Analysis of 2014 Illinois Post Consumer Carpet Recycling and Disposal
Prepared for: Illinois Carpet Recovery Stakeholders Group
October 2015

Prepared by: Georgina W Sikorski   S 3 Business Consultants, LLC
Table of Contents

Goal of the Project .................................................................................................................. 3
Scope of the Project .............................................................................................................. 3
Post Consumer Carpet and Carpet Pad/Cushion ................................................................. 3
Data Collection Approach .................................................................................................... 3
Background On Post Consumer Carpet Recycling ............................................................... 4
The Challenges of Post Consumer Carpet Recycling .......................................................... 5
Post Consumer Carpet Generation and Discards-Methodology and Volumes ................. 7
Carpet Sales in Illinois .......................................................................................................... 7
Post Consumer Carpet Generation and Discards Methodology ...................................... 7
Formula for Calculating Post Consumer Carpet Generation in Illinois ......................... 8
Table 1: Illinois Carpet Replacement as a % of Sales, 2007-2014 ........................................ 10
Table 2: Illinois Carpet Sales, 2007-2014, in millions of lbs. .............................................. 10
Table 3: Illinois Post Consumer Carpet Generation, 2007-2014, in millions of lbs. .... 11
Figure 1: Illinois Post Consumer Carpet Generation, 2014, in millions of lbs. .............. 11
Figure 2: Illinois Carpet Sales and Generation, 2007-2014 .............................................. 12
Illinois Per Capita Post Consumer Carpet Generation ..................................................... 12
Carpet Collection, Recycling and Disposal Survey ........................................................... 13
Survey Response Rate ......................................................................................................... 14
Figure 3: Illinois Post Consumer Carpet Survey Respondents by Region ....................... 14
Figure 4: Illinois Post Consumer Carpet Survey Respondents by Occupation ............. 15
Figure 5: Illinois Post Consumer Carpet Flow Chart, 2014 ............................................. 16
Details of the Carpet Recycling Survey Responses ......................................................... 17
Post Consumer Carpet Collection by Market Segment .................................................... 17
Figure 6: Post Consumer Carpet Collection by Market Segment ................................... 18
Post Consumer Carpet Collection and Recycled Output Rates ........................................ 19
Table 4: Illinois Post Consumer Carpet Collection and Recycle Output Rates ............... 19
End Markets for Recycled Output ..................................................................................... 19
Figure 7: End Markets for Post Consumer Carpet Recycled Output, 2014 .................... 20
Waste to Energy .................................................................................................................. 20
Incineration ......................................................................................................................... 20
Post Consumer Carpet Disposal in Landfills ................................................................ 21
Landfill Capacity ............................................................................................................... 21
Figure 8: Illinois Landfill Locations .................................................................................. 22
Figure 9: Comparisons of Post Consumer Carpet Discard Estimates ............................ 24
Summary ............................................................................................................................. 25
Appendix 1, Illinois Post Consumer Carpet Recycling Survey ........................................ 27
Appendix 2, Definitions ....................................................................................................... 34
Analysis of 2014 Illinois Post Consumer Carpet Recycling and Disposal

Goal of the Project

The goal of this Project is to collect valuable data on the recycling and disposal of Illinois residential and commercial Post Consumer Carpet for the year 2014. This data will be used to assist the Illinois Carpet Recycling Stakeholders’ Group in (1) establishing a quantitative baseline of Post Consumer carpet recycling in Illinois, (2) assessing the current status of carpet recycling in Illinois, and (3) identifying opportunities to increase recycling.

Scope of the Project

Collection, recycling and disposal of Post-Consumer residential and commercial carpet discarded in the State of Illinois in 2014. Please note that capitalized words are defined in Appendix 2.

Post Consumer Carpet and Carpet Pad/Cushion

This report does NOT include carpet pad/carpet cushion. Carpet pad/cushion is a separate material stream and is recycled separately from carpet. There is a separate trade association, Carpet Cushion Council that manages carpet pad/cushion. On average, the weight of carpet is about 4.0-4.5 lbs./ square yard, and carpet pad/cushion is about 2 lbs. /square yard.

Data Collection Approach

For this report, we acquired 2007-2014 sales data of residential and commercial carpet into Illinois, from Market Insights LLC, an outside market research firm. We used this data to calculate Post Consumer Carpet generation and discards. We included the years of 2007-2014 for purposes of looking at trends on carpet sales.

Please note, however, that we do not have historic information on Illinois Post Consumer Carpet recycling for 2007-2014. For purposes of this report, we collected Post Consumer Carpet collection, recycling and disposal information from survey participants for 2014 only.

To quantify the Post Consumer Carpet recycling stream, we created a database of businesses that may have been involved in the collection, recycling and/or disposal of Post Consumer Carpet, discarded in the state of Illinois, during the year 2014. We
contacted the businesses in this database in June 2015 and asked for their participation in a survey.

BACKGROUND ON POST CONSUMER CARPET RECYCLING

In order to put this report in perspective for the reader who may not be familiar with carpet recycling, here are some important points about Post Consumer Carpet and the challenges and opportunities it presents to those in the business of carpet recycling:

• Carpet is made up of several components. The highest value component of carpet is the carpet fiber. Carpet fiber may be made from several different synthetic polymers (i.e. Nylon 6, Nylon 6,6, Polypropylene, PET), Wool and combinations of polymers.
• Post Consumer Carpet recycling businesses may do one or more of the following: Collect and/or Sort Post Consumer Carpet, separate the fiber from the carpet backing, process the fiber, and sell the processed fiber to a manufacturer who incorporates the processed material into consumer products.
• There are differences in the value of the polymers used to make the carpet fiber, i.e. Nylon 6 and Nylon 6,6 may have higher value today, compared to other polymer types. The demand and supply dynamics can and have changed over time and are closely monitored by carpet recycling businesses.
• Carpet fiber is about 30-35% of the total composition, by weight, of the carpet.
• Residential carpets tend to have higher face weights (tufts) (35-40%) of fiber than commercial carpets (25-30%). Thus, carpet recyclers prefer residential carpet, because they can harvest more fiber by weight from residential carpet than from commercial carpet.
• The remaining 65-70% of the weight of the carpet has very low or no value in the marketplace. Note that carpet filler (primarily calcium carbonate) can be separated and sold in the market. However its value in the market is limited by the cost/price of virgin filler material.
• Thus, the total opportunity for carpet recycling is a function of the components of the carpet, their ability to be processed and their value in the market.
• Today, it is estimated that up to 25-35% of carpet, by weight, can be cost-effectively recycled. The remaining material may have little or no value in the market.
The Challenges of Post Consumer Carpet Recycling

There are many factors that contribute to the difficulties facing Post Consumer Carpet recycling efforts. A recent article in the Washington Post \(^1\) highlights the current challenges for recycling in general, including (1) associated cost of separating and harvesting recycled materials and (2) market demand, closely linked to economic factors such as the price of oil, a strong U.S. dollar, and a weakened China economy. These factors have sent the prices for recyclables, including Post Consumer Carpet plummeting, and have reduced demand for recycled material.

Most of the specific factors effecting Post Consumer Carpet stem from the logistical hurdles in collecting Post Consumer Carpet for processing, the basic construction of quality carpet as it is manufactured, and the limitations of end use markets for harvested Post Consumer Carpet face fibers. Together, these factors make large scale or mandated carpet recycling extremely challenging.

Post Consumer Carpet is available in abundant quantities where population is most dense, as in the major metropolitan areas around the country where regular high volume collection is taking place now. However, outside major metropolitan areas, Post Consumer Carpet requires more logistical cost to retrieve fewer relative pounds. The cost required to collect Post Consumer Carpet from smaller cities and especially rural areas is disproportionate to the revenue it can generate in a manageable collection model.

Once collected, carpet must be sorted by fiber type before a recycler can process it into a salable product. Because the different face fiber types (Nylon 6, Nylon 66, polyethylene terephthalate (PET), and polypropylene (PP)) are not compatible in end use applications, great care must be taken to keep contaminating fiber types out of each fiber type stream. This can only be achieved with specialized analyzer devices that cost $15,000 - $18,000 each. Also, the Post Consumer Carpet of any fiber type must be kept clean of any debris or other contamination, which is frequently present as a result of tear-out. The Post Consumer Carpet must also be kept dry, which is a challenge for collectors in any market, but especially in those areas that have higher annual precipitation amounts.

Once carpet is collected, sorted, cleaned, and baled, it is ready for processing by a recycler. At this step, the construction of carpet becomes a barrier. With 50+ years of engineering and product improvements manufacturers have made carpet durable over many years of use. This creates a barrier to de-constructing that same product. Carpet is made of 3 components – face fiber, backing, and latex/filler. These three components are bound tightly to each other to maintain the integrity of the product over its intended life. The process of harvesting clean face fiber, which is the

\(^1\) American Recycling is stalling, and the big blue bin is one reason why, Washington Post, June 20, 2015
valuable portion of Post Consumer Carpet, from the backing and filler, is a technological challenge.

The cost of processing Post Consumer Carpet is another factor. The collected Post Consumer Carpet only has about 35% face fiber, so the yield on any Post Consumer Carpet recycling process is very low compared to recycling processes for homogenous products such as paper or tires. This yield limitation means that all costs associated with acquiring the minority portion of harvested face fiber pounds must be absorbed in processing Post Consumer Carpet. As a result, costs can quickly escalate into a lack of profitability for recyclers.

The cleanest recycled Post Consumer Carpet products bring the highest end-use market price, but producing this cleaner product is more costly. For instance, a simple shredding operation requires little start-up capital and operational costs, but it produces a product that is very contaminated with backing and filler and therefore brings a low market price. Overall, current Post Consumer Carpet processing technology is limited to a few technologies that are inadequate for producing a clean product at an affordable cost on a large scale.

The limitations of end-use applications for harvested Post Consumer Carpet face fiber are another factor in the difficulty of recycling Post Consumer Carpet. To move large quantities of material, a demand side market “pull” must be present along with a supply side cost structure that is favorable to the market's alternatives. In this case, market alternatives for harvested Post Consumer Carpet face fiber are virgin polymers or post-industrial recycled polymers. Both alternatives create a price ceiling that Post Consumer Carpet products cannot go above and be sold. This market dynamic, along with the costs associated with collecting and processing Post Consumer Carpet, make it difficult for recyclers to operate profitably. Rather than the demand side “pull” needed to really open up markets and increase activity, in Post Consumer Carpet recycling there exists primarily a supply side “push”.

Also, end-use applications are limited by polymer type and by the quality of the Post Consumer Carpet product. Nylon products have value in the engineered resins market and a higher price ceiling due to higher virgin prices, but that demand is tempered by quality constraints (>97% purity) that are difficult to meet at an acceptable cost. Polypropylene has little market demand and a low virgin price ceiling. PET has small market demand and a low virgin price ceiling.

In spite of these current challenges, entrepreneurs in the carpet recycling industry continue to adjust their strategies and focus on long term opportunities. They continue to invest capital and other resources into their businesses, and work to identify opportunities that will enable them to meet their sustainable objectives.

In light of this market place overview, the remainder of this report will focus on establishing the baseline for Illinois Post Consumer Carpet Generation recycling and disposal in 2014.
POST CONSUMER CARPET GENERATION AND DISCARDS-
METODOLOGY AND VOLUMES

Carpet Sales in Illinois

As a first step in the analysis of carpet recycling in Illinois, we acquired sales data of residential and commercial carpet from 2007-2014. This data was supplied from Market Insights LLC, an independent market research firm, with years of experience in collecting carpet sales data for the carpet recycling industry. Market Insights supplies carpet sales data to the Carpet America Recovery Effort (CARE) for the CARE Annual Report, and for preparing the California Carpet Stewardship Program Annual Report for the California Department of Resources Recycling and Recovery (CalRecycle).

Post Consumer Carpet Generation and Discards Methodology

The Post Consumer Carpet generation and discard methodology used in the Illinois survey is the same as that adopted by CARE. In 2011, the CARE BOD adopted a formula for calculating carpet generation and discards, which starts with reported sales data of residential and commercial carpet in the United States. Further, in the fall of 2012, CalRecycle agreed to the use of this formula for calculating Post Consumer Carpet generation and discards in California.

The purpose of using the methodology is to enable the update of generation and discards on an annual basis, starting with reported sales data. The formula can be updated every year by factors that influence the calculation. Those factors include changes in imports/exports, percent of the market that is replacement versus new installations, average weight, market share of carpet versus hard surface flooring, and percent demolition.
Formula for Calculating Post Consumer Carpet Generation in Illinois

Post Consumer Carpet Generation is the amount of Post Consumer Carpet available for recycling and disposal. The factors used to calculate the amount of Post Consumer Carpet generated include:

**S:** Carpet Sales in the Illinois for the reporting period (square yards). Sales Data comes from Market Insights, an independent market research firm, who collect confidential sales data from carpet manufacturers doing business in Illinois.

**R:** Percent of carpet that has been replaced by new carpet. The Post Consumer Carpet that is removed from building and replaced by new carpet is the carpet destined for the landfill. Market Insights quantified the replacement rate in Illinois to be 92%.

**P:** Average weight of carpet per square yard. In 2014, the average weight was about 4.2 pounds/square yard. (Raw data was supplied by the industry and analyzed by CARE. Weighted averages of carpet weights of broadloom and carpet tile used in the commercial and residential sectors were calculated.)

**MS:** Although the deselection/market share of carpet versus hard surface flooring has stabilized over the last few years, we have included a measure of market share changes that can be updated annually. For 2014, we estimate that the market share for carpet declined by <1%.

**D:** Pounds of carpet from demolition projects not replaced. In 2014, the weighted demolition rate was reported at 0.5% in Illinois, (estimate provided by Market Insights). D is converted to pounds by multiplying the demolition % by (Sales x R x P).

Note that the term demolition represents the teardown of a building. There is no easy way to know the reported square yards of carpet coming out of such a process. By assuming the reported demolition rate obtained from Marketing Insights we are likely overestimating the total volume of carpet sent to landfill. However, this is a tiny fraction (<1%) of the overall amount and does not significantly alter the flow.
The following calculation shows the formula to calculate Generation using reported Illinois data from 2014 and is rounded for clarity.

\[
\text{Generation} = (((\text{Sales} \times R) \times P) + \text{MS} + \text{D})
\]

Illinois Carpet Sales 2014: 44 million square yards

Sales in lbs. = 44 million * 4.2 lbs/square yard = 187 million lbs.

Generation = Sales*Replacement= (187*0.92) = 172 million lbs. + MS+D

Where MS = 187 * 0.01 = 1.9 million pounds
and D = 187*0.005 = 0.93 million pounds

Thus, \( \text{Generation} = 172 + 1.9 + 0.93 = 175 \text{ million pounds in 2014} \)

Sales of replacement carpet and Post Consumer Carpet generation are closely linked. In 2007, 85% of the carpet sold in Illinois replaced carpet in existing buildings. The carpet replaced from existing buildings becomes the Post Consumer Carpet available for disposal and recycling. As the economy slowed in 2008-2014, and new construction rate declined, the replacement % of total sales increased from 85% to 93%. In 2014, the replacement level decreased slightly to 92%. See Table 1.

According to Market Insights, the reason Illinois replacement levels are so high include the following:

1. Very little new construction in 2014. On the residential side, Illinois was one of the states that were very much a part of the mortgage loan debacle. Illinois had a large number of foreclosures and this situation continues to be an impediment for builders to want to build more new homes in that environment and keeps residential construction depressed.

2. Illinois also suffered harder than most states during the last recession with huge pension deficits and large budget deficits. This caused government financed construction to be severely curtailed (schools, public safety buildings, government offices, etc.)

3. The U.S. as a whole has and continues to fare much better than Illinois, fiscally, economically, and construction-wise.
Table 1: Illinois Carpet Replacement as a % of Sales, 2007-2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Carpet Replacement as a % of Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>85%</td>
</tr>
<tr>
<td>2008</td>
<td>89%</td>
</tr>
<tr>
<td>2009</td>
<td>91%</td>
</tr>
<tr>
<td>2010</td>
<td>93%</td>
</tr>
<tr>
<td>2011</td>
<td>92%</td>
</tr>
<tr>
<td>2012</td>
<td>93%</td>
</tr>
<tr>
<td>2013</td>
<td>93%</td>
</tr>
<tr>
<td>2014</td>
<td>92%</td>
</tr>
</tbody>
</table>

Table 2 shows the reported sales of carpet into Illinois, in millions of lbs., for the years 2007-2014. Note that 2007 was the peak year for carpet sales in the years included in this report. There was a significant decline in carpet sales between 2007-2008, (-45 million lbs.), or (-17%). The decline continued in 2009, down an additional 40 Million lbs. versus 2008. The declines are a result of the downturn in the economy similar to what was experienced throughout the US. Industry experts noted in early 2010 “the carpet industry experienced 26 quarters of decline in production volume, but it finally is looking at the bottom of the trough.”

Table 2: Illinois Carpet Sales, 2007-2014, in millions of lbs.

<table>
<thead>
<tr>
<th>Illinois Carpet Sales (MMlb)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
</tr>
<tr>
<td>Residential</td>
<td>211</td>
</tr>
<tr>
<td>Commercial</td>
<td>56</td>
</tr>
<tr>
<td>TOTAL</td>
<td>267</td>
</tr>
</tbody>
</table>

Table 3 shows the calculated generation of Post Consumer Carpet in millions of lbs., starting with sales figures in Table 2 and using the formula for estimating Post Consumer Carpet generation. Carpet sales and thus Post Consumer Carpet generation remain significantly below the levels in 2007. For example, in 2014 the Post Consumer Carpet generation were still well below that of 2007 (-55 million lbs.) or (-24%). The volume in pounds of Post Consumer Carpet generated in Illinois increased by 8 Million lbs. (+5%) since its lowest year in 2009.

2 Chattanooga Times Free Press, February, 2010

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>180</td>
<td>145</td>
<td>116</td>
<td>118</td>
<td>113</td>
<td>110</td>
<td>114</td>
<td>116</td>
</tr>
<tr>
<td>Commercial</td>
<td>48</td>
<td>53</td>
<td>52</td>
<td>53</td>
<td>55</td>
<td>58</td>
<td>59</td>
<td>55</td>
</tr>
<tr>
<td>TOTAL</td>
<td>228</td>
<td>197</td>
<td>165</td>
<td>171</td>
<td>168</td>
<td>168</td>
<td>173</td>
<td>175</td>
</tr>
</tbody>
</table>

Figure 1 shows the Illinois Post Consumer Carpet generation for 2014, using the above formula and data.

- 187 Million lbs. of carpet were sold into Illinois in 2014.
- In order to calculate Post Consumer Carpet generation, sales of carpet was adjusted as follows:
  - Minus 8% (15 million lbs.) for new construction
  - Plus 0.5% (0.9 million lbs.) for demolition carpet (carpet taken from torn down buildings and not replaced) becomes Post Consumer Carpet
  - Plus 1% (1.9 million lbs.) deselection/market share adjustment for carpet versus hard surface

Figure 1: Illinois Post Consumer Carpet Generation, 2014, in millions of lbs.

Note: The row entitled “New” is the adjustment for new construction. As mentioned previously, 92% of sales in 2014 was replacement carpet, thus new construction was estimated to be 8% of the total carpet sales. Therefore 8% or 15 million lbs. was subtracted from the total sales.
Figure 2 shows the comparison of Carpet sales and Post Consumer Carpet Generation in Illinois for the years 2007-2014.

Figure 2: Illinois Carpet Sales and Post Consumer Carpet Generation, 2007-2014

Illinois Post Consumer Carpet Per Capita Generation

Illinois Post Consumer Carpet Generation per capita was calculated from the total Generation divided by the Illinois population. The 2014 Illinois population was reported to be 12,880,000 people. In 2014, the per capita carpet Generation in Illinois was 13.4 lbs./capita.

The US per capita Generation rate for 2014 was about 10.9 lbs., (-2.5 lbs.), slightly below the Illinois rate. As noted in the 2015 Illinois Waste Characterization Study, two MSW Generation demographic drivers that increase Generation include median income and level of urbanization. The Illinois statewide 2012 median income was seven percent higher than the U.S. average and 88% of the Illinois population lives in urban areas, compared to 85% on the national level.

Further, it has been the experience of CARE and its members to observe that the use of carpet tends to be higher in colder climates, as carpet increases the R-value, or insulation level, in buildings and homes. This could also contribute to the Illinois per capita discard number being higher than the national average.

---

3 Department of Commerce, US Census Bureau.
4 CARE Annual Report, 2014
5 2015 Illinois Waste Characterization Study, page 3-8
CARPET COLLECTION, RECYCLING AND DISPOSAL SURVEY

In order to thoroughly quantify and qualify the carpet-recycling stream in Illinois, we identified contacts and locations of collectors, processors and disposal facilities throughout and outside the state that may manage Illinois Post Consumer Carpet.

We prepared a data base of possible contacts, and used secondary research including:

- 2009 and the 2015 Illinois Commodity/Waste Generation and Characterization Studies\textsuperscript{7}
- Illinois Environmental Protection Agency report, Illinois Landfill Projections of Disposal Capacity as of January 1, 2015 \textsuperscript{8}
- Advancing Sustainable Materials Management: Facts and Figures 2013\textsuperscript{9}
- SWALCO web site – carpet information\textsuperscript{10}
- Carpet Mills who may have processed Post Consumer Carpet from Illinois (data results from this group were included in the “Processor” category)
- Select Commercial Carpet Dealers in Illinois
- Select Residential Carpet Retailers in Illinois
- Post Consumer Carpet processors who may recycle Post Consumer Carpet from Illinois

In our effort to sample as broadly as possible, we also identified whether a contact was from a metropolitan region, non-metropolitan region\textsuperscript{11}, or out of state. Some processors from out of state handle carpet discarded in the state of Illinois.

The database for this project was approximately 20 businesses. The survey was conducted in June 2015 and covered Post Consumer Carpet collection, recycling and disposal in 2014.

All potential survey participants were called in order to confirm that the potential respondent handled Post Consumer Carpet. If a potential respondent reported that he/she did not handle Post Consumer Carpet, it was noted in the database, and the interview was terminated. Surveys were conducted only with those potential respondents who agreed to participate.

Some respondents chose to give answers verbally. These responses were captured and are incorporated in the Results section of this report.

\textsuperscript{7} Illinois Commodity/Waste Generation and Characterization Study Update, 2015
\textsuperscript{8} Illinois Environmental Protection Agency, July 2015
\textsuperscript{9} Advancing Sustainable Materials Management: Facts and Figures 2013, EPA
\textsuperscript{10} www.SALCO.org
\textsuperscript{11} Bureau of Labor Statistics, May 2013 Metropolitan and Nonmetropolitan Area Definitions
A copy of the Illinois Post Consumer Carpet Recycling Survey is included as Appendix 1.

**Survey Response Rate**

Of the 20 businesses in the database, we interviewed 14 people for the survey, for a survey response rate of 70%. The remaining 6 either confirmed that they were not currently engaged in carpet recycling in Illinois, or data was already collected from their customers.

Most of the respondents (71%) to the survey were from the state of Illinois; with 100% of the Illinois respondents from the metro region. 29% of the respondents were from out of state. See breakout in Figure 3.

**Figure 3: Illinois Post Consumer Carpet Survey Respondents, by Region**
Figure 4 shows the breakout of respondents by occupation. 39% were carpet retailers or dealers, 23% were mill representatives, 23% were Processors, and 15% were Collectors or Sorters.

Figure 4: Illinois Post Consumer Carpet Survey Respondents, by Occupation
ILLINOIS POST CONSUMER CARPET FLOW IN 2014
SUMMARY AND HIGHLIGHTS

- Of the 175 Million lbs. of carpet that was generated, 8 Million lbs. was collected and further processed.
- Of the 8 Million lbs. that was collected and processed, 3 Million lbs. became recycled output, and was sold to end market applications.
- End market applications may include carpet fiber, carpet tile, engineered resins, carpet pad, etc.
- 50,000 lbs. of discarded carpet went to Waste to Energy (WTE).

Figure 5 summarizes the flow of Post Consumer Carpet generated (175 million lbs.), and recovered (3 million lbs.). The vast majority of remaining 172 Million lbs. of Post Consumer Carpet was discarded in landfills. About 50,000 lbs. of material was reportedly sent to a Waste to Energy facility.

Figure 5- Illinois Post Consumer Carpet Flow Chart, 2014
DETAILS OF THE 2015 ILLINOIS POST CONSUMER CARPET SURVEY RESPONSES

Post Consumer Carpet Collection by Market Segment

Of the 8 Million pounds of Post Consumer Carpet collected in 2014, 80% was residential carpet and 20% was commercial broadloom and/or commercial carpet tile. See breakout in Figure 6.

Processors prefer residential broadloom carpet to commercial broadloom carpet for recycling because residential carpet tends to have a higher fiber pile. Therefore it is easier to shear and harvest the valuable fiber material from residential carpet. However, in some regions, collection and processing costs can be high and landfill costs low, thus reducing the opportunity for recycling residential carpet.

Commercial carpet tiles are an excellent source of recycling material for processors and recyclers. Commercial carpet tile can be shredded and recycled back into carpet tile backing at a very high yield rate, approaching 100% yield.

There is also an active market for carpet reuse, although it is not tracked and quantified. Commercial dealers will take back used tiles, clean them and donate them to charities such as Habitat for Humanity and ReDo. Planet Recycle may also participate in this effort as a 'matchmaker' putting companies and charities together, and then working with dealers on fulfillment.

Corporate clients especially value the participation in these charitable programs. For their participation, customers receive certificates, for example, from the Starnet/CARE Carpet Reclamation program. The certificates highlight the customer names, the dealer names, and the volume diverted from the landfill. The certificates are very much appreciated by program participants.

Commercial carpet recycling and reuse is reportedly successful because it meets the needs of the clients:

1. Logistics are easier to manage. Larger projects allow for trailers to be arranged at the project site. Trailers are filled and transported to selected Sorter.
2. Demand for carpet tile is strong.
3. The Commercial market has environmental factors on its side- Major companies and the facility managers at those companies appreciate being able to contribute to sustainability through the reuse and/or recycling of carpet.
4. Recycling and/or reusing carpet qualifies for U.S. Green Building Council LEED project points, which may be an important objective for leading architecture and design firms.

Figure 6: Illinois Post Consumer Carpet Collection, by Market Segment
Post Consumer Carpet Collection and Recycled Output

As shown in Table 4, about 175 million lbs. of carpet were generated in Illinois in 2014. The range of this calculation is (+/- 10%). Approximately 8 million lbs. of Post Consumer Carpet was collected. This is a gross collection rate of about 5%.

Of the volume collected, about 3 million lbs. of the collected material became recycled output, meaning the marketable output from collected carpet that was further processed by shearing or shredding. This recycled output was about 37% of the collected volume or 2% of the total generated.

Table 4: Illinois Post Consumer Carpet Collection Recycled Output, and Disposal 2014

<table>
<thead>
<tr>
<th></th>
<th>2015 Illinois Carpet Recovery Survey</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Total Generation</td>
<td>175</td>
<td>+/- 10%</td>
</tr>
<tr>
<td>Gross Collections</td>
<td>8.0</td>
<td>158-192</td>
</tr>
<tr>
<td>Reused</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Recycled Output</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Gross Collection Rate</td>
<td>5%</td>
<td>4.5-5.5%</td>
</tr>
<tr>
<td>Recycle Output Rate</td>
<td>2%</td>
<td>1.8-2.2%</td>
</tr>
</tbody>
</table>

End Markets for Recycled Output

The Post Consumer Carpet is collected from residential and commercial sites. The carpet is then sent to Sorters. Sorters separate Post Consumer Carpet by fiber type using spectrographic fiber analysis, bale the material, and ship it to the Processors. In 2014, Processors received 8 Million of Illinois Post Consumer Carpet from Sorters.

Processors either shred or shear the material, in order to harvest fiber. The harvested fiber is then sent on for further processing into engineered resins, new recycled content fibers, carpet backing, etc.

In 2014, Processors successfully produced 3 Million lbs. of recycled output. About 70% of the recycled output was transformed into pellets for use in engineered resins, 11% went to carpet fiber use and 19% was used in carpet tile backing. Engineered resins are used to make a range of products for industries including: automotive, transportation, construction and home and garden.
Waste to Energy
In 2014, 50,000 lbs. of carpet discarded in Illinois reportedly went to a Waste to Energy facility, which was not located in Illinois.

Incineration
There was not reported incineration of Post Consumer Carpet from Illinois in 2014.
Post Consumer Carpet Disposal in Landfills, 2014

2014 Landfill Capacity in Illinois

According to the *Illinois Landfill Projections of Disposal Capacity as of January 1, 2015*¹², there are about 962 Million gate cubic yards of combined landfill capacity in Illinois, of which 39 landfills reported receiving about 44 Million gate cubic yards in 2014, or about 4.5% of capacity. The remaining landfill life is estimated to be 21 years.

Thus, there is no apparent capacity issue for the disposal of Post Consumer Carpet in Illinois. Survey respondents indicated that their goal is to be competitive with landfill tipping fees, which will vary from region to region, and may range from $60-$100+/ton ($0.03-.05/lb.) depending on location.

---

Figure 8 shows the locations of landfills in Illinois urban and rural counties.

**Figure 8: Illinois Landfills in Urban and Rural Areas**

<table>
<thead>
<tr>
<th>Key</th>
<th>Landfill location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Areas</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Rural Areas</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

---

Post Consumer Carpet Discards Comparison between Survey Responses and the 2015 Illinois Commodity/ Waste Generation and Characterization Study Update

The 2015 Illinois Carpet Recycling Study estimates 172 Million lbs. of post consumer carpet that was disposed of in Illinois landfills in 2014. The error range is +/- 10% (155-192 Million lbs.)

The 2015 Illinois Commodity/Waste Generation and Characterization Study Update included estimates of Post Consumer Carpet, discards. The estimated mean of Post Consumer Carpet discards was 1.2%\(^{14}\) of the Illinois statewide aggregate composition by weight (error range was +/- .68%).

In the 2015 study, the estimated discarded carpet tonnage was 146,290 tons (292 million lbs.). The error range is +/-57% (124-459 Million lbs.)

The per capita discard rate is approximately 22.6 lbs./capita for 2014. The Waste Study carpet discard rate per capita is 9.2 lbs. higher (+68%) than the 2014 per capita discard rate 13.4 lbs./capita calculated from the 2015 Illinois Carpet Recycling Study.

The 2015 Illinois Waste Characterization Study utilizes a sampling methodology, which analyzed approximately 263 samples from 27 solid waste facilities, 15 landfills and 12 transfer stations. Samples were taken during the period of September 10, 2014- December 2, 2014. In total, there were 59,046 lbs. of MSW analyzed, of which the total sample size of Post Consumer Carpet was 729 lbs.

There are significant differences between the estimates of Post Consumer Carpet discards in the Illinois Waste Study and the responses to the 2015 Illinois Carpet Recycling Survey. Potential reasons for the differences between two studies include:

1. Differences in testing methodologies-The 2015 Carpet Recycling Survey starts with sales of carpet into Illinois, whereas the 2015 Waste Study uses sampling of MSW disposal facilities.


For the purposes of this report, we report both the discards estimated in the Survey (172 million lbs. +/- 10%) and the 2015 Waste Study (292 million lbs. +/- 57%).

---

\(^{14}\) Illinois Commodity/Waste Generation and Characterization Study Update, March 2015
When the error range is taken into account, the estimates of discards overlap.

Figure 9: Comparison of Post Consumer Carpet Discard Estimates

For future years, it is recommended the methodology outlined in this report be used for calculating discards of Illinois Post Consumer Carpet. This will allow annual measurements of progress, and analysis of trends.

When the Illinois Waste Study is updated periodically (usually about every 5 years), this data should also be reported.
SUMMARY

• Carpet sales into Illinois in 2014 were 44 Million square yards (187 Million lbs.). In order to understand the trends, carpet sales for 2007-2014 were included in this report. Carpet sales in 2007 were 64 Million square yards (269 Million lbs.)
  
  o There was a significant decline in carpet sales between 2007-2008, from 267 Million lbs. to 222 Million lbs. (-45 million lbs.), or (-17%). The decline continued in 2009, with sales of about 182 Million lbs., down an additional 40 Million lbs. versus 2008. Sales have been steady since 2010, and in 2014, sales were 187 Million lbs.

• The Post Consumer Carpet generation and discards calculation utilizes a detailed formula that takes into account the reported carpet sales into Illinois, replacement rate, imports and exports, average weight of carpet, deselection, and demolition rates. This formula can be updated every year based on reported sales data and market changes (i.e. replacement versus new building, change in average carpet weights, deselection, etc.)

• Post Consumer Carpet generated in Illinois was approximately 175 Million lbs. in 2014. In 2014 the Post Consumer Carpet generated were still well below that of 2007 (-55 million lbs.) or (-24%). The volume in pounds of Post Consumer Carpet discarded in Illinois increased by 8 Million lbs. (+5%) since 2009, the lowest year of the period studied.

• Post Consumer Carpet generated for 2014 were 13.4 lbs./capita. This amount was slightly higher (+2.5 lbs.) than the US carpet generated per capita of 10.9 lbs./capita.

• In June, 2015, about 20 Commercial carpet dealers, residential retailers, collectors, sorters and processors, who may manage Post Consumer Carpet in Illinois, were contacted and asked to participate in a survey to quantify and qualify the Post Consumer Carpet recycling stream from 2014. Of these potential participants, 14 or 70% responded either verbally or in writing.

• Most of the respondents (71%) to the survey were from the state of Illinois; with 100% from the metro region. 29% of the respondents were from out of state.

• 39% were carpet retailers or dealers, 23% were mill representatives, 23% were Processors, and 15% were Collectors or Sorters.
• Approximately 8 million lbs. of Illinois Post Consumer Carpet was collected in 2014. This was a gross collection rate of 5% of total discards.

• 80% of the collected Post Consumer Carpet was residential carpet, and 20% was commercial broadloom carpet and/or carpet tiles.

• There was no quantitative data on reuse of Post Consumer Carpet in 2014, although dealers that responded to the survey did report that there is an active market for reused/refurbished carpet tiles.

• Approximately 50,000 lbs. of Post Consumer Carpet reportedly were sent to a Waste to Energy facility.

• Of the 175 million lbs. of generated Post Consumer Carpet, about 3 million lbs. became recycled output. This was a recycle output rate of 2%.

• In 2014, Processors successfully produced 3 Million lbs. of recycled output. About 70% of the recycled output was transformed into pellets for use in engineered resins, 11% went to carpet fiber use and 19% was used in carpet tile backing.

• This report includes estimated Post Consumer Carpet discards from the 2015 Illinois Carpet Recycling Survey of approximately 172 Million lbs., and the 2015 Illinois Commodity/Waste Generation and Characterization Study of 292 million lbs. When the error range is taken into account, the estimates of discards overlap.

• For annual reporting, it is recommended the methodology used in this report be used for calculating discards of Illinois Post Consumer Carpet. This will allow annual measurements of progress, and trend analysis.

• When the Illinois Commodity/Waste Generation and Characterization Study is updated periodically (usually about every 5 years), this data should also be reported.
Appendix 1

Illinois Post Consumer Carpet Recycling Survey


Dear Illinois Carpet and Carpet Recycling Colleague,

We are an independent third-party consulting group and we are conducting a comprehensive survey of businesses involved in Illinois Post Consumer Carpet (PCC) collection, recycling and/or disposal. The goal of this survey is to assist Illinois Carpet Recycling Stakeholder Group in the evaluation of alternative methods for managing PCC in Illinois.

Thank you for taking the time to complete this survey. Your complete answers to this survey will allow us perform quantitative analysis on the carpet recycling stream in Illinois and create a detailed report for our stakeholders.

Please report on only PCC that was discarded in the state of Illinois, and was collected, recycled and/or disposed of at your location.

The survey should take less than 15 minutes to complete. To minimize the amount of time spent on completing the survey, we recommend that you read through the survey and have your data available before completing the survey.

If you need any assistance or have questions while completing this survey, please contact Georgina Sikorski, at gwsikorski@gmail.com or at 678 644 2782. Due to the time sensitive nature of this survey, please complete survey by close of business on June 30, 2015.

Note All Company information and answers to this survey will be CONFIDENTIAL, and will only be seen and used by the consultant for the purpose of summarizing aggregate information.

All data collected will be reported in the aggregate, thus removing any references to individual companies.

Thank you,
Georgina W Sikorski
S 3 B Business Consultants
To assist you in answering the next series of questions, please see the attached flowchart, definitions and example.

**Post Consumer Carpet Process Flowchart**

- **Collector** – A company that consolidates and temporarily stores recovered commercial and/or residential carpet.

- **Sorting Facility** – A facility that segregates collected carpet into the various backing types (PVC, SBR Latex, etc.) and/or fiber types (e.g., Nylon 6, Nylon 6.6, Polypropylene and Polyester).

- **Processor** – A company or facility that receives postconsumer carpet from a sorting facility, collector, or consumer, and processes it for use as a feedstock in a manufacturing facility.

- **Manufacturer** – A company or facility that utilizes processed carpeting materials and transforms them.

- **Disposal Facility**– A facility that accepts Post Consumer Carpet from a residential or commercial customer, and disposes of the carpet in a landfill, incinerator, cement kiln or Waste-to-Energy (WTE) facility.
Example: A Post Consumer Carpet recycler has 50,000 lbs. of Post Consumer Carpet in beginning inventory on January 1, 2014. Throughout 2014, he/she collects 1 million lbs. of carpet. The recycler sorts and shears this material and sends it to a processor. Along the way, some of the Post Consumer Carpet is reused, and some is not able to be recycled, for various reasons, and is either sent to a cement kiln facility, waste-to-energy facility, incinerator, or the landfill. The ending inventory is 100,000 lbs. The recycler tracks the amount of material as it progresses through the process.

For this example, the respondents would answer the next questions as follows:

- **Beginning Inventory at the Collection Facility:**
  - 50,000 lbs.
  1 Million lbs. of Post Consumer Carpet was collected. This was added to beginning inventory of 50,000 lbs., for a total of 1,050,000 lbs.:
    - 850,000 lbs. sent to Sorting Facility
    - 50,000 lbs. sent to Waste-to-Energy
    - 10,000 lbs. were Reused
    - 40,000 lbs. went to Landfill
    - 100,000 lbs. went to ending inventory

- **Beginning Inventory at the Sorting Facility:**
  - 25,000 lbs.
  850,000 lbs. of postconsumer carpet received from Collector. This was added to beginning inventory, of 25,000 lbs., for a total of 875,000 lbs.:
    - 700,000 lbs. was sorted by fiber type and went to the Processor
    - 25,000 lbs. were Reused
    - 25,000 lbs. went to Waste-to-Energy
    - 25,000 lbs. went to the landfill
    - 75,000 lbs. went to ending inventory

- **Beginning Inventory at Processing Facility:**
  - 50,000 lbs.
  700,000 lbs. of postconsumer carpet was received from Sorting facility. This was added to beginning inventory of 50,000 lbs. for a total of 750,000 lbs. available for Processing:
    - Produced 210,000 lbs. of sheared material
    - 100,000 lbs. went to cement kiln
    - 100,000 lbs. went to waste-to-energy
    - 290,000 lbs. went to the landfill
    - 50,000 lbs. went to ending inventory
Using the example to help you, please answer the following questions:

If you a collector, please answer the following questions.

If you are not a collector, please skip to the section which best identifies your role in the carpet recycling process, i.e. sorting facility, processing, manufacturing, or disposal.

**COLLECTION OF POST CONSUMER CARPET**

1. How many lbs. of Post Consumer Carpet did you have in your starting inventory on January 1, 2014? ________________________________

2. How many pounds of Post Consumer Carpet did you collect in 2014?

3. Please indicate your total lbs. available. (Your total lbs. available equals (Q1) plus (Q2). ________________________________

Please use this total number to answer the following question:

4. Of the Post Consumer Carpet lbs. that you have available (total lbs. in Q3), how much of it was:
   - Reused______________________________
   - Sent to Sorting Facility________________________
   - Sent to Waste-to-Energy Facility____________________
   - Sent to Incinerator__________________________
   - Sent to Cement Kiln__________________________
   - Sent to Landfill____________________________
   - Put in Ending Inventory______________________
SORTING OF POST CONSUMER CARPET
If you a sorting facility, please answer the following questions.

5. How many lbs. of Post Consumer Carpet did you have in your starting inventory on January 1, 2014? ________________________________

6. How many pounds of Post Consumer Carpet did you receive from a collector, or from other people, in 2014?
___________________________________

7. Please indicate your total lbs. available. (Your total lbs. available equals (Q5) plus (Q6).) _________________________________________

8. Of the Post Consumer Carpet lbs. that you have available (total lbs. in Q7), how much of it was:
   • Reused________________________________________
   • Sent to Processor_______________________________
   • Sent to Waste-to-Energy Facility__________________
   • Sent to Incinerator______________________________
   • Sent to Cement Kiln____________________________
   • Sent to Landfill_______________________________
   • Put in Ending Inventory_________________________

9. For the sorting facility, indicate the percentage of post-consumer carpet that you handled by fiber type:
   **Note: Total must equal 100%**
   • Nylon 6________________________________________
   • Nylon 6,6_______________________________________
   • Polypropylene_________________________________
   • PET___________________________________________
   • Other/Unknown________________________________

10. Please indicate the percentage of Post Consumer Carpet that you handled, by community type:
    **Note: Total must equal 100%**
    • Urban__________________________________________
    • Rural___________________________________________
    • Unknown________________________________________

11. Please indicate the percentage of Post Consumer Carpet that you handled, by market segment:
    **Note: Total must equal 100%**
    • Commercial____________________________________
    • Residential_____________________________________
    • Other/Unknown_________________________________
PROCESSING OF POST CONSUMER CARPET
If you a processor of Post Consumer Carpet, please answer the following questions.

11. How many lbs. of Post Consumer Carpet material did you have in your starting inventory on January 1, 2014?
________________________________________________________

12. How many pounds of Post Consumer Carpet did you receive from a sorter, or from others, in 2014 (you may have sorted the material yourself or you may have received sorted material from someone else)
________________________________________________________

14. Please indicate your total lbs. available. (Your total lbs. available equals (Q12) plus (Q13)
________________________________________________________

15. Of the Post Consumer Carpet lbs. that you have available (Total lbs. from Q14), how much of it was:
   • Reused
   • Processed (i.e. shredded or sheared) and shipped to manufacturer
   ______________________________________________________
   • Sent to Waste-to-Energy Facility
   • Sent to Incinerator
   • Sent to Cement Kiln
   • Sent to Landfill
   • Put in Ending Inventory
I affirm that the answers provided in this survey are accurate and complete to the best of my knowledge.

Print Name:

Company and Contact Information
Name:
Company:
Address:
Address 2:
City/Town:
State: 6
ZIP:
Country:
Email Address:
Phone Number:
Appendix 2
Definitions

**Carpet**: A manufactured article that is used in commercial or residential flooring applications in the U.S. as a decorative or functional feature and that is primarily constructed of a top visible surface of synthetic or natural face fibers or yarns or tufts attached to a backing system derived from synthetic or natural materials. 
(1) “Carpet” includes, but is not limited to, a commercial or a residential broadloom Carpet or modular Carpet tiles.
(2) “Carpet” does not include a Rug, pad, detached cushion, or detached underlayment used in conjunction with, or separately from, a Carpet.

**Carpet America Recovery Effort (CARE)**: A nationwide, 501(c)(3) non-profit organization whose focus is on Post Consumer Carpet stewardship.

**Carpet Industry**: The universe of participants involved in the production of Carpet, including Carpet Manufacturers, fiber manufacturers, and material suppliers. It includes, but is not limited to, members of the Carpet and Rug Institute (CRI).

**Carpet Recycling Industry**: The universe of participants in the U.S. involved in the net diversion and/or recycling of Post Consumer Carpet from landfills. The industry includes, but is not limited to Collectors, Sorters, Recyclers, Carpet Manufacturers, and Carpet Industry suppliers.

**Cement Kiln**: Cement production facility that may use Post Consumer Carpet as a source of alternative fuel, in lieu of other fuel sources.

**Collection**: Any method of consolidating and temporarily storing recovered Post Consumer Carpet.

**Collector**: An entity that is engaged in the activity of the Collection of Post Consumer Carpet.

**Carpet and Rug Institute (CRI)**: A nationwide organization whose purpose is to provide science-based information about Carpet and Rugs.

**Net Diversion**: Carpet removed from the waste stream, handled by a sorter, and used for recycling, waste-to-energy, CAAF, cement kiln, or pyrolysis. This does not include material going to incineration or to the landfill.
Discards - The remainder of Post Consumer Carpet which is disposed into a landfill or incinerator, after processing Post Consumer Carpet into Recycled Output or use in Waste to Energy, CAAF, Cement Kiln or pyrolysis.

Inbound Raw Material - The Post Consumer Carpet that is collected, and readied for Sorting.

Incineration: Complete burning of material to ashes, with no energy recovery to reduce waste volume.

Landfill: The placement of Post Consumer Carpet and/or the residuals into a disposal facility.

Manufacturer: Carpet mill that makes or sells Carpet in the U.S.

Post Consumer Carpet: Carpet that has completed its life cycle as a consumer product, after processing into Recycled Output or use in waste-to-energy, CAAF, cement kiln or pyrolysis, or is no longer used for its manufactured purpose.

Processor: An entity that accepts Post Consumer Carpet from a Sorter for Recycling or diversion.

Recycling: Transforming or remanufacturing Post Consumer Carpet into usable or marketable materials, rather than for Reuse, WTE, CAAF, Cement Kiln, incineration or landfill disposal.

Recycled Output: The shredded or sheared material that is generated by the Processor for the purpose of being further manufactured into engineered resins, recycled content fibers, carpet pad, etc.

Reuse: Refurbishing and donating/selling recovered Carpet back into the market. The Reuse of recovered Carpet retains the original purpose and performance characteristics of the Carpet.

Rug: A single piece of loose-laid (not installed or attached at wall base) soft floor covering manufactured from natural or synthetic fiber, including Carpet cut into room or area dimensions that is not intended to cover the entire floor.

Sorter: An entity that is engaged in the activity of Sorting collected U.S. Post Consumer Carpet. Sorters will accept and manage all applicable Post Consumer Carpet, regardless of polymer type or primary materials of construction, at the facility where the Post Consumer Carpet is analyzed and baled.

Sorting: The method used for segregating collected Post Consumer Carpet into the various backing types (PVC, SBR Latex, etc.) and/or fiber types (e.g. Nylon 6,
Nylon 6.6, Polypropylene and Polyester), using a spectrographic fiber analyzer; and transferring for internal or external processing or alternative fuel source.

**Waste to Energy**: Process of recovering thermal energy from solid waste through combustion.