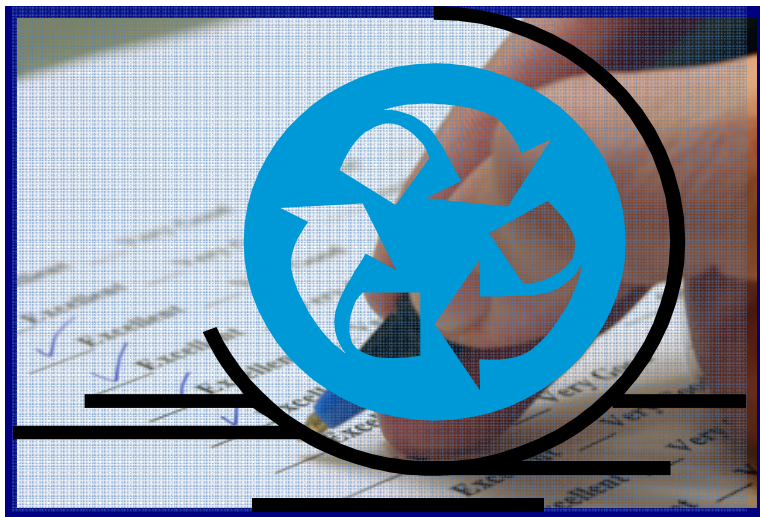


**SWANA RECYCLING
TECHNICAL ASSISTANCE STUDY**

FINAL REPORT

**LOWER MAKEFIELD TOWNSHIP,
BUCKS COUNTY, PENNSYLVANIA**

RECYCLING PROGRAM EVALUATION AND SURVEYS



GANNETT FLEMING, INC.



HARRISBURG, PENNSYLVANIA

February 2010

**SWANA RECYCLING
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SWANA RECYCLING TECHNICAL ASSISTANCE STUDY

EXECUTIVE SUMMARY

LOWER MAKEFIELD TOWNSHIP RECYCLING EVALUATION AND SURVEYS

Under the Pennsylvania Recycling Technical Assistance Program, Lower Makefield Township requested assistance from Gannett Fleming (GF) to evaluate its existing waste management and recycling program. As part of this evaluation, GF worked with the Township to develop residential and commercial waste and recycling surveys. Based on survey results and the program evaluation, GF provides the following summary of findings and recommendations.

Findings

- Managing the activities of four different hauling companies presents a number of challenges and negatively contributes to the overall performance of the Township's waste management program.
- Because the Township does not have full support at this time to consider a single-hauler contract for curbside waste management, which could address a number of collection system deficiencies, the Township will require an alternate strategy to meet its goals to improve recyclables recovery and program compliance.
- As delivered to customers across the Township, the waste and recycling services are inconsistent from the days of collection, to recyclable materials accepted, to curbside container sizes. These inconsistencies thwart recovery of recyclable commodities and diminish the effectiveness of Township educational efforts.
- The per capita curbside recycling rate is below the national average, indicative of the deficiencies identified by the EAC and in this evaluation.
- The Township's existing waste collection program structure and corresponding solid waste ordinance do not optimize the waste program performance in a way that encourages participation and accountability from both haulers and residents.
- Leaf waste collection service is expensive, but valued by customers. Over 6,000 tons of yard waste was reported as collected in 2008, exceeding the total of other residential curbside recyclables combined.

Recommendations

- The Township should continue to use the Environmental Advisory Council (EAC) to evaluate programs and to develop a concise, 3-year Waste Management Strategy that uses a phased approach including the following concepts:
 - It is a primary responsibility of the Township, not its waste haulers, to design and implement an environmentally-sound and service-conscious waste management program that accurately reflects the interest of the community health, safety and welfare; and

- The solid waste ordinance (Chapter 172) can be improved. Ordinance revisions are needed to develop a streamlined waste management program that increases recovery of recyclables while facilitating Township oversight of its haulers and residents.
- GF recommends the Township consider the following ordinance revisions to enhance its waste and recycling program:
 - Designate the collection days haulers are allowed to provide service to improve hauler accountability, reduce program route overlap, and reduce environmental and roadway impacts.
 - If the Township is no longer obligated under the Bucks County Procurement, Processing and Marketing agreement to utilize Otters Recycling Center, Inc. for recyclables, the Township should give serious consideration to implementing (requiring via ordinance) single-stream residential recycling. If single-stream recycling is implemented, distribution of “64-gallon or larger” recycling containers by haulers is recommended.
 - Require haulers to provide customer lists.
 - Require residents and businesses to provide Proof of Hauler or other accepted means of trash disposal.
 - Require property owners/landlords of multi-family establishments to post the Township’s recycling requirements in a visible location for all occupants.
 - Streamline the enforcement process by designating codes personnel, the recycling coordinator or other designees to issue “Administrative Tickets”.
 - Require Haulers to provide educational information on waste management and recycling procedures once every six months (consistent with Act 101) to all customers and to provide a copy to the Township.
- The Township should issue a Business Information Request (BIR) form to new businesses and periodically to existing businesses to obtain information regarding business type, waste and recycling practices, number of employees, etc. Information on office recycling could be provided along with the BIR.
- The Township should develop a Sustainable Business Recognition Program (or similarly named program) to recognize local businesses for outstanding achievements in recycling and other sustainable business practices.
- The Township should review and decide on the implementation of leaf and yard waste alternatives presented in Section 5.0 of this Report:
 - GF recommends the Township procure at least one, truck mounted self-contained leaf collection equipment (operated by one person) to significantly increase leaf collection efficiency while lowering operating costs (regardless of whether grant funding is available).
 - Horizontal grinders have operational advantages over tub grinders and should be evaluated before any final decision is made regarding yard waste processing.
 - It is recommended the Township utilize GF to conduct a site visit and develop recommendations to improve the operation and sustainability of the yard waste facility.

**SWANA RECYCLING
TECHNICAL ASSISTANCE STUDY
FINAL REPORT
LOWER MAKEFIELD TOWNSHIP**

1.0 INTRODUCTION

Lower Makefield Township is continually working to improve its recycling programs to increase diversion rates and assure the program complies with Pennsylvania Department of Environmental Protection (PADEP) policies and the Municipal Waste Planning, Recycling and Waste Reduction Act of 1988 (Act 101) and Act 140 requirements. In order to continue efforts to understand residential and commercial sector waste management and recycling practices and needs, the Township wishes to conduct surveys to obtain feedback from both residential and commercial sectors. Under the Solid Waste Association of North America (SWANA) Recycling Technical Assistance Program, the Township was awarded \$7,500 in technical assistance from Gannett Fleming (GF) to evaluate its recycling program and develop and summarize residential and commercial sector surveys. GF worked with Lower Makefield Township to develop the following three tasks for this recycling study.

1.1 Scope of Work

- Task #1 Gather and review background information provided by the Township related to the existing waste and recyclables program.
- Task #2 GF will assist the Township in developing residential and commercial establishment surveys to obtain information on current practices and interests related to waste management and recycling.
- Task #3 GF will prepare and provide the Township with a summary report of findings and recommendations. This task includes a review of the report by PADEP and response to PADEP comments. An electronic file of the final report will be submitted to PADEP. Both an electronic and hardcopy version of the final Report will be provided to the Township.

2.0 BACKGROUND

Lower Makefield Township is a “mandated” recycling community located in the southeastern portion of Bucks County, Pennsylvania. The Township covers 18 square miles and has a population of 32,681 residents. Pennsylvania’s Act 101 of 1988 mandates municipalities with over 5,000 persons and more than 300 persons per square mile to conduct curbside recycling of at least three materials. Act 140 of 2006 further

requires municipalities that receive over \$10,000 in Act 101, Section 904 performance grants to mandate waste collection and recycling services as follows:

- Requires, through ordinance, that all residents have waste and recycling service.
- Has an implemented residential recycling program and facilitates a commercial recycling program or participates in a similar county or multi-municipal program.
- Has a residential and business recycling education program.
- Has a program of enforcement that periodically monitors participation, receives complaints, and issues warnings for required participants and provides fines, penalties, or both, in its recycling ordinance.
- Has provisions, participates in a county or multi-municipal program, or facilitates a private sector program for the recycling of special materials.
- Sponsors a program, facilitates a program or supports an organization to address illegal dumping and/or littering problems.
- Has a person or entity designated as the recycling coordinator who is responsible for recycling data collection and reporting recycling program performance in the municipality or municipalities.

The laws, evolving PADEP policies, and the competition for a diminishing pool of Recycling Grant funds add to the Township's need to assure an affordable and effective, Act 101-compliant recycling and waste management program. Retaining eligibility for Recycling Grants benefits both the Township and the residents by offsetting a portion of program costs. The Township expects to receive over \$100,000 in Act 101, Section 904 Performance Grants in 2010. Without grant funding, these important programs must be fully funded by the Township, and ultimately by Township residents.

Lower Makefield Township has a private subscription waste collection system where residents subscribe with one of four primary trash haulers to collect municipal waste and recyclables at the curb. In 2008, the Township's Environmental Advisory Council (EAC) conducted a comprehensive evaluation of a contracted waste management and recycling system. The EAC report concluded that establishing a single-hauler was the best waste management alternative. GF agrees. At this time, however, the Township has not garnered support from its elected officials to go forward with contracting with a single-hauler. In other recent initiatives, the Township has improved its recycling program through revisions to the ordinance and through communications with residents, schools and commercial establishments regarding recycling.

3.0 EXISTING WASTE MANAGEMENT SYSTEM

The four residential trash hauling companies operating in the Township are subject to the Township’s solid waste ordinance. The majority of residential units receive twice-a-week trash collection. According to the Lower Makefield Environmental Advisory Committee (EAC) revised Report dated December 2008, the four residential trash haulers reported there are 9,281 individual homes receiving residential trash service. Some residential units are serviced through contracts administered by neighborhood townhouse and condo associations. There are approximately 11,706 households in the Township.

3.1 Residential Curbside Recycling

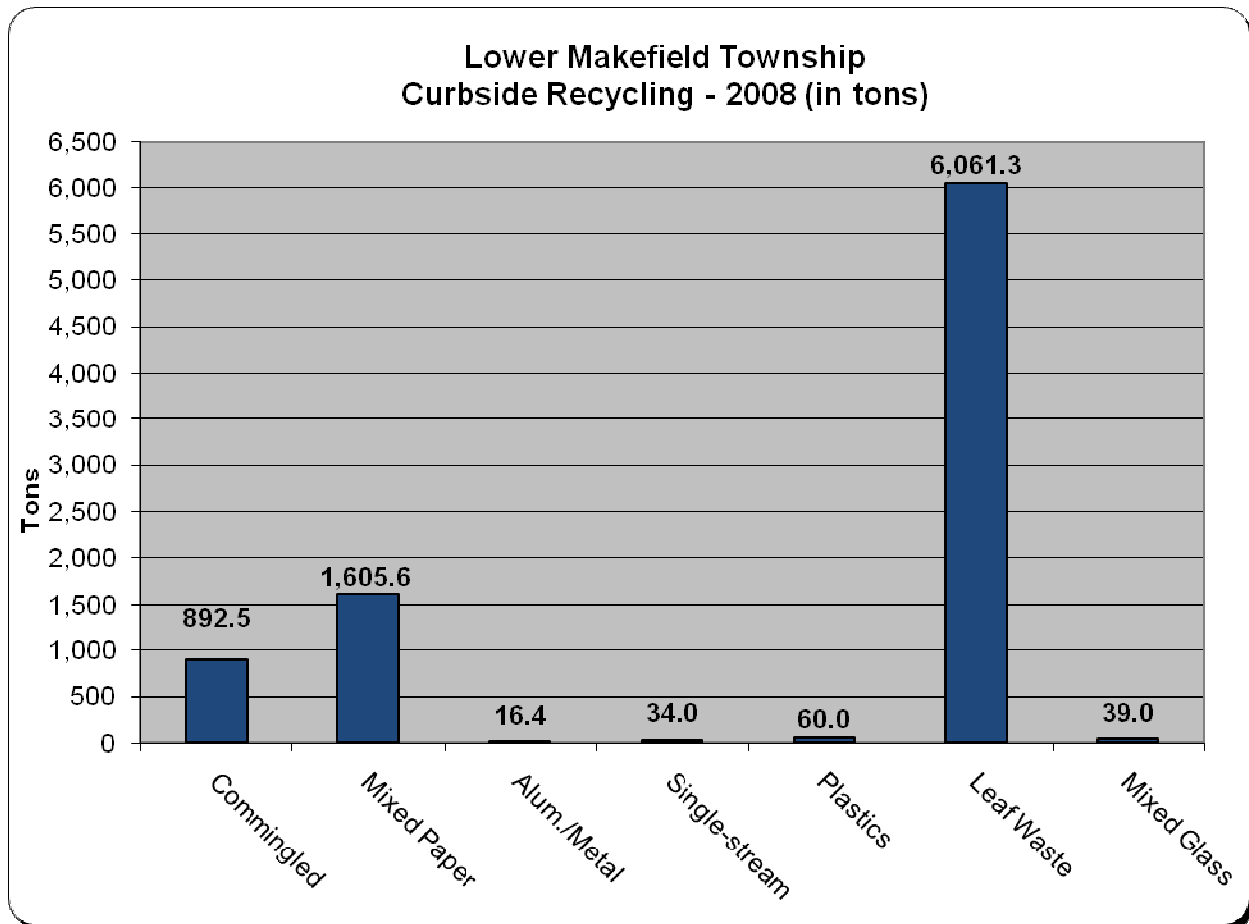
Lower Makefield Township’s curbside recyclables collection is provided by the private trash haulers. The recyclables collection schedules, methods and costs vary depending on the selected hauler. Most households receive once-a-week recyclables collection. The Township solid waste ordinance specifies collection of:

newspapers	bi-metal and tin cans
glass bottles and jars	plastic bottles/containers (#1 and #2)
aluminum	corrugated cardboard
steel	

In addition to the above, chipboard (ex. cereal boxes), magazines and catalogs, junk mail, phone books, and computer/office/writing paper are collected curbside. The Township’s Environmental Advisory Council (EAC) has noted that there are problems with the existing curbside recycling program:

- Haulers do not collect all types of recyclables as specified in the ordinance;
- Some haulers collect additional recyclables others do not;
 - Allied Waste: plastics #1-#7
 - George Leck & Sons, Inc.: #1-#5
- Some haulers collect single-stream and others collect dual-stream; and
- Effective program education is difficult due to program variability.

As shown in the following 2008 Curbside Recycling chart, the largest portion of reported recyclables materials is leaf and yard wastes. Commingled recyclable containers and mixed paper make up the bulk of the remainder.



The national per capita recycling recovery rate is 1.15 pounds per person per day. This figure includes rubber, leather, textiles, plastics, metals, glass, paper and paperboard. Based on the reported recycling tonnages, the per capita curbside recycling rate in Lower Makefield is .61 pounds per person per day for its reported materials, which does not include several materials considered in the national value. Although the Township’s list of materials excludes certain materials, the Township’s low per capita recovery reveals an opportunity to increase the amount of recyclables recovered to move closer to the national recovery rate. Details on the national recycling rates can be found at <http://www.epa.gov/osw/nonhaz/municipal/pubs/msw07-rpt.pdf>.

3.1.1 Curbside Leaf Collection

The Township estimates it collects over 25,000 cubic yards of leaves in the fall. EPA uses a conversion factor of 350 pounds per cubic yard for vacuumed leaves, or an estimated 4,375 tons annually (reported tons are higher). Leaf collection normally starts the first week in November. There are two pick-ups scheduled to be completed before Christmas depending on weather. Leaves are vacuumed from curbside piles or picked up in biodegradable bags. As shown in the table below, the Township typically uses 3-man crews, including a driver and two laborers.

Lower Makefield Leaf Waste Collection Program			
Collection Vehicle	Quantity	Capacity	Laborers Per Vehicle
Tarrant	6	25-30 cubic yards	3
ODB	1	25 cubic yards	3
Actual Leaf Waste Expenditures (2008)			\$414,730

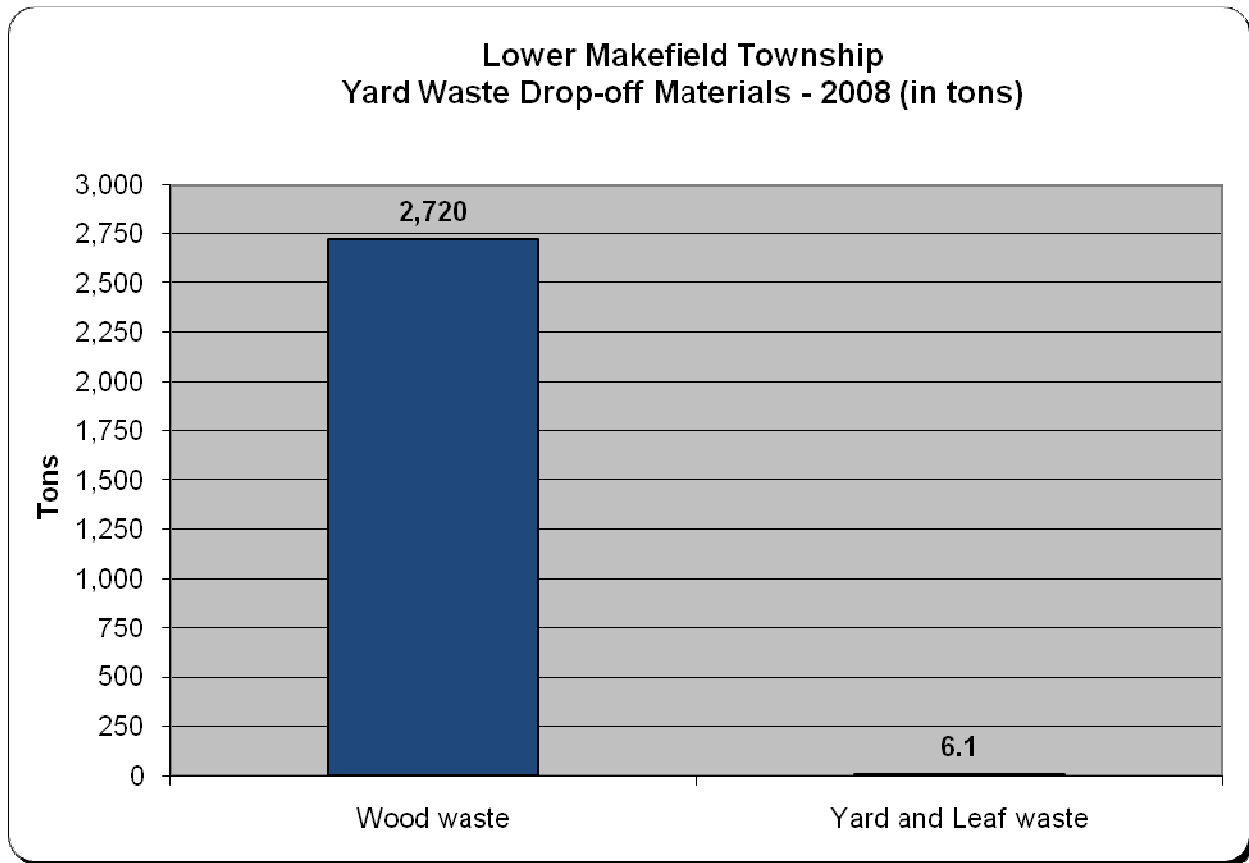
The labor and costs associated with managing leaf and yard wastes varies by season, but is high. In 2008, Lower Makefield Township spent over \$400,000 collecting and managing leaf waste. Residents pay \$40 annually through taxes to cover the cost of municipal leaf collection service. Consideration is being given to the procurement of a variety of different equipment to help process leaves, which will add to program costs.

As seen in the Curbside Recycling table in Section 3.1, leaf and yard wastes comprise the largest portion of the recycled waste stream in the Township. The national average recovery rate for composting (not including backyard composting) of yard trimmings, food scraps and organic material is .39 pounds per person per day. The Township’s reported per capita rate for leaf and yard wastes and wood is 1.47 pounds per person per day, which is much higher than the national average. The Township does not have or report food waste recycling. Lower Makefield’s reported organics recovery is nearly four times the national per capita average for organics recovery.

3.2 Yard Waste Drop-off Recycling

Residents can drop off yard waste for recycling Monday thru Friday from 7 a.m. to 11:45 a.m. and also the first Saturday of each month from 8 a.m. to noon at the Recycle Yard located at 1100 Edgewood Road. Acceptable yard waste includes wood, grass clippings, tree limbs and leaves. Yard waste is ground into mulch at the facility and provided free of charge to residents to pick up. Free mulch is also provided to local schools, non-profit organizations, and churches. Asphalt is also accepted from approved sources. As shown in the 2008 Drop-off Materials chart, wood waste makes up the majority of the material at over 2,700 tons. The cost of operating the yard waste drop-off facility was \$72,144 in 2008. Reported yard waste comes primarily from commercial landscapers and residents.



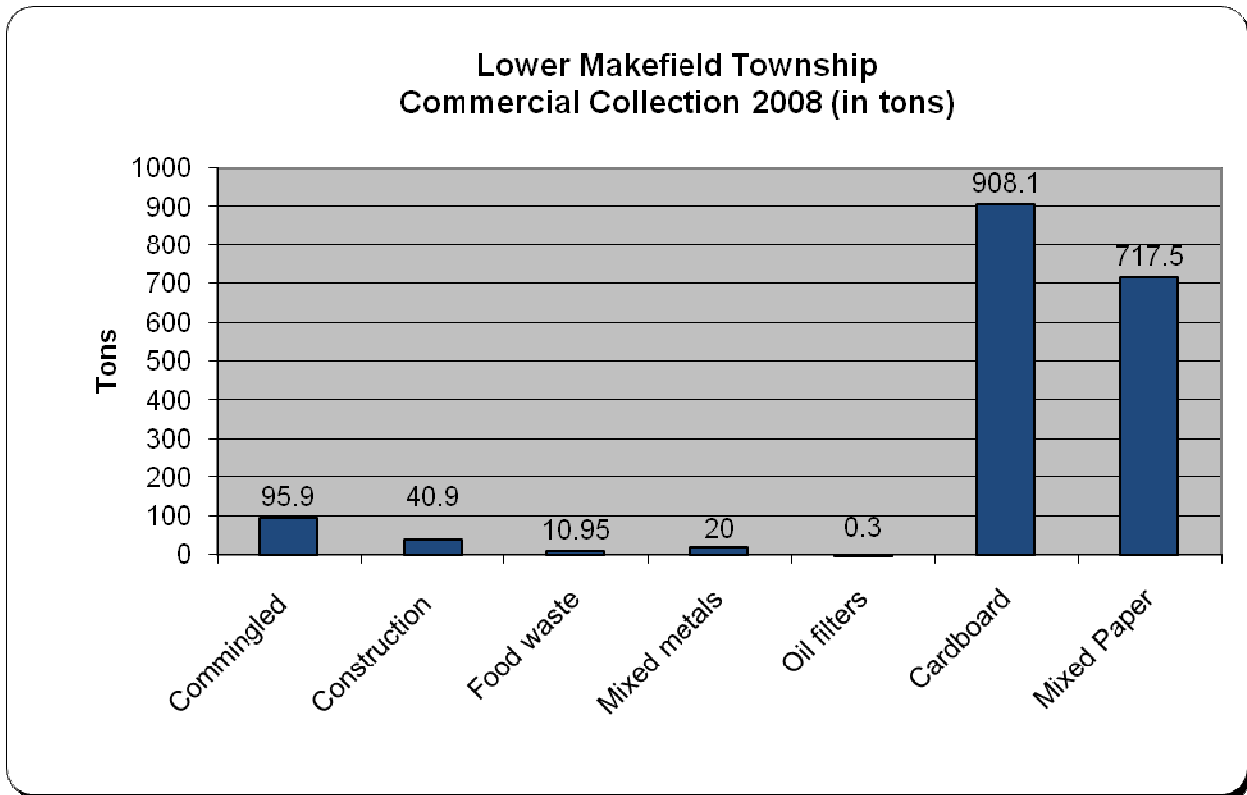


3.3 Commercial Recycling

The Township’s solid waste and recycling ordinance requires commercial, municipal and institutional establishments to recycle the following:

- | | |
|---|------------------------------|
| newspapers | magazines |
| catalogs | phone books |
| computer/office/writing paper | junk mail |
| glass bottles and jars | aluminum |
| steel | bi-metal and tin cans |
| plastic bottles/containers (#1 and #2) | corrugated cardboard |

The Township encourages businesses to recycle by issuing letters explaining the need and requirements for recycling. As shown in the 2008 Commercial Collection chart, cardboard and mixed paper are the most prevalent recycled materials by commercial establishments in Lower Makefield Township. Combined, over 1,600 tons of paper and cardboard were recovered from commercial establishments in 2008 to be recycled. Much smaller quantities of materials including commingled materials (cans, bottles, etc.), construction materials, food waste, mixed metals, and oil filters were also reported.



3.4 Uncertain Status of Act 101, Section 902 Grant Funding

In the past, the Township has utilized Recycling Grants from the State to offset costs for its program, including capital expenditures for leaf waste collection and processing equipment. As of December 2009, Act 101, Section 902 Grants and other Act 101 Recycling Grants have an uncertain future. House bill 1768 is pending for reauthorization of Act 101’s \$2.00 per ton of waste Recycling Fee, which is used to generate these funds. Recycling Grant programs are in jeopardy and the grant application process has been slowed as revenues for the fund begin to sunset. Gannett Fleming is closely following this situation and finds that there is great support for reauthorization of the Fee on the part of Legislators, PADEP, municipal officials and the private solid waste sector. The current Pennsylvania legislative process has hampered efforts for reauthorization of the fee, but support for the grant program continuation is positive. If the Recycling Fee is not reauthorized, PADEP has indicated that there would be one more competitive Act 101, Section 902 grant round. All Pennsylvania municipalities are encouraged to contact their legislators in support of Pennsylvania’s Recycling Grant programs. Act 101, Section 904 Performance Grants will likely also be impacted, potentially by reducing the per-ton award granted to the Township for eligible commercial and residential recycling tons.

4.0 RESIDENTIAL AND COMMERCIAL RECYCLING SURVEYS

An important step for improving recycling programs is to understand existing activities and public opinion about services and programs. GF worked with the Township to develop residential and commercial recycling surveys. During the course of this study, commercial surveys were mailed to Township businesses. A Township newsletter notice and a link on the Township website was provided for the residential survey that was hosted by Survey Monkey (www.surveymonkey.com). Survey Monkey is a website and software tool that facilitates the development and posting of survey questions and then summarizes responses. Waste and Recycling Survey information is contained in **Appendix A**.

4.1 Residential Survey

GF worked in conjunction with Lower Makefield Township to develop questions for the residential recycling survey. The residential survey gathered a general understanding of how residents participate, value, and understand the waste and recycling services currently offered. The survey asked questions to characterize residential opinions regarding waste and recycling issues and services. Some questions asked respondents to rate the importance given to trash pickup, recycling, and yard waste collection. Several questions asked the respondents to measure their participation and satisfaction with the Township's yard and leaf waste program.

4.1.1 Residential Survey Response Summary

There were 140 residential survey responses. Key findings include:

- Nearly all households responding contained two to four people with the breakdown as follows: two (41%), three (19%) or four (25%) people.
- Both weekly curbside collection of trash and recyclables were rated as “very important”. Curbside recycling (at 89%) ranked slightly higher in importance than trash collection.
- 34% of respondents rated the yard waste drop-off as “not important”, while only 20% of respondents felt fall curbside leaf collections were “not important”.
- 79% of respondents use twice-per-week trash collection and 20% indicated once-per-week trash collection.
- Although the majority of respondents do not have trash or recycling service problems, 11% indicated they have collection service problems.
- Only 4% of respondents felt the cost was too high.

- 98.5% of respondents indicated they participated in curbside recycling, and 87% of respondents receive once-per-week recyclables collection.
- 23% of respondents did not feel their recycling bin was large enough.
- Nearly 83% of respondents separate leaf waste for recycling at least some of the time.
- Although only 61% of residents rate the yard waste site as important, 88 percent of respondents feel the Township should continue the yard waste drop-off site.
- 44% of residents dispose of yard waste with their trash,
- Only 50% of respondents were aware of State laws and Township ordinance requirements pertaining to leaf waste management.

Based on review of the residential responses, some key observations and findings include:

- The residential survey responses demonstrate a strong interest and participation in the Township’s curbside recycling and leaf waste management programs.
- 79% of respondents indicated that they pay for twice-a-week trash collection. This willingness to pay for the added convenience and additional capacity for trash disposal contrasts with the positive view on recycling. GF does not recommend twice-per-week collection in this type of demographic setting because:
 - The added convenience for waste disposal discourages recycling
 - It adds costs
 - It unnecessarily places more trash trucks on roadways contributing to:
 - Harmful emissions and consumption of fossil fuels
 - Roadway safety concerns
 - Added noise
 - Roadway deterioration: According to the American Association of & Transportation Officials (AASHTO) Guide for Design of Pavement Structures, roadway damage from a standard trash truck equates to 1,400 cars.
 - Twice-per-week trash collection is not a necessary part of a functioning waste management system, particularly if comprehensive recycling services are offered. Three of the 4 haulers in the Township offer 96-gallon wheeled trash containers and one hauler; George Leck & Sons, Inc. (Leck) offers a 64-gallon container. However, Leck allows the customer to put out a second container of the same size if needed.

- Nearly 25% of respondents felt their recycling bins were undersized. Three of four haulers offer 18-20 gallon curbside bins. Small bins create inconvenience and there is a direct correlation that larger recyclable containers improve recycling participation and per-capita recovery rates.
- Over 80 percent of respondents favor and use curbside leaf waste collection service at least some of the time, clearly indicating that this is a very important program for community. Eliminating or reducing this service would result in negative public feedback.
- Less the 5% of respondents felt the cost of waste and recycling services was too high.
- 59% of respondents were not aware of the township’s special yard/leaf waste curbside collection last May. Only 16% of respondents took advantage of the special collection.
- Provided these survey responses are a fair representation of the Township opinion, the Township may have some leverage and flexibility to implement program changes provided the proposed changes align with the residents desire to improve recycling and environment responsibility.

4.2 Commercial Survey

Commercial establishments are required by Act 101 of 1988 and the Township ordinance to recycle. The commercial survey asked businesses to characterize their business type and waste management practices. The survey asked companies what items are recycled, its importance and if the business buys recycled products. Questions were also asked to gain an understanding of what makes recycling most difficult for the business and what the Township is providing or could provide to ensure that recycling requirements are met and understood.

4.2.1 Commercial Survey Response Summary

In the fall of 2009, the Township mailed 275 recycling surveys to commercial, industrial, institutional and government establishments located within the Township. 60 survey responses were received, a 22 percent response rate. The business sizes ranged from 1 to 250 employees (average size 15) and business types included:

1 Grocery Store	4 Restaurants /cafés	2 Convenience stores
3 Gas/Fuel Stations	0 Government Offices	0 Residential/home care
2 Retail Businesses	16 Medical Offices	3 Hairdressers/beauticians
0 Garden centers	21 Business Offices	5 Churches/Synagogues
1 Library	1 Dry Cleaner	1 Water Utility

A detailed survey response Summary is included in **Appendix A**. GF summarizes the questions and answers in the Commercial Recycling Survey Summary below. GF cautions that the data likely has an immediate bias: companies who already recycle and/or are proud of their recycling efforts tend to be more responsive to these types of surveys than companies that do little or no recycling. Therefore, responses from non-recyclers or poor recyclers may be limited. Based on review of business responses, some key observations and findings include:

- Over 35 of 60 respondents indicated recycling of all of the following items, reflecting fairly comprehensive recycling programs:
 - Office paper
 - Cardboard
 - Ink/toner
 - Mixed paper
 - Aluminum
- 44 of 60 respondents indicated they have a recycling coordinator. Based on GF's experience, a majority of businesses do not assign a recycling coordinator. This result either demonstrates the responding businesses may be above the average level of recycling effort and/or the Township's focus on business education is working.
- 50 of 60 respondents were aware they are required to recycle. However, because 215 businesses did not respond, there is indication that substantial portions of businesses do not recycle for a combination of reasons including little generation, not a priority, cost, etc.
- 70 percent of responding businesses recycle using a waste hauler to provide the service. 25 percent of business use their own staff and a small portion businesses use volunteer efforts. The statement "25 percent of the business use their own staff" is actually the property owner or property manager's staff handling the recycling (the janitors the property owner or manager hires), and the recyclables are eventually picked up by the waste hauler.
- Most paper recycling containers in business offices were located in copy or central areas, with fewer programs having desk-side recycling. Only six businesses reported having 10 or more paper recycling containers.
- Although there were a number of "obstacles" that limit recycling efforts, the two primary obstacles were 1) minimal recyclables generation and, 2) cost.
- 25 percent of respondents did not feel they received adequate information from the Township, hauler or property manager concerning recycling.

5.0 LEAF AND YARD WASTE MANAGEMENT ALTERNATIVES

GF provides a preliminary overview of leaf and yard waste management alternatives in the following section. Due to rising program costs, it is increasingly important for the Township to evaluate and implement changes to its leaf and yard waste programs.

5.1 Truck-Mounted, Self Contained Leaf Waste Equipment (State College Borough)

The procurement and use of a one-man operated curbside leaf collection vehicle can substantially reduce labor and associated operational costs associated with the Township curbside leaf program. GF summarizes State College Borough's leaf waste collection program in this section to demonstrate a program that has successfully improved the operating efficiency of its leaf waste collection program. State College Borough conducts leaf waste collection services both in and outside of the Borough for approximately 4,300 single family units and 2,700 multi-family units. In 2007, the Borough implemented the use of an ODB SCL800SM25 leaf waste vacuum truck. The truck is operated by a single person, reducing the typical 3-man crew used for leaf waste collection routes. The Pennsylvania Department of General Services state contract cost for this vehicle is \$135,000 (www.odbc.com/PADGS.htm), which is about the same cost as a waste packer (often used by municipalities for leaf waste collection). The vehicle has a 25-cubic yard capacity and the particular truck options selected by State College Borough allow the ODB to dually operate as a brush chipper. Vacuumed leaves average 350 lbs. per cubic yard according to the EPA Procurement Guidelines. On average, a nearly full ODB SCL800SM25 will hold 8,000 lbs. of dry leaves and 12,000 lbs. of wet leaves.

Through use of the ODB SCL800SM25, the Borough realized a marked improvement in leaf waste collection efficiency and associated cost reductions. As reflected in the following table, there was a 35 percent reduction in labor costs from 2006 to 2007, which is directly attributable to implementation of the one-man leaf truck. The Borough is purchasing another vehicle and hopes to complete all leaf waste routes using two vehicles, each having one operator. Transitioning to the one-man ODB truck resulted in a dramatic reduction in labor and equipment for a program that at one time utilized 4-5 leaf waste collection vehicles. Estimating the number of households serviced prior to dumping the leaf truck is difficult because participation varies and the quantity of leaves also varies. In the early fall and spring when leaf drop is minimal to moderate, the Borough completes service routes covering all 3,500 Borough households, which is 1,750 households covered in one day by the ODB SCL800SM25. The dumping point is a composting site owned by the Borough in nearby Patton Township.

State College Borough Leaf Waste Collection Program		
Year	Leaf Waste Labor Costs	Leaf Waste Tonnages
2005	\$67,000	2,890
2006	\$71,800	3,130
2007	\$46,400	2,878

GF recommends the Township give serious consideration to modifying the existing fleet of leaf collection vehicles to incorporate at least one of the one-man operated leaf waste collection vehicles. The result will be reduced labor effort and cost savings for the municipal leaf waste collection program. This unit’s efficiency is optimized when a composting facility is close by. The added efficiency will help the Township complete leaf collection earlier, decreasing the risk of collection delays and added effort for managing leaves in bad weather. It will be up to the Township to determine how to make staff adjustments when the efficient equipment is implemented and the required labor effort is reduced. New responsibilities, including those that can enhance the municipal recycling programs, may become valid. The cost savings realized will benefit residents by stabilizing tax increases associated with leaf waste collection. On a competitive basis, leaf waste collection vehicles are eligible for funding under the Act 101, Section 902 Recycling Grant. However, even without any grant funding, this equipment is still recommended for implementation within the Township.

ODB (www.odbc.com) also offers a self-contained unit (SCL800TM25) that is a 25-cubic yard capacity leaf collector that costs about \$30,000. This equipment can also yield cost savings, particularly when compared to common tow-behind configurations that use 14 cubic yard leaf boxes.

5.2 Reduce Level of Service

Although residents are accustomed to a comprehensive level of leaf waste management services, the high costs and limited options for processing and marketing material may make the timing feasible to rethink how often and how much leaf waste should be collected at the curbside. As one example, an alternative leaf program in the Township could be a “hybrid” of the current program. In the hybrid program, one scheduled leaf waste collection is provided at the curbside (instead of two) using vacuum trucks and a second collection is a “call-in” service. Residents would be required to call in by a certain date to schedule pick-up, which could be provided and include a separate fee (if a fee is deemed feasible). Some municipalities have reduced vacuum collections by supplementing curbside vacuum service with a bag service. On the bag service day(s),

leaves must be placed at the curbside in kraft/paper bags. Municipalities may charge a fee per bag ranging from 25 cents to \$4.00.

Note: Backyard composting should be a focal point of the Township educational message on an ongoing basis to minimize the quantity of leaf and yard wastes that require hands-on management.

5.3 Yard Waste Processing Equipment and Operation

The Township should evaluate yard waste processing equipment options closely. Since the Township anticipates the need for new grinding equipment in 2015, it should work closely with several vendors to identify suitable equipment and a feasible cost. Used and demo equipment should be considered, particularly since grant funding may not be available. Many municipalities and industrial compost operations have moved away from using tub grinders to horizontal grinders. GF has reviewed



many types of grinders in recent years. The Beast 3680 by Bandit is a horizontal grinder with a good reputation used by many municipal compost operations. The Beast has a throughput of over 500 cubic yards per hour (see **Appendix B**, Equipment Specs).

GF has provided ongoing leaf waste management and compost expertise to Lower Paxton Township in Central Pennsylvania. In December 2009, GF contacted Lower Paxton Township to obtain current information on their compost operation and the Bandit Beast 360 they use to grind leaves and yard wastes. Based on discussions with the Township, the following is noted about its Bandit Beast 3680:

- Original price of the demo unit was \$325,000 (Typically \$350,000 - \$375,000 new).
- Processes 30,000 to 40,000 cubic yards annually (60% of process volume is leaves, size-reduced and then windrowed for composting)
- The horizontal grinder is operationally more efficient than the Township's tub grinder:
 - The operator can continually feed the machine at different load rates based on material type;
 - Less maintenance is facilitated by the ability of viewing potentially damaging material prior to grinding;
 - Has higher processing capacity than the tub grinder;
 - Remote control operation optimizes single-operator use.

- Recommend specifying a “shingle-package” with additional teeth for finer grinding.
- Recommend having teeth hard-faced to protect cutter bodies.
- There have been no maintenance problems.

On the collection side, Lower Paxton Township recently implemented the use of two, one-man operated ODB leaf vacuum trucks. The Public Works director indicated that the one-man operated vehicles:

- Dramatically improved collection efficiency.
- Eliminated all overtime associated with the leaf collection program, saving 30-40% of the public works department’s total overtime expenditures.
- Completed curbside leaf collections 2-3 weeks early, before the snow storm, thus avoiding a significant amount of additional labor and costs.

5.4 Diversified Leaf and Yard Waste Outlets

The Township should continually investigate options for the disposition of leaves and compost products in an environmentally responsible and economically viable manner. The Township should consider the following as part of its leaf and yard waste processing strategy:

- The Township should strive to have one or more locations to process leaves and yard wastes where tipping or other processing fees are not incurred. Centralized locations in or near the Township will optimize equipment and labor utilization.
- Windrowed leaves turned periodically take as long as 1-year to compost effectively and therefore should not be managed or marketed as a finished “compost” product prematurely.
- Leaf ‘compost’ is a valuable commodity. Identifying land and using low-technology windrow composting may offer long-term benefits to the Township through the production and possible sale of a quality finished product.
- Compost can be sold in bulk to landscapers, construction contractors, and others.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Lower Makefield trash and recycling services are provided by four independent hauling companies contracted by the homeowner, or in some cases contracts are managed by townhouse and condo associations. Managing the activities of multiple hauling companies presents a number of challenges and negatively contributes to overall performance of the Township's waste management program. At this time, the Township wishes to continue the multiple hauler system and at the same time improve recycling and compliance. Consequently, it will be up to the Township to make a number of decisions that modify the structure of the waste management program to achieve its goals. Adding provisions to the Township ordinance will be a key part of a successful strategy.

Under the existing program, the majority of residents receive twice-per-week trash service and once-per-week recycling. Generally, the Township and most residents actively participate in curbside recycling and leaf waste collection and believe these services are an important part of proper waste management. An unknown portion of residential establishments do not subscribe with a trash hauler. The average household cost for curbside trash collection is over \$400 per year paid to hauling companies, and residents pay an additional \$40 annually for municipal leaf waste services in their taxes. Residential trash bills are 20-40% higher than many other similar residential waste programs that have secured a municipal-wide contract for collection services with a hauler. However, it does not appear that the cost for trash service is perceived as a problem by many residents in this wealthy community. Commercial recycling participation is hit or miss, which is common throughout Pennsylvania. The Township's effort to target individual businesses through letters and via phone takes time, but is effective.

The Environmental Advisory Committee (EAC) plays an important role in evaluating ongoing waste and recycling initiatives. There is public support of recycling and ongoing Township efforts to improve waste diversion and program compliance for both the residential and commercial sectors. Although both the Township and the community desire enhanced recycling, several aspects of the existing waste management program interfere with achieving the Township's goals to increase recycling diversion and program compliance:

- It will continue to be challenging to oversee and assure program accountability and participation, including the consistent and cost-effective delivery of trash and recycling services provided by four different hauling companies operating in

the Township. GF fundamentally supports the findings of the EAC Report, “Township Contracted Residential Solid Waste/Recycling Collection in Lower Makefield Township” dated December 16, 2008.

- The most successful waste management programs clearly define trash and recyclables collection methods and schedules, and as a result, facilitate enforcement. The Township solid waste ordinance establishes some basic guidelines for haulers, and designates a comprehensive list of recyclable items. However, it falls short in specifying some essential requirements that will assure haulers provide trash collection and recycling services in a way that effectively aligns with Township goals. Consequently, the flexibility the haulers have to conduct business on their terms contributes to: service variability; collection schedules that do not facilitate hauler and residential accountability; ineffective education, decreased program participation and waste diversion, and other avoidable impacts.
- 10-15 percent of residential households do not subscribe for trash service in a typical multi-hauler/private subscription waste management program. Some households share service with neighbors, take trash to a dumpster, and/or contribute to other improper waste disposal practices. Act 140 of 2006 requires the Township to implement mandatory trash collection and conduct periodic verification of participation. The Township appears to lack a sound structure for validating municipal-wide trash and recycling service by all residential property owners.
- For a portion of Township households, the 18-gallon or 20-gallon recycling bins (typically used and provided by haulers) do not have sufficient capacity for recyclable items generated between pickups. Failure to distribute and require use of adequately-sized recycling containers creates inconvenience that translates into lower participation and recovery rates. The use of larger and standardized recycling containers sends a clear message about the importance of recycling in the community.
- A consistent educational message is particularly important to enhance recycling participation. However, the EAC reports inconsistency between the actual recycling services provided by some haulers and the solid waste ordinance requirements. The current program does not appear to effectively coordinate the Township’s desired recycling message and services with the haulers.
- A majority of residents subscribe for twice-per-week trash service. Particularly when compared with once-per-week trash collection, twice-per-week trash service decreases waste diversion to recycling. Twice-per-week trash disposal makes trash disposal so convenient it deteriorates the incentive to recycle. Allowing twice-per-week trash service also negatively impacts the community, roadway infrastructure (adding costs) and the environment because more trucks

are on roadways than necessary to competently meet residential waste management needs. It adds 15% to 20% to the cost of the average trash bill.

- The \$40 annual cost per household for municipal leaf collection is higher than the average cost for many municipal leaf collection programs. This cost will be \$50 per household in 2010. Although GF did not evaluate the leaf waste collection program in detail, initial evidence supports the following: 1) the public wants the municipality to continue this service, and 2) there are one-man operated leaf waste collection vehicles that can reduce the overall labor and associated costs for conducting leaf waste collection services.
- The Township has received significant funding from recycling activities in the past. In 2008, the total revenue to the township from Otters Recycling Facility and the Pennsylvania 904 Grant (\$126,000 for calendar year 2007 tons) was \$215,777. After a recent decline, paper market prices are gradually recovering but may not reach 2007 and 2008 levels in the foreseeable future. The Township's Act 101, Section 904 Performance Grant is based on each year's total tons of commercial and residential recycling. This grant is approximately \$20 per ton of recycled material, and in 2010 the township anticipates a \$126,000 Performance Grant. It is in the Township's financial interest to increase both commercial and residential recycling rates. It should be noted the reported amount of commercial and residential recycling in the township has increased over 26 % since 2004.

GF provides the following **recommendations** to the Township:

- **EAC:** The Township should continue to utilize the EAC to evaluate and make ongoing recommendations regarding waste management and recycling initiatives.
- **Waste Management Strategy:** The Township should develop a concise, 3-year waste management strategy that uses a phased approach to implement waste management initiatives. This phased approach and strategy should:
 - Be based on the premise that it is a primary responsibility of the Township, not its waste haulers, to design and implement an environmentally-sound and service-conscious waste management program that accurately reflects the interest of the community health, safety and welfare; and
 - Re-evaluate its solid waste ordinance (Chapter 172) and make revisions to the ordinance that will result in the development of a streamlined waste management program structure. The new program structure should improve: hauler accountability and service consistency; education; residential trash and recycling participation; and program enforceability while promoting the efficient and environmentally responsible use of resources.

- GF recommends the Township consider the following ordinance revisions to enhance its waste and recycling program:
 - **Designate Collection Days:** Add a provision to specify the days that haulers are permitted to collect waste and recyclables within the Township. Due to the size of the Township, it may be feasible to establish three (3) or four (4) “trash collection districts” or zones. For example: Zone 1 (collection of trash and recyclables on Mondays); Zone 2 (collection of trash and recyclables on Tuesdays), etc. This should include a requirement allowing only once-per-week trash collection. Limit the number of trash collections to once per week on the basis that it promotes recycling, accountability, and is environmentally responsible and therefore in the interests of the community health, safety and welfare. The EAC could contact one or more haulers to investigate this prior to implementation. This action should be clearly communicated to all parties due to potential negative hauler and public feedback.
 - **Closely follow commodity market arrangements, and change collection structure to single-stream if feasible:** Legal action has been taken against Otter Recycling Center, Inc., which may jeopardize the 5-year Procurement, Processing and Marketing Agreement with Bucks County and the Township. If the Township’s obligation with Otter’s Recycling Center under the County agreement falters, it may be feasible (depending on market conditions) to implement (require via ordinance) single-stream residential recycling. Single-stream recycling has proven to increase residential recycling in many communities due to convenience and acceptance of additional materials. If this measure is implemented, the Township could specify the distribution of “64-gallon or larger” recycling containers by its haulers. There are also significant operational cost reductions for single-stream collection systems (compared with dual-stream), largely because increased collection capacity per vehicle. Maximizing the benefit to the Township for these operational savings will not be realized in the current multi-hauler program.
 - **Hauler Customer Lists:** Require haulers operating in the Township to provide up-to-date customer lists once per year by a specified time.
 - **Proof of Hauler or Trash Disposal:** Add a provision that residential property owners shall be required, upon request, to provide the Township with proof of a hauler or other acceptable waste disposal method upon request (e.g. a copy of a trash bill).
 - **Posting Recycling Requirements:** Require property owners/landlords of multi-family establishments to post the Township’s recycling requirements in a visible location for all occupants.

- **Administrative Ticket:** The Township should streamline the enforcement process by designating codes personnel, the recycling coordinator or other designees the authority to issue an “Administrative Ticket”. This ticket process is a pre-citation process that legally allows the Township’s designated persons to write a ticket on the spot for certain violations. The person receiving the Administrative Ticket can admit guilt by signing and paying the fine or refuse to pay and go to court. It is recommended that one or more warning notices be issued to educate violators prior to issuing Administrative Tickets.
- **Hauler Education Requirements:** Require waste haulers to provide educational information on waste management and recycling procedures once every six months (consistent with Act 101) to all customers and to provide a single copy of the educational material to the Township at the same time it is distributed to customers. A working relationship should be developed with haulers to facilitate a shared and consistent education process, including for special leaf and yard waste collections that occur in May.
- **Business Information Request:** Based on legal consultation received in a similar project, the Township can legally solicit waste management information from new and existing businesses using a Business Information Request or registration process; however, business “licensing” and associated fee assessment should be avoided due to legal limitations for Class 2 Townships, except for the following business categories; transportation, cable television, restaurants and/or junk dealers. Develop and distribute a Business Information Request (BIR) form for all new and existing businesses and accompany the BIR with office recycling information. The BIR information should updated every two years and be used to inform the businesses of the Township of current recycling requirements and to request company information including, at a minimum:
 - Business type (e.g. office, retail, restaurant, etc.)
 - Number of employees
 - Recyclables collected or intended to be recycled (if a new business)
 - Verification of a waste and recycling hauler (via a waste hauler invoice or receipt evidence for self-hauling of recyclables).
- **Sustainable Business Recognition Program:** The Township should develop a program that recognizes local businesses at least twice per year for outstanding achievement in recycling and other sustainable business practices. The program could include an achievement letter to the business, advertising the achievement on the Township website and through other media, issuing a plaque, etc.
- **School Recycling:** The Township should distribute the school survey drafted during this study to obtain and document information about school waste and

recycling practices. The Township should work with schools to ensure they are recycling properly by doing the following:

- Update the schools regarding their requirements.
 - Require haulers to report to the Township on what waste and recycling services are provided to school facilities.
 - Conduct school workshops to get the students involved who will gladly put pressure on the school to recycle.
 - Work with the schools to develop information that can be posted in the schools related to recycling requirements and benefits. Poster contests and similar events for kids can be used to get students involved and increase awareness.
- **Leaf and Yard Waste Alternatives:** The Township should review Section 5.0 of this report and consider the alternatives provided. Because leaf and yard waste collection and processing equipment requires a heavy capital investment, each alternative or equipment purchase must be considered and evaluated over a payback period.
 - **Leaf Collection Equipment:** The Township should procure a one-man operated leaf waste collection truck to improve operation efficiency, thus reducing labor and associated costs.
 - **Yard Waste Processing Equipment:** It is recommended the Township conduct more extensive research on yard waste processing equipment. Due to the status of Recycling Grants, it may be feasible to submit a grant for yard waste processing equipment as soon as possible, rather than wait until 2015. GF recommends the Township closely investigate procurement of horizontal grinders instead of a tub grinder for processing yard waste. It may be feasible to maintain the tub grinder as back up to a new grinder in case of equipment failure.
 - **Yard Waste Compost Evaluation:** It is recommended the Township utilize GF to conduct an evaluation of the existing yard waste processing operation. The cost for a brief evaluation now will help the Township develop its ongoing waste management strategy and identify methods to reduce costs for this expensive operation.
 - **Ongoing Evaluations:** It is recommended the Township conduct additional evaluations, particularly related to its curbside leaf waste collection program and yard waste processing site. GF has extensive experience with evaluating leaf waste management alternatives as well as compost facility design and operations.

APPENDIX A
Surveys

Surveys not included in On-line Report

APPENDIX B
Equipment Specifications

Detailed Specifications for 2009 Model 35,000# GVW Dual Drive Cab & Truck Chassis Complete with One Man Operation Leaf and Grass Vacuum Loading and 25 cubic yard Body

It is the intent of these specifications to provide the _____ with a Dual Drive cab & Chassis truck. Complete with chassis and a One Man Operation leaf and grass vacuum loading unit and 25 cubic yard body to be used to load, and unload residential yard waste. The _____ will accept bids only from Franchised Truck Dealers. The truck will be operating within the limits of _____, with the longest run being to a compost facility less than a 10-mile distance. The vehicle shall be conventional cab type. The vehicle must comply with all requirements of Act 40-1984, the Motor Vehicle Procurement Act. The type of truck quoted shall have been in successful use for two or more seasons and shall meet the following minimum requirements. **ANY DEVIATIONS FROM THE MINIMUM SPECIFICATIONS ARE TO BE NOTED BY THE BIDDER**

Engine, Power train, Frame, Chassis and Mechanics

1. Engine: Shall be a minimum 7.6L diesel, 260 HP @ 2200 RPM; 800lb/ft torque @ 1300 RPM, or approved equal. Shall meet January 1, 2007 Emission requirements.
Engine to be equipped with 110-volt 1000 watt engine block heater with parallel prong receptacle. (No ether assist). To be supplied with a water filter. Electric safety shutdown; magnetic drain plug; and fuel/water separator.
2. Transmission: Allison Automatic 3500 RDS 6 speed transmission. Controls shall be dash mounted push button electronic type. Water to oil transmission cooler shall be in radiator tank. Oil Filter to be included. PTO Gear or equal.
3. Chassis: Wheelbase to accommodate a 25 cubic yard leaf body, and vacuum collector; Shall have 220" minimum wheelbase (154" cab to axle)
4. Frame: Hi-tensile strength frame rails shall be a minimum of .375 x 3.6 x 10.25. Section Modulus shall be a minimum 16.979 cu. inch per rail and shall a minimum RBM of 2,037,500 lbf. Inch. And yield strength of 120,000 PSI. Shall have frame mounted tow hooks. Bumper shall be painted steel.
5. Brakes: 16.5 x 5 Q-Plus brakes with cast iron drums shall have automatic slack adjusters; front dust shields.
6. Parking Brake: shall be air type mounted on rear axle

Engine, Power train, Frame, Chassis and Mechanics (Continued)

7. Air Cleaner: Dry Type with restriction indicator (Farr or Donaldson).
8. Exhaust: Right hand Horizontal type.
9. Alternator: 12 volt, 160-amp minimum.
10. Battery: Heavy duty 2 – 12 volt – 1850 CCA minimum.
11. Power steering: Hydraulic
12. Front Axle: Rated capacity = shall be 12,000 pounds.
13. Air Compressor shall be a minimum of 16.5 CFM
14. Starter shall be 12 volt 38MT series or approved equal.
15. Rear Axle: Rated capacity of single speed rear axle = 23,000GVW pounds and shall have minimum 30,000 lb. leaf springs with auxiliary helper. Springs shall be modified to keep entire unit level. Rear suspension shall be modified to accommodate a SCL800SM 25 yard self contained leaf loader.
16. Rear Brakes shall be 16.5 x 7 Q-plus brakes with cast iron drums. Brake cams and chambers and shall have automatic slack adjusters, and rear dust shields.
17. Fuel Tank: Shall be aluminum mounted left hand under cab and shall have a minimum capacity of 50 gallons. Shall have a heated fuel/water separator.
18. Axle Ratio: Shall be 6.43 or equivalent
19. Air brake system shall be WABCO 4S/4M ABS or equal. The Air dryer shall be Meritor System Saver 1200 type or equal.

Wheels and Tires

1. Tires: Front – 11R22.5 radial, highway tread, 14 ply Rear 11R22.5 radial, lug tread, 14 ply.

Wheels & Tires Cont'd

2. Wheels: 8.25 x 22.5, hub piloted, 2 hand hole steel wheels front, iron front and rear hubs. Spare wheel and tire shall be included. Oil seals shall be Chicago Rawhide Scotseal Plus XL or equal.

Exterior

Mirrors:

Shall be West Coast type, heated and remote control mirrors with heated convex mirrors mounted below main mirrors

Paint:

The entire unit shall be properly cleaned, painted with an acrylic enamel primer, with a base coat of acrylic urethane enamel, safety yellow (Centari #43536, or equal) black paint followed by acrylic urethane high gloss enamel clear coat. All products shall be as manufactured by DuPont, Sherwin Williams, or approved equal. Cab shall be safety yellow (Centari #43536, or equal) and all other components shall be black. Aluminum & stainless steel components shall remain unpainted

1. Cab: Shall be aluminum or galvanized steel construction with a minimum 5 year warranty.
2. Cab assist grab handles, shall be non-slip, both sides.
3. Engine hood: sloped down/forward type for maximum operator visibility.
4. Front tow eyes, hooks, pins or other tow devices.
5. Truck to be undercoated except where fully insulated.
6. Tinted Glass
7. Front bumper –Bumper shall be painted steel.
8. Door Hinges must be bolted/ **welded hinges not acceptable**
9. Dual 8” convex heated mirrors shall be installed on both fenders.

Body Building Wiring

Body builder wiring shall be provided at back of frame. Sealed connectors for tail, turn, marker, and backup lights. Accessory Power/Ground and sealed connector for Stop/Turn shall also be provided.

Interior of Cab

1. Seat: Shall have dual "Bostrom Talladega 910" or National high back air ride seats. Both seats shall have an inboard arm rest.
2. Dome light.
3. Electronic throttle.
4. Deluxe airflow heater and defroster
5. Dual intermittent windshield wipers and washers.
6. Dual Gauge Panels shall be provided and consist of the following gauges:
 - a. Voltmeter
 - b. Engine hour meter
 - c. Tachometer
 - d. Fuel
 - e. Water temperature (with high temperature light indicator)
 - f. Transmission oil temperature
 - g. Oil pressure with low pressure indicator (both light and buzzer)
 - h. Air restriction indicator
 - i. If unit has a center console it must be removed to accommodate the mounting of Controls for the one-man leaf loader operation. All switches shall be relocated to the center dash panel.
 - j. All other gauges as required by manufacturer
7. AM/FM stereo radio with digital clock
8. cigarette lighter
9. Tinted windows
10. Sun visors
11. Shall have OEM factory installed Left Hand and Right Hand steering and controls with tilt steering wheel.

Interior of Cab Cont'd

12. Heavy Duty insulation shall be provided as a Silence package.
13. Unit shall have dual 18" two spoke steering wheels
14. Cruise control shall be provided for operator convenience.
15. Unit shall have factory installed Air-Conditioning with a recirculation switch.
17. Dual dash mount cup holders shall be provided for use from both sides of the cab.

Safety Equipment

1. Dual tone electric horns
2. Audio backup warning device
3. First Aid Kit
4. Two = Fire extinguishers: 1 – 5 lb (min.) dry chemical charge with gauge or equal, one shall be mounted inside cab and one shall be mounted out by auxiliary power unit.
5. Flares: 1- reflective triangle type flair set, three flares in set, sorted in mountable box.

One Man Truck Mounted Compaction Debris Collector

General

The intent of these specifications is to cover the requirements to manufacture a heavy-duty one-man operated truck mounted self-contained debris collector that vacuums from the right (passenger) side of the unit.

1. The design of the unit shall incorporate the latest available technology and engineering capacities.
2. All bolts shall have aircraft quality nylon lock nuts on the unit and any component that is riveted shall use only stainless steel rivets.
3. For superior strength and durability of the machine, tab and slot construction procedures shall be used for all metal fabricated components.

General Cont'd

4. The proposed unit shall be a current production model; proto type or obsolete units will not be considered.
5. The proposed unit bid shall be a regularly manufactured unit with at least ten (10) references available (please provide references with bid)
6. The leaf collection unit shall meet or exceed all OSHA, federal and state regulations and requirements.

Power Unit

1. A turbo charged four-cylinder diesel engine shall be certified and rated for 84HP at 2500 RPMs. Ref: John Deere model 4045T or approved equal.
2. The engine shall be equipped with a 12-volt starter, alternator, 120volt block heater, and a heavy-duty air cleaner.
3. A heavy-duty 6.62" diameter x 21" long muffler that is horizontally mounted shall be supplied.
4. The engine sound rating shall be no higher than 80 dBa at 50 feet.
5. For maximum safety, a 2.5" diameter stainless steel exhaust pipe shall root the engine exhaust out to the lower driver's side of the unit, no exceptions.
6. To reduce the possibility of the radiator from becoming clogged with leaf dust, a pressurized "trash" style radiator shall be used.
7. The radiator shall have a minimum of 3 cores to provide maximum cooling.
8. For maximum engine cooling, and 18" diameter fan with seven 5" wide blades shall be provided.
9. The fan blades shall be at a 40° chord angle and shall be capable of producing 7,600 cfm to pull the air through the radiator.
10. The radiator shall be equipped with a bottom hinged secondary screen.

Power Unit Cont'd

11. The radiator screen shall be constructed out of ½” expanded metal backed with 1/8” hardware screening. The use of fine window screening is not acceptable due to the lack of air that can pass through and the overall durability of the material.
12. The secondary radiator screen shall be powder coated black to prevent corrosion; painted screen assemblies shall not be acceptable.
13. The secondary radiator screen shall be held in place by two adjustable over-center clamps and shall be opened and cleaned without powering down the unit.

Cab Mounted Engine Controls

1. The auxiliary engine controls shall be mounted inside the truck’s cab in an instrument panel.
2. The instrument panel shall be designed for easy access to the instrument control wiring.
3. Controls shall include the following: voltmeter, oil pressure gauge, water temperature gauge, electric throttle, tachometer, clutch engagement and hour meter.
4. All engine-monitoring gauges shall be illuminated with back lighting for early morning or late evening operation.
5. All engine gauges shall be of marine quality to insure proper functioning in all weather conditions.
6. All electrical controls and gauges shall be connected via circuit board with circuit breaker protection. The use of electrical wiring strips and fuses shall not be acceptable.
7. A relay shall be provided to isolate any external loads from the control circuit.
8. All electrical connections associated with the engine shall be made with heat shrink connectors.
9. The engine’s wiring harness shall be connected to the circuit board by CPC screw type connectors.

Cab Mounted Engine Controls Cont'd

10. All electrical wiring shall be color-coded and use watertight terminal boxes with clear covers.
11. Due to the electrical complexity of this unit, all bidders shall submit wiring diagrams/schematics with their bid, NO EXCEPTIONS.
12. An automatic safety engine shutdown for low oil pressure and high water temperature shall be provided.
13. LED indicator lights shall indicate what function has caused the engine to shutdown; water temperature, oil pressure, E-stop or inspection door/hose.

Engine Enclosure

1. The engine shall be fully enclosed in a custom metal housing.
2. The enclosure shall have front and rear access doors that protect operators from all belts, fans and moving parts.
3. Front and rear access doors shall have stamped openings for optimum ventilation.
4. The top of the engine enclosure shall be completely removable without the use of tools.
5. All access doors shall be securely held in place by adjustable twist latches.
6. The top of the engine compartment shall have hinged doors for convenient access to the radiator cap and oil fill.
7. Adjustable twist latches shall secure the top access door.

Fuel Tank

1. A 40-gallon minimum capacity fuel tank shall be supplied.
2. The tank shall be constructed out of the strongest of cross link polyethylene resins and shall be roto-molded in a manner to have a wall thickness of 1/4" over the entire surface of the tank.
3. The fuel line pickup inside the fuel tank shall have a screen mesh for filtration as well as a check valve.

PTO and Power Transmission Belt Drive

1. The power tank off shall be a heavy-duty spring loaded automotive type clutch with a 2-1/4" diameter hardener shaft.
2. PTO shaft shall turn on 2 roller bearings that shall be pressed into the housing
3. The PTO shall be separate from the clutch assembly and bolt directly to the engine bell housing.
4. The clutch shall consist of an automotive style industrial quality 13" pressure plate and a one-piece clutch disc.
5. All clutch linkage shall be on the outside of the housing so that it is not necessary to remove the clutch housing for adjustments.
6. Power shall be transferred from the engine to the impeller shaft via a 4-grooved power band belt.
7. Power band belt shall provide the suction fan with a 1:1 ratio with the engine PTO shaft speed.
8. Both of the drive pulleys shall have a minimum diameter of 11".
9. The power band belt shall be constructed with Kevlar to provide the maximum amount of life with minimal stretching.
10. To minimize belt stretching, the maximum distance between the engine PTO shaft and the impeller drive shaft shall be 18".
11. Belt tension shall be achieved by rising and lowering the height of the engine via 4 threaded sleeves.
12. The engine base that supports the threaded adjustment sleeves shall have a minimum thickness of 1/2".
13. To aid in the replacement of the power band belt, a cam rod shall be supplied so the PTO end of the engine shall be capable of being raised a minimum of 1 1/2 inch.

PTO Safety Engagement System

1. The PTO and clutch shall be equipped with a non-electric safety engagement system that prevents abrupt engagement of the PTO at High RPM's. Information shall be provided with bid packet on this item
2. The PTO and clutch shall have an adjustable hydraulic cylinder that automatically ensures that every engagement is exactly the same no matter what operator activates it.
3. The assist cylinder shall be leak proof and incorporate a constant velocity speed control to ensure precise engagement speed of the PTO every time.
4. Bidder shall supply of a list of ten (10) references that are currently using a PTO safety engagement system on their unit.
5. For safety reasons, the operator shall be able to completely disengage the drive mechanism while the engine is running; fluid drive couplers are not acceptable alternatives to the PTO safety engagement system.

Skid

1. The skid frame shall be properly balanced and constructed of heavy-duty enclosed tubular steel. The tubular steel shall be a minimum of three (3") inch x (8") inch with 1/4" inch thick walls. No open design frame shall be acceptable.
2. The skid shall be designed to mount on a flatbed truck or directly to the chassis framework.
3. An amber LED oval strobe light shall be cab mounted top of the roof. An on/off rocker switch located in the cab easily accessible to the operator.
4. All wiring for the skid shall be run through protective looming and have protective rubber grommets when passing through steel openings.

BE Series Box Container (Bottom Exhaust)

1. The box has a useable inside capacity of not less than 25 cubic yards and is self-dumping.

BE Series Box Container (Bottom Exhaust) Cont'd

2. Top of the box is equipped three easily removable ½” expanded metal mesh screens with a smaller 1/8” metal screening on the inside of the box for proper ventilation. The use of larger screens or dust tarps will not be acceptable.
3. The top screens slide into a channel and are bolted in place. Top screens welded in place are not acceptable.
4. Top screens shall be capable of being removed without requiring personnel to enter the interior of the hopper, no exceptions.
5. Hinged access panels with over-center latches shall be provided to gain access to the top screens.
6. The box is constructed out of 12-gauge steel and is bolted to the platform floor. Hoppers that are welded to the platform floor are not acceptable.
7. The box is structurally supported by a minimum of four 3” channels vertically positioned on the sides and tied into cross members across the top. Units without top cross members will not be acceptable.
8. The interior walls of the box are smooth and the floor has drain holes to help eliminate additional water weight.
9. The floor of the box shall be supported by channel cross members.
10. The front of the box shall extend over the suction blower and engine to provide additional protection.
11. Front of the box shall be angled to provide a built-in brush guard to guide low hanging branches up and over the unit. Units with flat or vertical front hopper walls are not acceptable.
12. There shall be a ¼” thick abrasion resistant deflector and an in-line deflector to insure proper settlement of leaves in the box.
13. There shall be metal duct work so to direct the exhausted air across the top of the box, down the sides and exit at the bottom of the unit.

BE Series Box Container (Bottom Exhaust) Cont'd

14. At the final exit point of the exhausted air shall be angled inward towards the bottom center of the unit.
15. To help dissipate the exhausted air flow, the air exhaust ducting shall be at it largest opening at the final exit point of the system.
16. The box is equipped with a single top hinged rear door securely fastened at the bottom corners of the door.
17. The rear door latch mechanism shall be hydraulically controlled from inside the cab.

Dumping Hoist

1. Both dumping cylinders shall have a 5" diameter piston with a minimum stroke of 27".
2. The box is dumped via a Crysteel scissors style lifting mechanism incorporating twin hydraulic cylinders capable of dumping 26.6 tons. Systems with single hydraulic cylinders will not be acceptable.
3. Both dumping cylinders shall have a 5" diameter piston with a minimum stroke of 27".
4. The lift mechanism is powered up and down. Single acting dump systems are not acceptable.
5. The rear dumping hinge assembly shall be a minimum of 1/2" thick steel with a 2" diameter pins.
6. The dumping hoist shall come standard with a manufactures five-year warranty, no exceptions.
7. There shall be means of dumping the hopper from within the cab as well as a manual control valve that is located near the auxiliary engine.
8. There shall be a hydraulic check valve incorporated into the container box dump cylinder that prevents the box container from falling should a hydraulic line, hose or fitting fail, no exceptions.

Dumping Hoist Cont'd

9. The hopper shall have an automatic guide system to realign the hopper and the blower housing when the hopper is lowered back down into a working position, no exceptions.

Hydraulic Systems

1. The unit shall be equipped with independent hydraulic systems to provide proper flow and pressure to the 3-axis hose boom assembly, the hydraulic dumping hoist and rear hopper latches, no exceptions.
2. The unit shall have a piston style hydraulic pump that is gear driven off of the engine's auxiliary drive. Belt driven or electric/hydraulic pumps are not acceptable.
3. The piston hydraulic pump shall have variable volume and be pressure compensating.
4. The hydraulic systems shall operate at 3200 psi and shall be "live" as soon as the engine is started.
5. A hydraulic reservoir shall be supplied with an in-line hydraulic filter.
6. Hydraulic tank shall be conveniently mounted on the side of the chassis frame and include a sight gauge and fill cap that are easily accessible.

Suction Impeller

1. The impeller diameter shall be a minimum of 32" diameter with six gusseted blades.
2. The blade shall be constructed out of 3/8" thick abrasive resistant T-1 steel with a Brinell hardness exceeding 400.
3. For maximum vacuum and superior wear characteristics, the suction blades shall be straight (flat) with no curve or cups formed in them.
4. Suction blades shall be robotically welded to a backing plate.
5. The impeller back plate shall have a minimum thickness of 1/4".

Suction Impeller Cont'd

6. The suction impeller blades shall be keyed and notched into the back plating along with external gussets to provide the safest and strongest bond.
7. The suction impeller blades shall have a gently serrated tip to lower the operating noise level.
8. The suction impeller shall be secured to the drive shaft via a taper locking hub to provide a better-fit and easy removal.
9. The taper locking hub shall have a safety ring to protect it from direct impact of foreign material.
10. The suction impeller shall be both statically and dynamically balanced.
11. The suction impeller shall be stress relieved via Bonal stress relief technology. This will ensure the safest and most durable impeller. A copy of the Bonal stress report shall be supplied with the new unit.

Impeller Support Shaft (Belt Drive)

1. The impeller shall be supported by a minimum of 2-1/4" diameter x 26.56" long shaft.
2. The impeller shaft shall be supported by two 2-1/4" diameter four bolt flange bearings. Two bolt bearings will not be acceptable.
3. The four bolt flange bearings shall have a double row of precision spherical roller bearings and shall utilize an eccentric locking collar to lock the shaft.
4. The impeller bearings shall be heavy duty type with a minimum dynamic load rating of 26,500 pounds. Please indicate the dynamic load rating _____ lbs.
5. The impeller bearing shall be heavy duty type with a minimum static load rating of 31,000 pounds. Please indicate static load rating _____ lbs.
6. The flange bearings shall be mounted to steel plates with a nominal thickness not less than 7/16".

Impeller Support Shaft (Belt Drive) Cont'd

7. The flange bearing shall have a Teflon seal to prevent any foreign material from seeping through the blower-housing opening.
8. After the removal of the blower housing cover plate, the entire suction fan shaft and bearings shall be removable as a complete assembly by the removal of only 8 bolts.

Blower Housing

1. The blower housing shall be located at the curbside of the unit and shall be bolted in place.
2. The outer scroll of the blower housing shall be constructed out of 10-gauge steel.
3. The front and back plates of the blower housing shall be constructed out of 7-gauge steel.
4. The interior of the housing shall be equipped with a two-piece slip inner liner constructed out of ¼" thick abrasion resistant steel that requires no bolts.
5. An additional bolt in ¼" thick liner shall be provided to protect the housing from material that gets carried over before it exits the housing.
6. An inspection/clean out door shall be provided with a safety kill switch that shuts the engine down when opened or improperly closed.
7. The inspection/clean out door shall be side hinged and require no more than two (2) nuts to be removed to open.
8. The bottom of the blower housing shall have a drain to help prevent water from accumulating when not in use.

Intake Hose

1. The intake hose shall be 16" diameter x 120" long of heavy-duty wire reinforced flexible urethane hose with a wall thickness of 0.70".
2. The intake hose shall be suspended from the hydraulic boom arm by an adjustable chain, for operator's safety, the use of springs or cables will not be acceptable.

Intake Hose Cont'd

3. The hose support tube shall connect to a metal hose support band wrapped around the hose for a secure and safe connection. The use of rubber or belting materials to support the weight of the intake hose will not be acceptable.
4. The intake hose shall be equipped with a 16" nozzle that is constructed out of 12-gauge steel.
5. The suction nozzle shall be connected to the boom assembly via an I-beam structure that is designed to pivot at both ends. This design provides a secure connection for both vertical and horizontal movement of the assembly.
6. The use of chains, cables or rods to connect the suction nozzle to the boom assembly will not be acceptable.
7. The suction nozzle shall have wear strips welded to the bottom to prevent the nozzle from being sucked to the ground surface.
8. The suction hose shall be secured to the straight inlet via an over-center clamp.
9. The hose shall be capable of pivoting forward or rearward and lock to the unit for transport without having to remove the hose.

Exhaust Duct

1. A rectangular extension of the blower housing shall be horizontal and discharge the leaves through the packer's ejection plate.
2. There shall be a hinged panel on the ejector plate that allows the leaves to blow through.

Hydraulic Boom

1. The intake hose boom shall be a 3-axis (in/out, up/down & forward/reverse) that is hydraulically operated.
2. The boom assembly shall be capable of having a 180° working arc that allows the hose to be pointed toward the front of the truck and swing all the way towards the rear of the truck.

Hydraulic Boom Cont'd

3. The boom shall raise and lower by a hydraulic cylinder with a minimum 1-1/2" diameter piston with a minimum stroke length of 12".
4. A flow control valve shall be provided so that the downward speed of the boom is adjustable.
5. A double acting hydraulic cylinder shall provide the in/out function of the boom assembly.
6. A hydraulic motor coupled to a straight cut spear gear via a roller bearing block assembly shall provide the 180° forward/reverse boom motion.
7. Two-2 diameter 4-bolt flange bearings shall support the 3-axis boom shaft
8. Adjustable boom "stops" shall be provided to limit the forward/reverse motion of the assembly.
9. The hydraulic boom shall be capable of working off the front bumper of the truck and store along the side of the hopper.
10. Units that store beside the passenger's side of the cab will not be acceptable.
11. A hydraulic pump that is coupled to the auxiliary engine shall power the boom. The use of electric/hydraulic pumps will not be acceptable.
12. The pivot point of the boom shall include a bushing and grease fitting for proper lubrication.
13. The hydraulic boom assembly shall be mounted directly over the center of the suction hose so that it can work freely to the front or rear of the unit. Side mounted booms will not be acceptable.
14. The hydraulic boom shall be straight for maximum strength, boom with kinks or bends will not be acceptable.
15. For maximum strength, the first section of the boom shall be constructed out of a minimum of 4" x 4" x 1/4 tubing, with the second section out of 2" x 3" x 1/4 tubing.

Hydraulic Boom Cont'd

16. The boom assembly shall be mounted to 4" square tubing frame that is not attached to the vacuum blower housing
17. The entire boom mounting assembly shall be capable of telescoping out approximately 18" from the blower housing cover plate via a screw mechanism.
18. Complete access for service and maintenance of the impeller and blower housing liners shall not require the removal of the suction hose or 3-axis boom assembly.
19. Boom controls shall be located in side the cab of the truck.
20. A three-way joystick shall be used to control the functions of the boom assembly.
21. The joystick must incorporate a "dead man" trigger that must be pulled in order to activate the joystick, no exceptions to this requirement.
22. Boom controls shall have a remote joystick that can be utilized by the operator from either left or right hand and shall have the capability of being temporarily or permanently mounted.

Warranty and Manuals

1. The entire unit shall carry a one-year warranty for parts and labor against manufacturing defects and materials.
2. The Auxiliary engine and the Auto PTO clutch shall have a minimum two-year warranty.
3. An unconditional 30-day guarantee shall be submitted on the bidder's letterhead stating, "If the end user is not pleased or satisfied in the quality and performance of the proposed equipment within 30 days after delivery, a full refund including freight will be furnished to the customer."
4. The successful bidder shall provide a minimum of 8 hour operator and mechanic training. A videotape shall also be provided showing maintenance and operating procedures.
5. Complete parts, operating and service manuals for the chassis, power unit, and the body shall be supplied on cd-rom.

Warranty and Manuals Cont'd

6. The bidder shall provide replacement parts and service directly from the manufacture.

Options

1. To make the unit more versatile in the fleet, the _____ is requesting a "Brush chipper Door" be built into the tailgate of the unit. This will aide in the recycling of wood material. The door shall be located in the center of tailgate side to side. The bottom of the door shall be 84" from ground and the top of door shall be 118" from ground the door shall be a minimum of 45" wide. The door shall be removable and shall be air-tight and sealed when installed on unit.
2. A 7 pole trailer connector socket Ref: Part # 755-5019 NAPA shall be installed on rear of chassis and meet SAE-J560 B specs. A hitch capable of receiving a 2 ½ pintle hook shall be provided. The hitch shall be capable of supporting and towing the weight of a Brush Bandit 250 wood chipper. Safety chain rings or hooks shall be provided as well.
3. To reduce the exhaust of leaf dust into the air the _____ is requesting a "Bottom Exhaust" where as the leaf dust is exhausted through an enclosed channel included in the body of the unit.
4. Two tailgate safety props shall be installed on the tailgate (one each side) and be able to be hinged into a safety latch hole on body
5. An access ladder shall be hinged on the rear of the underbody and be utilized by pulling out and lowering to assist in getting inside the body for cleaning purposes.

Camera System

6. A Camera System shall be provided for safety and shall be a **Safety Vision SV-5065** Camera System or approved equal
 - A) Camera system shall include (1) SV-510 Camera , (1) SV-511 Monitor and (1) SV-523 65' camera cable with threaded metallic connectors with rubber O-ring seals.
 - B) 5 ½" black/white monitor. (**Location to be decided by State College**)

Camera System Cont'd



C) Camera System Warranty shall be a minimum of 5 years and shall include camera cable

D) Camera System shall have sound to allow for operator to hear as well as see what is behind vehicle.

E) (2) rear flood lights shall be mounted on rear of tailgate beside camera, facing rearward. Camera placement on rear shall be decided by the _____ by contacting the Operations Manager at 814-234-7138.

F) Installation shall include having split loom protection installed on complete length of camera cable to prevent rubbing and damaging cable.



SPECIFICATIONS FOR MODEL 3680 HORIZONTAL GRINDER			
 			
This chipper shall be a Bandit Industries Model 3680 Horizontal Grinder			
<p>The column on the left lists the specifications required, thus establishing the type of equipment for which bids are to be submitted. Bidder must fill in column on the right side of page with a check mark or an "X", signifying model being bid meets this specification; or if different, with the specification of the model being quoted.</p>			
SPECIFICATION			BIDDERS REPLY
1	Grinder Capacity:	35" diameter capacity Mill opening is 35" X 60"	
2	Weight:	Approximate 57,500 pounds	
3	Dimensions:	Length: 39' Width: 9' 7" Height: 13' 3"	
4	Noise Level:	Approx. 80 decibels at 50' 360 degrees around unit or less, depending on species of wood being chipped.	
5	Frame:	Frame is 1/4" thick steel with 20" deep formed high tensile steel plate, and 3/8" thick C-channel, 18" deep with 7" reinforced channel.	
6	Hitch:	3" pintle ring with (2) safety chains with hooks	
7	Tongue Jack:	One hydraulic front stabilizer	
8	Axle:	(3) 25,000 pound air brake axles	
9	Tires:	(6) 385/60R 22.5, load range "H" tires mounted aluminum rims	
10	Lighting System:	12 volt system with LED taillights	
11	Engine:	Diesel engine options are available from Cat, Cummins, and John Deere ranging from 440 horsepower to 700 horsepower. Engine items include tachometer and hour meter, engine manufacturer's gauges: such as high temp/low oil pressure shut down system. Also includes engine manufacturer's exhaust system, air cleaner system, cooling system, and electrical system.	
12	Belt Guards:	To enclose all drive systems, guards shall have seams welded inside and out. All guards are easily removed by 3/8" NC grade 8 hardness bolt.	
13	Infeed Conveyor:	Horizontal slat style infeed conveyor 20' long x 60" wide driven by (1) 24 CID hydraulic motor with gearbox and chain. Also includes (2) side infeed wings.	
14	Infeed Conveyor Speed:	Varies according to load sensed by IQAN system (18-43 FPM)	
15	Feed Wheel:	(1) 24" diameter by 5' wide floating feed wheel internally driven by a hydraulic motor/gearbox combination.	
16	Cutter Mill:	42" diameter X 63" wide cutter mill consisting of 60 cutter bodies and teeth. Mill must cut material apart by rotating down toward the material.	
17	Cutter Mill Drive:	(3) 5/5VF2000 banded Kevlar belts	



SPECIFICATION		BIDDERS REPLY
19	Cutter Head Bearings:	(2) 4 5/16" diameter spherical roller pillow block bearings
20	Cutter Head Shaft:	6" diameter, coaxially mounted inside 24" diameter by 1" pipe
17	Gate:	(1) replaceable, hydraulic operated concave gate 10" X 63" (standard gate is s 3/4" thick x 1" modified diamond)
18	Screen:	(1) replaceable concave screen 25" X 63" (standard screen is a 3/4" thick x 3" modified diamond)
19	Anvil:	Full width adjustable anvil constructed with structural steel
20	Augers:	Must have 10 augers to capture and feed the debris falling from the feed end of the infeed conveyor into the cutter mill.
21	Discharge:	30' long x 4' wide (2-speed) discharge with a discharge height of 17' 7"
22	Dust Suppression System:	Consists of (2) 1 1/2 GPM nozzles spraying into the cutter mill, and (1) 1 1/2 GPM nozzle spraying over the feed wheel. Also must include (2) 1/2 gallon nozzles spraying on the discharge belt.
23	Fire Suppression System:	(3) heat actuated fire suppression bombs to be mounted as follows: (inside the control cabinet, inside the hydraulic cabinet, and on the bottom of the hydraulic tank).
24	IQAN Feed System:	Fully adjustable IQAN controllers with panel
25	Radiator Screen:	High capacity radiator screen
26	Hydraulic Shutdown:	Includes (4) electric over hydraulic shut down switches located on all 4 corners of machine.
27	Screen Changing Arm:	Assists operator with replacing screens from inside of the cutter mill.
28	Radio Remote:	Radio remote control with tether back-up. Functions include yoke up/down, feed forward/reverse, engine stop, engine throttle up/down, gate open/close.
29	Hydraulic Tank:	140 gallon steel hydraulic tank, magnetic drain plug, rubber shock mounted, and aluminum sight gauge
30	Fuel Tank:	500 gallon steel fuel tank, magnetic drain plug, rubber shock mounted, and aluminum sight gauge
31	Paint:	Standard colors: Bandit yellow, Cat yellow, John Deere Green, Alert Orange, Black, or white
32	Air Compressor:	11 horsepower gas powered, with 10 gallon air tank complete with fittings, impact wrench, and swivel sockets.
33	Tool Boxes:	(2) Lockable control and storage compartments
34	Fire Extinguisher:	(1) fire extinguisher to be mounted inside control cabinet
		Bandit Industries, Inc. reserves the right to modify any and all specifications as it see fit, without notice.