

**State of Delaware  
Assessment of Municipal Solid  
Waste Recycling  
For Calendar Year 2007**

**Final Draft Report  
*December 1, 2008***



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## Appendices

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## **Acknowledgements**

There is a long list (over 150 names) of Delaware organizations, facilities and individuals who have voluntarily participated in this survey over the past three years to help make it complete and accurate. DSM Environmental Services, Inc. would like to thank each of them for providing DSM with the data, details on material flow, and their time to make this report as accurate as possible.

# Introduction

DSM Environmental Services, Inc. (DSM) has undertaken two previous assessments of commercial and industrial recycling activity for the State of Delaware. The first study, completed in 2005 for the Delaware Solid Waste Authority (DSWA) attempted to quantify all types of materials being recycled in Delaware from all sources. In 2006 DSM updated the 2005 study for the Recycling Public Advisory Council (RPAC), Subcommittee on Methods and Measurement (M&M Subcommittee) quantifying all materials recycled in Delaware exclusive of materials recycled by DSWA. DSWA material was separately reported to the M&M Subcommittee by DSWA. The 2006 report further differentiated between materials classified as municipal solid waste (MSW) under the United States Environmental Protection Agency (EPA) definition, and all other materials.

In 2008, DSM was asked by the M&M Subcommittee to update the 2006 study (*State of Delaware Assessment of Commercial and Industrial Recycling Activity*) for Calendar Year (CY) 2007, but to concentrate only on recyclables that meet the EPA MSW definition. Therefore, this current assessment updates the data collected for 2006, but only for recyclables meeting the US EPA definition.

The original 2005 study entailed on-the-ground surveys of most of the large generators and processors of recyclable material in Delaware focusing on materials recovery from the commercial and industrial sector. The 2006 and 2007 assessment utilized the internet, email, mail, faxing, and telephone calling to collect the information. As in the 2006 assessment DSM was also asked to disaggregate recycling by residential versus commercial sources. Finally, DSM was asked to include any data on residential recycling and leaf and yard waste collection programs run by municipalities or entities *other than DSWA*.

The resulting report is intended to provide baseline, CY 2007 data on all materials being recycled that meet the US EPA, MSW definition in Delaware exclusive of DSWA programs, which will be reported directly to the M&M Subcommittee by DSWA.

# Material Categories

This assessment encompasses all material identified by the EPA as Municipal Solid Waste (MSW). MSW is defined in the EPA document, *Measuring Recycling, A Guide for State and Local Governments (September 1997)* as:

*“Wastes such as durable goods, nondurable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources such as appliances, automobile tires, old newspapers, clothing, disposable tableware, office and classroom paper, wood pallets and cafeteria wastes.” MSW “excludes solid waste from other sources, such as construction and demolition debris, auto bodies, municipal sludges, combustion ash, and industrial process wastes that might also be disposed of in MSW landfills or incinerators. (US EPA1996b)”*

The EPA guidance document further defines what is and what is not MSW (Table A), and what counts as recycling and what does not count as recycling (Table B). These tables and accompanying table notes are included as reference in Appendix A to this report.

While the EPA guidance document is helpful in delineating what materials to include in the measurement of MSW recycling it is often the case that recycling generators, brokers and processors do not report, or keep records, sufficient to differentiate between materials that would be included or excluded from EPA's definition of recycling.

DSM's approach for this 2007 assessment was to survey only those residential, commercial and industrial activities that would be expected to generate and recycle materials that fall into *EPA's definition of MSW and recycling as shown* in Table 1, below (in column 2 titled “EPA's MSW”). In some cases it was necessary to survey generators or recyclers who manage both included and excluded materials, in which case the generator/recycler was asked to estimate the quantity of included material only.

Each material type is listed in the first column of Table 1 consistent with the way the EPA reports materials recycling. Check marks in Columns 2, 3 and 4 then identify which waste (or recycling) stream the material might be generated from. In the case where a material is generated as “MSW”, and therefore included, and as industrial process waste (“Industrial”) or construction and demolition waste (“C&D”), and therefore excluded, it is followed by a note on what is excluded in the far right column. The detailed text which follows Table 1 then describes DSM's methodology or assumptions associated with what was excluded or included in the final recycling numbers reported in Table 2.

Finally, if the checkmark is centered between columns, as in the case of metals, (as opposed to clearly in one or more generator columns such as MSW, Industrial and/or C&D) it indicates that there is no way of differentiating where the material is generated and the material is therefore excluded from further consideration. This is the case for all metals, except for appliances, which results in the calculation of a lower recycling rate than if metals (other than appliances) were counted toward recycling.

**Table 1: Type of Materials Included in Delaware Recycling Study, and Generator Category**

Materials Surveyed	Delaware Generators of Recycled Materials			EPA Methodology Exclusions
	EPA's MSW	Industrial	C&D	
<b>Paper</b>				
Corrugated Cardboard (OCC)	✓		✓	C&D corrugated recycling
Newspaper (ONP)	✓	✓		Print overruns
Sorted Office Paper	✓			
Mixed Paper (includes junk mail)	✓	✓		Print overruns and overissue publications
<b>Non Paper Packaging</b>				
Plastic Film and Shrink Wrap	✓		✓	Pre-consumer plastic waste
Plastic Bottles and Containers	✓			
Mixed Plastics/Other Plastics	✓	✓	✓	Pre-consumer plastic waste, C&D plastic waste
Aluminum Cans	✓			
Glass Bottles and Jars	✓			
<b>Metals (Scrap Metal Processors) (1)</b>				
Aluminum		✓		Nonferrous metals from industrial or construction sources, ferrous metals from transportation equipment or C&D waste.
White Goods / Appliances	✓			
All other Nonferrous Metals		✓		
All other Ferrous Metals		✓		
All other metals		✓		
<b>Automotive Wastes</b>				
Oil Filters	✓			Excluded from MSW
Waste Oil		✓		
Lead Acid Batteries	✓	✓		Batteries from large equipment, boats, heavy duty trucks and tractors, and from industrial applications.
Tires	✓			Bus and heavy farm and construction equipment tires; tire derived fuel.
<b>Organics</b>				
Food Waste	✓			Food processing waste
Fats, Oils, Grease	✓			
Leaf and Yard Waste	✓			
Tree Waste	✓		✓	C&D stumps and trees and wood used for biomass.
Clean Wood	✓		✓	Wood used for biomass.
Pallets	✓		✓	Wood used for biomass and pallet repair and reconstruction.
Textiles	✓			Reuse of apparel
Poultry Wastes, Sludges		✓		Excluded from MSW
Municipal Biosolids		✓		Excluded from MSW
Food Processing Waste		✓		Excluded from MSW
Bottom and Fly Ash		✓		Excluded from MSW

**Table 1: Type of Materials Included in Delaware Recycling Study, (continued) and Generator Category**

Materials Surveyed	Delaware Generators of Recycled Materials			EPA Methodology Exclusions (1)
	EPA's MSW	Industrial	C&D	
<b>Special Wastes</b>				
Electronics	✓			C&D debris
Florescent Bulbs	✓			
Other Batteries	✓	✓		
Carpet	✓		✓	
<b>Other Construction Wastes</b>				
Asphalt			✓	Excluded from MSW
Concrete and Brick			✓	Excluded from MSW
Soils		✓	✓	Excluded from MSW
Stones			✓	Excluded from MSW

(1) A single check mark representing all generator categories is used for metals, except appliances, since it is impossible to disaggregate quantities by generator type (i.e. residential/commercial, industrial and/or C&D) for aluminum, ferrous, non ferrous and all other metals.

A review of Table 1 illustrates that there are many material categories where generation occurs by both included and excluded categories. Some of the exclusions present real challenges in allocating waste and recycling following the EPA methodology. For example, as discussed above print overruns (which are excluded by EPA) are typically recycled with trim and other paper wastes from newspaper and other printers (which are included by EPA) and cannot be separately accounted for by recycling processors. Similarly, bus and heavy farm equipment tires are difficult to track separately from other truck tires because they are often handled and processed by the same processor and for the same market/end use.

Of particular concern is the exclusion by EPA of construction and demolition (C&D) waste from the definition of MSW. This causes particular problems with respect to tree wastes, which are defined by the EPA as included in MSW if discarded as MSW but excluded if discarded with C&D waste. The major grinders/mulchers do not keep records of where the material is generated, and therefore can only estimate as to what percent of the material that is ground for mulch would come from C&D sources (and thus be excluded in the definition of MSW). A similar problem occurs in the case of metals which are excluded if they are derived from C&D waste, or from automotive or transportation equipment, but included if they are part of a durable product.

This report attempts to identify and address each of these allocation issues to assist the M&M Subcommittee as they make decisions on what to include in their report on Delaware's recycling and diversion rates.

# Project Approach

## Survey Methodology

The CY 2007 assessment follows the same methodology as the 2006 RPAC assessment. The survey methodology is described in detail below.

**First**, DSM used the large data base of recycling contacts developed during the 2005 and 2006 survey to ensure all materials discussed with the M&M Subcommittee were included, and that all of the major recyclers (and/or handlers/brokers) were included. The 2006 survey was augmented by contacting many of the largest generators of recyclable material in the State to verify where their recyclable material was being sent. This assisted our effort to eliminate double counting.

The types of facilities included in DSM's master contact list fall into the following major categories:

- Recycling haulers that collect recyclables from small and large generators.
- Processing facilities, brokers and end users that either handle, process or buy recovered fiber, plastics, metals, glass and pallets.
- Large retailers and grocers that generate large quantities of corrugated, film, pallets, appliances, and/or lead acid batteries and who tend to backhaul these materials to internal central distribution centers for processing and marketing. This is especially critical for corrugated containers because many of the national and regional chains (e.g., Wal-Mart, Acme, Safeway) organize backhauling of baled corrugated from their retail stores to a central warehouse, rather than rely on local waste haulers or paper brokers. Therefore, recycling of corrugated containers would be under-counted if the survey only relied on reports from waste haulers and paper brokers.
- Financial institutions and insurance companies that are large employers in Delaware and are likely to generate large quantities of paper waste for shredding and recycling. This was important to ensure most of the large shredding operations were identified and contacted, and similar to retailers, that a national account for shredding and recycling was reported and accounted for.
- Large generators and processors of leaf and yard waste and natural wood waste such as major landscaping companies, tree companies, land clearing companies and mulchers, who grind the material for resale.

In all cases DSM offered survey respondents an opportunity to request that the data be kept confidential. As such, for some materials, data on quantities by individual firms will not be available to the RPAC.

**Second**, DSM used an electronic survey form to send out to recyclers and large generators that reported in 2006. This was utilized to try to increase the efficiency and accuracy of the survey process.<sup>1</sup> A version of this electronic survey form was also made available on the DSM web site. In most cases, DSM first made a telephone attempt to the contact person, and then (if necessary) sent both a letter of confidentiality along with the survey form filled out with the 2006 reported quantities by material type. DSM then followed up with telephone calls and e-mails to try to obtain updated figures and any changes in information. A copy of the survey form is attached as Appendix B.

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<sup>1</sup> DSM's experience has been that when survey participants fill out a form, they are more likely to report exact numbers as opposed to providing (rounded) estimates during a telephone interview.

**Third**, DSM attempted to update our database with any new companies and recyclers using internet searches, or identified during telephone interviews. DSM also called larger companies and facilities to find out whether any major changes had taken place (e.g., retail stores have been added or closed, companies grew and shrunk, and brokers changed).

**Fourth**, DSM collected information from each survey participant on:

- types of materials handled or recycled;
- the names of facilities or brokers used for processing in CY 2007 (to ensure double counting did not occur);
- quantities recycled by material type for CY 2007; and,
- specific end uses of materials to ensure that uses such as tire derived fuel, wood for biomass, and any shredded paper to waste to energy facilities would be excluded from the totals reported.

**Finally**, on a case-by-case basis, if a large generator of recyclables failed to respond to the 2007 survey, data from 2006 was used as a placeholder, but only if DSM expected that no major changes to that company had occurred during 2007. These data are specifically noted.<sup>2</sup>

### ***Excluded and Included Material Types***

The assessment concentrates on materials recycled from municipal solid wastes only. Construction and demolition wastes as well as industrial process wastes are excluded. In addition, gaseous and liquid wastes, infectious wastes, and Sub-title C (of RCRA) hazardous wastes are excluded.

### ***Potential for Off-Site Disposal***

Only those materials which would be disposed off-site if they were not beneficially reused or recycled, and therefore could potentially be delivered to a Delaware landfill, are included in the assessment. Examples include:

- Wood chips and stumps that are disposed on site are excluded while wood waste, including trees and stumps, that must be removed from the site are included.
- Plastic wastes reused on-site in a manufacturing process are excluded, but plastic wastes sent off-site for reclamation are included.
- Pallets that are reused on-site are excluded, but pallets that are shipped off-site for reuse, rebuilding or grinding for mulch are included in the totals.

### ***Import and Export***

In all cases the assessment **excludes** materials that are imported into Delaware for either recycling or beneficial reuse. Similarly, the study **includes** recyclables generated in Delaware but exported for recycling. For example, recycled materials backhauled or transported from large generators in Delaware directly to out-of-state warehouses or recyclers are included (e.g., grocery stores that backhaul cardboard to an out-of-state, central distribution facility) and any out-of-state material consolidated at a Delaware warehouse/recycler is excluded.

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<sup>2</sup> DSM continues to discuss with the M&M Subcommittee the need for legislation or regulation requiring reporting of recyclables generation. The State of Oregon has adopted legislation and supporting regulations which might serve as a model for Delaware.

## Description of Final Material Categories

Based on an initial Scoping Study conducted by DSM in 2005 to determine how to approach this analysis, subsequent meetings with the M&M Subcommittee (May and September, 2007) telephone calls and e-mails with M&M Subcommittee members and the definitions of excluded and included wastes described above, the material categories listed in Table 1 were included in the study. A more detailed description of the material categories, the specific data gathering approach and the recycling process, if any, is described below for each material.

**Automotive Wastes:** Automotive wastes include the byproducts from operating cars and trucks, such as oil filters, waste oil, lead acid batteries and tires. DSM excluded antifreeze and other cleaning fluids from these estimates.

- **Oil Filters:** DSM obtained data on oil and oil filter recycling from large generators (manufacturers) and processors (e.g. Safety Kleen), which are reported here. Oil filter recycling totals from DSWA (which are ultimately sent to CitiSteel for feedstock) are excluded from this report because DSWA has separately provided this information to the RPAC. DSM believes oil filter recycling is underestimated because not all of the handlers of oil filters were identified and surveyed. In addition, scrap metal recyclers who may handle oil filters that are properly drained did not report this material separately so it would be included in their aggregate estimate of ferrous metals.
- **Waste Oil:** In 2006, DSM attempted to identify waste oil recovered for re-refining. To do so, waste oil handlers were queried as to the end uses in order for DSM to apply the percentage of waste oil going to fuel verses re-refining, because waste oil going to fuel is not defined as recycling while oil for re-refining has been defined as recycling in some states, including Vermont. EPA however excludes all used oil or waste oil from the definition of MSW and recycling. In 2006, DSM was not able to confirm waste oil recovery that went for re-refining, and so waste oil was excluded from both 2006 and 2007 totals.
- **Lead Acid Batteries:** DSM surveyed by telephone vendors of lead acid batteries to confirm statewide recycling totals. In 2006, DSM also contacted one regional smelter to confirm lead recycling processes, and determine if statewide estimates could be made. The smelter, however, was unable to break down their supply by source. DSM believes that the surveyed total for lead acid batteries continues to underestimate battery recycling in Delaware. For example, using the national per capita estimate of 15.75 pounds (EPA 2003) with a reported national 97% recycling rate would equate to roughly 6500 tons of lead acid battery recycling in Delaware, compared to DSM's reported total of 3539 tons. Included in DSM's estimate are batteries from large equipment, boats and tractors because recyclers did not break out batteries separately by generator type. (Note that the total amount of material recycled includes both lead and the polypropylene battery casing.)
- **Tires:** DSM surveyed the two largest tire recyclers in Delaware – Magnus and Emanuel Tire – as well as several other large handlers of tires to confirm 2007 total quantities recovered. End uses for tires recovered were found to be mainly landscaping and drainage products, which are included in the EPA recycling definition. DSM also believes that reported data on tire recycling underestimates total quantities because tires that are retreaded are not included.

**Commercial Waste:** The commercial waste stream includes a number of materials that are traditionally recycled such as corrugated, mixed paper, office paper, plastic film and pallets. As in previous years DSM concentrated our survey effort on large commercial generators to ensure that material going to distribution centers and out of state recycling facilities was captured. DSM

also made numerous telephone calls to brokers and end users to attempt to account for any material bypassing processing facilities located in Delaware that may have been missed from our survey effort.

The types of business surveyed by DSM and the materials that they typically recycle include:

- **Office workers** including government offices and large employers in the banking, finance and insurance industries such as Wilmington Trust, Bank of America (former MBNA), and Blue Cross Blue Shield, who generate large quantities of office paper waste typically destined for shredding or secure document destruction. It should be noted that this sector has been especially difficult to obtain data from for 2007.
- **Secure Document Destruction Firms** that service the banking, finance and insurance industries of which some have used incineration or waste-to-energy facilities in the past for ensure destruction of documents. As in previous surveys, DSM verified the end uses of paper collected and reported only tonnage recycled in this report. DSM also reviewed the major sources (generators) of paper waste to ensure double counting did not occur.
- **Groceries/Supermarkets**, including most of the major supermarket chains in Delaware such as Acme/Albertson's, Food Lion Giant Foods/Super Fresh, and Shop-Rite, who typically backhaul corrugated and more recently shrink wrap to central distribution facilities for consolidation for recycling end markets. With the price of polyethylene shrink wrap and clean film at record highs in 2007, and the increase in the use of shrink wrap over corrugated in packaging, grocers and retailers had a greater incentive to try to recycle this material.
- **Retailers**, including Wal-Mart and Lowe's and other "big box" department stores such as Target and Costco, as well as major chains located in Delaware such as Happy Harry's drugstores and Wawa convenience stores, who typically recycled corrugated and shrink wrap, as well as pallets, appliances, and in the case of Wal-Mart vehicle wastes from automobile service.
- **Distributors**, such as Amazon and NKS (malt beverages) who recycle corrugated, shrink wrap and in the case of beverage distributors, glass.
- **Restaurants**, DSM interviewed representatives of some of the large restaurant chains in 2005 to obtain data on corrugated container recycling and contact information on the rendering facility taking the grease. DSM contacted the major recyclers serving these restaurants in 2006 and again in 2007 to obtain statewide quantities.



Note that while DSM asked about container recycling (e.g. beverage containers, cans, jars, jugs and other bottles); these materials were typically not recycled by commercial businesses with the exception of those covered under the state bottle deposit legislation.

All of these materials, with the exception of fats, oil and grease are clearly categorized as MSW and are included in the EPA definition of recycling. (See discussion of fats, oils, and grease in "Food Waste" below.)

**Food Waste:** Includes expired and waste meats from grocery stores and food trapped in collected oil and grease. The former is recovered and used in feed and the latter sent for organics composting out of state, and more recently also in state. DSM did not identify any fruit or

vegetable waste separation by large retailers or restaurants for composting. DSM did not attempt to estimate backyard composting, which is excluded from EPA's definition of recycling.

It should be noted here that grease and oils collected from restaurants are not explicitly addressed in the EPA Guidance Document. DNREC initially agreed, in the case of prior DSM work on calculation of a recycling rate, to include this material as MSW. EPA's definition of food scraps includes liquid fats so DSM has included fats, oil and grease recovered from food preparation, mainly restaurants, in the MSW totals.

**Green Waste:** This category has been sub-divided into three categories of organic wastes: (1) yard waste or landscaping waste – primarily leaf waste and grass clippings; (2) tree company waste; and, (3) tree waste from site clearing.

- **Yard waste:** This category is primarily from professional landscapers, which typically remove yard waste from a job and bring these materials to a central site for grinding and mulching. For this study, this material has been counted at the point of processing (grinding). DSM attempted to gain participation from all of the large mulching operations in the state. DSM also included estimates from municipal yard waste collection programs, although a number of municipalities did not respond to DSM survey attempts requiring DSM to utilize data from previous years. This report also excludes DSWA's yard waste collection program since they report directly to RPAC. All of this material is included in the totals for MSW recycling. Note that this category can include yard waste from commercial sources (e.g. landscaping waste from office parks and shopping malls) as well as from households.
- **Trees and branches:** This category is for wood waste generated from tree companies and includes tree removal (which would include some stumps) and branches from trimming. This material is generally delivered to processors for grinding and mulching, but is also delivered to some end users for fuel. DSM surveyed the processors or consolidation points as to the end use of this material. DSM has included only those quantities of trees and branches that were delivered to grinding operations for mulching.
- **Trees and stumps:** This category is for tree and stump removal in the process of site clearing for development. This material could be categorized as construction waste (and therefore excluded from MSW recycling), even though most of this material is removed from the site separate from any C&D waste. To the extent possible, DSM has excluded this material, although it is likely that some of this material is ultimately reported as yard waste by the mulchers, or reported as composting (used as a bulking agent) and therefore reported as MSW recycling.
- **Pallets and Clean Wood:** This category is for pallets collected primarily from businesses and industry because they are damaged or otherwise destined for disposal, and includes dimensional lumber that is not treated, stained or painted. Companies that handle pallets either rebuild or reconstruct them for resale, or grind them for mulch. Only the portion that is ground for mulch is reported in the MSW recycling rate (typically around 10% of all pallets collected for reuse and recycling).



DSM surveyed large generators of pallets (both industry and retailers), as well as pallet recyclers and mulchers to obtain estimates of annual quantities handled and the end uses.

Some clean wood is included in the pallet category as pallet recyclers will often pick up clean wood along with the pallets from a generator. In addition, mulchers rarely distinguish between pallet wood and other clean wood. As long as it is free of stains or paint, and relatively free of nails, they will grind it for mulch. However DSM specifically surveyed generators, reconditions/recyclers and grinders of wood and asked them to distinguish between clean wood and pallet recovery.

**Scrap Metal:** DSM has only included appliances in the assessment of municipal recycling. Unfortunately scrap metal businesses typically do not distinguish appliances from other light iron. Therefore, for purposes of this report, DSM specifically asked scrap metal dealers to estimate the percent of light iron represented by appliances, and then used these percentages to report appliance recycling by scrap metal dealers. DSM also reported backhauling of appliances from big box stores who do not use Delaware scrap dealers. DSM then separately reported appliance recycling, which is counted as recycling by the EPA.

While EPA includes metals from furniture, tires and miscellaneous durables in the definition of MSW, DSM believes it would be impossible to accurately estimate the percentage of metals recycled that would be classified as furniture, tires or durables and therefore fit into the EPA definition of MSW.

**Other Wastes:** This category is a catch-all for all other materials that are being recovered, such as electronics, carpet waste, textiles, and universal waste such as fluorescents containing mercury. DSM attempted to survey the major recyclers of textiles and carpet. However we did not contact all processors and therefore the numbers are underreported. DSM surveyed only a few recyclers of electronics and fluorescents, and believes that the quantities reported for these materials are severely underreported. However, even if all recyclers reported, the quantities would still be relatively small compared to the large quantities of other materials reported in this assessment. Note that any electronics and textiles handled by DSWA are not reported here. All of these other wastes reported to DSM are included in the totals for MSW.

## Study Limitations

The methodology used for this analysis, which counts all activity and tracks material flow, is more likely to under report than over report recycling activity. This is because DSM's approach ensured almost no double counting, since the flow of material was tracked from almost all generators to processors and/or to end markets. Therefore, the downfall of this methodology is that unless all generators and brokers participate, some material will be missed.

To compensate for this shortfall, DSM used some 2006 data for those large generators or processors that did not report. However for those processors that did not report from whom DSM had no data from 2005 or 2006, no data are included in material totals.

In addition, in some cases, such as generators of small corrugated bales and grinders of yard and tree waste, material was not weighed. Therefore estimates based on the number and size of bales or on volume are used to calculate weights.

Thus the final caution is that until there is a mandatory reporting requirement, changes from year to year in the commercial and industrial recycling rate must be viewed through the lens of voluntary reporting, and may, or may not, represent real changes in recycling rates.

## Results

Table 2 below presents estimated quantities of materials recovered for recycling or beneficial use by major material category in calendar year 2007, allocated between included and excluded MSW categories as defined by EPA. For each material category in Table 2, a description of what material has been included or excluded in the computation of the total quantity of MSW recycling is listed. In the case of metals, no quantities other than appliances and limited reporting of durables have been allocated to MSW even though the EPA includes metal from furniture, tires and miscellaneous durables in the definition of MSW. DSM could not disaggregate these types of materials from the totals reported for ferrous and nonferrous recycling.

A comparison of the 2007 data to the 2006 data leads to the following observations about the 2007 results:

- OCC tonnages have increased, probably due to high OCC values in 2007 and to increased economic activity.
- ONP dropped, probably reflecting decreased newspaper readership and newspaper size, which has been documented at the national level.
- SOP and MOP both dropped, probably due to lack of reporting by the major banks and the document destruction firms, not due to changes in the quantity generated or recycled.
- Shrink wrap increased, probably as a result of a mis-reporting of one survey result last year (it was mistakenly allocated to pallets because it was reported as "pallet wrap), and because of higher material value for all polyethylene plastics as well as an increase in sustainability programs at national retailers.
- Green waste is up significantly, probably as a result of the on-again/off-again yard waste ban in New Castle County which was heavily reported in the newspapers and promoted by the major waste haulers, as well as the increased demand for mulch, and better reporting. In addition, one of the large commercial composters significantly increased their composting activity in 2007 requiring much large quantities of carbon (ground tree and yard waste). Finally, a large storm in 2007 resulted in large quantities of tree waste which were ground for mulch.
- There was an increase in the quantity of pallets recovered for mulch, probably reflecting increased economic activity in 2007, increased reporting by additional companies in 2007 and an increase in the need for wood waste in composting operations.
- Lead acid battery recycling is up mostly due to new reporting that didn't take place in 2006.
- Fluorescent bulbs doubled because of a new company reporting to DSM.
- Carpet recovery is down although it is unclear why.
- Mixed recyclables are up due to implementation of city-wide single stream recycling by Wilmington in 2007.

**Table 2: Materials Recovery by Material Type and Breakdown of Materials Included in EPA Definition of MSW Recycling (State of Delaware, CY 2007)**

<b>Material Category</b>	<b>Total (tons)</b>	<b>MSW (tons)</b>	<b>Excluded from MSW (tons)</b>	<b>Explanation</b>
<b>Paper</b>				
Corrugated (OCC)	73,314	73,314		
Newspaper (ONP)	3,033	3,033		Print overruns excluded where identified
Sorted Office Paper	5,249	5,249		
Mixed Paper (1)	10,179	10,179		Breakdown of print overruns unknown
<b>Subtotal:</b>	<b>91,775</b>	<b>91,775</b>	<b>0</b>	
<b>Packaging</b>				
Glass	10	10		
Shrink Wrap	1,713	1,713		
Plastic Containers	46	46		
Aluminum Cans	16	16		
Pallets (2)	12,412	12,412		Pallets rebuilt excluded
Mixed Recyclables (3)	4,680	4,680		
<b>Subtotal:</b>	<b>18,877</b>	<b>18,877</b>	<b>0</b>	
<b>Metals</b>				
White Goods	21,036	21,036		
Aluminum	3,099	unknown	3,099	
Ferrous	149,259	unknown	149,259	Includes metals removed from vehicles, C&D, etc.
Non-ferrous	14,345	unknown	14,345	Includes metals removed from vehicles, C&D, etc.
Scrap Cars	8,948	0	8,948	Scrap cars excluded and underreported
<b>Subtotal:</b>	<b>196,687</b>	<b>21,036</b>	<b>175,652</b>	
<b>Green Waste</b>				
Leaf and Yard Waste	72,769	72,769		All DSWA curbside and drop-off excluded
Trees and Branches	106,637	106,637		Trees and stumps from land clearing excluded
Clean Wood	2,000	0	2,000	Clean wood not broken out from pallets by most reporting facilities
<b>Subtotal:</b>	<b>181,405</b>	<b>179,405</b>	<b>2,000</b>	

**Table 2: Materials Recovery by Material Type and Breakdown of Materials  
(continued) Included in EPA Definition of MSW Recycling  
(State of Delaware, CY 2007)**

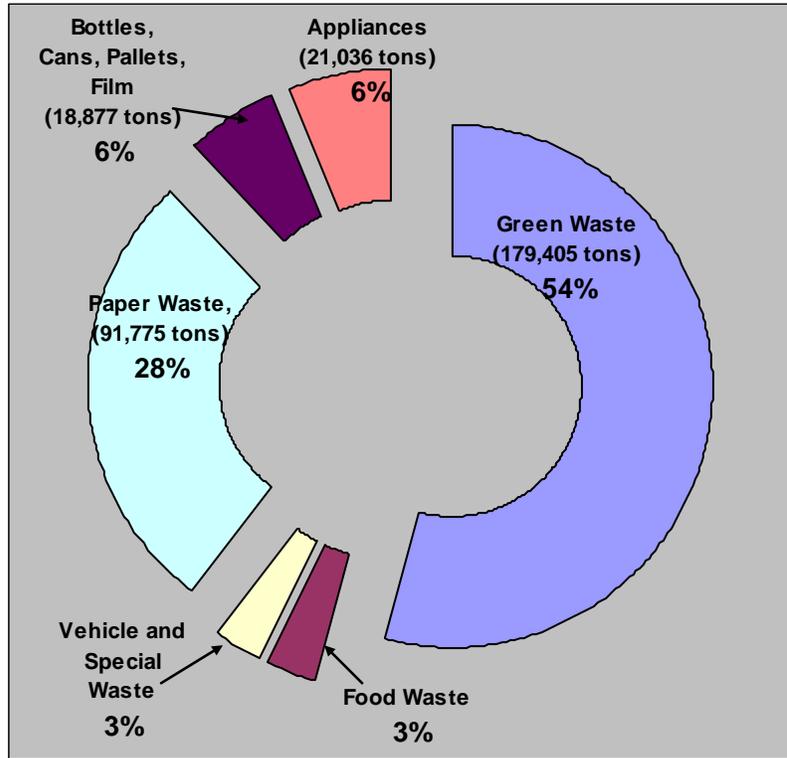
<b>Material Category</b>	<b>Total (tons)</b>	<b>MSW (tons)</b>	<b>Excluded from MSW (tons)</b>	<b>Explanation</b>
<b>Vehicle Waste</b>				
Tires (4)	7,123	5,911	1,212	Tire derived fuel excluded from MSW
Lead Acid Batteries	3,739	3,739		
Oil Filters	91	91		
<b>Subtotal:</b>	<b>10,953</b>	<b>9,741</b>	<b>1,212</b>	
<b>Special Wastes</b>				
Textiles (5)	3,409	3,409		Textiles were shipped overseas and some were reused
Electronics	200	200		Excludes all DSWA recycling activity
Florescent Bulbs	40	40		Undercounted
Carpet	32	32		
<b>Subtotal:</b>	<b>3,682</b>	<b>3,682</b>	<b>0</b>	
<b>Ag and Food Wastes</b>				
Fats, Oil, Grease	4,716	4,716		
Food Waste	4,847	4,847		
<b>Subtotal:</b>	<b>9,563</b>	<b>9,563</b>	<b>0</b>	
<b>Industrial Waste Recovery</b>				
Mixed Plastics	1,862	931	931	Estimate 50% MSW
<b>Subtotal:</b>	<b>1,862</b>	<b>931</b>	<b>931</b>	
<b>Total Recovery:</b>	<b>514,800</b>	<b>335,000</b>	<b>179,800</b>	

**Table 2 Notes:**

(Numbers may not add due to rounding)

- (1) Mixed Paper: All included in MSW as most was reported from processors who did not reveal sources.
- (2) Pallets: Only pallets composted or ground for mulch are included in the totals reported.
- (3) Mixed Recyclables: Single stream materials collected from Wilmington's curbside recycling program during CY 2007.
- (4) Tires: Roughly 1212 of the 7123 tons reported went to tire derived fuel, which is excluded from the EPA recycling rate. The balance went to end uses such as crumb rubber and engineered products including drainage material, landfill cell construction and playground surfacing, which is included in the EPA rate.
- (5) Textiles: Used clothing including shoes are exported for recycling or reuse. The end uses change based on the condition and changing markets. The clothing is sorted into 4 color categories and sold as rags, or bagged as is and sold as clothing. No breakdown of the actual end use is available.

**Figure 1: Materials Recovery by General Material Category Included in EPA Definition of MSW Recycling (State of Delaware, CY 2007)**



## Residential vs. Commercial Recycling Activity

As discussed above, DSM was also asked to estimate the percentage of each material recycled and classified as MSW that was from a residential as opposed to a commercial source. These allocations are shown in Table 3.

In some cases, the source of the material was clear, however in other cases DSM was required to make our best professional judgment as to the source of the material. Since EPA does not attempt to quantify residential and commercial recycling separately, generally acceptable guidelines for allocation of materials recycling to the residential and commercial sector are not available. It should be noted when reading Table 3 that while significant amounts of newspaper, corrugated and mixed paper are generated by residential sources, these quantities are being reported to the M&M Subcommittee separately by DSWA, and the Wilmington single stream paper is reported under "packaging" as a separate category called "mixed recyclables" in Table 3.

**Table 3: Estimate of Residential vs. Commercial MSW Recycling Activity (CY 2007), Exclusive of DSWA Materials**

Material Category	<i>Residential</i> (tons)	<i>Commercial</i> (tons)	Total MSW (tons)
<b>Paper</b>			
Corrugated (OCC)	0	73,314	73,314
Newspaper (ONP)	0	3,033	3,033
Sorted Office Paper	0	5,249	5,249
Mixed Paper (1)	0	10,179	10,179
<b>Packaging</b>			
Glass	0	10	10
Shrink Wrap	0	1,713	1,713
Plastic Containers	0	46	46
Aluminum Cans	0	16	16
Pallets	0	12,412	12,412
Mixed Recyclables (2)	4,680	0	4,680
<b>Metals</b>			
White Goods	21,036	0	21,036
<b>Green Waste</b>			
Leaf and Yard Waste (3)	67,093	5,676	72,769
Trees and Branches (4)	94,790	11,847	106,637
Clean Wood	0	0	0
<b>Vehicle Waste (5)</b>			
Tires	4,729	1,182	5,911
Lead Acid Batteries	3,739	748	4,487
Oil Filters	91	18	109
<b>Special Wastes</b>			
Textiles (6)	3,409	0	3,409
Electronics	0	200	200
Florescent Bulbs	0	40	40
Carpet	0	32	32

<b>TABLE 3 Continued</b>			
<b>Ag and Food Wastes</b>			
Fats, Oil, Grease	0	4,716	4,716
Food Waste	0	4,847	4,847
<b>Totals:</b>	<b>199,600</b>	<b>135,300</b>	<b>335,000</b>

**Table 3 Notes:**

(Numbers may not add due to rounding)

- (1) Includes some print overruns.
- (2) Single stream material from Wilmington curbside recycling program.
- (3) Leaf and Yard waste allocations were made using the same percentage from CY 2006 report.
- (4) Tree waste allocations were made using the same percentage from CY 2006 report.
- (5) Reported source of tires was 80% cars by one major tire recycler. Reported source of oil and oil filters is unknown. DSM assumed 80% of vehicle wastes recycled originated from households, and the balance from commercial vehicles.
- (6) Documented source of textiles is unknown, however DSM assumes most textiles came from residential sources. Also textiles reused are excluded under EPA but included here since reuse versus recycling cannot be determined.

## **Appendix A**

**SCOPE OF MATERIALS AND ACTIVITIES  
INCLUDED IN THE STANDARD MSW RECYCLING RATE  
SOURCE: EPA, 1996**

**TABLE A. SCOPE OF MATERIALS INCLUDED IN THE STANDARD MSW RECYCLING RATE**

<b>MATERIAL<sup>1</sup></b>	<b>WHAT IS MSW</b>	<b>WHAT IS NOT MSW<sup>2</sup></b>
Food Scraps	Uneaten food and food preparation wastes from residences and commercial establishments (restaurants, supermarkets, and produce stands), institutional sources (school cafeterias), and industrial sources (employee lunchrooms).	Food processing waste from agricultural and industrial operations.
Glass Containers	Containers; packaging; and glass found in appliances, furniture, and consumer electronics.	Glass from transportation equipment (automobiles) and construction and demolition (C&D) debris (windows).
Lead-Acid Batteries	Batteries from automobiles, trucks, and motorcycles.	Batteries from aircraft, military vehicles, boats, and heavy-duty trucks and tractors.
Tin/Steel Cans and Other Ferrous Metals	Tin-coated steel cans; strapping; and ferrous metals from appliances (refrigerators), consumer electronics, and furniture.	Ferrous metals from C&D debris and transportation equipment.
Aluminum Cans and Other Nonferrous Metals	Aluminum cans; nonferrous metals from appliances, furniture, and consumer electronics; and other aluminum items (foil and lids from bimetal cans).	Nonferrous metals from industrial applications and C&D debris (aluminum siding, wiring, and piping).
Paper	Old corrugated containers; old magazines; old newspapers; office papers; telephone directories; and other paper products including books, third-class mail, commercial printing, paper towels, and paper plates and cups.	Paper manufacturing waste (mill broke) and converting scrap not recovered for recycling.
Plastic	Containers; packaging; bags and wraps; and plastics found in appliances, furniture, and sporting and recreational equipment.	Plastics from transportation equipment.
Textiles	Fiber from apparel, furniture, linens (sheets and towels), carpets <sup>3</sup> and rugs, and footwear.	Textile waste generated during manufacturing processes (mill scrap) and C&D projects.
Tires	Tires from automobiles and trucks.	Tires from motorcycles <sup>4</sup> , buses, and heavy farm and construction equipment.
Wood	Pallets; crates; barrels; and wood found in furniture and consumer electronics.	Wood from C&D debris (lumber and tree stumps <sup>5</sup> ) and industrial process waste (shavings and sawdust).
Yard Trimmings	Grass, leaves, brush and branches, and tree stumps. <sup>5</sup>	Yard trimmings from C&D debris.
Other	Household hazardous waste (HHW) <sup>6</sup> , oil filters, fluorescent tubes <sup>7</sup> , mattresses, and consumer electronics.	Abatement debris, agricultural waste, combustion ash, C&D debris, industrial process waste, medical waste, mining waste, municipal sewage and industrial sludges, natural disaster debris <sup>8</sup> , used motor oil, oil and gas waste, and preconsumer waste.

## TABLE A. NOTES

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<sup>1</sup> Composite materials are categorized according to their main constituent; however, they can be designated as a separate category under Other MSW if they cannot be otherwise categorized.

<sup>2</sup> These wastes are not considered MSW due to one or more of the following reasons: (1) they are not defined as MSW in EPA's *Characterization of Municipal Solid Waste in the United States*, (2) they have not been historically handled and disposed of as MSW, (3) they are regulated as hazardous waste, and/or (4) they were generated by a preconsumer source. These non-MSW wastes are referred to as Other Solid Waste in this guide and on the survey forms and worksheets.

<sup>3</sup> Carpets are categorized as Textiles when discarded in MSW and are included in the rate calculation. When carpets are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.

<sup>4</sup> Tires from motorcycles are not defined as MSW because they historically have not been characterized as MSW in EPA's *Characterization of Municipal Solid Waste in the United States*.

<sup>5</sup> Tree stumps are categorized as Yard Trimmings when discarded in MSW and are included in the rate calculation. When tree stumps are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.

<sup>6</sup> HHW includes paints, stains, varnishes, solvents, pesticides, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. Specific examples include oil-based paint, antifreeze, household cleansers, and bug sprays. Used motor oil is excluded.

<sup>7</sup> Fluorescent tubes are categorized as Other MSW when found in MSW and are included in the rate calculation. When fluorescent tubes are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.

<sup>8</sup> Natural disasters include earthquakes, floods, hurricanes, and tornados. Heavy storms are not considered natural disasters.

**TABLE B. SCOPE OF ACTIVITIES INCLUDED IN THE STANDARD MSW RECYCLING RATE**

<b>RECYCLABLE MATERIAL</b>	<b>WHAT COUNTS AS RECYCLING</b>	<b>WHAT DOES NOT COUNT AS RECYCLING<sup>1</sup></b>
Food Scraps	Composting of food scraps from grocery stores, restaurants, cafeterias, lunchrooms, and private residences, and the use of food scraps to feed farm animals.	Backyard (onsite) composting of food scraps, and the use of food items for human consumption (food banks).
Glass	Recycling of container and packaging glass (beverage and food containers), and recycling of glass found in furniture, appliances, and consumer electronics into new glass products such as containers, packaging, construction materials (aggregate), or fiberglass (insulation).	Recycling of glass found in transportation equipment and construction and demolition (C&D) debris, recycling of preconsumer glass or glass from industrial processes, and reuse of refillable glass bottles.
Lead-Acid Batteries	Recycling of lead-acid batteries found in cars, trucks, or motorcycles into new plastic and lead products.	Recycling of lead-acid batteries used in large equipment, aircraft, military vehicles, boats, heavy-duty trucks and tractors, and industrial applications.
Metals	Recycling of aluminum and tin/steel cans, and recycling of metals found in appliances and packaging into new metal products.	Reuse of metal containers, packaging, furniture, or consumer electronics, and recycling of metals found in transportation equipment (autobodies) and C&D debris.
Paper	Recycling of paper products (old newspapers and office papers) into new paper products (tissue, paperboard, hydromulch, animal bedding, or insulation materials).	Reuse of paper products, recycling of preconsumer or manufacturing waste (trimmings, mill broke, print overruns, and overtone publications), and combustion of paper for energy recovery.
Plastic	Recycling of plastic products (containers, bags, and wraps), and recycling of plastic from furniture and consumer electronics into new plastic products (fiber fill and plastic lumber).	Reuse of plastic products (storage containers and sporting equipment), recycling of preconsumer plastic waste or industrial process waste, and combustion of plastics for energy recovery.
Textiles	Recycling of textiles into wiper rags, and recycling of apparel and carpet fiber <sup>2</sup> into new products such as linen paper or carpet padding.	Reuse of apparel.
Tires	Recycling of automobile and truck tires into new products containing rubber (trash cans, storage containers, and rubberized asphalt), and use of whole tires for playground and reef construction.	Recycling of tires from motorcycles, buses, and heavy farm and construction equipment, retreading of tires, and combustion of tire chips for energy recovery.
Wood	Recycling of wood products (pallets and crates) into mulch, compost, or similar uses.	Repair and reuse of pallets, combustion of wood for energy recovery, recycling of industrial process waste (wood shavings or sawdust), and recycling of wood from C&D debris.
Yard Trimmings	Offsite recycling of grass, leaves, brush or branches <sup>3</sup> , and tree stumps <sup>4</sup> into compost, mulch, or similar uses; and landspreading of leaves <sup>5</sup> .	Mulching of tree stumps <sup>4</sup> from C&D debris, backyard (onsite) composting, grasscycling, landspreading of leaves <sup>5</sup> , and combustion of yard trimmings for energy recovery.
Other	Household hazardous waste (HHW) <sup>6</sup> , oil filters, fluorescent tubes <sup>7</sup> , mattresses, circuit boards, and consumer electronics <sup>8</sup> .	Recycling of used oil, C&D debris (asphalt, concrete, and natural disaster debris), transportation equipment (autobodies), municipal sewage sludge, and agricultural, industrial, mining, and food processing waste.

**TABLE B. NOTES**

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<sup>1</sup> These activities are not considered recycling due to one or more of the following reasons: (1) they are not defined as recycling in EPA's *Characterization of Municipal Solid Waste in the United States*, (2) they involve the recycling of materials that are not part of MSW, (3) they involve reuse or source reduction, and/or (4) they involve the recycling of preconsumer waste.

<sup>2</sup> Carpeting is categorized as Textiles when discarded in MSW and is included in the rate calculation. When carpets are discarded in C&D debris, they are excluded from the rate calculation.

<sup>3</sup> Includes woody material such as branches, brush, and whole trees such as Christmas trees.

<sup>4</sup> Tree stumps are categorized as Yard Trimmings when discarded in MSW and are included in the rate calculation. When tree stumps are discarded in C&D debris, they are excluded from the rate calculation.

<sup>5</sup> Landspreading of leaves counts as recycling if the manner of the application allows timely biodegradation of the organic plant material. Landspreading of leaves does not count as recycling if the manner of the application precludes the timely biodegradation of the organic plant material.

<sup>6</sup> HHW includes paints, stains, varnishes, solvents, pesticides, antifreeze products, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. Specific examples include oil-based paint, antifreeze, household cleansers, and bug sprays. Used motor oil is excluded.

<sup>7</sup> Fluorescent tubes are categorized as Other MSW when discarded in MSW and are included in the rate calculation. When fluorescent tubes are discarded in C&D debris, they are excluded from the rate calculation.

<sup>8</sup> Composite materials are categorized according to their main constituent; however, they can be designated as a separate category under Other if they cannot be otherwise categorized.

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## **Appendix B**

### **DSM SURVEY FORM**

**Delaware Commercial and Industrial Recycling Survey**

ANNUAL REPORTING FORM CALENDAR YEAR 2007

Confidential – No company-specific data will be released

Thank you for completing this survey. If you have any questions about this form or the annual Delaware recycling report, please call the third party consulting firm, DSM Environmental, at (802) 674-2840, or the Recycling Public Advisory Council, BJ Vinton, Chair: (302) 777-1832.

Company Information			
Company _____	Subsidiary of _____		
Mailing Address _____	Contact Name _____		
City _____ State _____ Zip _____	Title _____		
Physical Address _____	Phone _____		
<input type="checkbox"/> Same as mailing	Cell _____		
City _____ State _____ Zip _____	Email _____		
Company Type	<input type="checkbox"/> Broker	<input type="checkbox"/> Banking/Financial	<input type="checkbox"/> Wood/Composting
	<input type="checkbox"/> Retailer	<input type="checkbox"/> Manufacturer	<input type="checkbox"/> Biosolids Management
	<input type="checkbox"/> Recycling Industry	<input type="checkbox"/> Aggregate/Construction	<input type="checkbox"/> Agriculture

Materials Recycled (between January 1 and December 31, 2007)				
Material <sup>1</sup>	Annual Tons Recycled 2007	Please list (as available) the company or location where you send the material for Recycling, Processing or End Use <sup>2</sup>	Approx. percent of material originating from	
			All of Delaware	New Castle County
			%	%
			%	%
			%	%
			%	%
			%	%
			%	%

1. Please be specific as to material type: corrugated cardboard (OCC); office paper for shredding; mixed paper; old newspaper; shrink wrap; plastic containers; mixed/other plastics; aluminum cans; steel cans; glass; scrap metal [aluminum; white goods/appliances; nonferrous; ferrous]; food waste; fats, oils, grease; yard waste; tree waste; clean wood; pallets; textiles; poultry wastes; poultry sludges; biosolids; food processing waste; bottom and fly ash; rubber; electronics; fluorescent bulbs; household batteries; carpet; asphalt; concrete and brick; soils; waste oil; oil filters; lead acid batteries; tires.

2. This information is important so that DSM does not double count material that is handled by another recycler that participates in our survey. If you broker direct to an end user outside of DE, and you would prefer not to list them, just list "End-User outside of DE."

Non-Disclosure
The information provided is confidential
<input type="checkbox"/> Yes <input type="checkbox"/> No
DSM Environmental Services, Inc. (DSM) will hold confidential any information and data provided to us which you specify as confidential, as part of the Delaware Statewide Commercial and Industrial Recycling Annual Report that DSM is conducting for the Delaware Recycling Public Advisory Council (RPAC). The purpose of the study is to develop reasonable and professional estimates of the quantity of material recovered for recycling from non-residential activities located in Delaware, and to ensure no double counting of material occurs. Data provided to DSM will be aggregated with all other material quantities reported to develop a single, annual quantity (in tons) of material recycled for each material type. DSM agrees not to release, divulge or report any individual data or information reported to any party, including RPAC, and will maintain complete confidentiality with the data using it only for aggregate material reporting.

