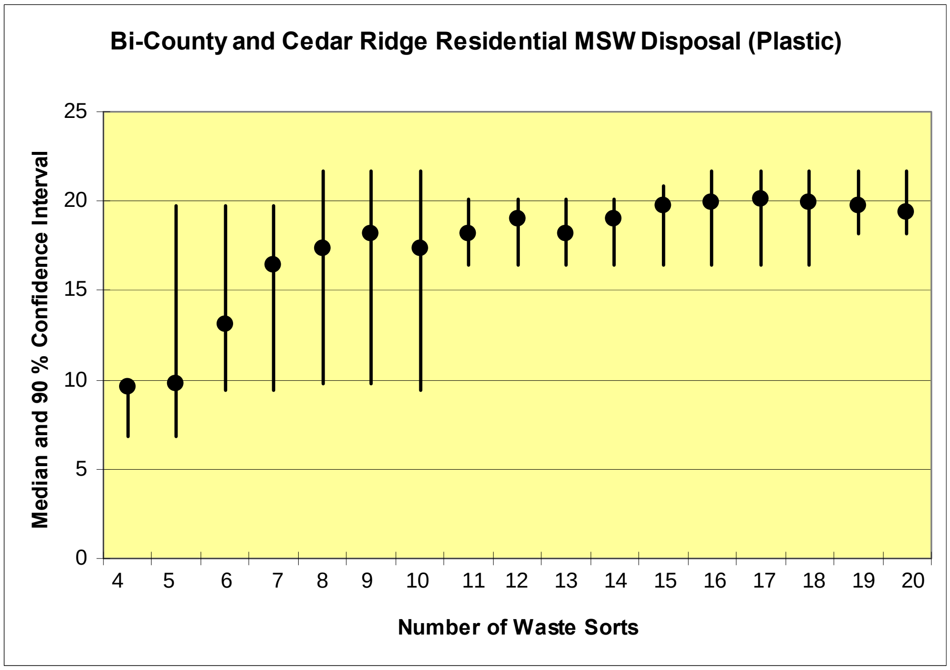

Figure 4-2 Mean and 90 % Confidence Interval for Plastic Composition for Bi-County and Cedar Ridge

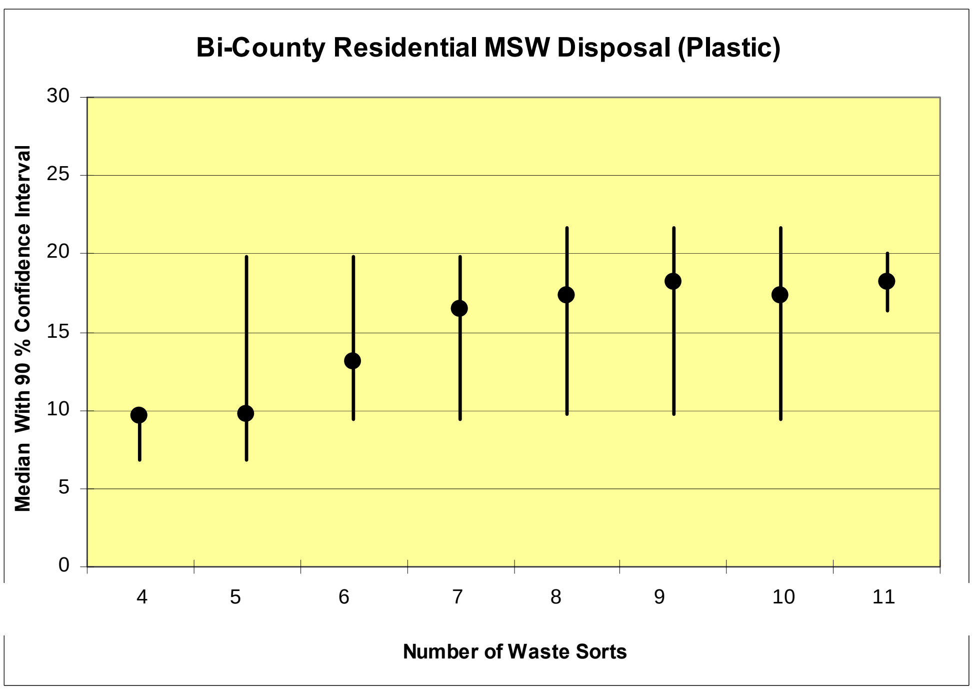

Figure 4-3 Mean and 90 % Confidence Interval for Plastic Composition for Bi-County Residential

Figure 4.4 depicts the 90% CI range versus numbers of waste sorts, for the primary categories of MSW disposed at Bi-County and Cedar Ridge. Figure 5 depicts the estimate of the mean concentration as a function of the number of waste sorts. Figures 4.4 and 4.5 indicate that there is a smaller range for all waste categories for the 90% CI with increasing *n*.. Two of the categories, namely paper and organics, demonstrate substantial fluctuations in the 90% CI, indicating that there is significant variability in the percentage of the waste sorts, However note that for n equals say 10 waste sorts the rate of decrease of the 90% CI with increasing *n* is small.

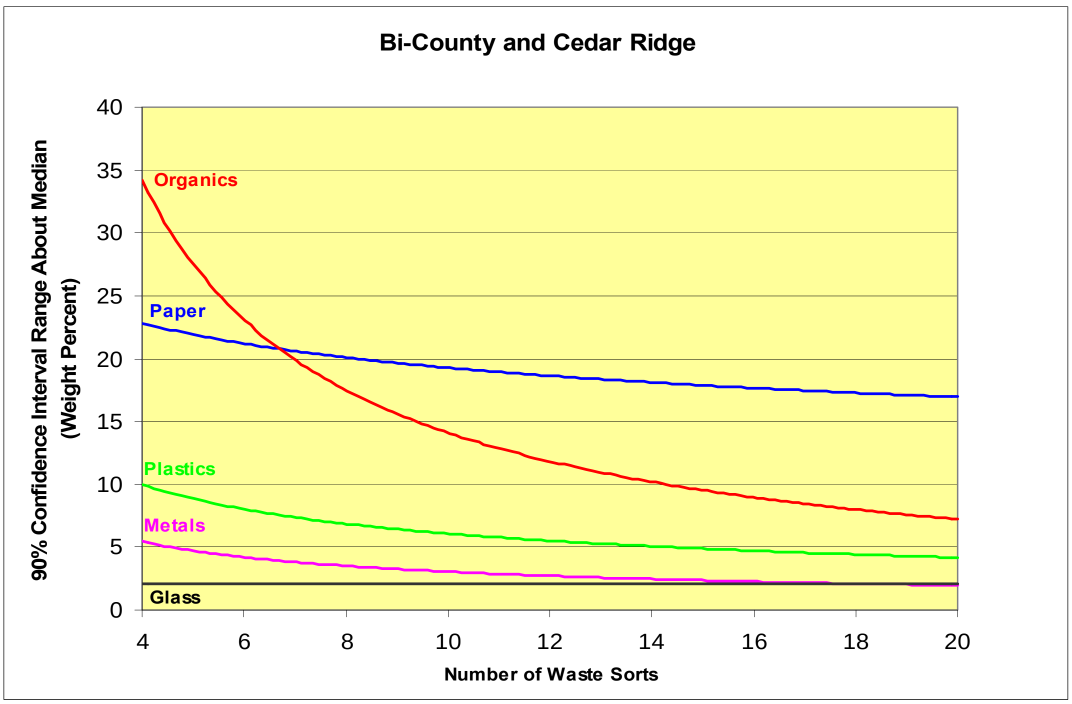

Figure 4-4 Decreasing Range of 90% Confidence Interval with Increasing Waste Sorts

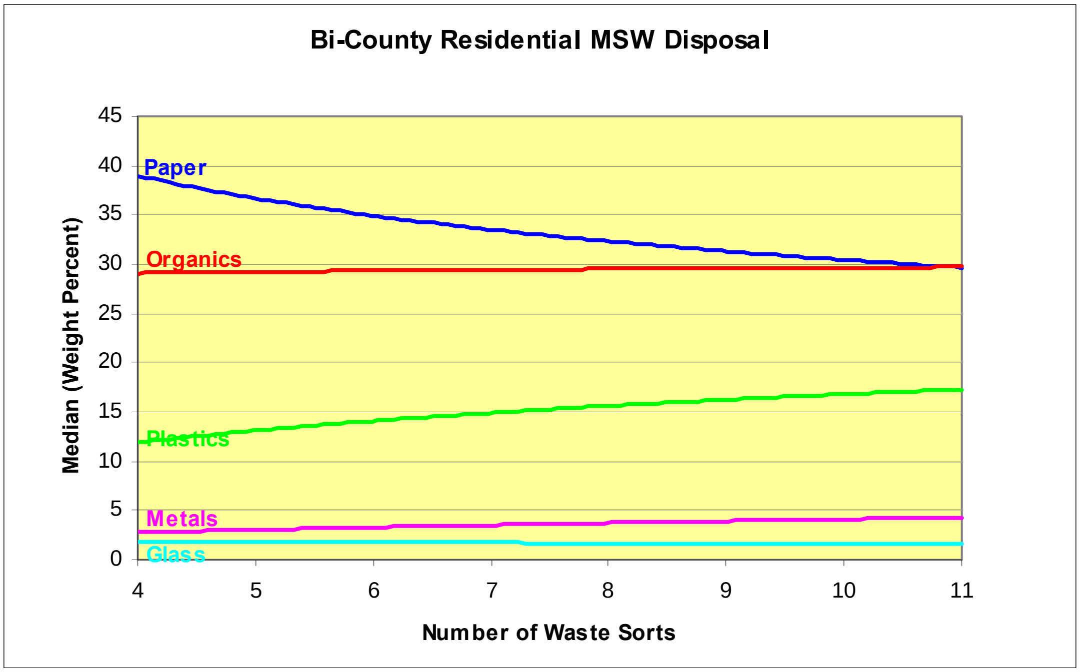

Figure 4-5 Decreasing Rate of Change in Mean Concentration with Increasing Waste Sorts

5.0 Composition of MSW Disposed at Bi-County and Cedar Ridge

This section provides a detailed summary of the composition of MSW disposed at the Bi-County and Cedar Ridge facilities. To adequately interpret these data, it is important to have a layman's understanding of the statistical analysis that was used to generate the results. Details of the statistical analysis are described in Section 4 of this report. Definition of material categories are provided in Appendix A.

5.1 Comparison to National and Georgia Statewide MSW Streams

As a way to validate the results of the study the combined results from the Bi-County and Cedar Ridge Facilities were compared to national data from the United States Environmental Protection Agency's ("EPA's") publication "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: 2003 Data Tables" and Georgia statewide MSW data from the 2005 Georgia Statewide Waste Characterization Study. The MSW data for this study of course differs from other states and jurisdictions and to some extent from the U.S. national data but gross differences could indicate analysis errors. Beyond that it is instrumental to solid waste planners to compare local results to national data and data from other jurisdictions. To facilitate this comparison all the data had to be categorized the same. These categories differ slightly from the categories for this study as presented in Section 5.2. It is recommended that the categories shown in Figure 5.4 be used in future studies.

Table 5-1 indicates that more paper is disposed, on average, at Bi-county and Cedar Ridge than in the rest of the country. The amount of wood disposal observed in this study is considerably less than in the national MSW stream. The difference in the observed wood disposal is at least partly due to Bi-Counties considerable efforts to divert wood from disposal. In any case, this difference does not invalidate the results of the study since wood is a small fraction of the waste stream. The disposal rate for wood will come more in line with the national data as the data from this initial study is clustered with future studies that target self haulers and C&D waste haulers

Table 5.1 Comparison to US MSW Disposal Stream						
Material Category	Bi-County and Cedar Ridge (%)	US (%)	% Diff (%)	σ (std dev)	90% CI	
					Low (%)	High (%)
Paper	32.09	26.3	18.05	15.70	27.30	36.89
Glass	5.06	6.2	-22.59	6.25	3.15	6.97
Metal	5.73	7.3	-27.33	3.60	4.63	6.83
Plastics	17.08	15.4	9.85	9.28	14.25	19.92
Food Scraps	15.28	16.4	-7.36	11.42	11.79	18.76
Yard Trimmings	6.38	7.6	-19.10	10.13	3.29	9.48
Rubber Leather & Textiles	5.35	9.00	-68.33	6.03	3.51	7.19
Wood	1.34	7.50	-457.67	1.86	0.78	1.91
Other	11.70	4.20	64.10	10.42	8.52	14.88

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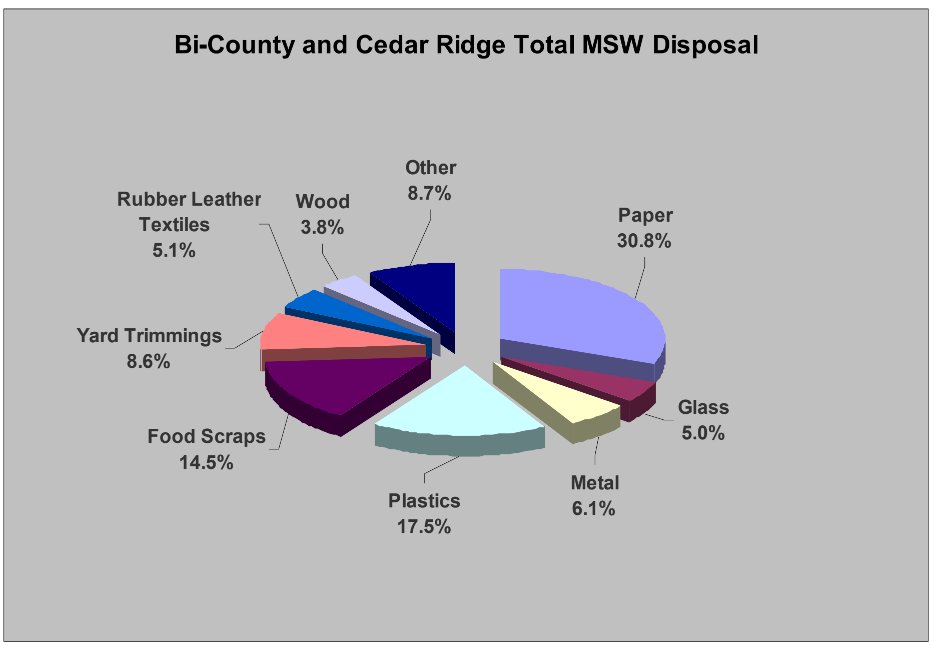

Figure 5-1 Aggregate composition of major material groups in the samples from the Bi-County and Cedar Ridge facilities. As shown, paper, plastics and food scraps make up the largest fractions of the waste stream.

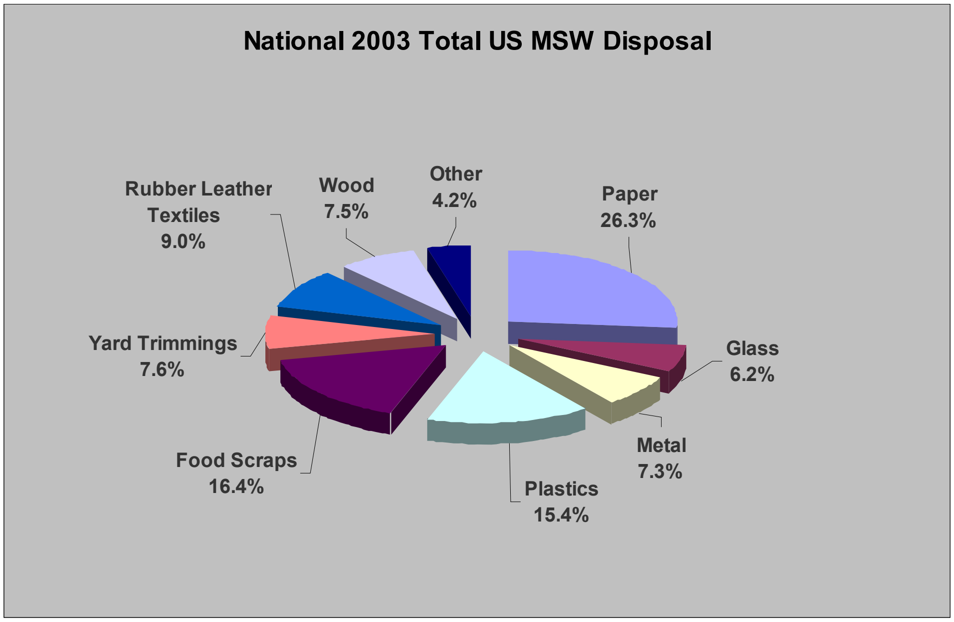

Figure 5-2 Aggregate composition of major material groups disposed in the United States MSW in 2003

Table 5.2 Comparison to Georgia MSW Stream

Material Category	Bi-County and Cedar Ridge (%)	Georgia Disposal (%)	% Diff (%)	σ (std dev)	90% CI	
					Low (%)	High (%)
Paper	32.09	38.7	-20.59	15.70	27.30	36.89
Glass	5.06	3.7	26.84	6.25	3.15	6.97
Metal	5.73	7.4	-29.08	3.60	4.63	6.83
Plastics	17.08	15.8	7.51	9.28	14.25	19.92
Food Scraps	15.28	12	21.44	11.42	11.79	18.76
Yard Trimmings	6.38	2.7	57.69	10.13	3.29	9.48
Rubber Leather & Textiles	5.35	5.6	-4.74	6.03	3.51	7.19
Wood	1.34	4.4	-227.17	1.86	0.78	1.91
Other	11.70	9.8	16.24	10.42	8.52	14.88

As indicated in Table 5.2, Georgia's paper disposal rate is considerably higher than the rate observed in this study but Georgia's paper disposal rate is much higher than the national rate. The Georgia Comprehensive Solid Waste

Management Act places restrictions on yard waste in Georgia's MSW stream, therefore a lower than average amount of yard waste is expected. The explanation for the much lower rate of wood disposal is the same as above for the comparison to national data.

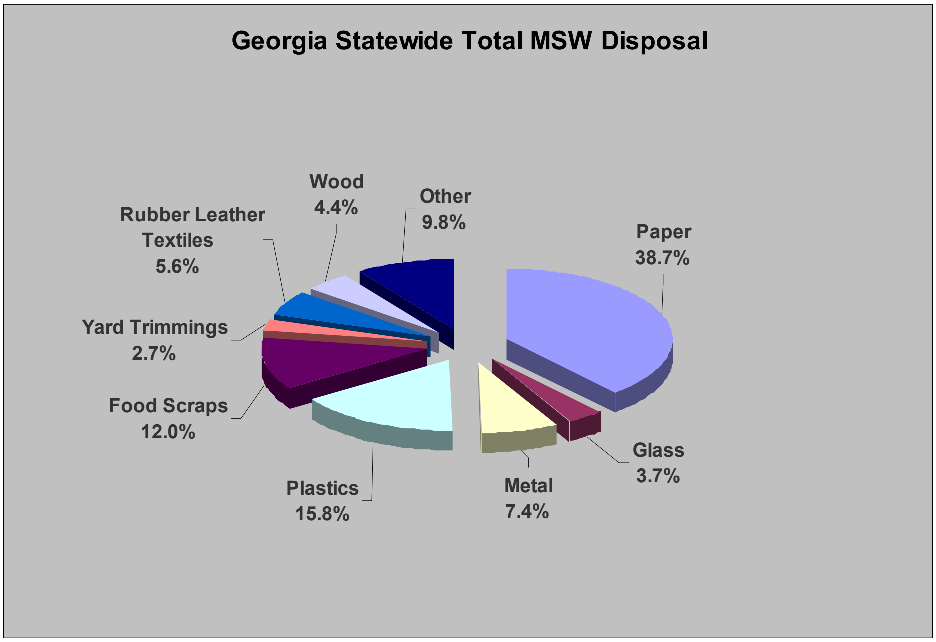

Figure 5-3 Aggregate composition of major material groups in Georgia's MSW stream. .

Table 5-3 Comparison to Georgia Residential MSW Stream						
Material Category	**Bi-County and Cedar Ridge (%)**	**Georgia Disposal (%)**	**% Diff (%)**	**σ (std dev)**	**90% CI**	
					Low (%)	**High (%)**
Paper	29.55	37.1	-25.56	15.70	27.30	36.89
Glass	5.18	4.6	11.15	4.55	3.67	6.45
Metal	5.64	5.1	9.59	3.60	4.63	6.83
Plastics	18.63	16.6	10.90	9.28	14.25	19.92
Food Scraps	17.73	13.4	24.40	11.42	11.79	18.76
Yard Trimmings	6.39	2.1	-1.07	10.13	3.29	9.48
Rubber Leather & Textiles	5.27	5.1	3.19	6.03	3.51	7.19
Wood	0.86	2.7	-214.08	1.86	0.78	1.91
Other	10.75	13.3	11.75	9.46	8.11	13.89

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As shown in Figure 5.3, the combined Bi-County and Cedar Ridge residential waste stream is very similar to Georgia's statewide residential waste stream. Again the observed wood disposal rate is considerably less than Georgia's statewide rate.

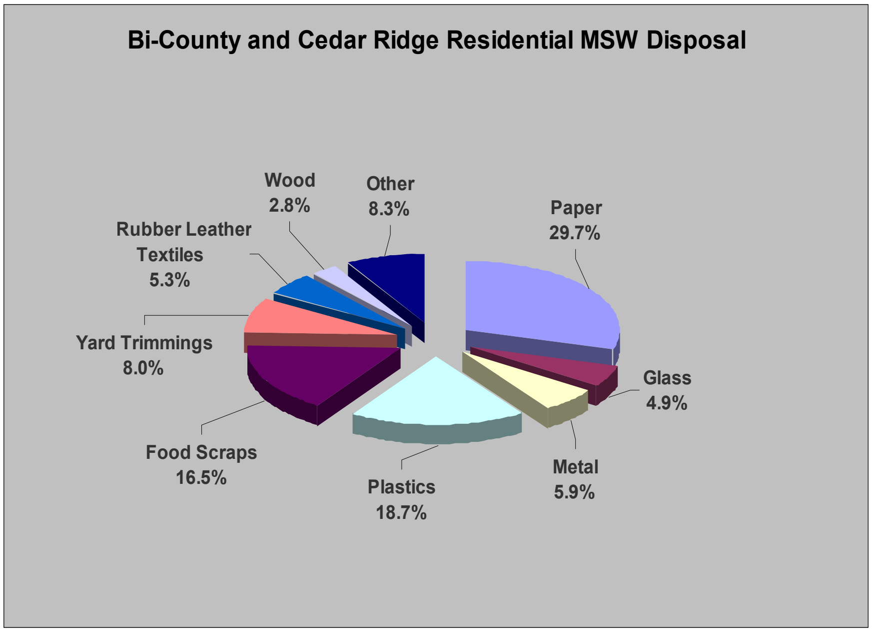

Figure 5-4 Residential MSW composition of major material groups in the samples from the Bi-County and Cedar Ridge facilities.

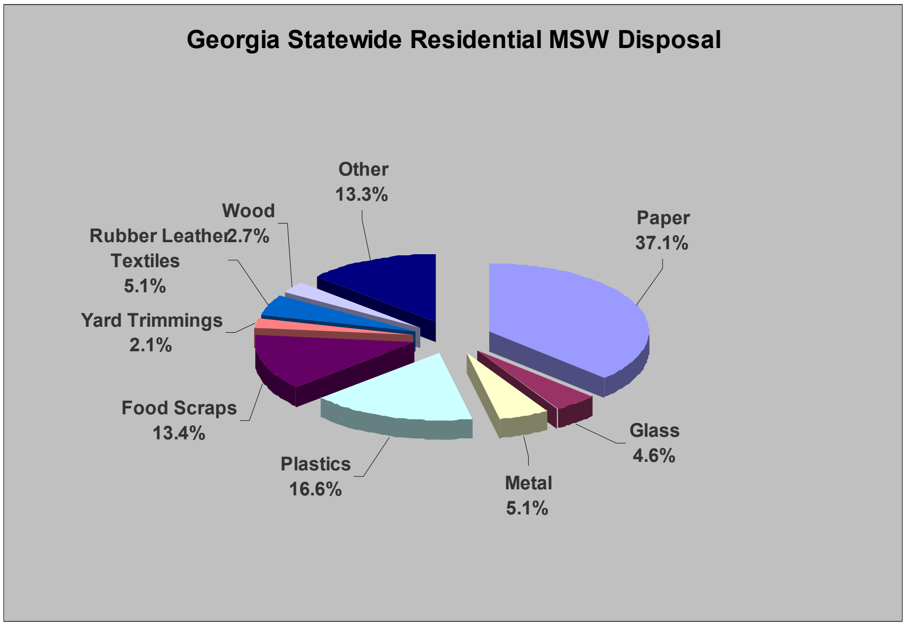

Figure 5-5 Composition of Major Material Groups in Georgia's Residential MSW stream. From the 2005 Georgia Statewide Waste Characterization Study.

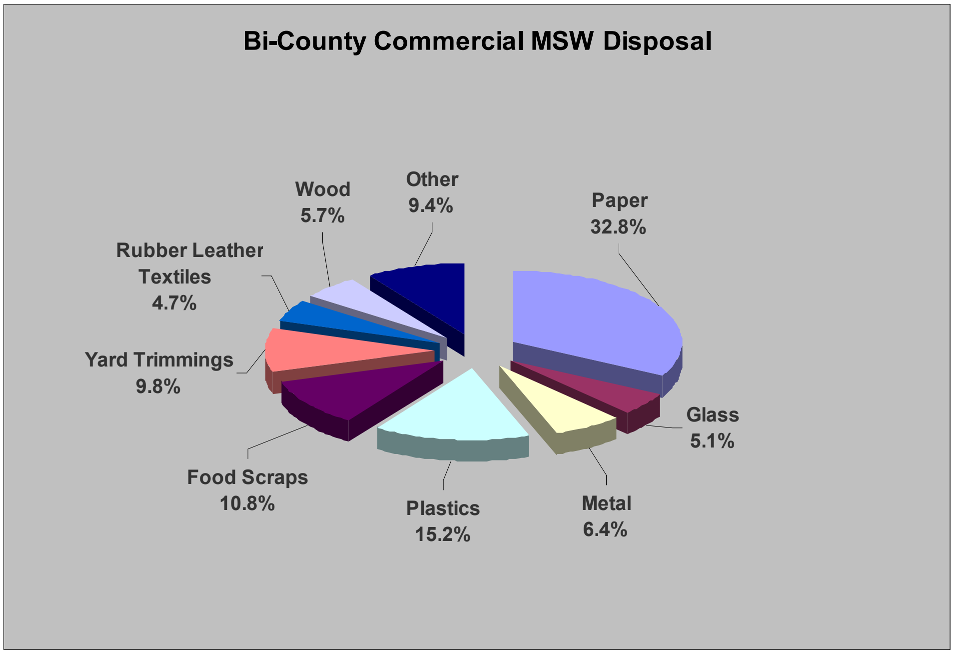

Figure 5-6 MSW composition of major material groups in Commercial MSW in samples from the Bi-County facility. As shown, paper, plastics and food scraps make up the largest fractions of the waste stream.

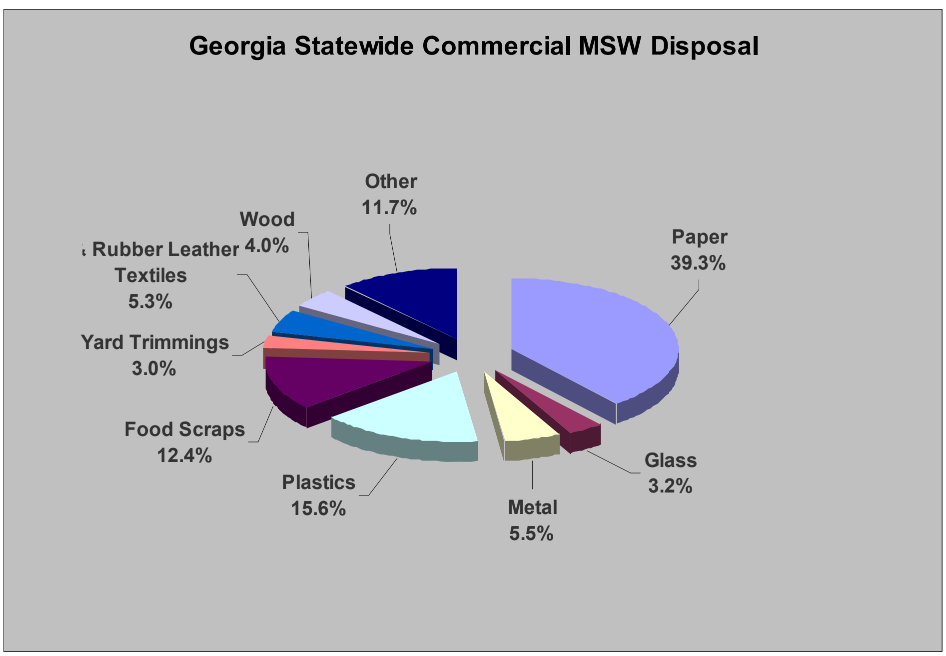

Figure 5-7 Georgia's Disposed Residential MSW. From the 2005 Georgia Statewide Waste Characterization Study

5.2 Detailed Composition from Residential and Commercial Sampling

Table 5-4 Subcategory Concentrations for Bi-County and Cedar Ridge				
Category	**Material**	**Residential**	**Commercial**	**Combined**
Paper		**(%)**	**(%)**	**(%)**
	Corrugated Cardboard	9.69	8.79	9.62
	Paper Bags/Kraft	0.89	2.05	1.25
	Newspaper	3.02	4.09	3.35
	White Ledger	2.47	6.05	3.61
	Colored Ledger	0.65	1.49	0.90
	Magazines	2.85	3.79	3.19
	Phone Books	0.62	1.77	0.95
	Other Paper	0.56	1.81	0.94
	Composite Paper	8.79	7.21	8.29
	All Paper	**29.55**	**37.03**	**32.09**
Glass				
	Clear Glass	2.63	1.84	2.38
	Green Glass	0.58	0.77	0.60
	Brown Glass	1.68	1.30	1.56
	Composite Glass	0.29	1.04	0.52
	All Glass	**5.18**	**4.94**	**5.06**
Organics				
	Food	17.73	9.61	15.28
	Leaves and Grass	4.31	4.52	4.47
	Prunings and Trimmings	2.08	1.68	1.91
	All Organics	**24.11**	**15.81**	**21.65**
Textiles				
	Textiles	5.27	5.42	5.35
	All Textiles	**5.27**	**5.42**	**5.35**
Metal				
	Tin/Steel Cans	0.97	0.53	0.79
	Other Ferrous	2.96	2.53	2.87
	Aluminum Cans	1.14	0.97	1.06
	Other Non-Ferrous	0.29	0.63	0.39
	Composite Metal	0.29	1.36	0.62
	All Metal	**5.64**	**6.02**	**5.73**

Table 5-4 Subcategory Concentrations for Bi-County and Cedar Ridge				
Category	**Material**	**Residential (%)**	**Commercial (%)**	**Combined (%)**
Paper				
	Corrugated Cardboard	9.69	8.79	9.62
	Paper Bags/Kraft	0.89	2.05	1.25
	Newspaper	3.02	4.09	3.35
	White Ledger	2.47	6.05	3.61
	Colored Ledger	0.65	1.49	0.90
	Magazines and Catalogs	2.85	3.79	3.19
	Phone Books etc.	0.62	1.77	0.95
	Other Paper	0.56	1.81	0.94
	Composite Paper	8.79	7.21	8.29
	All Paper	**29.55**	**37.03**	**32.09**
Glass				
	Clear Glass Containers	2.63	1.84	2.38
	Green Glass Containers	0.58	0.77	0.60
	Brown Glass Containers	1.68	1.30	1.56
	Composite Glass	0.29	1.04	0.52
	All Glass	**5.18**	**4.94**	**5.06**
Special				
	Paint	1.10	1.63	1.29
	Batteries	0.13	0.27	0.16
	Composite Household	0.23	0.59	0.32
	All Household Special	**1.45**	**2.49**	**1.77**

Table 5-4 Subcategory Concentrations for Bi-County and Cedar Ridge				
Category	**Material**	**Residential Concentration (%)**	**Commercial (%)**	**Combined %**
Plastic				
	PETE Containers	2.48	1.32	2.05
	#2 - #7 Containers	2.51	1.69	2.23
	Plastic Grocery	1.15	1.10	1.11
	Commercial Packaging Film	0.65	0.67	0.64
	Other Film	1.86	2.11	1.95
	Durable Plastic Items	0.62	0.82	0.65
	Composite Plastic	1.95	0.79	1.55
	Diapers	4.59	1.71	3.55
	All Plastic	**18.63**	**14.65**	**3.36**
C&D				
	Asphalt Roofing	1.16	1.91	1.31
	Lumber	0.86	2.41	1.34
	Treated Wood Waste	1.74	2.45	1.84
	Rock, Soil, and Fines	0.10	0.20	0.13
	Composite C&D	0.21	0.34	0.25
	All C&D	**4.07**	**7.29**	**4.87**
Electronics				
	All Electronics	**1.53**	**1.84**	**1.66**
Fines				
	All Fines	**4.57**	**4.51**	**4.73**

5.3 Comparison of the MSW Stream for Bi-County and Cedar Ridge

Sampling Results were used to compare residential MSW disposal at the Bi-County and Cedar Ridge facilities. The area served by the Bi-County facility is largely urban and the area serving the Cedar Ridge facility is largely rural. The average concentrations of several of the major waste categories were significantly different. However, when the ranges of the 90% confidence intervals are compared in Figures 5.10 and 5.11only the C&D distributions are clearly statistically different. The ranges for plastics subcategories were investigated further in Figures 5.12 and 5.13. The results of these comparisons indicate that significantly less C&D waste and less mixed plastic waste are entering the Bi-County facility from residential sources. The confidence intervals are based on non-parametric analysis of ten residential samples from each facility and consequently the 90 percent confidence ranges are large. More elaborate analysis of the differences of rural and urban waste streams will be possible when results from sampling other Tennessee jurisdictions are clustered with the results from this study. Seasonal sampling at Bi-County and Cedar Ridge could also be combined to increase the accuracy of the composition estimates.

Table 5-5 Comparison of Bi-County and Cedar Ridge Residential

Material Category	Bi-County Disposal (%)	Cedar Ridge Disposal (%)	Difference (%)
Paper	32.76	26.33	-19.62
Glass	4.51	5.84	29.37
Metal	5.27	6.01	14.01
Electronics	1.99	1.07	-45.96
Plastics	14.10	23.16	64.32
Organics	31.58	27.19	-13.92
Textiles	5.27	5.42	5.35
C&D	1.24	6.89	453.38
Household Special	1.42	1.49	5.22
Fines	7.13	2.01	-71.74

Table 5-6 90 % CI for Cedar Ridge Residential MSW				
Material Category	Cedar Ridge (%)	Difference (%)	90% CI	
			Low (%)	High (%)
Paper	26.33	-19.62	19.89	32.77
Glass	5.84	29.37	3.57	8.11
Metal	6.01	14.01	4.77	7.25
Electronics	1.07	-45.96	-0.17	2.32
Plastics	23.16	64.32	17.81	28.52
Organics	22.37	-13.92	17.13	27.62
Textiles	4.81	5.35	2.73	6.90
C&D	6.89	453.38	3.93	9.84
Household Special	1.49	5.22	0.35	2.64
Fines	2.06	-71.74	1.46	2.66

Table 5-7 90 % CI for Bi-County Residential MSW				
Material Category	Bi-County (%)	Difference (%)	90% CI	
			Low (%)	High (%)
Paper	32.76	-19.62	25.08	40.44
Glass	4.51	29.37	1.51	7.52
Metal	5.27	14.01	2.61	7.93
Electronics	1.99	-45.96	0.00	6.45
Plastics	14.10	64.32	9.90	18.29
Organics	25.86	-13.92	18.52	33.20
Textiles	5.72	5.35	1.23	10.22
C&D	1.24	453.38	0.38	2.11
Household Special	1.42	5.22	0.00	3.46
Fines	7.13	-71.74	3.90	14.93

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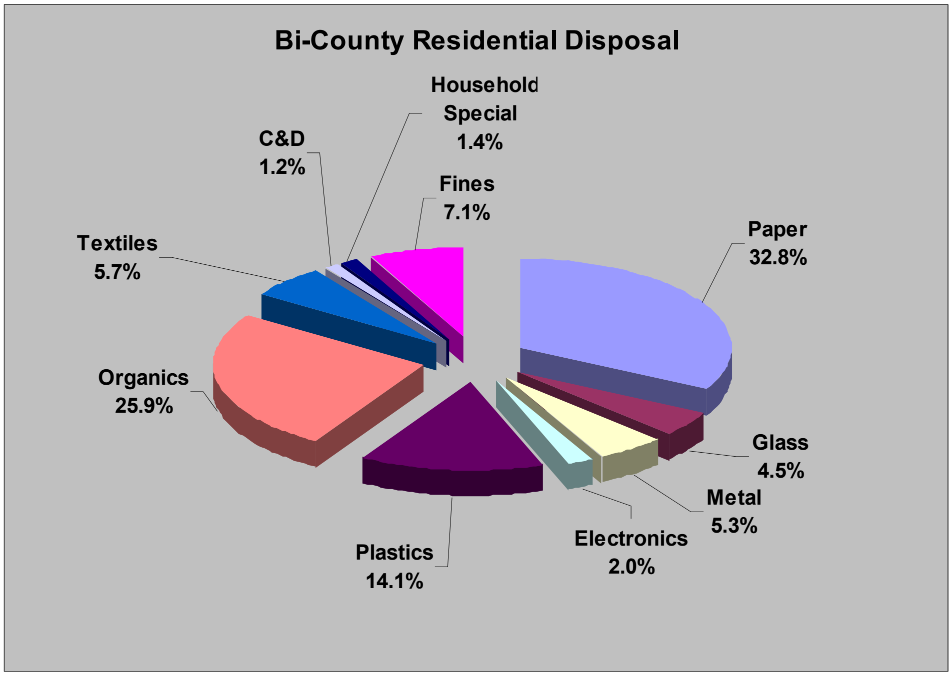

Figure 5-8 Composition of Major Material Groups in Residential MSW from Bi-County. As shown, paper, plastics and organics make up the largest fractions of the waste stream.

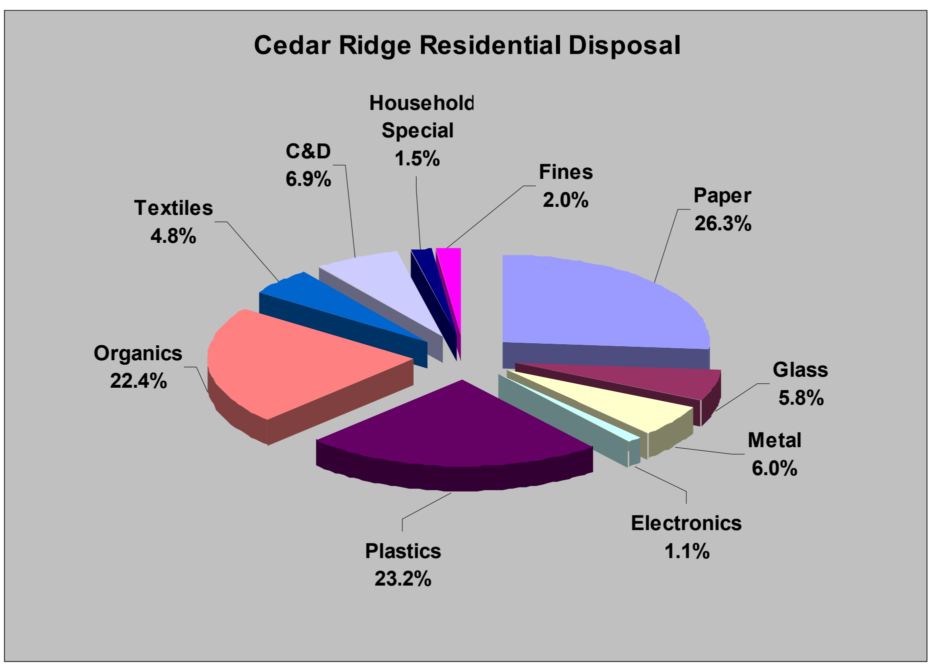

Figure 5-9 Composition of major material groups in Residential samples from the Cedar Ridge facility. As

shown, paper, plastics and organics make up the largest fractions of the waste stream.

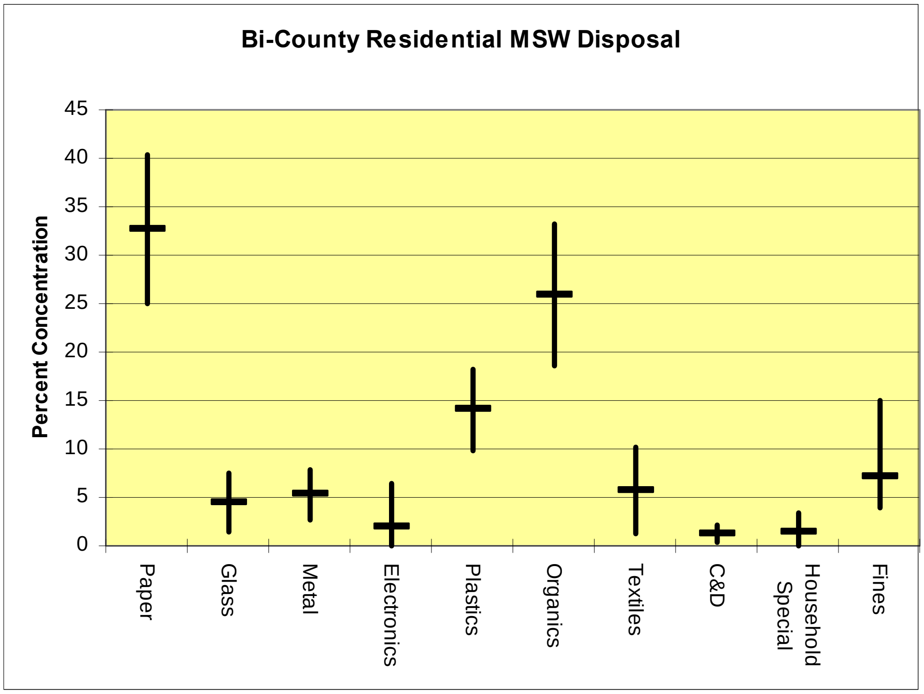

Figure 5.10 90% Confidence Ranges for Major Waste Categories in Bi-County Residential MSW

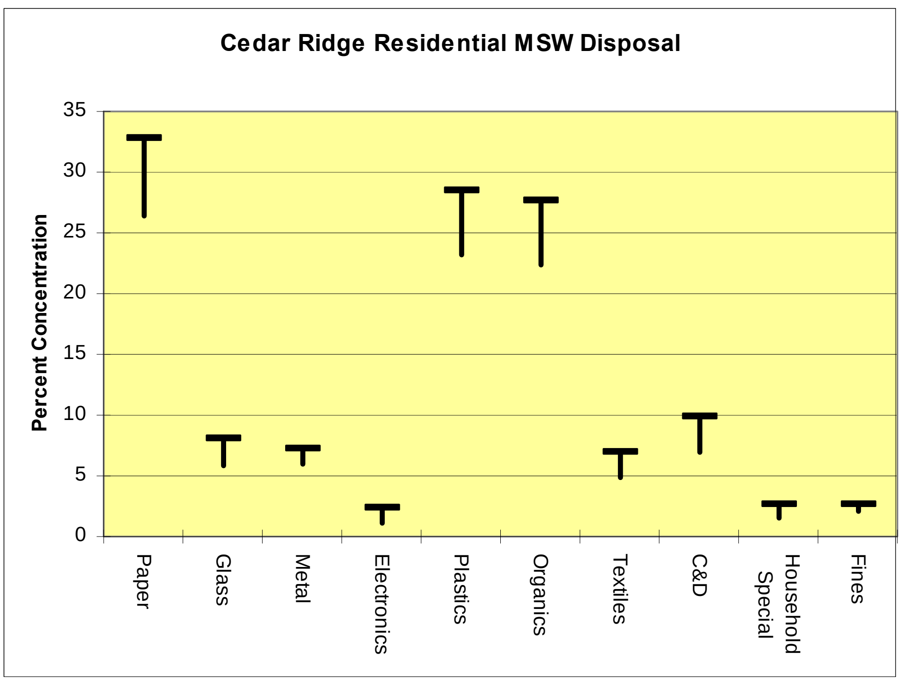

Figure 5.11 90% Confidence Ranges for Major Waste Categories in Cedar Ridge Residential

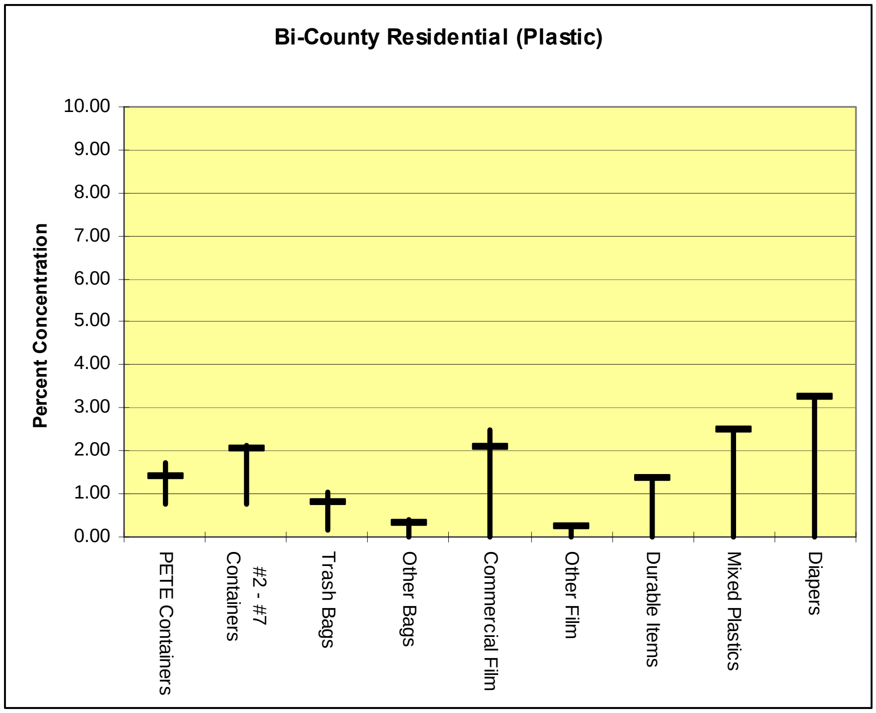

Figure 5.12 90% Confidence Ranges for Plastic Waste Subcategories in Bi-County Residential MSW

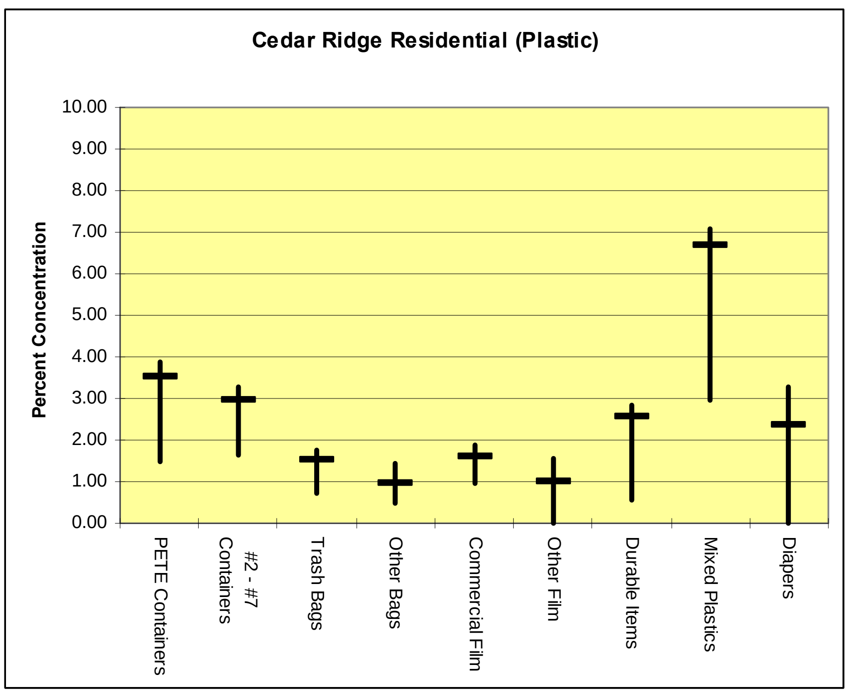

Figure 5.13 90% Confidence Ranges for Plastic Waste Subcategories in Cedar Ridge Residential MSW

5.4 Tennessee Statewide MSW Disposal

Tennessee generated 13,371,000 tons of solid waste in 2005 (11,889,888 tons of MSW and 1,481,112 tons of C&D waste). 5,209,777 tons of the MSW stream was diverted and the balance of 6,683,111 tons of MSW was disposed in Tennessee landfills. The sampling results from Table 5.4 were used in conjunction with Tennessee 2005 MSW generation data to generate the results in this section. The extrapolation of the sampling results to the statewide MSW disposal is used for estimating parameters in Section 6 to assist TDEC in its efforts to plan and implement MSW material bans.

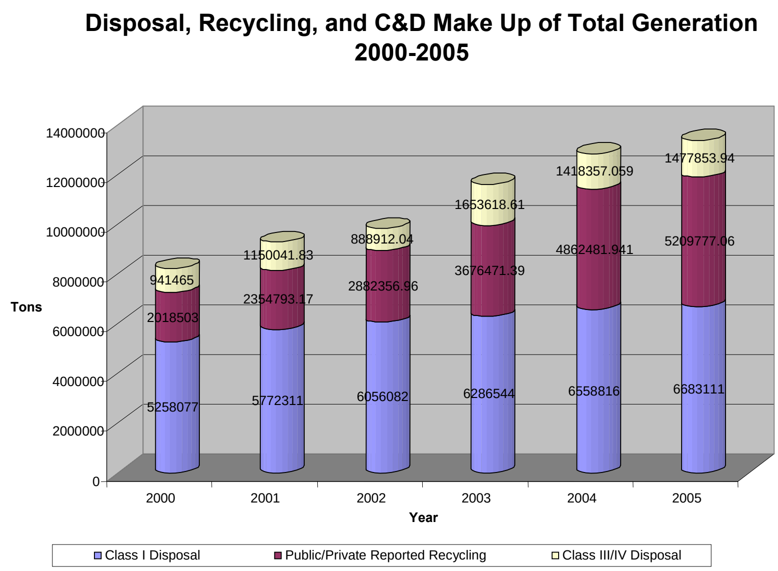

Figure 5.14 Fate of Tennessee solid waste stream in 2005

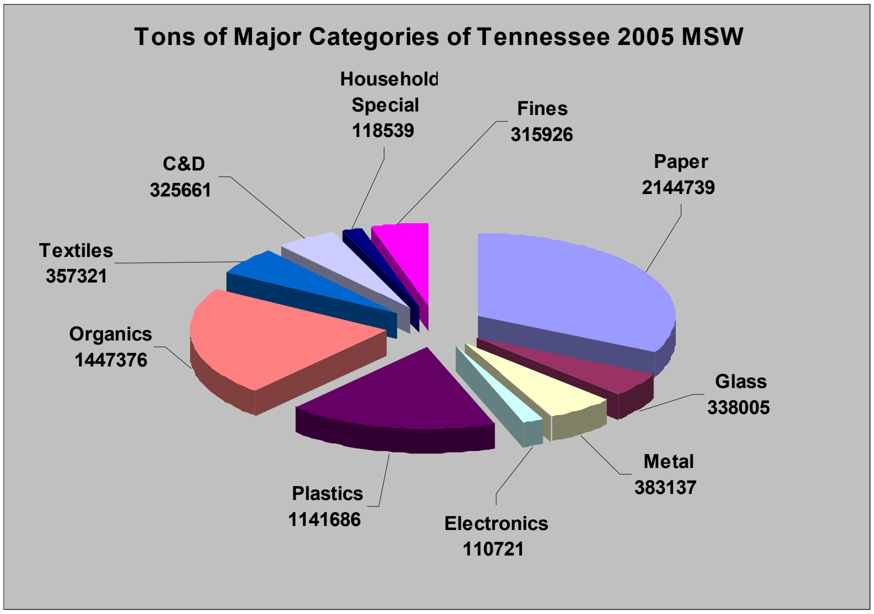

Figure 5.15 Tons of Major MSW Components Disposed in Tennessee in 2005

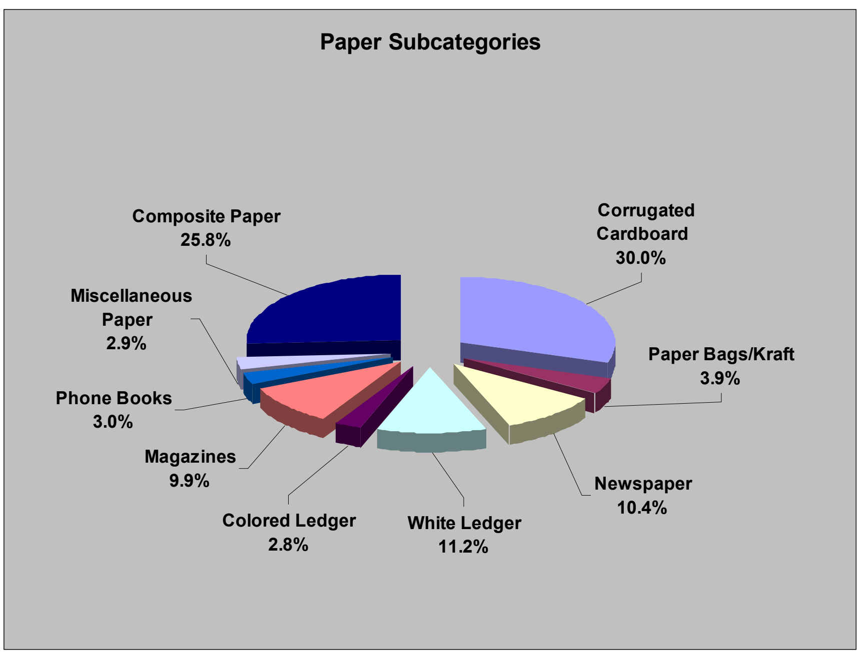

Figure 5.16 Distribution of Paper Subcategories

Table 5.8 Distribution of Paper Subcategories			
Category	**Material**	**Percent of Paper Category (%)**	**Disposed in Tennessee 2005 (Tons)**
Paper			
	Corrugated Cardboard	30.0	642829.47
	Paper Bags/Kraft	3.9	83397.43
	Newspaper	10.4	223678.76
	White Ledger	11.2	241222.61
	Colored Ledger	2.8	59935.44
	Magazines	9.9	213085.48
	Phone Books etc.	3.0	63704.77
	Other Paper	2.9	63059.35
	Composite Paper	25.8	553826.03
	All Paper		**2144739.35**

Table 5.9 Distribution of Organic Subcategories			
Category	**Material**	**Percent of Organics Category (%)**	**Disposed in Tennessee 2005 (Tons)**
Organics			
	Food Scraps	70.5	1020899
	Leaves and Grass	20.7	298953
	Prunings and Trimmings	8.8	127524
	All Organics		**1447376**

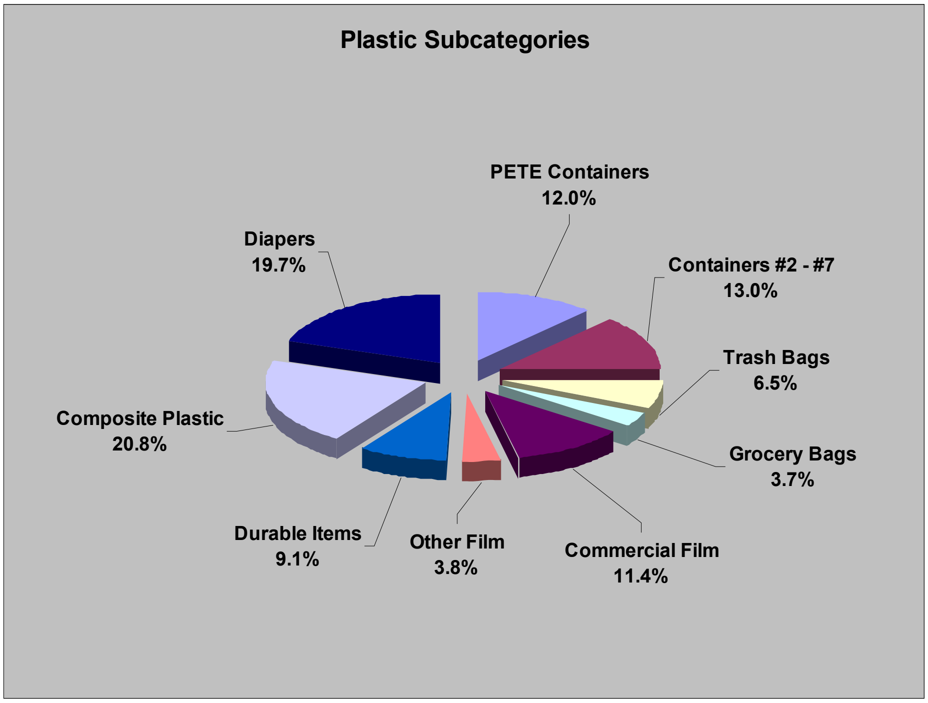

Figure 5.17 Distribution of Plastic Subcategories

Table 5.10 Distribution of Plastic Subcategories

Category	Material	Percent of Plastic Category (%)	Disposed in Tennessee 2005 Tons
Plastics			
	PETE Containers	12.0	136901
	#2 - #7 Containers	13.0	148763
	Trash Bags	6.5	74412
	Grocery Bags	3.7	42445
	Commercial Film	11.4	130520
	Other Film	3.8	43642
	Durable Items	9.1	103475
	Composite Plastic	20.8	237123
	Diapers	19.7	224404
	All Plastic		**1141686**

6.0 Impact of Specific Material Disposal Bans

Estimates of the disposal rates of major waste categories shown in Figure 5.15 indicate that paper, plastic and organics make up over 70 percent of MSW disposal in Tennessee. These categories and their subcategories were targeted for specific material bans.

This section presents estimates of parameters needed for cost benefits analysis of specific material disposal bans. This report focuses on the environmental impact of material bans but some insight is provided regarding financial parameters. The full range of parameters that must be weighed in regard to planning for and implementing material disposal bans are presented below in Table 6.1. This study focuses on the parameters highlighted in the table. These parameters will assist TDEC in its efforts to choose what waste components to target with material disposal bans. These parameters will also facilitate TDEC's efforts to educate the public with regard to environmental impacts of the bans.

Estimates of the net potential landfill diversion (tons) is based on the compositions for the major waste categories and their subcategories shown in Table 5.4. These compositions were applied to Tennessee statewide MSW disposal for 2005 to give an estimate of potential tons diverted for a particular material ban. The accuracy of this approach will improve as TDEC continues to study the characteristics of Tennessee MSW. However this initial estimate is valid as indicated by the comparison of the results of this study to national average MSW composition.

The landfill capacity savings ($) was then estimated using an assumed average tipping fee of $30.00. Landfill space savings were estimated based on USEPA "Weight-to-Volume Standards". In every case the landfill compacted bulk densities were used. In cases were ranges of bulk density was provided the values were taken at mid range. Greenhouse Gas (GHG) Reduction was estimated using USEPA Waste Reduction Model (WARM). Examples of WARM output are provided in Appendix B and GHG reduction factors used in the model are provided in Appendix C.

Table 6.1 Parameters for Planning and Implementing Material Bans	
Parameter Type	Criteria
Financial	**Annualized Capital costs in 2008 dollars ($)**
	Annual Operating Cost ($)
	Operating Costs per ton ($/ton)
	Landfill Lifecycle Capacity savings ($/ton)
Environmental	**Net Diversion Potential (tons)**
	Greenhouse Gas Reduction Potential (tons)
	Potential Landfill space saving (cubic yards)
Social	**Accessibility, Convenience and Acceptance**

Evaluation parameters for the paper, plastic and organic waste categories and their readily recyclable subcomponents are shown in Figure 6.2. These evaluation parameters focus on GHG reduction and maximizing MSW diversion rates. Limiting recommendations to these wastes is largely a function of the scope of this study. For example certain components of C&D waste have low bulk densities and high GHG generation factors but this study focuses on MSW.

Diversion of paper waste results in relatively greater GHG reductions and paper's low bulk density also results in relatively higher landfill space savings. As indicated in Table 6.2 there is still significant potential reductions in GHG and landfill space in increasing the recycle rate of some waste components that are currently recycled at high rates. For example note the potential savings associated with corrugated cardboard.

Food waste is dense and composed of about 70 percent water and consequently the potential landfill space and GHG savings for food waste is relatively lower. However methane generation and nuisance impacts associated with food waste have to be weighed. Perhaps the most important consideration supporting a ban on food waste is the fact that food waste commingles with the other recyclables making it much more difficult to increase recycle rates of other waste components.

Table 6.2 Estimation of Parameters for Evaluation of Disposal Bans					
Category	**Material Banned**	**Net Diversion Potential[1] tons**	**Greenhouse Gas Reduction[2] (MTCE[5])**	**Landfill Space Savings[3] yd^3**	**Landfill Capacity Savings[4] $**
Paper					
	Corrugated Cardboard	642,829	601,022	3,214,147	$19,284,884
	Newspaper	223,679	116,467	520,183	$6,710,363
	White Ledger	241,223	377,631	771,912	$7,236,678
	All Paper	**2,144,739**	**2,012,326**	**7,726,940**	**$64,342,180**
Plastic					
	PETE Plastic	136,901	59,384	531,656	$4,107,045
	HDPE Plastic	148,763	58,204	330,585	$4,462,896
	All Plastic	**1,141,686**	**458,249**	**3,112,806**	**$34,250,586**
Organics					
	Food Scraps	1,020,899	244,276	1,361,198	$30,626,959
	Yard Trimmings	298,953	-5,192	1,594,416	$8,968,592
	Leaves and Grass	127,524	-31,454	248,827	$3,825,718
	All Organics	**1,447,376**	**207,630**	**3,204,442**	**$43,421,269**

1 Estimated based on Tennessee MSW disposal in 2005 and combined results from Bi-County and Cedar Ridge
2 Estimated based on net diversion potential using USEPA Waste Reduction Model (WARM), 9/08 revision
3 Estimated based on net diversion potential using USEPA "Standard Volume-to-Weight Conversion Factors
4 Estimated based on net diversion potential and assuming a tipping fee of $30.00
5 Metric Tons Carbon Equivalent1 metric ton carbon equivalent = 3.667 metric tons of CO_2 equivalent.

Adequate infrastructure to process some materials at much higher rates in support of material bans may not currently exist in some jurisdictions in

Tennessee. Estimates for the annualized capital costs and annual operating costs of processing facilities will depend on the size of the waste stream being processed. Initial work needs to be done to determine the likely distribution of facilities (local or regional) and what specific processes will be promoted (recycling, composting, anaerobic digestion, energy conversion etc.). Commodity prices and channel to market considerations will also play a role. The bottom line is that these facilities have to be profitable operating at tipping fees low enough to provide the needed incentive for their utilization. The initial costing for these facilities should be based on case studies of existing operations and the input of equipment vendors and solid waste service providers. In most cases determining the financial parameters in Table 6.1 would involve engineering scale-up calculations based on pilot scale facilities or existing facilities. In any case, financial parameters can be used in conjunction with the results of this study to plan and implement MSW disposal bans.

References

1 Georgia Statewide Waste Characterization Study-Final Report, June 22,2005.

2 A methodology for solid waste characterization based on diminishing marginal returns, M. Sharma and E. McBean, 5 April 2006.

.
3 ASTM, 1992. Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste. D523 1-92, September.

4 Tchobanoglous et al., 1993 G. Tchobanoglous, H. Theisen and S. Vigil, Integrated Solid Waste Management, McGraw-Hill Inc., New York (1993).

5 Introduction to Mathematical Statistics, R. Hogg, A. Craig, Fourth Edition, Macmillan Publishing, New York,NY,1978

6 National Source Reduction Characterization Report,USEPA,EPA530-R-99-034,Nov.1999, www.epa.gov/osw

7 California Integrated Waste Management Board, Statewide Waste Characterization Study, Dec. 1999.

8 USEPA, Volume-to-Weight Conversion Factors http://www.epa.gov/epawaste/conserve/tools/recmeas/docs/guide_b.pdf

9 USEPA Waste Reduction Model (WARM) http://epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

10 USEPA, Municipal Solid Waste, Recycling, and Disposal in the United States, 2003 Data Tables.

Appendix A:
List and Definitions of Material Types

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PAPER		
1	**Uncoated Corrugated Cardboard**	**Uncoated Corrugated Cardboard** usually has three layers. The center wavy layer is sandwiched between the two outer layers. It does not have any wax coating on the inside or outside. Examples include entire cardboard containers, such as shipping and moving boxes, computer packaging cartons, and sheets and pieces of boxes and cartons. This type does not include chipboard.
2	**Paper Bags/Kraft**	**Paper Bags** means bags and sheets made from Kraft paper. Examples include paper grocery bags, fast food bags, department store bags, and heavyweight sheets of Kraft packing paper.
3	**Newspaper**	**Newspaper** means paper used in newspapers. Examples include newspaper and glossy inserts, and all items made from newsprint, such as free advertising guides, election guides, plain news packing paper, stapled college schedules of classes, and tax instruction booklets.
4	**White Ledger**	**White Ledger** means uncolored bond, rag, or stationary grade paper. It may have colored ink on it. When the paper is torn, the fibers are white. Examples include white photocopy, white laser print, and letter paper.
5	**Colored Ledger**	**Colored Ledger** means colored bond, rag, or stationery grade paper. When the paper is torn, the fibers are colored throughout. Examples include colored photocopy and letter paper. This type does not include fluorescent dyed paper or deep-tone dyed paper such as goldenrod colored paper.
6	**Computer Paper**	**Computer Paper** means paper used for computer printouts. This type usually has a strip of form feed holes along two edges. If there are no holes, then the edges show tear marks. This type can be white or striped. Examples include computer paper and printouts from continuous feed printers. This type does not include "white ledger" used in laser or impact printers, nor computer paper containing groundwood.
7	**Other Office Paper**	**Other Office Paper** means other kinds of paper used in offices. Examples include manila folders, manila envelopes, index cards, white envelopes, white window envelopes, white or colored notebook paper, carbonless forms, and junk mail. This type does not include "white ledger", "colored ledger", or "computer paper".
8	**Magazines and Catalogs**	**Magazines and Catalogs** means items made of glossy coated paper. This paper is usually slick, smooth to the touch, and reflects light. Examples include glossy magazines, catalogs, brochures, and pamphlets.
9	**Phone Books and Directories**	**Phone Books and Directories** means thin paper between coated covers. These items are bound along the spine with glue. Examples include whole or damaged telephone books, "yellow pages", real estate listings, and some non-glossy mail order catalogs.
10	**Other Miscellaneous Paper**	**Other Miscellaneous Paper** means items made mostly of paper that do not fit into any of the above types. Paper may be combined with minor amounts of other materials such as wax or glues. This type includes items made of chipboard, groundwood paper, and deep-toned or fluorescent dyed paper. Examples include cereal and cracker boxes, unused paper plates and cups, goldenrod colored paper, school construction paper/butcher paper, milk cartons, ice cream cartons and other frozen food boxes, unopened junk mail, colored envelopes for greeting cards, pulp paper egg cartons, unused pulp paper plant pots, and hardcover and softcover books.

11	**Remainder/ Composite Paper**	**Remainder/Composite Paper** means items made mostly of paper but combined with large amounts of other materials such as wax, plastic, glues, foil, food, and moisture. Examples include waxed corrugated cardboard, aseptic packages, waxed paper, tissue, paper towels, blueprints, sepia, onion skin, fast food wrappers, carbon paper, self-adhesive notes, and photographs.
		GLASS
12	**Clear Glass Bottles and Containers**	**Clear Glass Bottles and Containers** means clear glass beverage and food containers with or without a California Redemption Value (CRV) label. Examples include whole or broken clear soda and beer bottles, fruit juice bottles, peanut butter jars, and mayonnaise jars.
13	**Green Glass Bottles and Containers**	**Green Glass Bottles and Containers** means green-colored glass containers with or without a CRV label. Examples include whole or broken green soda and beer bottles, and whole or broken green wine bottles.
14	**Brown Glass Bottles and Containers**	**Brown Glass Bottles and Containers** means brown-colored glass containers with or without a CRV label. Examples include whole or broken brown soda and beer bottles, and whole or broken brown wine bottles.
15	**Other Colored Glass Bottles and Containers**	**Other Colored Glass Bottles and Containers** means colored glass containers and bottles other than green or brown with or without a CRV label. Examples include whole or broken blue or other colored bottles and containers.
16	**Flat Glass**	**Flat Glass** means clear or tinted glass that is flat. Examples include glass windowpanes, doors, and tabletops, flat automotive window glass (side windows), safety glass, and architectural glass. This type does not include windshields, laminated glass, or any curved glass.
17	**Remainder/ Composite Glass**	**Remainder/Composite Glass** means glass that cannot be put in any other type. It includes items made mostly of glass but combined with other materials. Examples include Pyrex, Corningware, crystal and other glass tableware, mirrors, non-fluorescent light bulbs, and auto windshields.
		METAL
18	**Tin/Steel Cans**	**Tin/Steel Cans** means rigid containers made mainly of steel. These items will stick to a magnet and may be tin-coated. This type is used to store food, beverages, paint, and a variety of other household and consumer products. Examples include canned food and beverage containers, empty metal paint cans, empty spray paint and other aerosol containers, and bimetal containers with steel sides and aluminum ends.
19	**Major Appliances**	**Major Appliances** means discarded major appliances of any color. These items are often enamel-coated. Examples include washing machines, clothes dryers, hot water heaters, stoves, and refrigerators. This type does not include electronics, such as televisions and stereos.
20	**Used Oil Filters**	**Used Oil Filters** means metal oil filters used in motor vehicles and other engines, which contain a residue of used oil.
21	**Other Ferrous**	**Other Ferrous** means any iron or steel that is magnetic or any stainless steel item. This type does not include "tin/steel cans". Examples include structural steel beams, metal clothes hangers, metal pipes, stainless steel cookware, security bars, and scrap ferrous items.
22	**Aluminum Cans**	**Aluminum Cans** means any food or beverage container made mainly of aluminum. Examples include aluminum soda or beer cans, and some pet food cans. This type does not include bimetal containers with steel sides and aluminum ends.

23	**Other Non-Ferrous**	**Other Non-Ferrous** means any metal item, other than aluminum cans, that is not stainless steel and that is not magnetic. These items may be made of aluminum, copper, brass, bronze, lead, zinc, or other metals. Examples include aluminum window frames, aluminum siding, copper wire, shell casings, brass pipe, and aluminum foil.
24	**Remainder/ Composite Metal**	**Remainder/Composite Metal** means metal that cannot be put in any other type. This type includes items made mostly of metal but combined with other materials and items made of both ferrous metals and non-ferrous metal combined. Examples include small non-electronic appliances such as toasters and hair dryers, motors, insulated wire, and finished products that contain a mixture of metals, or metals and other materials, whose weight is derived significantly from the metal portion of its construction.
ELECTRONICS		
25	**Brown Goods**	**Brown Goods** means generally larger, non-portable electronic goods that have some circuitry. Examples include microwaves, stereos, VCRs, DVD players, radios, audio/visual equipment, and non-CRT televisions (such as LCD televisions).
26	**Computer-related Electronics**	**Computer-related Electronics** means electronics with large circuitry that is computer-related. Examples include processors, mice, keyboards, laptops, disk drives, printers, modems, and fax machines.
27	**Other Small Consumer Electronics**	**Other Small Consumer Electronics** means portable non-computer-related electronics with large circuitry. Examples include personal digital assistants (PDAs), cell phones, phone systems, phone answering machines, computer games and other electronic toys, portable CD players, camcorders, and digital cameras.
28	**Televisions and Other Items with CRTs**	**Televisions and Other Items with CRTs.** Examples include televisions, computer monitors, and other items containing a cathode ray tube (CRT).
PLASTIC		
29	**PETE Bottles**	**PETE Bottles** means clear or colored PETE (polyethylene terephthalate) bottles and jars. Generally, these containers are narrower at the top than at the bottom and have a neck. When marked for identification, it bears the number 1 in the center of the triangular recycling symbol and may also bear the letters PETE or PET. The color is usually transparent green, clear or amber. A PETE bottle usually has a small dot left from the manufacturing process, not a seam. It does not turn white when bent. Examples include soft drink and water bottles, some liquor bottles, cooking oil bottles, aspirin bottles, some food jars such as peanut-butter and pastry containers and similar items.
30	**Other PETE Containers**	**Other PETE Containers** means PETE (polyethylene terephthalate) containers (other than bottles and jars). When marked for identification, it bears the number 1 in the center of the triangular recycling symbol and may also bear the letters PETE or PET. A PETE container usually has a small dot left from the manufacturing process, not a seam. Examples include opaque black trays used for frozen food packaging and non-food clamshell packaging.
31	**HDPE Natural Bottles**	**HDPE Natural Bottles** means natural HDPE (high-density polyethylene) bottles and jars. Generally, these containers are narrower at the top than at the bottom and have a neck. This plastic is cloudy white, allowing light to pass through it. When marked for identification, it bears the number 2 in the triangular recycling symbol. Examples include milk jugs, water jugs, and some juice bottles.

32	**HDPE Colored Bottles**	**HDPE Colored Bottles** means colored HDPE (high-density polyethylene) bottles and jars. Generally, these containers are narrower at the top than at the bottom and have a neck. This plastic is a solid color, preventing light from passing through it. When marked for identification, it bears the number 2 in the triangular recycling symbol. Examples include detergent bottles, some shampoo and hair-care bottles, empty motor oil, empty antifreeze, and other empty vehicle and equipment fluid bottles, and some food containers such as for coffee and non-dairy creamer.
33	**HDPE 5-gallon Buckets — Food**	**HDPE 5-gallon Buckets — Food** means all types of HDPE (high-density polyethylene) 5-gallon buckets that can be clearly identified as food or food related packaging. This plastic is usually a solid color, preventing light from passing through it (colored). When marked for identification, it bears the number 2 in the triangular recycling symbol on the bottom of the bucket.
34	**HDPE 5-gallon Buckets — Non-food**	**HDPE 5-gallon Buckets — Non-food** means all types of HDPE (high-density polyethylene) 5-gallon buckets other than those that are clearly identifiable as food or food related packaging. This plastic is usually a solid color, preventing light from passing through it (colored). When marked for identification, it bears the number 2 in the triangular recycling symbol on the bottom of the bucket.
35	**Other HDPE Containers**	**Other HDPE Containers** means all types of HDPE (high-density polyethylene) containers not included above. When marked for identification, it bears the number 2 in the triangular recycling symbol. Examples include some margarine, cottage cheese, and yogurt tubs.
36	**#3–#7 Bottles**	**#3–#7 Bottles** means plastic bottles and jars made of types of plastic other than HDPE (high-density polyethylene) or PETE (polyethylene terephthalate). Generally, these containers are narrower at the top than at the bottom and have necks. Items may be made of PVC (polyvinyl chloride), LDPE (low-density polyethylene), PP (polypropylene), PS (polystyrene), or mixed resins. When marked for identification, these bottles bear the number 3, 4, 5, 6, or 7 in the triangular recycling symbol. Examples include bottles for some salad dressings, vegetable oils, juices, syrup, shampoo, and vitamins. NOTE: Previously called “Miscellaneous Plastic Containers”.
37	**#3–#7 Other Containers**	**#3–#7 Other Containers** means plastic containers (other than bottles and jars) made of types of plastic other than HDPE (high-density polyethylene) or PETE (polyethylene terephthalate). Items may be made of PVC (polyvinyl chloride), LDPE (low-density polyethylene), PP (polypropylene), PS (polystyrene), or mixed resins. When marked for identification, these items bear the number 3, 4, 5, 6, or 7 in the triangular recycling symbol. Examples include food containers such as flexible and brittle yogurt cups, some margarine tubs, microwave food trays, clamshell-shaped fast food or muffin containers, and foam egg cartons. NOTE: Previously called “Miscellaneous Plastic Containers”.
38	**Plastic Trash Bags**	**Plastic Trash Bags** means plastic bags sold for use as trash bags, for both residential and commercial use. Does not include other plastic bags like shopping bags that might have been used to contain trash.
39	**Plastic Grocery and Other Merchandise Bags**	**Plastic Grocery And Other Merchandise Bags** means plastic shopping bags used to contain merchandise to transport from the place of purchase, given out by the store with the purchase. Includes dry-cleaning plastic bags intended for 1-time use.
40	**Non-Bag Commercial and Industrial Packaging Film**	**Non-Bag Commercial And Industrial Packaging Film** means film plastic used for large-scale packaging or transport packaging. Examples include shrink-wrap, mattress bags, furniture wrap, and film bubble wrap.

41	**Film Products**	**Film Products** means plastic film used for purposes other than packaging. Examples include agricultural film (films used in various farming and growing applications, such as silage greenhouse films, mulch films, and wrap for hay bales), plastic sheeting used as drop cloths, and building wrap.
42	**Other Film**	**Other Film** means all other plastic film that does not fit into any other type. Examples include other types of plastic bags (sandwich bags, zipper-recloseable bags, newspaper bags, produce bags, frozen vegetable bags, bread bags), food wrappers such as candy-bar wrappers, mailing pouches, bank bags, X-ray film, metallized film (wine containers and balloons), and plastic food wrap.
43	**Durable Plastic Items**	**Durable Plastic Items** means all other plastic objects other than containers, or film plastic. Examples include mop buckets, plastic outdoor furniture, plastic toys, large paint/food buckets, CD's, plastic stay straps, sporting goods, and plastic house wares such as dishes, cups, and cutlery. This type also includes building materials such as house siding, window sashes and frames, housings for electronics (such as computers, televisions and stereos), fan blades, impact-resistance cases (e.g. tool boxes, first aid boxes, tackle boxes, sewing kits, etc.), and plastic pipes and fittings.
44	**Remainder/ Composite Plastic**	**Remainder/Composite Plastic** means plastic that cannot be put in any other type. They are usually recognized by their optical opacity. This type includes items made mostly of plastic but combined with other materials. Examples include auto parts made of plastic attached to metal, plastic drinking straws, foam drinking cups, produce trays, foam meat and pastry trays, foam packing blocks, packing peanuts, foam plates and bowls, plastic strapping, plastic lids, some kitchen ware, toys, new plastic laminate (e.g., Formica), vinyl, linoleum, plastic lumber, insulating foams, imitation ceramics, handles and knobs, plastic string (such as is used for hay bales), and plastic rigid bubble/foil packaging (as for medications).
		ORGANIC
45	**Food**	**Food** means food material resulting from the processing, storage, preparation, cooking, handling, or consumption of food. This type includes material from industrial, commercial, or residential sources. Examples include discarded meat scraps, dairy products, egg shells, fruit or vegetable peels, and other food items from homes, stores, and restaurants. This type includes grape pomace and other processed residues or material from canneries, wineries, or other industrial sources.
46	**Leaves and Grass**	**Leaves and Grass** means plant material, except woody material, from any public or private landscapes. Examples include leaves, grass clippings, sea weed, and plants. This type does not include woody material or material from agricultural sources.
47	**Prunings and Trimmings**	**Prunings and Trimmings** means woody plant material up to 4 inches in diameter from any public or private landscape. Examples include prunings, shrubs, and small branches with branch diameters that do not exceed 4 inches. This type does not include stumps, tree trunks, or branches exceeding 4 inches in diameter. This type does not include material from agricultural sources.
48	**Branches and Stumps**	**Branches and Stumps** means woody plant material, branches, and stumps that exceed four inches in diameter from any public or private landscape.
49	**Agricultural Crop Residues**	**Agricultural Crop Residues** means plant material from agricultural sources. Examples include orchard and vineyard prunings, vegetable by-products from farming, residual fruits, vegetables, and other crop remains after usable crop is harvested. This type does not include processed residues from canneries, wineries, or other industrial sources.

50	**Manures**	**Manures** means manure and soiled bedding materials from domestic, farm, or ranch animals. Examples include manure and soiled bedding from animal production operations, racetracks, riding stables, animal hospitals, and other sources.
51	**Textiles**	**Textiles** means items made of thread, yarn, fabric, or cloth. Examples include clothes, fabric trimmings, draperies, and all natural and synthetic cloth fibers. This type does not include cloth-covered furniture, mattresses, leather shoes, leather bags, or leather belts.
52	**Carpet**	**Carpet** means flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material. Does not include carpet padding.
53	**Remainder/ Composite Organics**	**Remainder/Composite Organics** means organic material that cannot be put in any other type or subtype. This type includes items made mostly of organic materials but combined with other materials. Examples include leather items, cork, hemp rope, garden hoses, rubber items, hair, carpet padding, cigarette butts, diapers, feminine hygiene products, wood products (popsicle sticks and toothpicks), sawdust, and animal feces.
		CONSTRUCTION & DEMOLITION
54	**Concrete**	**Concrete** means a hard material made from sand, gravel, aggregate, cement mix, and water. Examples include pieces of building foundations, concrete paving, and cinder blocks.
55	**Asphalt Paving**	**Asphalt Paving** means a black or brown, tar-like material mixed with aggregate used as a paving material.
56	**Asphalt Roofing**	**Asphalt Roofing** means composite shingles and other roofing material made with asphalt. Examples include asphalt shingles and attached roofing tar and tar paper.
57	**Lumber (non-treated)**	**Lumber (non-treated)** means non-treated processed wood for building, manufacturing, landscaping, packaging, and non-treated processed wood from demolition. Examples include dimensional lumber, lumber cutoffs, engineered wood such as plywood and particleboard, wood scraps, pallets, wood fencing, wood shake roofing, and wood siding.
58	**Treated Wood Waste**	**Treated Wood Waste** means wood that has been treated with a chemical preservative for purposes of protecting the wood against attacks from insects, microorganisms, fungi, and other environmental conditions that can lead to decay of the wood, and the chemical preservative is registered pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. Sec. 136 and following). This includes wood that has been pressure treated, chemically treated (with copper etc.) or treated with creosote (e.g. railroad ties, marine timbers and pilings, landscape timbers, and telephone poles).
59	**Gypsum Board**	**Gypsum Board** means interior wall covering made of a sheet of gypsum sandwiched between paper layers. Examples include used or unused, broken or whole sheets of sheetrock, drywall, gypsum board, plasterboard, gypboard, gyproc, and wallboard.
60	**Rock, Soil, and Fines**	**Rock, Soil and Fines** means rock pieces of any size and soil, dirt, and other matter. Examples include rock, stones, and sand, clay, soil, and other fines. This type also includes non-hazardous contaminated soil.
61	**Remainder/ Composite Construction and Demolition**	**Remainder/Composite Construction and Demolition** means construction and demolition material that cannot be put in any other type. This type may include items from different categories combined, which would be very hard to separate. Examples include brick, ceramics, tiles, toilets, sinks, dried paint not attached to other materials, and fiberglass insulation. This type may also include demolition debris that is a mixture of items such as plate glass, wood, tiles, gypsum board, and aluminum scrap.

HOUSEHOLD HAZARDOUS		
62	**Paint**	**Paint** means containers with paint in them. Examples include latex paint, oil based paint, and tubes of pigment or fine art paint. This type does not include dried paint, empty paint cans, or empty aerosol containers.
63	**Vehicle and Equipment Fluids**	**Vehicle and Equipment Fluids** means containers with fluids used in vehicles or engines, except used oil. Examples include used antifreeze and brake fluid. This type does not include empty vehicle and equipment fluid containers.
64	**Used Oil**	**Used Oil** means the same as defined in Health and Safety Code section 25250.1(a). Examples include spent lubricating oil such as crankcase and transmission oil, gear oil, and hydraulic oil.
65	**Batteries**	**Batteries** means any type of battery including both dry cell and lead acid. Examples include car, flashlight, small appliance, watch, and hearing aid batteries.
66	**Remainder/ Composite Household Hazardous**	**Remainder/Composite Household Hazardous** means household hazardous material that cannot be put in any other type. This type also includes household hazardous material that is mixed. Examples include household hazardous waste which if improperly put in the solid waste stream may present handling problems or other hazards, such as pesticides, caustic cleaners, and fluorescent light bulbs.
SPECIAL WASTE		
67	**Ash**	**Ash** means a residue from the combustion of any solid or liquid material. Examples include ash from structure fires, fireplaces, incinerators, biomass facilities, waste-to-energy facilities, and barbecues.
68	**Sewage Solids**	**Sewage Solids** means residual solids and semi-solids from the treatment of domestic waste water or sewage. Examples include biosolids, sludge, grit, screenings, and septage. This type does not include sewage or waste water discharged from the sewage treatment process.
69	**Industrial Sludge**	**Industrial Sludge** means sludge from factories, manufacturing facilities, and refineries. Examples include paper pulp sludge, and water treatment filter cake sludge.
70	**Treated Medical Waste**	**Treated Medical Waste** means medical waste that has been processed in order to change its physical, chemical, or biological character or composition, or to remove or reduce its harmful properties or characteristics, as defined in Section 25123.5 of the California Health and Safety Code.
71	**Bulky Items**	**Bulky Items** means large hard to handle items that are not defined separately, including furniture, mattresses, and other large items. Examples include all sizes and types of furniture, mattresses, box springs, and base components.
72	**Tires**	**Tires** means vehicle tires. Examples include tires from trucks, automobiles, motorcycles, heavy equipment, and bicycles.
73	**Remainder/ Composite Special Waste**	**Remainder/Composite Special Waste** means special waste that cannot be put in any other type. Examples include asbestos-containing materials, such as certain types of pipe insulation and floor tiles, auto fluff, auto-bodies, trucks, trailers, truck cabs, untreated medical waste/pills/hypodermic needles, and artificial fireplace logs.

Appendix B:
Output From USEPA WARM Model

GHG Emissions for Current Paper Disposal				
Material	**Tons Recycled**	**Tons Landfilled**	**Tons Composted**	**Total MTCE[1]**
Corrugated Boxes	0	640,000	0	58,034
Magazines/third-class mail	0	213,000	0	-19,067
Newspaper	0	224,000	0	-54,495
Office Paper	0	300,000	0	144,373
Phonebooks	0	64,000	0	-15,570
Mixed Paper (general)	0	700,000	0	51,958
Corrugated Boxes	0	640,000	0	58,034

1 Metric Tons Carbon Equivalent (1 metric ton carbon equivalent = 3.667 metric tons of CO_2 equivalent).

GHG Emissions for Paper Disposal Ban in Place				
Material	**Tons Recycled**	**Tons Landfilled**	**Tons Composted**	**Total MTCE**
Corrugated Boxes	0	640,000	0	-542,988
Magazines/third-class mail	0	213,000	0	-178,370
Newspaper	0	224,000	0	-170,962
Office Paper	0	300,000	0	-233,258
Phonebooks	0	64,000	0	-46,421
Mixed Paper (general)	0	700,000	0	-675,094
Corrugated Boxes	0	640,000	0	-542,988

GHG Emissions for Current Plastic Disposal				
Material	**Tons Recycled**	**Tons Landfilled**	**Tons Composted**	**Total MTCE**
Food Scraps	0	148,000	0	1,550
Yard Trimmings	0	137,000	0	1,434
Leaves	0	800,000	0	8,376

GHG Emissions for Plastic Disposal Ban in Place				
Material	**Tons Recycled**	**Tons Landfilled**	**Tons Composted**	**Total MTCE**
HDPE	148,000	0	0	-56,654
PET	137,000	0	0	-57,950
Mixed Plastics	800,000	0	0	-332,285

Table 6.3-A GHG Emissions for Current Organics Disposal				
Material	**Tons Recycled**	**Tons Landfilled**	**Tons Composted**	**Total MTCE**
Food Scraps	0	1,020,000	0	189,158
Yard Trimmings	0	130,000	0	-12,217
Leaves	0	300,000	0	-47,665
Total		**1,450,000**		**129,276**

6.3-B GHG Emissions With Organics Material Ban in Place				
Material	**Tons Reduced**	**Tons Recycled**	**Tons Composted**	**Total MTCE**
Food Scraps	0	0	1,020,000	-55,118
Yard Trimmings	0	0	130,000	-7,025
Leaves	0	0	300,000	-16,211
Total	**0**	**0**	**1,450,000**	**78,354**
Total Net Change in GHG Emissions: -207,630 MTCE				

Appendix C:
USEPA Greenhouse Gas Emissions Factors

The emission factors presented in this table reflect national average landfill gas recovery practices and transportation distances.

Greenhouse Gas Emission Factors (MTCE per short ton)

Material	Source Reduction	Recycling	Landfilling, National Average	Landfilling, No Recovery	Landfilling, Flaring	Landfilling, Energy Recovery	Combustion	Composting
Aluminum Cans	-2.26	-3.73	0.01	0.01	0.01	0.01	0.02	N/A
Steel Cans	-0.87	-0.49	0.01	0.01	0.01	0.01	-0.42	N/A
Copper Wire	-2.02	-1.36	0.01	0.01	0.01	0.01	0.02	N/A
Glass	-0.16	-0.08	0.01	0.01	0.01	0.01	0.01	N/A
HDPE	-0.49	-0.38	0.01	0.01	0.01	0.01	0.25	N/A
LDPE	-0.62	-0.47	0.01	0.01	0.01	0.01	0.25	N/A
PET	-0.58	-0.42	0.01	0.01	0.01	0.01	0.29	N/A
Corrugated Box	-1.53	-0.85	0.09	0.41	-0.06	-0.13	-0.18	N/A
Magazines	-2.36	-0.84	-0.09	0.04	-0.15	-0.18	-0.13	N/A
Newspaper	-1.33	-0.76	-0.24	-0.13	-0.3	-0.32	-0.2	N/A
Office Paper	-2.18	-0.78	0.48	1.01	0.23	0.11	-0.17	N/A
Phonebook	-1.73	-0.73	-0.24	-0.13	-0.3	-0.32	-0.2	N/A
Textbook	-2.5	-0.85	0.48	1.01	0.23	0.11	-0.17	N/A
Dimensional Lumber	-0.55	-0.67	-0.14	0.02	-0.22	-0.25	-0.21	N/A
Fiberboard	-0.61	-0.67	-0.14	0.02	-0.22	-0.25	-0.21	N/A
Food Waste	N/A	N/A	0.19	0.39	0.09	0.04	-0.05	-0.05
Yard Waste	N/A	N/A	-0.09	0.02	-0.15	-0.17	-0.06	-0.05
Grass	N/A	N/A	0.04	0.14	-0.01	-0.03	-0.06	-0.05
Leaves	N/A	N/A	-0.16	-0.08	-0.2	-0.21	-0.06	-0.05
Branches	N/A	N/A	-0.14	0.02	-0.22	-0.25	-0.06	-0.05
Mixed Paper Board	N/A	-0.96	0.07	0.37	-0.07	-0.13	-0.18	N/A
Mixed Paper - Residential	N/A	-0.96	0.05	0.33	-0.08	-0.14	-0.18	N/A
Mixed Paper - Office	N/A	-0.93	0.1	0.39	-0.03	-0.09	-0.16	N/A
Mixed Metals	N/A	-1.43	0.01	0.01	0.01	0.01	-0.29	N/A
Mixed Plastics	N/A	-0.42	0.01	0.01	0.01	0.01	0.27	N/A
Mixed Recyclables	N/A	-0.79	0.02	0.25	-0.08	-0.13	-0.16	N/A
Mixed Organics	N/A	N/A	0.04	0.16	-0.07	-0.1	-0.06	-0.05
MixedMSW	N/A	N/A	0.1	0.37	-0.03	-0.08	-0.03	N/A
Carpets	-1.1	-1.97	0.01	0.01	0.01	0.01	0.1	N/A
PCs	-15.26	-0.62	0.01	0.01	0.01	0.01	-0.06	N/A
ClayBricks	-0.08	N/A	0.01	0.01	0.01	0.01	N/A	N/A
Aggregate	N/A	0	0.01	0.01	0.01	0.01	N/A	N/A
FlyAsh	N/A	-0.24	0.01	0.01	0.01	0.01	N/A	N/A
Tires	-1.09	-0.5	0.01	0.01	0.01	0.01	0.02	N/A