

**Analysis of Beverage Containers Within the
Massachusetts Municipal Solid Waste Stream**

An analysis of the Massachusetts Waste Characterization Studies
as reported by the Massachusetts Department of Environmental Protection

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Summary of Mass DEP Waste Characterization Studies¹

The Massachusetts Department of Environmental Protection (MADEP) regulations at 310 CMR 19.300 et seq. (Class II Recycling Program) established requirements in order for a Waste-to-Energy (WTE) Facility to qualify to be eligible to sell renewable energy credits (RECs), under the Department of Energy Resources Renewable Energy Portfolio Standards at 225 CMR 15.00. Among the requirements within the Class II Recycling Program was to conduct a Waste Characterization Study (WCS) for each respective Facility during the calendar year 2010, to be conducted in both the winter and fall seasons. The WCS was to be conducted in accordance with the methodology guidance finalized by MADEP on September 22, 2009, and the WCS Protocol prepared by Brown and Caldwell (BC), subsequently approved by MADEP on December 1, 2009.

As stated in the MADEP Waste Characterization Scope and Methodology Guidance (MADEP WCS Guidance), dated September 22, 2009, the goals of the WCS included the following:

1. Characterize the solid waste disposal stream at the Facility,
2. Provide statewide characterization information,
3. Allow MADEP to utilize the information to measure the success of waste reduction efforts,
4. Identify specific materials for increased diversion, and
5. Help guide MADEP policy and program initiatives in solid waste management.

BC was retained by Wheelabrator Saugus, Inc. to develop and implement the WCS by employing manual sorting of representative samples collected from the various sectors of the solid waste stream received at Wheelabrator Saugus, Inc.

The WCS was structured on the methodologies described in ASTM D5321-92, Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste, which is the method required in Section I (Scope), of the MADEP WCS Guidance. The number of samples needed to achieve a 90% confidence level with a 10% precision was found to be 52. The samples were evenly distributed over two seasons in calendar year 2010, as required by MADEP, and obtained in both the spring and fall seasons (26 samples per season). The sample allocation was based upon the cardboard waste component, and selected proportionately between residential and Industrial/Commercial/Institutional (ICI) using the MADEP's data for residential distribution of 46% and ICI of 54%. The first half of the WCS was conducted between February 13 to February 19, 2010, and the second half was conducted between November 29 to December 4, 2010.

The following figure (ES-1) provides a general overview of the waste composition at Wheelabrator Saugus, Inc., (the Facility) during the study periods. Further detail into the breakdown of waste composition for the Facility is provided in Section 3 of this report.

As can be seen from Figure ES-1, during the study period, the overall waste composition at the Facility was mostly comprised of paper at approximately 28%, organic material was approximately 20%, plastics composed 15%, and construction and demolition materials accounted for 13% of the waste stream. The figure depicts the thirteen (13) major waste categories provided in the MADEP WCS Guidance.

Analysis

Households, businesses and institutions across Massachusetts generate nearly 8 million tons of solid waste per year. More than one-third of this material is recycled or composted. The rest is burned in incinerators (known as municipal waste combustors), buried in lined landfills or transported to out-of-state disposal facilities. There are seven solid waste combustion facilities in Massachusetts.² The material that is sent to these combustion facilities closely mirrors municipal solid waste sent to landfills.

The Mass DEP Waste Characterization studies provide a wealth of information that enables the analysis of the waste stream. Loosely termed Municipal Solid Waste (MSW), which refers more to the manner in which the material arrived at the disposal facility rather than the source of the waste. In addition to the presence of typical home-generated materials, the raw data includes commercial waste, commercial-type waste, illegally disposed materials, and materials for which there is a waste ban.

This report is an analysis of what is typically found in this stream, with two significant adjustments: Construction and Demolition (C&D) waste, which has entered the waste stream illegally, is removed from the study. It also does not include other illegal materials, eg toxic waste, car batteries, and tires, as these are both illegal to dispose (and collect) at curbside and these items will (hopefully) not enter the municipal solid waste stream in the very near future. Excluded from the DEP report are materials that are placed in a recycling bin or delivered to a municipal recycling center, whether the items are indeed permitted to be placed there. These actually enter the waste stream at Material Recycling Facilities (MRFs).

This study uses the materials reported at the Wheelabrator Saugus facility and are representative of the other facilities in Massachusetts. It includes both home- and "ICI³" source materials. The inclusion of ICI in this study is necessitated by the fact that most single-serving beverage containers are consumed away from home, and often in workplace settings.

The study includes glass, plastic, and metal beverage containers. It does not include boxed juices⁴, nor does it include steel cans, occasionally used for tomato juice and other fruit juices, as data for these products is unavailable and rarely seen in the MSW stream.⁵

Conclusion:

The analysis that was conducted on behalf of the Department of Environmental Protection was performed by weight. This provides an understanding of the various components of the waste stream. Landfilled soft drink bottles weigh, on average 355 pounds per cubic yard.⁶ Average landfill density is 750-1250 pounds per cubic yard.⁷ For these calculations, we use the midpoint, 1000 pounds per cubic yard.

The study indicates that beverage containers make up approximately 5.4% of the state's MSW by weight, and more importantly, 15.2% by volume.

MSW Analysis

Data from Table 3-1 Overall Waste Composition at Wheelabrator Saugus, Inc.

	Categories	Res	ICI	Overall WCS	less illegal matf	beverage containers	adjusted to 100%
1.00	PAPER						
1.10	Uncoated Corrugated Cardboard/Kraft Paper	3.40%	2.40%	5.80%	5.80%		
1.20	Waxed Cardboard	1.60%	0.60%	2.30%	2.30%		
1.30	High Grade Office Paper	0.90%	0.40%	1.40%	1.40%		
1.40	Magazines/Catalogs	1.70%	0.60%	2.20%	2.20%		
1.50	Newsprint	2.10%	0.60%	2.70%	2.70%		
1.60	Other Recyclable Paper	2.00%	0.70%	2.80%	2.80%		
1.70	Compostable Paper	7.30%	1.70%	8.90%	8.90%		
1.80	Remainder/Composite Paper	1.60%	0.50%	2.10%	2.10%		
2.00	PLASTICS						
2.10	PET Beverage Containers	0.40%	0.10%	0.60%	0.60%	0.60%	0.75%
2.10	Film (non-bag commercial and industrial packaging film)	0.40%	0.60%	1.00%	1.00%		
2.11	Grocery and other Merchandise Bags	1.40%	0.20%	1.60%	1.60%		
2.12	Other Film means plastic film	3.00%	1.00%	4.00%	4.00%		
2.13	Remainder/Composite Plastic	1.90%	1.10%	3.00%	3.00%		
2.20	PET Containers other than Beverage Containers	0.20%	0.00%	0.20%	0.20%		
2.30	Plastic MA Deposit Beverage Containers	0.10%	0.00%	0.20%	0.20%	0.20%	0.25%
2.40	HDPE Bottles	0.50%	0.20%	0.70%	0.70%	0.70%	0.88%
2.50	Plastic Tubs and lids	0.60%	0.10%	0.70%	0.70%		
2.60	Plastic Containers Nos. 3, 4, 5, 6, 7	0.20%	0.10%	0.30%	0.30%	0.30%	0.38%
2.70	Expanded Polystyrene Food Grade	0.50%	0.20%	0.70%	0.70%		
2.80	Expanded Polystyrene Non-food Grade	0.00%	0.10%	0.20%	0.20%		
2.90	Bulk Rigid Plastic Items	1.80%	0.50%	2.30%	2.30%		
3.00	METALS						
3.10	Aluminum Beverage Containers (non-MA deposit containers)	0.00%	0.00%	0.10%	0.10%	0.10%	0.13%
3.20	Aluminum MA Deposit Beverage Containers	0.20%	0.00%	0.20%	0.20%	0.20%	0.25%
3.30	Tin/Steel Containers	0.60%	0.10%	0.80%	0.80%		
3.40	Other Aluminum	0.50%	0.30%	0.70%	0.70%		
3.50	Other Ferrous and non-ferrous	1.10%	1.20%	2.30%	2.30%		
3.60	White Goods	0.50%	0.10%	0.60%			
3.70	Remainder Composite Metal	0.70%	0.20%	0.90%	0.90%		
4.00	GLASS						
4.10	Glass Beverage Containers (non-MA deposit containers)	0.70%	0.30%	1.10%	1.10%	1.10%	1.38%
4.20	Other Glass Packaging Containers (non-MA deposit containers)	0.60%	0.10%	0.70%	0.70%	0.70%	0.88%
4.30	Glass MA Deposit Beverage Containers	0.30%	0.10%	0.40%	0.40%	0.40%	0.50%
4.40	Remainder/Composite Metal	0.40%	0.30%	0.70%	0.70%		
5.00	ORGANIC MATERIAL						
5.10	Food Waste	11.50%	3.30%	14.80%	14.80%		
5.20	Branches and Stumps	0.30%	0.00%	0.30%	0.30%		
5.30	Prunings, Trimmings, Leaves and Grass	1.70%	0.20%	1.90%	1.90%		
5.40	Manures	1.50%	0.10%	1.50%	1.50%		
5.50	Remainder/Composite Organic	0.90%	0.40%	1.30%	1.30%		
6.00	CONSTRUCTION AND DEMOLITION						
6.10	Asphalt Pavement, Brick, and Concrete	0.90%	0.10%	1.00%			
6.20	Aggregates, Stone, Rock	0.60%	0.50%	1.00%			
6.30	Wood – Treated	2.10%	0.90%	3.00%			
6.40	Wood – untreated	2.00%	0.90%	2.90%			
6.50	Asphalt Roofing	0.40%	0.50%	0.80%			
6.60	Drywall/Gypsum Board	0.30%	0.30%	0.60%			
6.70	Carpet and Carpet Padding	2.20%	0.30%	2.50%			
6.80	Remainder/Composite Construction and Demolition	0.90%	0.60%	1.40%			
7.00	HOUSEHOLD HAZARDOUS WASTE						
7.10	Ballasts, CFLs, and Other Fluorescents	0.60%	0.00%	0.60%			
7.20	Batteries – Lead Acid	0.10%	0.00%	0.10%			
7.30	Batteries – Other	0.00%	0.00%	0.00%			
7.40	Paint	0.10%	0.10%	0.20%			
7.50	Bio-Hazardous	2.50%	0.40%	2.90%			
7.60	Vehicle and Equipment Fluids	0.40%	0.10%	0.50%			
7.70	Empty Metal, Glass, and Plastic Containers (contained toxic materials)	0.10%	0.10%	0.20%			
7.80	Pesticides and Fertilizers	0.00%	0.00%	0.00%			
7.90	Other Hazardous or Household Hazardous Waste	0.00%	0.00%	0.00%			
8.00	ELECTRONICS						
8.10	Computer-related Electronics	0.30%	0.10%	0.40%	0.40%		
8.20	Other "brown goods"	0.90%	0.20%	1.20%	1.20%		
8.30	Televisions and Computer Monitors	0.30%	0.10%	0.40%	0.40%		
9.00	OTHER MATERIALS						
9.10	Tires and other rubber	0.70%	0.20%	0.90%			
9.20	Textiles	2.70%	0.80%	3.50%	3.50%		
9.30	Bulky materials	2.40%	0.50%	2.90%	2.90%		
9.40	Restaurant Fats, Oils and Grease	0.20%	0.10%	0.30%			
10.00	OTHER MISCELLANEOUS	0.60%	0.20%	0.90%			
TOTAL	by weight	74%	25%	100%	79.80%	4.30%	5.39%
TOTAL	by volume						15.2%

Sources:

- ¹ Mass DEP Waste Characterization Study Report, Wheelabrator Saugus, Facility ID# 39704, March 7, 2011
- ² Mass DEP website, introduction to Municipal Waste Combustors section, retrieved Jan 8 2012
- ³ Institutional, Commercial, and Industrial waste that has entered the municipal solid waste stream
- ⁴ Boxed juices utilize multilayer aseptic packaging, which are not currently being recycled regionally
- ⁵ Based on observations at Cambridge MA recycling dropoff facility, March 2012.
- ⁶ Profiles in Garbage: Polyethylene Terephthalate, by Chaz Miller, "Waste Age", May 2001
- ⁷ Measuring Recycling: A Guide for State and Local Governments: Standard Volume-to-Weight Conversion Factors, US EPA, OSWER, Office of Resource Conservation and Recovery, April 2012