California Integrated Waste Management Board

August 2009

Executive Summary

Contractor's Report

To The Board

California 2008 Statewide Waste Characterization Study

Produced Under Contract by:

Cascadia Consulting Group

CASCADIA CONSULTING GROUP

Introduction and Objectives

The California Integrated Waste Management Board (Board) is acting on California's commitment to a zero waste goal in order to reduce greenhouse gases, conserve resources, and maintain California's unique natural environment. As part of the California Global Warming Solutions Act of 2006 (AB32), the Board is tasked with implementing waste management strategies to reduce the production of greenhouse gases. The move toward zero waste means reducing waste whenever possible. The Board has a role in directing all materials to their highest and best use, while protecting public health and safety and the environment. To realize these goals, the Board needs up-to-date information on the types and amounts of materials disposed in the state's waste stream.

In 2008, the Board commissioned a study on the types and amounts of materials disposed at solid waste facilities throughout the state. This study followed similar standards and protocols to those used in the statewide waste characterization study conducted in 2004. The first statewide study was done in 1999 and used a different methodology. As with the previous two studies, the present study estimates quantity and composition of the commercial, residential, and self-hauled waste streams in California and aggregates this data to estimate the overall composition.

The 2008 study incorporated several additional research and analysis tasks, including:

- A divertibility analysis to determine the extent and source of contamination on commonly recoverable paper, plastic, and metal materials found in disposed waste;
- A laboratory analysis of asbestos in roofing materials since the presence of asbestos could be of concern for recycling these materials;

Study Methodology

A stratified random sampling methodology was used to sample waste from numerous subgroups (strata) to develop a waste composition profile for each stratum. Strata considered in this study included the geographical region, the waste sector (residential, commercial, or self-hauled), and the waste subsector (single-family residential, multifamily residential, residential self-hauled, and commercial self-hauled). The strata were then "added together" in a way that reflects each stratum's relative contribution to the overall waste stream, thus producing overall waste composition information.

The state was divided into five regions defined by similarities in demographic, climatic, geographic, and economic characteristics. Data regarding waste composition were gathered from 751 waste samples sorted at 27 solid waste facilities (landfills and transfer stations) during four seasons. Whenever possible, a randomized process was used to select participating solid waste facilities, dates for field work, vehicles carrying waste, and multifamily dwellings. Approximately equal numbers of waste samples from each waste sector were obtained from each region of the state.

The sampled waste was sorted into 85 *material types*. In contrast, the detailed composition tables in the main body of the report are presented using the 62 Standard Material Types drawn from the California Integrated Waste Management Board's Uniform Waste Disposal Characterization Method. The expanded list of 85 *material types* used for sorting allows additional detail on materials of interest, yet is designed to be "folded up" into the standard list used for presenting

results in this study and to the Board. All *material types* were chosen and defined such that they can be compared to the *material types* used during California's 2004 Statewide Waste Characterization Study. These materials are described in Appendix B: List and Definitions of Material Types. Tables containing waste composition data using the expanded list are found in Appendix D: Expanded Statewide Waste Characterization Tables.

In addition, drivers at participating solid waste facilities were surveyed in order to determine the waste-generating sector and the net weight of each load, among other data. Results from these surveys were used to estimate the portion of California's waste derived from each waste sector and subsector. Surveys were conducted on the same days that waste was sampled, with an additional 15 survey-only days split across the four study seasons. On these days, vehicles bringing disposed waste to the site were surveyed, for a total of 6,896 surveys completed over the study period.

Results

The data gathered during the sampling efforts were compiled and statistical analyses were performed in order to extrapolate the findings to statewide estimates. This report includes detailed findings for the following areas:

- Disposed waste composition and tonnage for the state's overall waste stream and the commercial, residential, and self-hauled sectors, as well as the subsectors of single-family residential and multifamily residential waste and commercial self-hauled and residential self-hauled waste;
- Disposed waste tonnage for four waste-generating activities that comprise commercial self-hauled waste (construction, demolition, and remodeling activities; roofing activities; landscaping activities; and other commercial or industrial activities);
- A divertibility assessment of the levels of contamination and likely sources of contamination for commonly recoverable materials encountered in loads at solid waste facilities; and
- A laboratory assessment of the prevalence of asbestos in samples of material from roofing removal or replacement projects.

Table ES-1 depicts each sector's estimated contribution to the overall waste stream. Figure ES- 1 through Figure ES- 4 display the breakdown of the waste stream by 10 **Material Classes** for the overall waste stream and each of the three studied waste sectors. Table ES-2 presents the ten most prevalent *material types* in the overall disposed waste stream. Finally, Table ES-3 provides a detailed breakdown of the composition of the overall waste stream by material type.

Table ES-1: Estimated Contribution of Each Sector to California's Overall Disposed Waste Stream

Sector	Est. Percentage of Disposed Waste Stream	Est. Tons Disposed Statewide
Commercial	49.5%	19,672,547
Residential	30.0%	11,935,173
Single-family residential	*21.6%*	*8,583,746*
Multifamily residential	*8.4%*	*3,351,428*
Self-hauled	20.4%	8,115,098
Commercial self-hauled	*17.2%*	*6,812,464*
Residential self-hauled	*3.3%*	*1,302,634*
Totals	**100.0%**	**39,722,818**

Numbers may not total exactly due to rounding. Source: Individual facility records and 2008 vehicle survey findings applied to CIWMB Disposal Reporting System 2007 tonnage figures.

Figure ES- 1: Material Classes in California's Overall Disposed Waste Stream

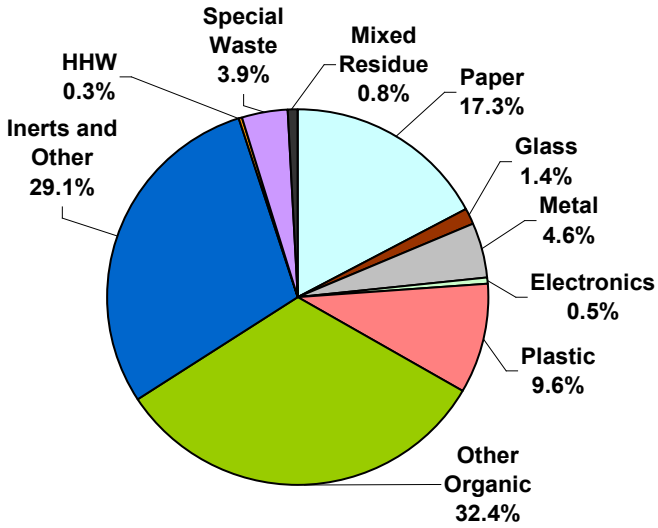


Figure ES- 2: Material Classes in the Commercial Disposed Waste Stream

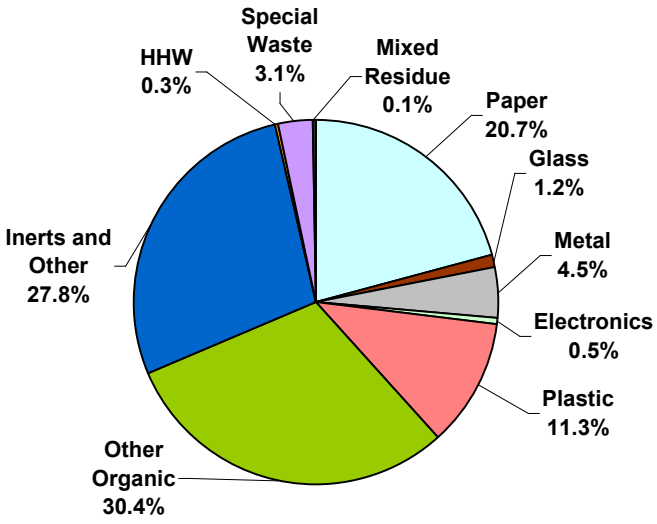


Figure ES- 3: Material Classes in the Residential Disposed Waste Stream

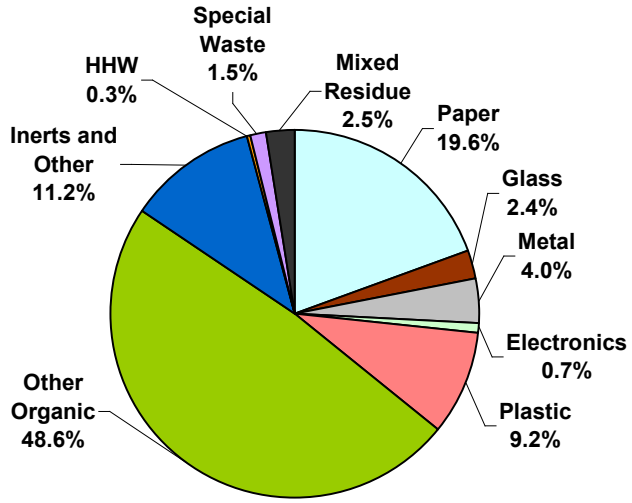
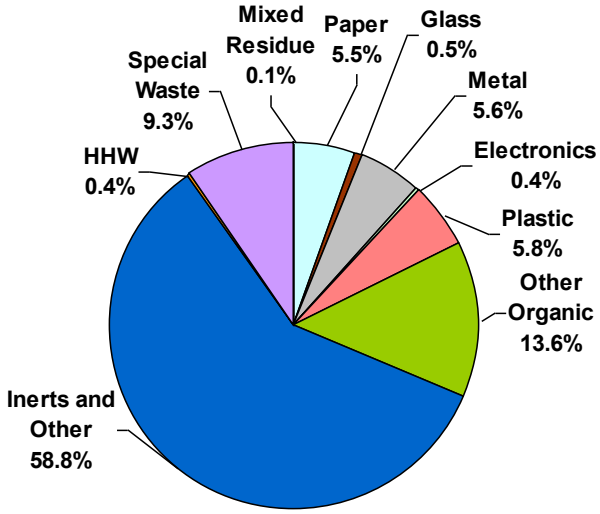


Figure ES- 4: Material Classes in the Self-hauled Disposed Waste Stream



Numbers may not total exactly due to rounding.

Table ES-2: Ten Most Prevalent Material Types in California's Overall Disposed Waste System

Material	Est. Percent	Cum. Percent	Est. Tons
Food	15.5%	15.5%	6,158,120
Lumber	14.5%	30.0%	5,765,482
Remainder/Composite Inerts and Other	5.5%	35.5%	2,175,322
Remainder/Composite Paper	5.2%	40.7%	2,056,546
Uncoated Corrugated Cardboard	4.8%	45.5%	1,905,897
Remainder/Composite Organic	4.3%	49.8%	1,719,743
Leaves and Grass	3.8%	53.6%	1,512,832
Bulky Items	3.5%	57.1%	1,393,091
Carpet	3.2%	60.3%	1,285,473
Rock, Soil and Fines	3.2%	63.5%	1,259,308
Total	**63.5%**		**25,231,814**

Any differences between *cumulative percent* figures and the sum of *estimated percent* figures are due to rounding. Note that the material type *remainder/composite inerts and other* includes such items as tiles, toilets, and fiberglass insulation. *Remainder/composite paper* includes such items as waxed corrugated cardboard, aseptic packages, paper towels, and photographs. Examples of *remainder/composite organic* include leather items, cork, garden hoses, carpet padding, and diapers.

Table ES-3: Composition of California's Overall Disposed Waste Stream by Material Type

Material	Est. Percent	+ / -	Est. Tons	Material	Est. Percent	+ / -	Est. Tons
Paper	**17.3%**		**6,859,121**	**Other Organic**	**32.4%**		**12,888,039**
Uncoated Corrugated Cardboard	4.8%	0.9%	1,905,897	Food	15.5%	1.9%	6,158,120
Paper Bags	0.4%	0.1%	155,848	Leaves and Grass	3.8%	0.7%	1,512,832
Newspaper	1.3%	0.3%	499,960	Prunings and Trimmings	2.7%	1.5%	1,058,854
White Ledger Paper	0.7%	0.3%	259,151	Branches and Stumps	0.6%	0.4%	245,830
Other Office Paper	1.2%	0.6%	472,147	Manures	0.1%	0.1%	20,373
Magazines and Catalogs	0.7%	0.2%	283,069	Textiles	2.2%	0.3%	886,814
Phone Books and Directories	0.1%	0.0%	24,149	Carpet	3.2%	2.0%	1,285,473
Other Miscellaneous Paper	3.0%	0.4%	1,202,354	Remainder/Composite Organic	4.3%	0.5%	1,719,743
Remainder/Composite Paper	5.2%	0.7%	2,056,546				
				Inerts and Other	**29.1%**		**11,577,768**
Glass	**1.4%**		**565,844**	Concrete	1.2%	0.4%	483,367
Clear Glass Bottles and Containers	0.5%	0.1%	196,093	Asphalt Paving	0.3%	0.4%	129,834
Green Glass Bottles and Containers	0.2%	0.1%	79,491	Asphalt Roofing	2.8%	1.5%	1,121,945
Brown Glass Bottles and Containers	0.3%	0.1%	108,953	Lumber	14.5%	2.2%	5,765,482
Other Colored Glass Bottles and Containers	0.1%	0.0%	40,570	Gypsum Board	1.6%	0.7%	642,511
Flat Glass	0.1%	0.1%	33,899	Rock, Soil and Fines	3.2%	1.1%	1,259,308
Remainder/Composite Glass	0.3%	0.1%	106,838	Remainder/Composite Inerts and Other	5.5%	1.3%	2,175,322
Metal	**4.6%**		**1,809,684**	**Household Hazardous Waste (HHW)**	**0.3%**		**120,752**
Tin/Steel Cans	0.6%	0.1%	236,405	Paint	0.1%	0.1%	48,025
Major Appliances	0.0%	0.1%	17,120	Vehicle and Equipment Fluids	0.0%	0.0%	6,424
Used Oil Filters	0.0%	0.0%	3,610	Used Oil	0.0%	0.0%	3,348
Other Ferrous	2.0%	0.4%	801,704	Batteries	0.0%	0.0%	19,082
Aluminum Cans	0.1%	0.0%	47,829	Remainder/Composite Household Hazardous	0.1%	0.1%	43,873
Other Non-Ferrous	0.2%	0.1%	84,268				
Remainder/Composite Metal	1.6%	0.5%	618,747	**Special Waste**	**3.9%**		**1,546,470**
				Ash	0.1%	0.1%	40,736
Electronics	**0.5%**		**216,297**	Treated Medical Waste	0.0%	0.0%	0
Brown Goods	0.2%	0.1%	76,725	Bulky Items	3.5%	1.2%	1,393,091
Computer-related Electronics	0.1%	0.1%	32,932	Tires	0.2%	0.1%	60,180
Other Small Consumer Electronics	0.1%	0.0%	34,588	Remainder/Composite Special Waste	0.1%	0.1%	52,463
Video Display Devices	0.2%	0.1%	72,053				
				Mixed Residue	**0.8%**		**330,891**
Plastic	**9.6%**		**3,807,952**	Mixed Residue	0.8%	0.2%	330,891
PETE Containers	0.5%	0.1%	199,644				
HDPE Containers	0.4%	0.1%	157,779				
Miscellaneous Plastic Containers	0.4%	0.1%	163,008				
Plastic Trash Bags	0.9%	0.1%	361,997				
Plastic Grocery and Other Merchandise Bags	0.3%	0.0%	123,405				
Non-Bag Commercial and Industrial Packaging Film	0.5%	0.2%	194,863				
Film Products	0.3%	0.2%	113,566				
Other Film	1.4%	0.3%	554,002				
Durable Plastic Items	2.1%	0.4%	834,970	**Totals**	**100.0%**		**39,722,818**
Remainder/Composite Plastic	2.8%	0.7%	1,104,719	**Sample Count**	**751**		

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.
More detailed composition tables can be found in Appendix D: Expanded Statewide Waste Characterization Tables

Overall Key Findings

- The findings show that, statewide, the commercial sector produces 50 percent of the disposed waste stream, and the residential sector (single-family plus multifamily) produces 30 percent. The self-hauled sector represents the remaining 20 percent.
- **Inerts and Other** materials account for nearly one-third (29 percent) of the statewide disposed waste stream, with *lumber* representing nearly 15 percent of disposed waste.
- Compostable materials, including food and vegetative materials, account for more than 20 percent of the statewide disposed waste stream. Of these, *food* is the largest component, comprising nearly 16 percent of disposed waste.
- Paper and fiber materials represent slightly more than 17 percent of disposed waste, with *uncoated corrugated cardboard* being the most prevalent recyclable material and representing more than one-quarter of the paper and fiber that is disposed.

Additional Research and Analysis Key Findings

- The divertibility analysis indicates that nearly two thirds of the commonly recycled types of paper, plastic, and metal materials found in disposed waste are uncontaminated at the time they arrive at disposal facilities.
- Of the 191 roofing samples collected and analyzed, just one sample of *roofing mastic* was found to contain traces of asbestos.
- The detailed analysis of *material types* found that of all PETE plastic containers disposed, 26 percent are water bottles of one liter or less in size. More than half of all roofing materials disposed consist of *asphalt composition shingles.* In the overall *lumber* type, 37 percent is *clean dimensional lumber* or *clean pallets and crates*.
- Detailed sorting of plastic carryout bags to determine sources (related to a statewide plastic bag recycling program) showed that 44 percent of bags disposed are from grocery stores.

Comparison with 2004 Statewide Waste Characterization Study

- The proportions of the waste stream contributed by the commercial, residential, and self-hauled sectors remained about the same.
- The largest change in the overall waste stream composition is an increase, from 22 percent to 29 percent, in the **Inerts and Other** category (formerly the **Construction and Demolition** category). This is largely due to an increase in disposal of *lumber*.
- In the commercial sector, disposal of **Paper**, **Glass**, and **Metal** decreased while **Inerts and Other** increased, again mainly due to increased disposal of *lumber*.
- Food waste increased from 17 percent to 25 percent of all residential waste disposed. The disposed tonnage of **Paper**, **Glass**, and **Metal** decreased.
- Overall per capita disposal decreased slightly from 1.11 to 1.06 tons per person per year (calculated by dividing tons of all disposed municipal solid waste by total population). Residential per capita disposal decreased from 0.35 to 0.32 tons per resident per year (calculated by dividing all disposed residential waste by total population).