

# ANALYSIS OF A COMPREHENSIVE RECYCLING PLAN FOR NEW CASTLE COUNTY



**FINAL REPORT**

**May 11, 2007**



**Prepared for:**

**Delaware Solid Waste Authority**

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## I. Introduction

The Delaware Solid Waste Authority (DSWA) was issued a Permit Renewal on January 6, 2006 for expansion of the Cherry Island Landfill (Permit SW-06/01). The Permit Renewal includes the provision that the DSWA submit to the Delaware Department of Natural Resources & Environmental Control (DNREC) a “*comprehensive recycling plan to maximize recycling and diversion of materials from landfill disposal with a goal of recycling 40 percent of the municipal solid waste (MSW) stream in New Castle County by December 31, 2007.*”

DSWA contracted with DSM Environmental Services, Inc. (DSM) to assist them with two tasks associated with this permit condition. First, DSM was to develop a baseline MSW recycling rate for New Castle County (NCC) so that all parties understand what the recycling rate was as of calendar year 2006 (CY 06). Second, DSM was asked to provide our best professional judgment as to a potentially achievable recycling rate for NCC given our knowledge of current recycling activities in NCC, and our experience increasing recycling rates in other regions of the United States.

The following tasks were necessary to carry out this assessment:

- Define what materials are included in the definition of municipal solid waste (MSW) as used by DNREC in Permit SW-06/01;
- Determine current deliveries of MSW from NCC generators to DSWA’s Cherry Island Landfill and Pine Tree Corners Transfer Station (PTCTS);
- Update DSM’s and DSWA’s databases of current recycling activities in NCC for CY 06 that are included in the DNREC definition of MSW;
- Calculate a current, or baseline recycling rate for NCC (CY 06);
- Project what additional materials could be potentially diverted for recycling under conventional recycling programs;
- Calculate the potentially achievable recycling rate associated with diversion of additional material; and
- Estimate the costs associated with meeting the potentially achievable recycling rate.

Each task is described in detail below, followed by DSM’s conclusions concerning the current, baseline recycling rate for MSW in NCC, and the potential to increase this recycling rate over time.

## II. Definition of Municipal Solid Waste

DNREC provided DSWA with a definition of MSW in Attachment B of a September 5, 2006 letter to Pasquale Canzano from James D. Werner, Director, Air and Waste Management Division. MSW is defined by DNR 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.”*

DSM confirmed with DNREC that this definition of MSW was taken directly from the US EPA, *Measuring Recycling, A Guide for State and Local Governments, September, 1997*.<sup>1</sup> Tables A and B of the EPA guidance document define what is MSW 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 notes are included as reference in Appendix A to this report.

While the US EPA Guide is helpful in delineating what materials to include in the measurement of recycling in NCC, certain definitions contained in the Guide are difficult to address because generators/recyclers do not report, or keep records, sufficient to differentiate between materials that are included and those that are excluded.

Of particular concern is the exclusion 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 US 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 one can only guess as to what percent of the material that is ground for mulch is included in the definition of MSW.

A similar problem exists for lead-acid batteries and tires, where discards from certain activities are included (e.g., lead acid batteries are included from cars, trucks, and motorcycles but excluded from boats, trucks and tractors). Again, the recyclers do not keep track of the generator of the material, and therefore it is necessary to make a reasonable guess as to the percent which is included and the percent that is excluded.

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<sup>1</sup> Telephone call with James Short, January 9, 2007.

### III. Baseline MSW Disposal: Calculation of the Denominator

Because of contracts that DSWA has signed with all of the major haulers operating in NCC, it is highly likely that virtually all MSW generated in NCC is disposed of at the two DSWA facilities in NCC – Cherry Island Landfill and the Pine Tree Corners Transfer Station (which currently transfers waste to DSWA's Central Landfill in Kent County).<sup>2</sup>

DSWA maintains detailed scale weigh data for each DSWA facility. However this data does not distinguish between residential and commercial waste. And, in the case of the Cherry Island Landfill, some portion of the waste reported as MSW is actually construction and demolition (C&D) waste because haulers can not meet the stringent specifications for disposal in the C&D area.

Fortunately, as part of a recent study for DSWA,<sup>3</sup> DSM conducted surveys of trucks entering the Cherry Island Landfill to determine the origin of the waste. In addition, DSM is currently involved in a year long waste characterization study for DSWA which includes visual analysis of C&D loads entering both the Cherry Island Landfill and PTCTS. As a result of these two studies it is possible to fairly accurately estimate the percent of waste entering the two facilities that is residential and commercial MSW, and what part is C&D waste, which is excluded from the definition of MSW.

Finally, for purposes of this analysis it can be assumed that all wastes disposed at the Cherry Island Landfill are from NCC. However, given the location of the PTCTS, it is likely that some portion of the waste delivered to PTCTS is collected in northern Kent County. Interviews with the two scale house operators, both of whom are very knowledgeable about deliveries, indicates that roughly 75 percent of the waste entering the PTCTS is from NCC. Therefore total deliveries of MSW to PTCTS have been reduced by 25 percent to represent NCC waste generation only.

Table 1 presents calendar year 2006 (CY 06) deliveries of material defined as MSW from NCC to Cherry Island and PTCTS, as well as the allocation between residential and commercial wastes.<sup>4</sup>

**TABLE 1.  
NCC MSW Disposal (CY 06)**

	<b>Cherry Island</b>	<b>PTCTS</b>	<b>Total</b>
<b>Total Deliveries (tons) (1)</b>	576,522	88,351	<b>664,872</b>
	<i>Percent from NCC</i>	100%	75%
<b>Net Tons, NCC</b>	<b>576,522</b>	<b>66,263</b>	<b>642,785</b>
	<i>Percent Residential</i>	46%	46%
Residential Tons, NCC	265,200	30,481	<b>295,681</b>
	<i>Percent Commercial (2)</i>	45%	45%
Commercial Tons, NCC	259,435	29,818	<b>289,253</b>
	<b>Net MSW Tons, NCC:</b>	<b>524,635</b>	<b>60,300</b>
			<b>584,934</b>

(1) Includes tires.

(2) Roughly 9% of delivered tonnage is C&D which is excluded from MSW.

<sup>2</sup> An estimated 12,000 tons of MSW generated by industrial sources in NCC is hauled out of state to waste-to-energy facilities because these industries have a no waste to landfill policy.

<sup>3</sup> *State of Delaware Assessment of Commercial and Industrial Recycling Activity*, July 2006.

<sup>4</sup> Delivery data, provided by Willie Brown, DSWA, was manipulated by DSM to eliminate out-of-county deliveries and C&D wastes, and to allocate the remaining waste between residential and commercial sources.

## IV. Baseline Recycling Rate: Calculation of the Numerator

Three primary sources were used to develop the current (CY 06), or baseline, recycling rate for NCC. These were:

- Reports from DSWA on their drop-off and curbside recycling collection activities in NCC, plus data from the Wilmington RecycleBank program and two other small curbside collection programs not run by DSWA;
- Data from DSM's July, 2006 report to DSWA, *State of Delaware Assessment of Commercial and Industrial Recycling Activity*, modified and updated where possible to include only materials being recovered from NCC; and,
- Data from DSWA and other leaf and yard waste collection programs in NCC and surveys of major yard waste processors in NCC.

Separate baseline recycling rates for residential and commercial MSW have been calculated, and then a composite MSW recycling rate calculated. While it is not always possible to differentiate between residential and commercial recycling (e.g., some portion of appliances, tires and batteries are commercial and some portion are residential) it would be difficult to develop realistic goals for increasing the recycling rate unless separate baseline residential and commercial recycling rates are established.

### Residential Recycling

The baseline residential recycling rate for CY 06 was calculated by summing the following materials and yard waste recycling programs:

- *Recycle Delaware* material from NCC drop-offs;
- Tons collected from DSWA's subscription curbside collection program in NCC;
- Wilmington's *RecycleBank* curbside collection pilot program serving 6700 households in Wilmington, and other small curbside programs who deliver to DSWA;
- Appliance recycling in NCC;
- Electronics collections;
- Material generated in NCC that was collected through the bottle bill container return program;<sup>5</sup>
- DSWA and municipal yard waste collection programs; and,
- Yard waste material from mulching operations.

### ***Residential Materials Recycling***

Table 2 summarizes CY 06 data for residential materials recycling associated with the *Recycle Delaware* drop-off program, the DSWA curbside collection program, and other curbside programs in NCC. The *Recycle Delaware* drop-off program data have been adjusted based on DSM's survey data assuming that five percent of the material is delivered from outside of Delaware, and ten percent of the material is delivered from businesses within Delaware (and therefore included in the commercial recycling rate, as shown below).

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<sup>5</sup> It could be argued that bottle bill material should be allocated between commercial and residential sources, but DSM does not have data with which to make this allocation.

**TABLE 2.  
Baseline Residential Materials Recycling (CY 06)**

<b>Program</b>	<b>Tons</b>
DSWA Curbside Collection (1)	1,907
Wilmington/RecycleBank (2)	923
Recycle Delaware Drop-off(1)	10,287
Other Curbside and Drop-off Collection (1)	480
Container Deposit Recycling (3)	2,415
Electronics (1)	565
<b>Total:</b>	<b>16,012</b>

(1) Source: DSWA.

(2) Source: City of Wilmington DPW.

(3) Estimated NCC beverage container deliveries to DSWA from NKS and Standard Distribution.

***Residential Yard Waste Recycling***

Table 3 summarizes CY 06 data on yard waste recycling activities in NCC. As stated above, it was necessary to differentiate between material coming from C&D activities (which are excluded), and material coming from residential and commercial activities (which are included). Further, to calculate a residential recycling rate separate from a commercial recycling rate, it was also necessary to estimate what percent of yard waste is being generated from residential versus commercial sources. For purposes of this report DSM has made the following gross assumptions:

- One hundred (100) percent of the yard waste from municipal programs and the DSWA yard waste collection program is residential;
- Fifty (50) percent of the tree waste delivered to grinders/mulchers is from C&D activities, 25 percent is from residential sources, and 25 percent from commercial sources; and,
- Seventy-five (75) percent of the yard waste delivered to grinders/mulchers is from residential sources and 25 percent from commercial sources.

**TABLE 3.  
Allocation of Yard Waste Recycling (CY 06)**

<b>Type of Recovery</b>	<b>Total (tons)</b>	<b>Residential</b>		<b>Commercial</b>	
		<b>(%)</b>	<b>(tons)</b>	<b>(%)</b>	<b>(tons)</b>
<b>Municipal Yard Waste Collection Programs</b>					
Delaware City	160				
Middletown	650				
New Castle	500				
Newark	2,520				
Newport	80				
Wilmington	1,100				
<i>Sub-Total, Municipal Programs</i>	<i>5,010</i>	<i>100%</i>	<i>5,010</i>		
DSWA Yard Waste Collection	86	100%	86		
<b>Grinders/Mulchers</b>					
Tree Waste	26,965	25%	6,741	25%	6,741
Yard Waste	16,665	75%	12,499	25%	4,166
<i>Sub-Total, Commercial Mulchers</i>	<i>43,630</i>		<i>19,240</i>		<i>10,908</i>
<b>Total Recovery:</b>	<b>48,726</b>		<b>24,336</b>		<b>10,908</b>

### ***Residential Appliance Recycling***

DSM's estimates for appliances are based on surveys of the major metals brokers as well as data reported by some of the big box stores on backhauling of appliances out of Delaware (similar to corrugated recycling).

DSM has made the assumption that 100 percent of the appliances are originally from residential sources. We recognize that this is not the case, and that some small percent come from commercial sources. However, given the lack of data, and the fact that we are choosing to allocate all lead acid batteries and tires to commercial sources, this seems to be a reasonable assumption.

**TABLE 4.  
Estimated Appliance Recycling (CY 06)**

<b>Source</b>	<b>Tons</b>
Scrap Metal Dealer/Brokers (1)	9,113
Big Box Stores (2)	1,792
<b>Total:</b>	<b>10,905</b>

(1) Includes DSWA Collected Material.

(2) Estimated based on average data from some stores.

### ***Total Residential Recycling***

Table 5 sums the residential data presented in Tables 2 through 4 above, to calculate total estimated residential recycling in NCC for CY 06.

**TABLE 5.  
Total Estimated Residential Recycling in NCC  
(CY 06)**

<b>Residential Recycling</b>	<b>Tons</b>
Materials Recycling	16,012
Yard Waste Recycling	24,336
Appliances	10,905
<b>Total Residential Recycling:</b>	<b>51,253</b>

### **Commercial Recycling**

The primary source of data for estimating the commercial recycling rate is the July 2006 *State of Delaware Assessment of Commercial and Industrial Recycling Activity* prepared for DSWA by DSM. For purposes of calculating a NCC only CY 06 rate we have attempted to go back to all of the major recyclers surveyed a year ago asking them to update their quantities, and to distinguish between materials collected in NCC versus the remainder of the State.

Our experience during the year that it took to prepare the July 2006 report was that without a requirement to report, many of the generators/recyclers are reluctant to report, requiring multiple telephone calls (an average of five telephone calls per respondent). This remains the case today, and in fact it is even more difficult now because a number of respondents originally believed this would be a one-time exercise, and are now worried that this will become an annual burden on

them. For this reason, if DNREC and RPAC are serious about measuring progress toward DSWA's recycling goal in NCC it is DSM's recommendation that specific reporting requirements be adopted by DNREC to help assure continued participation. We believe that reporting requirements exist in some of the surrounding states.

Table 6 presents the best data available to DSM as of the date of this report on commercial materials being recovered for recycling in NCC. In many cases we are still waiting for updated numbers, and have had to rely on last year's data, and/or have had to use our best judgment as to what percent of the material is from NCC. In addition, we believe that the paper quantities, especially, are under-reported because of the reluctance of many generators of confidential data to report where the paper is being sent for destruction (typically shredding and then recycling).

**TABLE 6.  
Estimated Commercial Recycling in NCC**

<b>Material Category</b>	<b>Estimated for CY 06</b>
<b>Paper</b>	<b>(tons)</b>
OCC	23,941
ONP	4,846
MOP	9,275
<b>Subtotal:</b>	<b>38,062</b>
<b>Packaging</b>	
Glass	906
Shrink Wrap	109
Mixed Plastics	1,378
Al/Steel Cans	55
Pallets	11,134
<b>Subtotal:</b>	<b>13,582</b>
<b>Metals</b>	
White Goods	0
Ferrous	32,573
Non-ferrous	5,000
All other	330
<b>Subtotal:</b>	<b>37,903</b>
<b>Organics</b>	
Clean Wood (Tree Companies)	10,908
Food Waste	139
Fats, Oil, Grease	700
<b>Subtotal:</b>	<b>11,746</b>
<b>Vehicle Waste</b>	
Tires and Rubber	3,903
Oil Filters	26
Lead Acid Batteries	609
<b>Subtotal:</b>	<b>4,538</b>
<b>Other Materials</b>	
Electronics	877
Florescent Bulbs	43
Textiles and Carpet	514
Recycle Delaware Drop-off	1,066
<b>Subtotal:</b>	<b>2,500</b>
<b>Total Commercial Recycling:</b>	<b>108,331</b>

## V. Baseline Recycling Rate: Putting Together the Numerator and Denominator

### Residential Baseline Recycling Rate

Table 7 sums the residential data presented in Section IV to calculate a current (CY 06) estimated residential recycling rate for NCC. This represents the current, or baseline recycling rate against which future progress can be measured. It should be noted that to accurately assess progress moving forward, the same assumptions about allocation will have to be made, or changes noted along with the impact of the changes in assumptions noted. In addition, as additional sources of data are reported to DSM/DSWA the baseline will change.<sup>6</sup>

**TABLE 7.  
Baseline Residential Recycling Rate  
(CY 06 for NCC)**

Category	Tons
<b>Residential Waste Disposed</b>	
Cherry Island	265,200
Pine Tree Corners Transfer Station	30,481
<i>Sub-Total, Disposed</i>	<i>295,681</i>
<b>Residential Recycling</b>	
Materials Recycling	16,012
Yard Waste Recycling	24,336
Appliances	10,905
<i>Sub-Total, Recycled</i>	<i>51,253</i>
<b>Baseline Residential Recycling Rate:</b>	<b>15%</b>

### Commercial Baseline Recycling Rate

Table 8 presents the estimated baseline (CY 06) commercial recycling rate based on the recovery data presented in Table 6 and data from Table 1 on commercial waste disposal at Cherry Island Landfill and PTCTS. It should be noted that Table 8 does not include roughly 12,000 tons of commercial MSW generated in NCC that is being disposed of out-of-state, primarily at waste-to-energy facilities.

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<sup>6</sup> In some cases we are still waiting for current year data and have had to rely on CY 05 data. In other cases we are still waiting for responses and have had to estimate based on the average of the responses received to date.

**TABLE 8.  
Baseline Commercial Recycling Rate  
(CY 06 for NCC)**

<b>Category</b>	<b>Tons</b>
<b>Commercial Waste Disposal</b> (from Table 1)	
Cherry Island Landfill	259,435
PTCTS	29,818
<i>Sub-Total Disposed:</i>	<i>289,253</i>
<b>Commercial Recycling</b> (Total from Table 6)	
<i>Sub-Total Recycled:</i>	<i>108,331</i>
<b><i>Baseline Commercial Recycling Rate:</i></b>	<b><i>27%</i></b>

**Combined, Baseline Recycling Rate (CY 06)**

Table 9 presents the combined residential and commercial baseline MSW recycling rate for NCC (CY 06) based on the definitions of "MSW" and "Recycling" contained in the US EPA guidance document (Appendix A).

**TABLE 9.  
Combined Baseline Recycling Rate  
(CY 06 for NCC)**

<b>Category</b>	<b>Tons</b>
Total Disposed (Residential and Commercial)	584,934
Total Recycled (Residential and Commercial)	159,583
<b><i>Baseline MSW Recycling Rate:</i></b>	<b><i>21%</i></b>

## VI. Establishing Realistic Goals Looking Forward

As stated in the Introduction to this report, DSWA's Permit Renewal for the Cherry Island Landfill includes the requirement that DSWA prepare a comprehensive recycling plan with a "goal of recycling 40 percent of the municipal solid waste (MSW) stream in New Castle County by December 31, 2007." Further, the Solid Waste Technical Working Group's report and the Recycling Public Advisory Council have established a goal of 51 percent recycling.<sup>7</sup>

It has been reported that the 51 percent goal was stimulated, at least in part, by San Diego's current recycling rate of 52 percent.<sup>8</sup> The San Diego recycling rate is instructive of the difficulties of comparing recycling rates among states and municipalities with varying laws, regulations, and ways of measuring recycling. According to a March 16, 2006 San Diego Union-Tribune article, *New Formula Stirs Trash Talk*, by Mike Lee, "It's a soft science in my mind, but obviously we'll take it" said Stephen Grealy, recycling coordinator for San Diego. His city's recycling rate rose from 45 percent to 52 percent [due to the new formula], the first time it has met California's mandate. Grealy said the numbers look good but carry little practical weight. "The amount of waste going to the Miramar landfill keeps increasing".

San Diego has a number of high quality recycling programs stimulated by the California Integrated Waste Management Board's recycling rate requirements, including offering single stream recycling collection with carts, on an every other week basis, to all single family households (roughly 276,000 households). However another 200,000 households (roughly) in multi-unit buildings and condominiums do not receive recycling collection from the City. And, the California law and regulations allow for the inclusion of alternate daily cover of ground C&D, green materials, sludge, ash, kiln residue and compost to be included in the recycling rate calculation, as well as the combustion of certain agricultural wastes, while excluding white goods.<sup>9</sup>

This is substantially different from Delaware's requirements, which are based on the US EPA Guide and Methodology (see Appendix A). For this reason, DSM was asked by DSWA to provide our best professional judgment as to a reasonably achievable recycling rate for NCC, based on the US EPA definition of MSW and recycling.

DSM's preferred approach would be to determine the amount of potentially recyclable material going into the Cherry Island and PTCTS facilities, and then calculate what percent of this material could realistically be diverted with a combination of bans (e.g., yard waste) and new and/or enhanced recycling collection and processing programs.

DSWA is currently in the middle of completing a new waste characterization study. The results will not be available until this coming summer, after the results of the winter and spring sorting have been completed and all the data tabulated.

Until the new waste characterization is completed it is necessary to rely on the 1997 SCS waste characterization. This is the waste composition data that DSM used to complete analyses for RPAC and DSWA over the past several years. DSM's analyses include:

- *Evaluation of Enhanced Residential Waste and Recyclables Collection and Processing for New Castle County*, October 15, 2003, prepared for the Delaware Recycling Public Advisory Council;
- *Analysis of the Impact of a Yard Waste Ban On Landfill Quantities and Household Costs*, September 15, 2004, prepared for the DSWA;

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<sup>7</sup> September 5, 2006 letter from James Werner to Pasquale Canzano, page 2.

<sup>8</sup> Telephone conversation with F. Michael Parkowski, November 21, 2006

<sup>9</sup> <http://www.ciwmb.ca.gov/LGCentral/Glossary.htm>

- *Analysis of Mandatory Curbside Recycling Program Costs*, October 28, 2004, prepared for the DSWA; and,
- *State of Delaware Assessment of Commercial and Industrial Recycling Activity*, July 2006, prepared for the DSWA.

## Potentially Achievable Residential Recycling Goal

### *Residential Materials Recycling*

An estimation of a potentially achievable residential materials recovery rate for NCC, based on the existing waste composition data, was made by DSM for RPAC in October, 2003. In the absence of new waste composition data, we believe that the estimates completed in 2003 remain valid today, after adjustments for population growth as reflected in current deliveries to DSWA facilities.<sup>10</sup> The only change is that the denominator – that is, how much residential waste is being disposed of at the Cherry Island Landfill and the PTCTS – has been refined by more recent survey data.

It is important to stress here that a potentially achievable recycling rate based on a *materials recovery rate* is, in our opinion, a more refined methodology for estimating a recycling rate, than simply basing the recycling rate on reported recycling rates in other areas of the country, as the discussion of San Diego's recycling rate, above, illustrates.

As discussed in detail in the October, 2003 RPAC report, and again in the October 28, 2004 report, *Analysis of Mandatory Curbside Recycling Program Costs* the potentially achievable recovery rate for residential recyclables is likely to range from 50 to 64 percent of the available recyclable material. That is, to achieve a materials recovery rate of 64 percent requires an overall, county-wide average household participation rate of 85 percent, and a capture rate of 75 percent.<sup>11</sup> This is on the high end of the range of participation and capture rates that DSM has observed from sorting waste and recyclables throughout the eastern United States.

It is likely that even if all of NCC were served by weekly curbside collection of recyclables on the same day as refuse collection that it would take education, time, and potentially an incentive program (e.g., RecycleBank, or Pay As You Throw pricing) to achieve the 64 percent recovery rate. Every other week collection and/or the absence of an incentive program would probably reduce the recovery rate to closer to 50 percent, which still represents a 75 percent participation rate and a 67 percent capture rate county-wide.

Adjusting the estimated recovery of material detailed in Table 13 of the October, 2003 RPAC report<sup>12</sup> to reflect current deliveries of residential waste to Cherry Island and PTCTS yields a total of 56,100 tons of residential recyclables that could be diverted assuming county-wide single stream collection with carts.

It should be noted that this 56,100 tons includes much of the tonnage that is currently being recovered from residential sources in NCC, including the Wilmington pilot curbside collection program, the DSWA curbside collection program, and some portion of the *Recycle Delaware* material.<sup>13</sup>

<sup>10</sup> The data presented in the October 15, 2003 RPAC report on single stream curbside collection of residential recyclables are consistent with the data from the new Wilmington, *RecycleBank* pilot program.

<sup>11</sup> An 85 percent participation rate means that 85 percent of all households in NCC set out recyclables at least once per month. A 75 percent capture rate means that each participating household sets out 75 percent of all their recyclables for recycling, with the remaining 25 percent being thrown away in the refuse.

<sup>12</sup> Page 21, Table 13, *Evaluation of Enhanced Residential Waste and Recyclables Collection and Processing for New Castle County*.

<sup>13</sup> It is DSM's experience that if DSWA continued to maintain a core group of drop-off locations for material that can't be collected curbside, and provided the opportunity to drop off conventional materials at these

## **Yard Waste**

The September 15, 2004 report, *Analysis of the Impact of a Yard Waste Ban on Landfill Quantities and Household Costs* presents DSM's best estimate, based on the 1997, SCS waste characterization study of the amount of additional yard waste that would be recycled in NCC under a yard waste ban. As stated in the September 15, 2004 report:

*"DSM has assumed that a landfill ban in Delaware, however defined and however enforced would result in a decline in per capita disposal from 234 pounds per capita to 76 pounds per capita. Of the remaining 158 pounds per capita, DSM has assumed that 30 percent will be left on-site – through on-site mulching or composting, and the remainder, roughly 111 pounds (rounded), will require collection and processing in new facilities."*

The US EPA does not define yard waste left on site as recycling (see Appendix A). However, all material taken off site for management would be considered recycling. This material must be added to the existing yard waste material that is already being recycled in NCC (Table 3, above) because the yard waste ban represents new material that is currently not recycled.

## **Appliances**

It can be assumed that the vast majority of appliances are already being recycled, and therefore the data presented in Table 4 would remain unchanged under an enhanced recycling program.

## **Calculation of Potentially Achievable Residential Recycling Rate**

Table 10 presents the estimated residential recycling rate associated with an aggressive, county-wide single stream, curbside collection program for residential recyclables, coupled with a yard waste ban and development of facilities for managing the resulting diverted yard waste. As illustrated by Table 10, it is DSM's opinion that a realistic goal for residential recycling would be 37 percent.

It should be noted that this estimated recycling goal ignores costs and/or political issues associated with implementation. It simply applies what DSM has observed in other areas of the country to NCC data.

**TABLE 10.  
Potentially Achievable Residential Recycling Rate**

<b>Material/Program</b>	<b>Tons</b>
<b>Materials Recycling</b>	
County-Wide Curbside Collection	56,100
Drop-Off Program	2,500
Container Deposit Recycling	2,415
<i>Sub-Total, Materials Recycling</i>	<b>61,015</b>
<b>Yard Waste Recovery</b>	
Current Yard Waste Recovery	12,500
Current Trees Recovered From Residential Sources	7,600
New Diversion Due To Ban	29,027
<i>Sub-Total, Yard Waste</i>	<b>49,127</b>
<b>Special Waste</b>	
Appliances	9,875
Electronics	565
<i>Sub-Total, Special Wastes</i>	<b>10,440</b>
<b>Sub-Total, Recycling</b>	<b>120,582</b>
<b>Current Residential Disposal</b>	
	295,681
Less Yard Waste Left On-Site	(12,291)
Less, New Diversion	
Yard Waste	(29,027)
Materials Recycling (1)	(49,918)
<b>Sub-Total, Adjusted Disposal</b>	<b>204,446</b>
<b>Total Material, Recycled and Disposed</b>	<b>325,028</b>
<b>Potentially Achievable Residential Recycling Rate:</b>	<b>37%</b>

(1) Calculated from the estimated 61,015 tons above minus existing curbside and 75% of residential drop-off recycling.

### **Potentially Achievable Commercial Recycling Rate**

Much less analysis has been conducted on potentially achievable commercial recycling rates, either in Delaware, or throughout the United States. This is due, in part, to the fact that: a) commercial waste is already being recycled at a higher rate than residential waste; and, b) state and local jurisdictions do not typically control the collection or recycling of commercial materials.

Ideally, data from DSWA's waste characterization would be used to develop estimates of what could potentially be recycled. However, until the current waste characterization is completed, it is necessary to rely on the SCS data. This 1997 characterization shows that paper and organics are the two largest waste types disposed of at the Cherry Island Landfill and PTCTS. Corrugated containers, newsprint and office papers are the largest fractions of the paper wastes, and food wastes are the single largest fraction of the organic waste. In addition, plastic film disposal represented roughly 7 percent of commercial waste in NCC in 1997. Commercial generation of

plastic film has probably grown since 1997, and we would anticipate that plastic beverage containers have also grown as a percent of the waste stream.

For lack of better data we have assumed that the maximum potentially achievable recycling rate for commercial waste would cut corrugated and mixed paper disposal in half, would recover roughly 25 percent of the food waste, 25 percent of the plastic film, and 50 percent of plastic beverage bottles.

Table 11 illustrates how much additional commercial material might be recovered under these assumptions.

**TABLE 11.  
Potentially Achievable Increases in Commercial Recycling**

<b>Category</b>	<b>Percent of Commercial Waste (1) (%)</b>	<b>Tons Available (tons)</b>	<b>Future Diversion (2) (%)</b>	<b>Additional Recovered (tons)</b>
<b>Total Commercial Tons</b>		<b>289,253</b>		
Corrugated Containers	13.5%	39,049	50%	19,525
Mixed Paper (3)	7.5%	21,694	50%	10,847
Food Waste	11.0%	31,818	25%	7,954
Plastic Film	7.0%	20,248	25%	5,062
Plastic Bottles	0.5%	1,446	50%	723
		<b>Total, Increased Commercial Recycling:</b>		<b>44,111</b>

(1) Average from SCS sorts at Cherry Island and PPTS.

(2) Percent of material disposed that is assumed to be diverted through new recycling programs.

(3) Includes corrugated, newsprint and office papers.

Table 12 illustrates the potentially achievable commercial recycling rate based on the additional recycling estimated in Table 11.

**TABLE 12.  
Potentially Achievable Commercial Recycling Rate**

<b>Category</b>	<b>Tons</b>
Current Disposal	289,253
Current Recycled	108,331
Less Recycle Delaware	(799)
New Recycled	44,111
	<b>Sub-Total, Recycled</b>
	<b>151,643</b>
New Disposal	245,142
	<b>Potentially Achievable Commercial Recycling Rate:</b>
	<b>38%</b>

## Potentially Achievable MSW Recycling Rate for NCC

Table 13 summarizes our best estimate of a reasonable recycling rate goal for NCC based on the data presented above. It should be emphasized that the estimate of a potentially achievable recycling rate is based on a waste characterization study that is now ten years old, and in the process of being revised. A more accurate estimate of a potentially achievable recycling rate will be possible when the new waste characterization has been completed and the data released for NCC.

**TABLE 13.**  
**Potentially Achievable Combined Residential and Commercial Recycling Rate for NCC**

<b>Category</b>	<b>Tons</b>
Total Disposed	449,588
Total Recycled	274,403
<b><i>Achievable MSW Recycling Rate:</i></b>	<b>38%</b>

## VII. Estimated Annual Costs to Implement Potentially Achievable Residential Recycling Rate

There will be increased costs associated with achieving the residential recycling rate presented in Table 13. These costs can vary significantly depending on the assumptions made about how the system will be implemented and who will be responsible for it. For example, costs will be higher if DSWA is responsible for developing an entirely new collection infrastructure to serve all of NCC. Costs will be somewhat lower if each of the existing private haulers are responsible for offering the service on a subscription basis, and costs will be even lower if there is county-wide organized curbside collection. Because of these differences, and because it is not the intent of this plan to develop detailed cost estimates, costs are presented as a range, using existing published sources. These include DSWA data on their current recycling collection costs, as well as reports that DSM has prepared for RPAC and DSWA over the past several years. DSM's costs have been taken directly from the October 28, 2004, *Task B, Analysis of Mandatory Curbside Recycling Program Costs*, prepared for DSWA, and the September 15, 2004, *Analysis of the Impact of a Yard Waste Ban On Landfill Quantities and Household Costs*, prepared for the DSWA.

The costs for commercial recycling have been estimated as described below.

### Estimated Residential Sector Costs

#### *Materials Recycling*

Because it is unlikely that organized collection of refuse and recyclables will be implemented in NCC in the near future, estimates for subscription curbside collection of recyclables by existing private haulers have been used as the low end of the range of curbside collection costs. Table 2 of the Task B Report estimates that per household costs for mandatory weekly curbside collection of recyclables, assuming the continuation of subscription service would cost between \$4 and \$5.40 per month per household<sup>14</sup>, or between \$48 and \$65 per year (rounded).

This annual cost has been multiplied times the estimated number of urban, suburban, and rural households in NCC, assuming \$48/year for the urban households, \$56/year for suburban, and \$65/year for rural households

These total costs are shown in Table 14, and form the low end of the range for subscription service based on the following assumptions about collection efficiency:

- Single person collection trucks
- Daily stops per truck ranging from 400 to 600 for rural and urban, respectively
- Single stream collection and processing
- Revenues from the sale of the collected materials used to off-set a portion of collection costs.

DSWA has also completed cost estimates for curbside collection based on their existing collection system. These costs, presented in Table 15, form the high end of the range because they assume:

- Two-person collection trucks
- Source separated collection
- Daily stops associated with source separation of approximately 325 stops
- Revenues not applied to collection costs

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<sup>14</sup> Assuming an average inflation rate of 3.5% per year since 2004 when the report was prepared.

### **Yard Waste Ban**

Costs for households who choose to subscribe to separate yard waste collection were estimated as part of the September 15, 2004, *Analysis of the Impact of a Yard Waste Ban On Landfill Quantities and Household Costs*, prepared by DSM for DSWA. Collection costs ranged from \$4-5 per month for subscription service households to \$2-3 per month for organized collection. In each case that is only for the months in which yard waste would be collected – we have assumed a nine month period.

In addition, the same report estimates the cost to DSWA associated with setting up yard waste composting facilities at the various DSWA facilities for haulers and households to drop off yard waste. These are also shown in Tables 14 and 15..

### **Total Annual Cost To Reach Potentially Achievable Residential Recycling Rate**

Tables 14 and 15 present estimated total annual costs, over and above current system costs, to reach a 37 percent residential recycling rate (as calculated in Table 10). As illustrated by Tables 14 and 15, the bulk of the cost is collection costs, which would be paid at the household level. Less than ten percent of the total cost, assumed to be borne directly by DSWA, is incurred in processing of the collected material, primarily because of revenues from materials sales.

**TABLE 14.**  
**Estimated Additional Costs To Achieve Residential Recycling Rate, Low End of Range (1)**

<b>Program</b>	<b>New Program Necessary?</b>	<b>Total Households</b>	<b>Households Participating</b>	<b>Cost/HH Per Year</b>	<b>Annual Cost</b>
<b>Recycling Collection</b>					
Urban	Yes	48,680	100%	\$48.00	\$ 2,336,640
Suburban	Yes	43,790	100%	\$56.00	\$ 2,452,240
Rural	Yes	105,400	100%	\$65.00	\$ 6,851,000
<b>Sub-Total, Recycling Collection</b>					<b>\$ 11,639,880</b>
<b>Yard Waste Collection</b>					
Urban	No	48,680			
Suburban	Yes	43,790	75%	\$40.00	\$ 1,313,700
Rural	Yes	105,400	25%	\$40.00	\$ 1,054,000
<b>Sub-Total, Yard Waste Collection</b>					<b>\$ 2,367,700</b>
<b>Processing</b>					
Yard Waste Composting					\$ 400,000
Single Stream MRF (net of revenues)					\$ 300,000
<b>Sub-Total, DSWA Processing</b>					<b>\$ 700,000</b>
<b>Total Costs:</b>					<b>\$ 14,707,580</b>

(1) Assumes mandatory weekly curbside collection.

**TABLE 15.**  
**Estimated Additional Costs To Achieve Residential Recycling Rate, High End of Range**

<b>Program</b>	<b>New Program Necessary?</b>	<b>Total Households</b>	<b>Households Participating</b>	<b>Cost/HH Per Year</b>	<b>Annual Cost</b>
Recycling Collection					
Urban	Yes	48,680	100%	\$110.00	\$ 5,354,800
Suburban	Yes	43,790	100%	\$130.00	\$ 5,692,700
Rural	Yes	105,400	100%	\$148.00	\$ 15,599,200
<b>Sub-Total, Recycling Collection</b>					<b>\$ 26,646,700</b>
Yard Waste Collection					
Urban	No	48,680			
Suburban	Yes	43,790	75%	\$40.00	\$ 1,313,700
Rural	Yes	105,400	25%	\$40.00	\$ 1,054,000
<b>Sub-Total, Yard Waste Collection</b>					<b>\$ 2,367,700</b>
Processing					
Yard Waste Composting					\$ 400,000
Dual Stream MRF (net of revenues)					\$ -
<b>Sub-Total, DSWA Processing</b>					<b>\$ 400,000</b>
<b>Total Costs:</b>					<b>\$ 29,414,400</b>

### Estimated Commercial Sector Costs

Limited data are available on the costs associated with increasing commercial recycling rates. This is because most transactions are between two private businesses, and therefore are typically not reported. In addition, in some cases increasing commercial recycling would actually reduce costs to businesses, while in other cases the cost would be borne internally by the business, as opposed to through external charges to the hauler.

DSM has collected pricing data for studies in Vermont and Massachusetts associated with commercial collection costs. No new pricing data was collected in Delaware for this study. Based on this limited data it is assumed that dumpster rental, collection, and processing will cost \$60/ton for corrugated containers, \$40 per ton for mixed office paper, \$100 per ton for separate organics collection and processing, and \$200 per ton for plastic film collection and processing, net of revenues. It is assumed that increased bottle recycling could occur at no cost if DSWA processed single stream recyclables and generators were allowed to mix bottles with corrugated or mixed paper loads.

We have made the additional assumption that roughly one-half of the new corrugated collection would actually save the business money, and therefore have cut the total tons subject to increased costs by 50 percent. We have further assumed that 25 percent of the mixed office paper recycling would also save businesses money, and so have reduced total tons subject to increased costs by 25 percent.

Table 16 presents *very rough* estimates of total annual increase in costs for achieving the commercial recycling rate.

**TABLE 16.  
Estimated Costs For Increased Commercial Recycling**

<b>Material</b>	<b>Estimated Annual Tons (tons)</b>	<b>Cost/Ton (\$)</b>	<b>Total Cost (\$)</b>
Corrugated Containers	9800	\$60	\$588,000
Mixed Office Paper	8100	\$40	\$324,000
Food Waste	8000	\$100	\$800,000
Plastic Film	5100	\$200	\$1,020,000
Plastic Bottles	700	\$0	\$0
	<b>Total Estimated Costs:</b>		<b>\$2,732,000</b>

**Total Estimated Costs for Increased Recycling Activity**

Estimated annual costs to achieve an overall MSW recycling rate of 38 percent for NCC are estimated to be range from \$17.4 to \$31 million over and above current solid waste system costs in NCC. Actual costs will depend on how the recycling collection system is organized, and the type of processing facilities available for the collected materials

## APPENDIX A

**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 overissue 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.