

**RECYCLING TECHNICAL ASSISTANCE
Project #504**

FINAL REPORT

**DOYLESTOWN TOWNSHIP
BUCKS COUNTY, PENNSYLVANIA**

CURBSIDE WASTE MANAGEMENT EVALUATION



SEPTEMBER 2012

**Sponsored by the Pennsylvania Department of Environmental Protection through the
Pennsylvania State Association of Township Supervisors**

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Project Completed By:



Gannett Fleming

PO Box 67100

Harrisburg, PA 17106-7100

717.763.7212 x2538

sdeasy@gfnet.com

1.0 STATEMENT OF PROBLEM

This study was conducted for Doylestown Township in Bucks County, Pennsylvania under the Recycling Technical Assistance program that is sponsored by the Pennsylvania Department of Environmental Protection (PADEP) through the Pennsylvania State Association of Township Supervisors (PSATS).

The Township requested a solid waste expert to assist the Township Board and Environmental Advisory Council (EAC) to analyze results from a public solid waste management survey in the context of improving the curbside waste management program. The Township also wants to understand environmental and financial impacts from the existing waste collection system. Together, the survey data and clarifications on environmental impacts should be combined into an independent opinion/recommendation for improving the solid waste management system.

2.0 SUMMARY OF WORK

The following subsections summarize the work conducted by Gannett Fleming under the approved project tasks. Gannett Fleming reviewed information on the existing solid waste management program and analyzed the public survey results.

2.1 Existing Solid Waste Management Program Review

According to the 2010 U.S. Census, the Township population was 17,565 living in 6,329 occupied housing units. The Township is zoned predominantly residential with only small isolated areas zoned commercial and institutional. The existing curbside solid waste management program is structured as follows:

- **Bucks County Municipal Ordinance**
 - Act 90 Hauler Licensing Requirements
 - Waste/Recyclables Reporting Requirements by Haulers
- **Doylestown Township Ordinance 366, Garbage, Rubbish and Refuse Article 3, Section 100-35 and Act II: Recycling**
 - Hauler licensing
 - Designates facilities
 - Solid waste and recyclables reporting
- **Homeowners contract with one of the following haulers who are licensed through the State Act 90 program and the Township licensing program.**

○ Republic Waste Services	○ Tinari Container
○ G and C Waste Services	○ Interstate Waste Services
○ Gorski Trash Removal	○ Waste Management
○ George Leck and Sons	

- **Single-stream recycling**, where container recyclables (e.g. plastics, aluminum and glass) are collected together in one container with paper items, is the dominant recyclables collection format. **Appendix A, Recycling Analysis** reveals:
 - Approximately 1,774 tons of curbside recyclables (excluding yard wastes) is collected annually.
 - 72% of reported residential curbside recyclables were collected by Allied Waste in 2011.

Appendix B, Memo To EAC - Environmental Impacts reveals:

- Using the Northeast Recycling Council (NERC) Environmental Benefits Calculator, the diversion of 1,774 tons of single-stream recyclables in 2011 saved 241,720 gallons of gasoline. Gasoline is saved because the lifecycle of the recycling process is more efficient in terms of carbon utilization, when compared with extracting and processing raw resources into products.

2.2 Existing Solid Waste Management Program Findings

Ordinance

- The recycling ordinance is inconsistent with the curbside services actually provided to households in the Township by the different haulers (e.g. haulers collect more materials than required by ordinance).
- The ordinance is difficult to enforce because it would require entering court to resolve even minor infractions. A citation process with warnings and small financial penalties could be integrated into the ordinance to streamline the process.
 - A primary complaint is early trash pickups, which continues to be a problem.

Solid Waste and Recycling Performance

- The recycling data from at least some haulers is unclear and/or does not make sense. The hauler that collects from the most households reported commingled and mixed paper recycling totals, but they utilize a single-stream recycling format. Recyclables are mixed, often split in 25% increments from other municipalities so recycling data is estimated, averaged, and not based on actual weights generated from the households in the municipality.
- Cost is a metric utilized to measure operation performance. Based on a review of homeowner trash bills in the Township, the costs for a portion of homeowners is substantially above average (even for private subscription) for the trash service provided. High costs are likely attributed to a combination of the following:
 - Inefficiencies in multiple-hauler collection routes and schedules increase operation costs for each hauler, and these are passed on to the customer.
 - The persistence of one dominant hauler in the service area leverages this advantage to charge premium pricing, and can increase operation costs for other haulers that may pass this cost on to customers.
 - It is extremely rare that haulers in a multi-hauler system lower customer costs when fuel prices decrease. Consequently, costs are based on the last price paid, and do not accurately reflect operational costs.

- Compared with other Bucks County curbside single-stream and commingled recycling programs, the Township recycling performance appears slightly above average based on the 2011 annual per capita recycling (See **Appendix A, Recycling Analysis**). However, Township recycling data is substantially flawed. Recyclables are usually mixed in trucks from one or more municipalities. Data reflects mixed load estimates, not actual weights. Additionally, comparing recycling performance with other private subscription programs is not a true measure of performance. Measured against a well-structured contractual program operated by a single hauler, the current recycling rate is relatively poor.
 - Insufficient recyclables container size for some households reduces recycling. When containers overflow, often recyclables are discarded as trash.
 - A substantial portion of residents subscribe for twice-per-week trash collection, which increases costs and decreases recycling (Collection Efficiency, Strategies for Success, EPA 1999).

2.3 Environmental Impacts From Multiple-Hauler Collection

In Doylestown Township, seven (7) hauling companies independently provide curbside collection service. There are distinct differences from how collection occurs in a contracted single-hauler system when compared with a multiple-hauler waste system. These differences result in inefficiencies that increase fuel and natural resource consumption, thus magnifying impacts to air, water, soil, plants and animals. These negative impacts are not a result of negligence by any individual hauler. It is an outcome that results from a system that does not optimize collection efficiency and recyclables recovery. When route, labor and equipment is not optimized, there is an increase in the number of miles traveled, and the number of trucks utilized to collect trash and recyclables. Nearly always, fewer total recyclables are collected in a multi-hauler system when compared with a single-hauler system. Less recycling increases the demand on natural resources. Most costs for environmental impacts are not addressed directly by trash bills, but are absorbed by the local and regional community in local, state and federal taxes and other fees paid by individuals. In multi-hauler systems:

- Additional collection vehicles are utilized to complete a given service area.
- Multiple trucks travel the same streets on any given day.
- Collection vehicles operate up to seven (7) days per week.
- Non-consecutive household collection occurs where trucks skip some houses; collecting only the houses where they are the individual subscription provider.
- Ineffective management of start or finish times for collection routes is typical.
- Lack of management, review or understanding of truck types, fuel types/efficiency and emissions of the vehicles servicing the community is evident.
- A portion of customers have twice-per-week trash collection (which increases costs and decreases recycling).
- 15%-25% of households do not subscribe for, or pay for trash service.

Gannett Fleming reviews potential environmental impacts in **Appendix B, Memo to EAC – Environmental Impacts**.

2.4 Community Impacts from Multi-Hauler Systems

Certain negative impacts that result from the operating scheme of a multiple-hauler trash system can be reduced using a contractually-based system with a single hauler that utilizes planned collection routes to service all occupied households. **Community impacts** exacerbated by the multi-hauler system in the Township include:

- **Noise.** Truck noise is the most frequent complaint regarding trash collection received by the Township.
 - In a single-hauler contract, the hauler can be required via contract to:
 - Start collections after an established time (e.g. 6am)
 - Only collect in one area, one day per week.
- **Safety.** Increased trash trucks traveling local roads increases public safety risks.
- **Cost.** Total waste system costs are higher; this is reflected by some trash bills being above the regional average. Based on discussions with Waste Management, Inc. and Penn Waste, Inc. in 2012, 15% to 25% of households do not subscribe for trash service in private subscription waste systems and another 10% do not pay their bills. The paying 70% of the customers partially subsidize the true cost of 100% of the collection, disposal and profit margin. Indirect costs are cumulative over time and include: roadway repairs, health care costs, and environmental costs.
- **Health Impacts.** Hydrocarbons degrade air, water, and soil quality and adversely impact all living organisms.
- **Community Aesthetics.** Trash and recycling containers are set out at the curbside nearly every day of the week in most areas of the municipality.
- **Roadway.** According to American Association of State Highway and Transportation Officials (AASHTO), full garbage trucks have loading factors equivalent to 11,700 cars and appreciably accelerate road damage. Passenger car impact is negligible.
 - Organized truck routes in a single-hauler collection system reduce roadway degradation over the life of the roadway and reduce associated costs.
 - For the average driver, rough roads add \$335 annually to typical vehicle operating costs. Philadelphia is calculated as \$525 per year per driver (Rough Roads Ahead, Fix Them Now or Pay for it Later. AASHTO and TRIP, 2009)

2.5 Residential Solid Waste Survey Review

Gannett Fleming analyzed the survey responses from the residential solid waste and recycling survey completed in 2011. The survey review is contained in **Appendix C, Survey Analysis**. Highlighted observations include:

- Based on household occupancy and household waste generation, once-per-week trash collection using 96-gallon trash totes accompanied by once-per-week recycling in 64-gallon or 94-gallon totes will satisfy disposal capacity needs for over 90% of Township households.

- Half of respondents are concerned about the high costs for curbside trash services.
- 92% of respondents want bulky item collection with standard trash service.

3.0 SOLUTIONS

These subsections describe possible and recommended solutions for the municipality to consider for implementing an improved curbside waste collection and recycling program. The pathway for implementation is based on the following:

- Although individual waste haulers perform satisfactorily at collecting waste and recyclables from Township households, there are a number of negative effects (financial, environmental, and community impacts) that can be managed much more effectively using an alternative municipal waste system.
- Because a single-hauling company services roughly 70% of the municipality, a franchise-like scenario results in a diminished ability of customers and competing haulers to manage costs.
- Although the survey indicates 97% of households recycle, the actual recycling performance (total tons diverted) will increase by implementing an alternative system with consistent service and adequately-sized recycling containers for every household.
- An accurate assessment of recycling performance cannot be obtained because the data from multiple haulers is incomplete, confusing, and represents only estimates by the haulers (trucks are filled with material from more than one municipality).
- At this time, the Board of Supervisors and the EAC lack the waste service and cost data, obtained via the municipal bidding processes, to objectively compare an alternative contracted curbside collection program with the existing system.

3.1 List of Possible Solutions for Improving Township Waste Management

Gannett Fleming briefly evaluated the use of ordinance revisions and the implementation of a municipally-operated waste management program as strategies for improving the existing waste program. Neither of the options is preferred for Doylestown Township. Refer to **Appendix D, Waste System Options** for additional information.

3.2 Recommended Solutions/Course of Action

Gannett Fleming recommends Doylestown Township take the following actions:

- To objectively compare the existing waste system with the preferred alternative, obtain actual pricing and service data from several haulers for a contractually-based

municipal-wide trash collection program. This should be done via the municipal bidding process with some of the following recommended core service components:

- A clause to permit the Township to “**reject any and all bids**” in case the pricing and services data does not result in appreciable improvements to the existing solid waste system.
 - Once-per-week 96-gallon trash cart service (base option). Twice-per-week trash is not recommended but could be included for price analysis.
 - Once-per-week single-stream recycling with one 64-gallon or one 96-gallon cart per household.
 - One bulky item collected per week with regular trash collection.
 - One freon-containing item collected per year (call for service).
 - Four (4) spring and four (4) fall collections of yard wastes.
 - Designated trash districts so trash and recyclables collection occur once-per-week for any given area within the Township.
- The EAC should review this report and issue a response and recommendation to the Board of Supervisors regarding the course of action.
 - The Board of Supervisors should vote on municipal waste collection bid issuance for the purpose of obtaining the data required to evaluate the proposed waste system alternative against the existing waste system.
 - If the Board of Supervisors agrees to obtain data via the bid process, Gannett Fleming recommends:
 - Using the Chalfont Trash Bid (previously revised by Gannett Fleming) as a template. Gannett Fleming can advise.
 - Conducting a public meeting after the data from the bids has been received, reviewed and summarized.

In conclusion, there are inefficiencies in the way the existing waste collection system operates. These inefficiencies increase the total sum of negative impacts to air, water, soil, plants, animals and community. Although transitioning to a single-hauler waste system does not eliminate the impact from waste collection, it substantially reduces the impacts. The optimization of waste management that occurs has numerous community benefits, including cost savings. The residential trash and recycling survey reveals residents care about recycling and are concerned about current costs.

A hard look at data from qualified waste haulers is needed to complete a comparison with the existing program to the proposed single-hauler waste system. If the results are consistent with statewide observations, trash bid data will reveal the average trash bill will go down by 20% to 30%, for an equivalent or enhanced level of curbside service. Improving the waste system is a rare opportunity where the community can reduce environmental impacts and improve health, safety and welfare, while reducing costs incurred by the community in trash bills and taxes.

APPENDICES

Appendix A - Recycling Analysis

Appendix B - Memo to EAC - Environmental Impacts

Appendix C - Survey Analysis

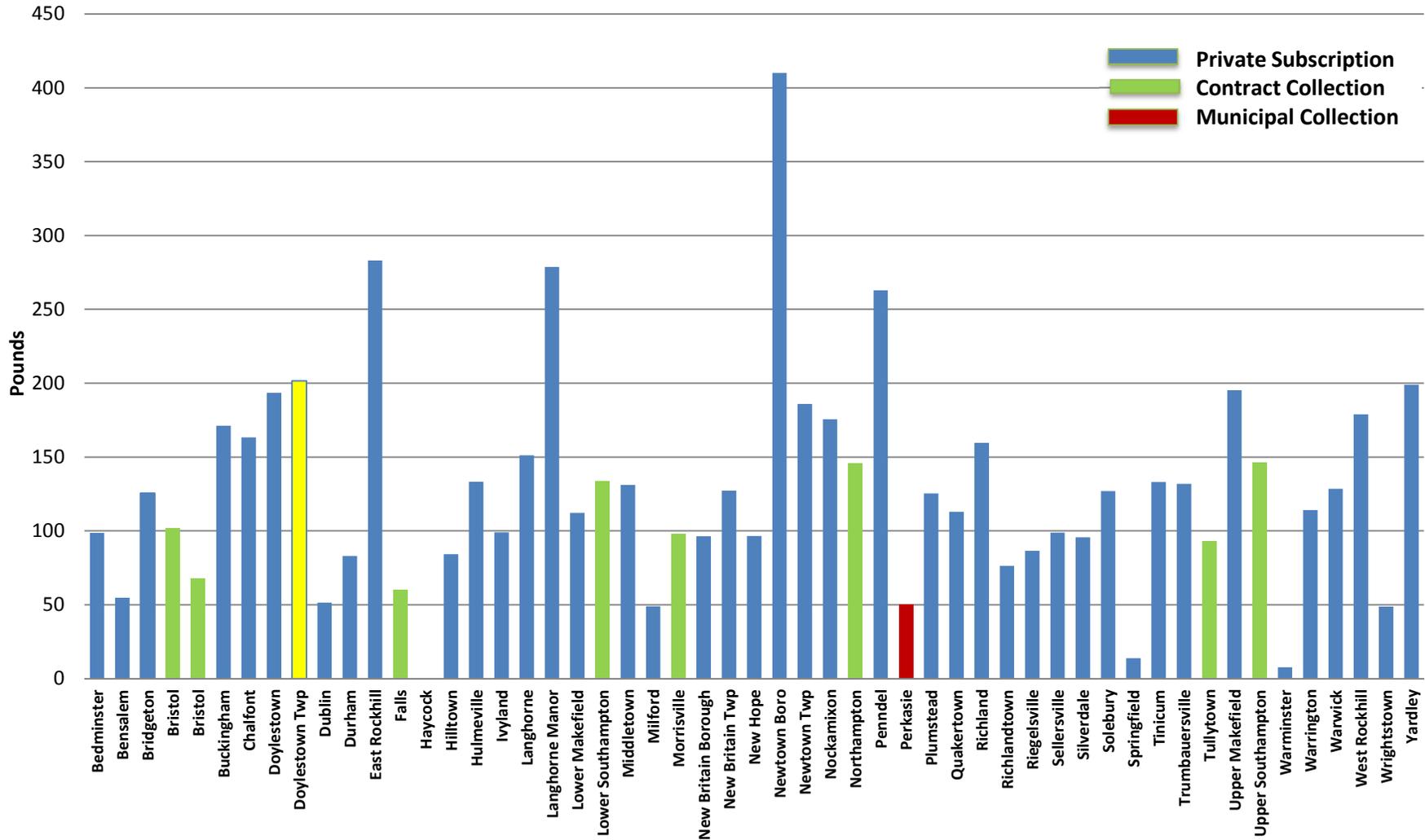
Appendix D - Waste System Options

Appendix A-1
Doylestown Township, Bucks County
Per Capita Waste Generation Calculator

EPA 2010 Figures	Pounds (EPA 2010)
Total Waste Per Person Per Day (lbs.)	4.43
Total Recycling Per Person Per Day (lbs.)	1.51
EPA National MSW Recycling Average (%)	34.09%
	Tons (EPA 2010)
Total Waste (including recyclables) Per Person Per Year (Tons)	0.808475
Total Recyclables Per Person Per Year (Tons)	0.275575
Total Waste (including recyclables) Per Person Per Year (lbs.)	1612.52
Total Recyclables Per Person Per Year (lbs.)	549.64
	Municipality: Doylestown Township
2010 Population:	17,565
2010 Occupied Households:	6,329
Total Waste Generated By Municipality Per Day (lbs.)	77,813
Total Recycling Generated By Municipality Per Day (lbs.)	26,523
Total Waste (including recyclables) Generated By Municipality Per Year (Tons)	14,200.86
Total Recycling By Municipality Per Year (Tons)	4,840.47
Total Waste (including recyclables) Generated By Household Per Year (tons)	2.24
Total Recycling Generated By Household Per Year (Tons)	0.76
	Municipal Reporting
Doylestown Annual Reported Curbside Recycling (2010)	1820.2 Single stream
Doylestown Annual Reported Organics Recycling (2010)	29.07 Curbside only
Other Annual Reported Recycling (2010)	0
Total Annual Reported Institutional & Commercial Wastes	0
Total Annual Reported Recycling (Tons)	1,849.27
Annual Recycling Per Occupied Household (Tons)	0.29
Recycling Rate (%) Calculated Using EPA Waste Gen (4.43 lbs./day)	13.02%

EPA's figures include municipal solid waste from homes, institutions such as schools and prisons, commercial sources such as restaurants and small businesses, and occasional industrial sources. MSW does not include wastes of other types or from other sources, including automobile bodies, municipal sludges, combustion ash, and industrial process wastes that might also be disposed in municipal waste landfills or combustion units. Waste tons are US short tons equal to 2,000 lbs. Days are estimated to be 365 per year.

Appendix A-2
Bucks County Municipal Curbside Recycling Performance
2011 Annual Per Capita Recycling (pounds)
Reported Single-Stream & Commingled Recycling Only



Appendix B

Doylestown Township, Bucks County

FINAL Memo to Doylestown Township EAC - Environmental Impacts – June 2012

Gannett Fleming, Inc.

This memo briefly addresses four concerns of the EAC regarding environmental impacts of the existing multiple hauler trash system in Doylestown Township. Items are addressed in the context of implementing an alternative: contractual trash collection service using a single hauler. Single hauler waste service optimizes collection routes, assures adequate waste and recycling container capacity, and will meet Act 101 recycling compliance. Reference the Recycling Technical Assistance Report.

1- Recycling Loss in a multiple hauler system - inaccuracies in reporting.

Reasonably accurate recycling data is required to benchmark program performance. Without accurate benchmarking it is difficult to calculate performance and environmental impacts. Lost recycling data can also diminish Act 101, Section 904 performance grants, which are based on reported recycling tons. If funds from recycling grants are injected back into waste management and recycling program enhancement, it can yield direct environmental benefits (e.g. increased waste diversion to recycling).

Recycling reporting in Doylestown Township is not accurate. The incoming data from 7 hauling companies is often errant, incomplete, and estimated. Every time a truck is filled with recyclables from Doylestown Township and other municipalities the hauler must estimate how much of the total load originated from Doylestown Township. One data capture advantage the Township has is that one hauling company serves roughly 70 percent of the customers. Inefficient recycling is not limited to poor data collection in a multiple hauler system. When compared with a preferred single hauler alternative, recycling “loss” occurs in the Township because:

- 1 – Some haulers do not provide sufficient recycling container capacity, reducing recycling participation and the total material recovered per household.
- 2 – Twice per week trash disposal increases costs and decreases recycling (Collection Efficiency, Strategies for Success, EPA 1999)
- 3 – Inconsistency with services and limited education outreach by haulers contributes to program confusion and reduced participation and contamination of recyclables.
- 4 – Between 15% and 25% of households do not subscribe or pay for curbside trash service based on data provided from several PA waste hauling companies. There is increased likelihood that a greater portion of recyclables generated from these households will be disposed as trash.

Notably, a single hauler program will not result in perfect recycling data and some loads may still be estimated. However, data recovery and accuracy should be substantially improved and consistent.

2- Impact of multiple trucks on environment - emissions, noise, fuel, spillage, road impacts.

Air Quality: Inherent to the operation of a multiple hauler collection system there is an increase in total truck miles travelled and an increase in total truck operating time within the Township when compared to a single hauler collection program using fewer trucks and well-planned collection routes. Single

hauler collection routes are designed to collect houses consecutively. Each hauler in a multiple hauler system service different customers in various locations and the result is non-consecutive collections - which increases service time, fuel consumption, emissions and road damage.

Buck County already suffers from relatively poor air quality. Chester, Montgomery, **Bucks**, Delaware counties and Philadelphia are part of the Philadelphia-Wilmington PM Non-Attainment Area. This Delaware Valley area does not meet the standards for two of these pollutants—**ground-level ozone** and **fine particulate matter** (PM2.5). According to the Air Quality Index (AQI), a standard index used by EPA to determine if air quality levels in a particular location are good, moderate, unhealthy, or worse, Bucks County has an AQI of 164, ranking it as the 5th worst in pollution in PA (data is 2003; updated AQI may be available).

The exceedence of air quality standards occurs from cumulative sources, but is directly related to car and truck traffic concentrations of the Philadelphia region. Diesel trash trucks get approximately **3 miles per gallon**. The California Air Resources Board (CARB) identified 41 toxic constituents of diesel exhaust that threaten human health, some causing cancer. There are six criteria pollutants actively monitored by EPA because of their threat to harm human health, the environment and property. Most of these are produced during trash truck operation. These pollutants include particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. <http://www.epa.gov/airquality/urbanair/>.

"**Fine particles**," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air. Small particles less than 10 micrometers in diameter pose the greatest problems, because they can get deep into your lungs, and some may even get into your bloodstream. Particle pollution - especially fine particles - contains microscopic solids or liquid droplets that are so small that they can get deep into the lungs and cause serious health problems. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including (www.epa.gov):

- increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing, for example;
- decreased lung function;
- aggravated asthma;
- development of chronic bronchitis;
- irregular heartbeat;
- nonfatal heart attacks; and
- premature death in people with heart or lung disease.

According to the Journal of the American Medical Association, people living in urban polluted areas (like the Philadelphia region) have a 12% higher risk of dying of lung cancer than people in the least polluted areas. That risk increases 50% for those who are repeatedly and regularly exposed to diesel exhaust, such as the workers who spend long days at the back of or driving garbage trucks.

Ground level ozone is produced from emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC. Even relatively low levels of ozone cause adverse health effects. People with lung disease, children, older adults, and people who are active outdoors are particularly sensitive to ozone.

Water Quality: The environmental impacts from vehicle emissions are not limited to air quality. Polycyclic aromatic hydrocarbons (PAHs) are formed when gas, coal and oil are burned and eventually reach water bodies. PAHs are highest in areas with high rates of development and motor vehicle traffic. Air pollution from vehicles, industries, gas-powered lawn tools and similar sources contribute to nearly one-third of the total nitrogen load to the Chesapeake's waterways (www.chesapeakebay.net).

Roadway Damage: Damage to roadways by trucks is significant while damage to roadways by cars is negligible. According to the American Association of State Highway Officials (AASHO) for a typical 20-year road paving design surface:

- Roadway damage caused by vehicles is exponential (x4). For example, doubling the load for a given axle increases the damage 16 times.
- For an equal number of applications (equal number of times travelled over a given road), heavier loads produce appreciably more damage to pavement than lighter loads.
- Using American Association of State Highway and Transportation Officials (AASHTO) vehicle load factors (VLF), a full, residential garbage truck is equivalent to **11,700 passenger** cars.
- The VLF of a passenger car (.0004) is so small that cumulative pavement impact is essentially moot; damage to a 20 year pavement design would be primarily associated with environmental impacts, not passenger vehicles.

There are increased costs, emissions and environmental harms associated with increased paving activities that result from premature paving repairs accelerated by heavy truck traffic (Rough Roads Ahead, fix them now or pay for it later. AASHTO and TRIP, 2009)

3- Impact of curbside leaf and yard waste recycling - how much waste is diverted from landfills and why is this important.

Doylestown Township recovered **22.37 tons** of yard waste curbside in 2011. Organic totals from the monthly drop-off site are not recorded. According to the Pennsylvania Statewide Composition Study (2003), Table 5, Residential disposal to Landfill in a Suburban Sector is characterized as follows:

- Yard waste grass represents **2%** of the disposed waste stream. Using EPA's waste generation factor and the Statewide Waste Composition Study (2003), 2% of grass represents between 186 and 254 tons of material annually for Doylestown Township.
- Other yard wastes represent **2.4%** of the disposed waste stream. Using EPA's waste generation factor and the Statewide Waste Composition Study (2003), 2.4% of other yard waste represents between 224 and 339 tons of material annually for Doylestown Township.

- Food waste represents **13.10%** of the disposed waste stream. Using EPA's waste generation factor and the Statewide Waste Composition Study (2003), 13.10% of food waste represents between 1,223 and 1,855 tons of material annually for Doylestown Township. Although not common in PA, curbside food waste collection is taking hold in some regions of the country.

Proper organics management is important. When organics are disposed of in landfills, they generate methane, a potent greenhouse gas with 21 times the global warming potential of carbon dioxide. To eliminate environmental impacts from organics transportation and processing, Gannett Fleming advises where feasible to utilize organic materials at the generation site (back yard) as mulch and compost. When composting and mulching on site is not possible, organics can be collected at the curb and supplemented by one or more drop-offs. To reduce environmental impact from fuel based collection and processing, Gannett Fleming recommends curbside collections are provided seasonally in spring and fall periods, when the generated quantities of yard waste are highest.

Environmental benefits from organic mulching and composting stem from reduced environmental harms from avoiding the production, use and transport of inorganic fertilizers (pollution generating activities). Inorganic fertilizers contain toxic chemicals and elevate nitrogen levels in surface water runoff and ultimately streams and water bodies. Inorganic fertilizer used in the Pennsylvania agriculture industry is a primary contributor to the destruction of the Chesapeake Bay estuary system. Additionally, mulch can reduce the demand for watering plants and reduces the use and impacts from mechanical/fueled equipment for managing weeds and grass where mulch is used.

4- Impact of Recycling- why is it important, what is its impact on landfill diversion

Recycling is important because the amount of energy (or fuel) required to extract, transport, refine and produce products from **raw materials** and then distribute these to markets is substantially greater than when compared with the lifecycle of products made from recycled materials. At the same time, the amount of pollution created by using recyclable materials is substantially reduced as compared to making the same products from raw materials. Examples provided by Carbon Footprint include:

- Producing aluminum cans from recycled aluminum cans uses 1/12th the energy compared with making them from raw aluminum.
- For glass bottles, 315kg of CO₂ is saved per ton of glass recycled.
- Making bags from recycled polyethylene uses 1/3 the Sulfur Dioxide and half the Nitrous Oxide compared to making plastic bags from raw materials.

Using EPA's per capita recyclables generation rates for 2010 are:

- Waste: **4.43 pounds per person per day**; or 0.808475 tons per person per year.
- Recycling: **1.51 pounds per person per day**; or 0.27575 tons per person per year.

Multiplying the EPA's annual per capita waste generation rate (**in short tons, 2,000 lbs.**) and population from the 2010 US Census (17,656), the estimated total waste generated (including recyclables) annually by the Township is 14,200 tons. Multiplying the EPA's annual per capita recycling (in tons) and population from the 2010 US Census (17,656), the estimated total recycling is approximately 4,800 tons. Doylestown reported single stream curbside recycling in 2011 was 1,170 tons. For estimating purposes

only, the amount landfilled annually by the township is 14,162 less 1,770, or 12,391 disposed tons. This data was entered into the Northeast Regional Environmental Benefits Calculator (NERC), which is a model that takes known factors and calculations about fuel consumption and combustion, emissions, Greenhouse gas (GHG) production and energy consumption for waste and recycling materials and calculates environmental impacts/reductions (e.g. carbon, GHG, energy) based on actual recycled quantities entered into the model. Diverting 1,770 tons to recycling saved 241,720 gallons of gas.

Doylestown Township, Bucks Co. PA						
NERC Environmental Benefit Calculator Analysis Summary (2012)						
Assumes 1,770 tons (2011) of Recyclables Diverted & 12,391 Tons Disposed						
Net GHG Savings from Recycling - CURBSIDE ONLY (MTCE)	Percent of Industrial Carbon Emissions from Fossil Fuel Combustion (%)	GHG Reductions as Percent of Total GHG Emissions (%)	Net Energy Savings from Source Reduction, Reuse and Recycling (Million BTUs)	Net Energy Savings from Recycling - CURBSIDE ONLY (Million BTUs)	Percent of Total Energy Used by Industry (%)	Gas Saved (Gallons)
1,430.98	0.01	0.00	30,030.85	30,030.85	0.00	241,720.15

Note: Refer to terms at the end of memo for clarifications on table abbreviations.

Keep in mind the reported tons in the Township are less than EPA’s national estimates but include only reported curbside single stream recycling and a small amount of curbside organics. The existing program data and performance are also flawed. EPA waste and recyclable generation estimates are nearly always higher values than measured totals of materials actually recovered curbside. EPA considers all generation and recycling of the entire municipal waste stream, including generation that may not end up in disposal and recycling beyond curbside recovery.

The Lancaster County Solid Waste Authority has good waste data. For Lancaster City, the actual 2011 average weight per household participating in a curbside collection program of refuse was 2,389 pounds and of recyclables was 355 pounds. These are strictly the curbside collection weights encountered in a typical collection program. They do not include tires, white goods, bulky items or yard waste collections and other non-curbside wastes.

Conclusion: Trash trucks consume large quantities of fuel. The imperfect burning of diesel fuel releases hydrocarbons into both air and water and are known to be toxic and cancer causing. Cars, not trucks are the largest contributor of emissions in Doylestown Township. It must be recognize that air and water do not have municipal boundaries; so many environmental benefits realized from improved waste management are not limited to the Township. While damage from cars to the Township roadway surfaces are negligible, garbage trucks accelerate road repairs at the expense of the Township’s budget

and the environment. Increased road repairs increases total fossil fuel and natural resource consumption, and thus increases environmental harms.

Implementing a single hauler trash collection program that replaces the existing multiple hauler program will not eliminate the human health and environmental impacts from trash collection in the Township. However, assuming all other factors are constant, a single hauler system will increase the total recovery of recyclables and result in cumulative reduction in the human health environmental impacts, total fossil fuel and total natural resource consumption that are result from waste management activities within Township. The reduction of these impacts are difficult to quantify, and would be proportionally small when considering all Township activities. However, since an efficient single hauler program would be utilized for years to come, the environmental benefits would be cumulative and significant over time.

Local governments are involved when activities affect the health, safety, and welfare of the community as whole. Implementing efficient waste management practices improves community and regional health, safety and welfare.

TERMS

PM = particulate matter. PM2.5 refers to particulate matter that is differentiated based on size, in this case 2.5 micrometers.

NOx = Nitrous oxides - NOx is a generic term for mono-nitrogen oxides NO and NO₂ (nitric oxide and nitrogen dioxide). They are produced from the reaction of nitrogen and oxygen gases in the air during combustion, especially at high temperatures. In areas of high motor vehicle traffic, such as in large cities, the amount of nitrogen oxides emitted into the atmosphere as air pollution can be significant. NOx gases are formed everywhere where there is combustion – like in an engine. In atmospheric chemistry, the term means the total concentration of NO and NO₂. NOx react to form smog and acid rain. NOx are also central to the formation of tropospheric ozone.

VOC = volatile organic compounds.

MTCE = Metric Ton Carbon Equivalent; Standard unit for greenhouse gas emissions calculations. A metric ton is approximately 2,200 pounds. One metric ton of carbon dioxide (CO₂) expressed as MTCO₂E, is produced to the meet the average monthly energy demand of the typical American household.

GHG = Greenhouse Gases are gases in an atmosphere that absorb and emit radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Greenhouse gases greatly affect the temperature of the Earth (Wikipedia, 2012).

Appendix C
Doylestown Township, Bucks County
Public Solid Waste and Recycling Survey Review
Gannett Fleming, Inc.

Gannett Fleming, Inc. reviewed responses from the public solid waste and recycling survey that was issued in February, 2011 by Doylestown Township. The purpose of the survey review is to use residential curbside solid waste and recycling customer feedback to understand the existing program, to learn customer needs and concerns, and to apply these findings to recommendations and decisions regarding future solid waste and recycling improvements to benefit the community.

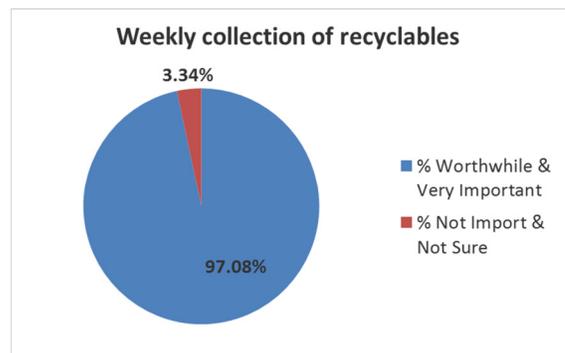
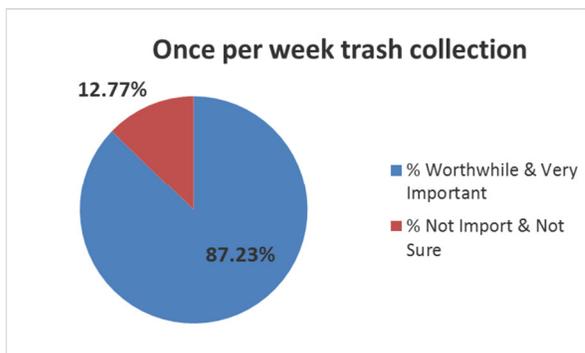
Survey Components

There were 13 survey questions. On average, there were 478 responses to the set of 13 questions. Questions included the following topics: Trash collection, recycling, cost, service satisfaction and yard waste and grass handling.

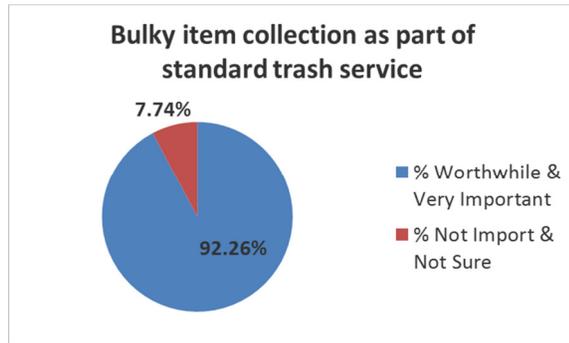
Survey Analysis and Findings

Gannett Fleming analyzed/graphed the following survey responses because they reveal important information about the existing program and/or are recommended for consideration when making adjustments to the existing curbside solid waste program.

- **Over 50% of households are occupied by 2 or less persons and 88 percent of household are occupied by 4 or less people. Over 90 percent of household produce 4 or less bags of trash per week.**
 - The typical quantity of municipal waste generated by 4 or less persons per household can adequately be collected by the commonly offered 95/96 gallon trash containers and 64 or 96 gallon recycling containers, even when trash service is offered only once per week. Notably, many Township households subscribe for twice per week collection, usually at a higher cost than once per week.
- **87% of respondents felt once per week trash collection is important and 54% of respondents felt twice per week trash collection is important. 97 percent of respondents felt weekly curbside recycling is important.**

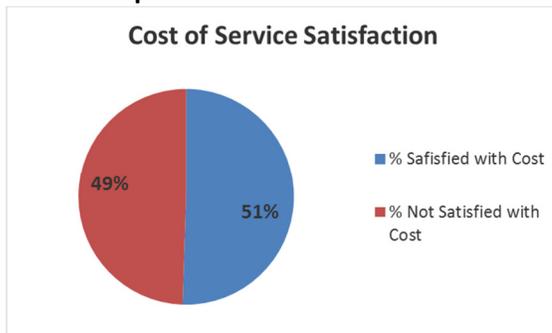


- In Gannett Fleming’s experience, twice per week trash collection contributes to a reduction in the total amount of waste diverted to recycling. This is attributed to the additional disposal convenience and container capacity dedicated to waste TWICE PER WEEK TRASH COLLECTION IS EXTREMELY RARE, and not provided to the vast majority of municipalities in PA or the US.
- **92 percent of respondents want bulky item collection included as part of standard trash service.**



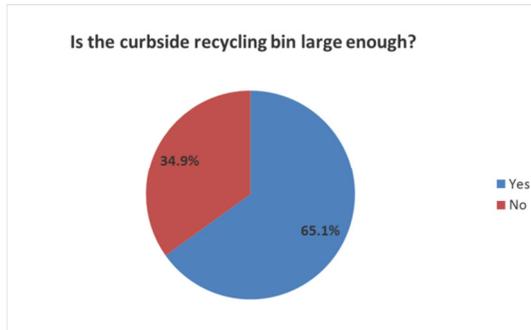
- Based on information provided by several Township residential trash customers, bulky item collection is often included as part of standard trash service. Freon containing bulky items are collected by at least some waste haulers operating in the Township as a separate service for a separate fee.
- Bulky item service, typically one bulk item per week, is easily included into a contract with a single-hauler. The residential customer would not be required to call for special pickup or be billed separately for bulky item service under this contracted service structure.

- **49% of respondents are not satisfied with the cost of service.**



- Based on an analysis of residential quarterly trash/recycling bills, the cost for curbside trash service is highly variable. Some customers pay administrative and/or environmental fees, while others do not – even when the customer bills analyzed originated from the same hauling company. For comparable 95/96 gallon curbside service where trash is collected twice per week and recycling is collected once per week there was a dramatic cost difference among customers that ranged from **\$291.68** to **\$655.32** per year.

- **35% of respondents do not feel the curbside recycling bin is large enough.**



- It would not be expected that this high of a percentage of households lacks sufficient recycling capacity when most households are 4 or less persons, and recycling tote service is common. This response raise questions about the recycling bin sizes being provided by haulers, such as:
 - Are large enough recycling bins provided by each hauler?
 - Gannett Fleming recommends 64 gallon and 94 gallon containers.
 - Are residents able to get additional recycling containers if needed.
 - Are all haulers collecting recyclables at least once per week?
- In a contract collection program, residents can be surveyed to indicate the number of persons occupying the household along with their preference of a 64 or 94 gallon cart. The contract would require the selected hauler to distribute the correct container size to each household.

Survey Analysis Conclusion

Residents are generally satisfied with their basic level of service in the Township and that should be expected. Customers set out trash and recyclables and it goes away. Resident satisfaction with basic trash service is consistent within a typical community. Concerns do exist regarding the high costs for curbside collection services in the Township. The cost concerns expressed by the survey responses were echoed by a separate analysis of quarterly trash bills from Doylestown Township residents. Trash bill fee variability and the cost range among customers with the same basic services are dramatic. Some households pay much higher than the local regional average of \$375 - \$475 for annual curbside collection and some customers pay less than the average. Some bills have administrative fees and environmental service fees and some bills do not. Why fees occur on some bills and not others is unclear, particularly when bills compared originated from the same hauling company.

Keep in mind the private sector is permitted to structure its prices any way it wants for individual customers and it is the responsibility of the homeowner to dispute trash bills or select an alternate hauler. This being considered, trash bills were compared where each customer had 95/96 gallon curbside service with trash collected twice per week and recycling once per week. One customer paid \$291.68 annually and another \$655.32. Is that an equitable price range for the same basic service? If

one customer is paying a very low cost for the same service, is this cost balanced out across other households that pay higher fees?

Survey responses, discussions with current customers, and an analysis of trash bills show a sizeable portion of residents are not taking effective steps to try and lower their trash bills, even when they feel they are too high. This is attributed to some of the following: residents have contacted their hauler but not been able to lower their cost; residents do not realize the costs are higher than the average fee or that their fee is substantially higher than a neighbor's fee; residents do not realize disputing costs with their provider may lower price; the bill has recently escalated without notification; residents can switch haulers and likely lower costs; residents are ok with paying their current rate; and residents could lower their trash bill if they changed to once per week trash collection (and they will have plenty of disposal capacity).

In conclusion, the Doylestown Township waste and recycling survey reveals several disconnects between what residents expect or want from their trash and recycling program and what is actually implemented at ground zero. Primary examples include:

- paying an equitable fee for the services provided;
- effective recycling (reported recycling levels are below Township potential)
 - diminished to some extent by limited recycling container capacity
 - recycling competed with convenient waste disposal in 2x/wk. trash service

WASTE SYSTEM OPTIONS

- **Solid Waste and Recycling Ordinance Revisions:** In concept, solid waste and recycling ordinances are the legal enforcement document for municipal solid waste systems. The Township is legally permitted to manage solid wastes via ordinances, the Solid Waste Management Act, Act 101 of 1988, and relevant chapters of the PA Code. Based on review of the existing solid waste and recycling ordinance, there are some deficiencies in the existing language, some language that is not needed, and also areas where the ordinance does not reflect the actual curbside solid waste program. To improve the performance of the existing multiple hauler waste collection system, the ordinance could be revised to address some of the following:
 - Specify the days collection is permitted, and/or establish trash districts.
 - Specify container sizes and types.
 - Specify once-per-week trash collection.
 - Improve the waste and recycling reporting methods.
 - Request a customer list is provided annually to the Township.
 - Streamline enforcement through a hauler and residential warning first, and then citation issuance that avoids court hearings.

If the above items could be added to the ordinance and be effectively enforced, this strategy could reduce truck traffic, truck noise and emissions. It could marginally improve recycling performance and may facilitate recycling data collection. Ordinance revision alone would not lower costs and could contribute to increased costs if haulers determine the regulations create added operational costs. It is extremely difficult and expensive to enforce solid waste and recycling ordinances in a multiple-hauler solid waste system. Consequently, realizing improvements to the solid waste system to benefit the health, safety and welfare of the community/environment will not be measurably improved via ordinance revisions.

- **Municipal Waste Collection:** The Township could enter into the waste and recyclables collection business, procure equipment and infrastructure, and employ staff to collect curbside waste and recyclables. Gannett Fleming did not explore this option in detail, but notes that this option is a very complex and expensive proposition. Most municipally-operated curbside waste and recycling programs that Gannett Fleming has analyzed result in a higher cost to individual homeowners as compared to a contractually-based single-hauler system.
- **Contracted Municipal Waste Collection Using a Single Hauler:** The Township could enter a contract with a single waste hauling company to provide curbside trash collection services. This option is preferred based on all factors considered.