



Nestor Resources, Inc.
208 Kozy Corner Road
Valencia, PA 16059

Phone: 724-898-3489

Fax: 724-898-3592

E-mail: info@nestorresources.com

Internet: www.nestorresources.com

**Recycling Technical Assistance
Project #425
Municipality of Monroeville,
Allegheny County**

**Feasibility of an enhanced
curbside recycling and yard
waste collection program**

December 2007



Nestor Resources, Inc.

Table of Contents

INTRODUCTION 5

BACKGROUND..... 5

PROJECT SCOPE OF WORK..... 6

SUMMARY OF FINDINGS AND RECOMMENDATIONS..... 7

MONROEVILLE AT A GLANCE 11

MUNICIPAL WASTE INDICATORS 11

WASTE GENERATION AND RECOVERY 12

The Franklin Study..... 12

CURRENT WASTE MANAGEMENT PROGRAM..... 13

Residential Curbside Collection..... 13

Glass..... 14

Aluminum..... 14

Bimetal..... 14

Plastic..... 14

Overall Results for Commingled Materials 14

Table -1 Drop-off Collection Sites 15

Residential Drop-off Collection 15

Overall Paper 15

Newsprint..... 15

Commercial Sources..... 16

Corrugated Cardboard..... 16

Office Paper..... 16

Yard Waste 17

Analyzing Monroeville’s Performance 17

Table 2 – Comparison of Expected and Reported Recovery 18

Assessment of Performance..... 18

OPPORTUNITIES FOR IMPROVEMENT 19

FEASIBILITY FACTORS 19

Capacity..... 20

Capture Rate 20

Consumer Acceptance 21

Cost..... 22

OPTIONS 22

Collection Methodologies..... 23

Dual Stream..... 23

Manual Collection..... 25

Automated Collection..... 26

Semi Automation 26

Full Automation 26

Outlets and Revenue for Materials 27

Figure 1 – Drivetime to Material Recovery Facilities 28

Table 3 – Material Recovery Facilities..... 28

SAMPLE SCENARIOS 29

Equipment and Labor Costs 29

Option A Dual Stream 29

Option A-1 Manual Dual Stream 29

Option A-2 Manual Dual Stream with Larger Capacity Split Body Vehicles 30

Option A-3 Semi-Automated Dual Stream Alternating Weeks..... 31

Option B Single Stream 31

Option B-1 Semi-Automated Single Stream 31

Option B-2 Fully Automated Single Stream..... 32

ACT 101 LEAF WASTE COMPLIANCE..... 32

CONCLUSIONS **33**

APPENDIX A **35**

PENNSYLVANIA’S ACT 101 LEAF WASTE COLLECTION REQUIREMENTS 35



Nestor Resources, Inc.

Introduction

The Recycling Technical Assistance Program is sponsored in partnership by the Pennsylvania Department of Environmental Protection (DEP) through the Solid Waste Association of North America (SWANA), the Pennsylvania State Association of Township Supervisors (PSATS) and the Department of Community and Economic Development (DCED) Governor's Center for Local Government Services. Qualifying municipalities wishing to enhance their recycling, composting and waste reduction programs are provided with professional support to assist them in achieving their goals and objectives.

The Municipality of Monroeville requested technical assistance to determine the feasibility of increasing the types of materials included in its curbside collection program, and the methodologies best suited to accomplish this goal. The municipality hopes to increase revenues realized by the sale of material and through performance grant opportunities. In conjunction with the changes considered for its recycling collection, Monroeville wanted to explore improvements to its yard waste program.

As the consultant selected to manage the project, Nestor Resources, Inc. is pleased to submit to the Municipality of Monroeville our findings and recommendations. This report includes background data, resources and references, as well as explanations and justifications for the consultant's suggestions.

Background

Monroeville qualifies as a "mandated municipality" under the provisions of the Municipal Waste Planning, Recycling and Waste Reduction Act of 1988, Act 101. Therefore, the municipality is required or "mandated" to provide curbside collection of recyclables for its residents and to ensure that recycling is conducted by all commercial, institutional and municipal establishments, and at all community activities in the municipality.. Additionally, leaf waste must be collected at the curb monthly unless alternative collection methods are made available to the residents.

Public works crews from the municipality currently provide residential collection services for recyclables and leaf waste, as well as for garbage. Residents benefit from reduced disposal costs provided by the landfill that is located there. The municipality pays only the fees directed to Growing Greener, the Recycling Fund, and the host county and not the landfill's normal tipping rate. However, municipal officials still recognize the importance of recycling and waste diversion.

Therefore, Monroeville desires to expand the curbside recycling program which is operated by its public works crew. By collecting a greater variety of materials the municipality hopes to not only reduce the amount of waste disposed, but also increase its revenue including, but not necessarily limited to: newspaper, magazines, cardboard. Additionally it wishes to improve its yard waste management program and come into compliance with Act 101 requirements for leaf waste collection.

Municipal officials sought technical assistance to evaluate the existing collection methods and explore options to improve operational performance, enhance participation, reduce overall costs and increase the rate of recovery within Monroeville.

Project Scope of Work

Task #1: Nestor Resources, Inc met with the Municipal Manager and Assistant along with the Public Works Director to discuss the current collection practices, perceived problems, budgetary requirements, compliance issues, overall performance of the recycling and leaf collection program and future expectations.

Task #2: Nestor Resources, Inc. reviewed material provided by the Municipality including; annual reports, performance grant applications and ordinances relevant to solid waste management and recycling. The consultant compared current recovery/recycling results to those that could be expected, based on national studies, for the types of materials collected in a municipality with similar demographics. The consultant provided projections of potential recovery that could be expected with an expanded selection of materials. Additionally, the consultant developed options with which the Municipality could expand current services, improve its recovery rate and potentially increase revenue derived from the sale of materials and performance grants.

Task #3: The consultant met with the Municipal Manager and Assistant along with the Public Works Director to discuss the findings regarding the current practices and present and explain the available options. The discussion focused on the risks and benefits of each scenario including: performance issues; savings resulting from operational efficiencies; capital outlays; funding; costs to the resident; incentives for recovery; public acceptance and compliance related issues.

Task # 4: Nestor Resources, Inc prepared and submitted to the Pennsylvania Department of Environmental Protection (PADEP) for review and comment, a draft project report, which summarizes the consultant's findings and recommendations. Based on the PADEP's input, the consultant finalized the report. Both the Municipality and the Department were provided with the report in electronic format. In addition, a hard copy of the document was provided to the Municipality.

Summary of Findings and Recommendations

The project's primary purpose was to identify additional materials with potential for recovery in a curbside collection program. Secondly, its objectives were to determine the best method of collecting such materials as well as projecting revenues that might be realized from their sale. In addition, suggestions for Monroeville's compliance with Act 101 leaf waste collection were to be provided.

- ❑ When compared to national norms, the existing curbside program is reasonably effective in recovering those specific items designated for recycling. It is reasonable to expect similar results for additional materials if they were added to the curbside program.
- ❑ The drop-off collection program, which is limited to newspapers and magazines, has demonstrated some margin of success. However, it leaves a considerable amount of newspaper, magazines and other waste paper uncollected. That it is less effective in recovering the maximum amount of material is particularly noticeable when compared to the relative success of the curbside program for other recyclables. The municipality should consider the most cost effective methods of including these materials in the curbside program as revealed in this report.
- ❑ Junk mail, various types of office paper and computer printouts are generated in significant quantities in today's homes. Approximately 160 tons of residential mixed paper, which could be reasonably expected to be recovered in Monroeville still remains in the waste stream. The municipality should consider the most cost effective methods of including these materials in the curbside program as revealed in this report.
- ❑ Based on the volume density of material currently captured in Monroeville's program one could conclude that the equipment utilized in the current system does not typically reach maximum capacity. In fact, loads appear to be delivered half full. Therefore, it provides options for the municipality to add more materials for curbside collection.
- ❑ User acceptance of a program is critical if it is to sustain participation and recover the maximum volume of material. Elements of a recycling program that require effort by the participants typically influence behavior and attitudes can mean the difference between a successful or failed endeavor. These items either individually or combined have impact on service costs. Monroeville will need to determine the public's

“willingness to pay” as it considers the costs and the level of convenience in the options provided

- ❑ The necessity for direct or indirect user fees seems likely based on the net cost of every scenario. The inclusion of some amount for equipment purchases in these user fees is recommended.
- ❑ The volume of material projected for recovery suggests that Monroeville should acquire and distribute containers before it can expand its program. This would be essential if the municipality opted for a dual stream program. The expected capture rate indicates that vehicle capacity is sufficient to incorporate mixed paper in a single stream recycling program.
- ❑ The potential may exist to consolidate routes through increased productivity, larger capacity, and potentially split body vehicles to reduce costs. To make that determination is outside this scope of work.
- ❑ Transportation represents at least 60 -70% of the costs of most waste management programs. Therefore, operations managers are encouraged to perform route audits on a regular basis to evaluate vehicle performance, worker productivity, unintended driver modifications to route sequences and unbilled service stops. Monroeville was unable to provide any route collection statistics. This information could play an important role at many levels as a move from drop-off to curbside collection is considered. It is suggested that the municipality make route auditing a regular practice.
- ❑ In order to compare the various options, the current cost of collection and revenue receipts provided by Monroeville were used as benchmarks. It was unclear how the municipality allocated cost for vehicle replacement. Therefore, in all scenarios those costs are not included in the actual cost of collection. These are important expenditures to consider and should be factored into any final decision. The cost of collection containers has been included in each total cost and cost per home where it is applicable.
- ❑ It is anticipated that to implement a manual dual stream curbside collection program using traditional bins and vehicles similar in design to those in the existing system, the municipality’s current annual cost of \$200,000 would double to \$400,000. Its revenue would increase to only \$84,355 for a net cost of \$315,645. It is recommended that Monroeville explore other curbside options to recover this material.

- ❑ Aside from the cost, the disadvantage of manual dual stream is that the traditional bins would still have limited container capacity to add an even greater variety of material for curbside collection in the near future, particularly in the event that pending disposal bans will be enacted. Purchasing bins would not make it practical to initiate the first phase toward automated collection anytime soon.
- ❑ The possibility of establishing a transfer point in Monroeville was explored. Here municipal vehicles could off load the fiber into a trailer, which would then be transported to a processing facility. The loss of revenue required to compensate for the transfer rate of the trailer was greater than the savings realized from decreasing direct transport. Total revenue would be \$42,691 with a net cost of \$319,869.
- ❑ Semi-automated dual stream collection, pending findings from the recommended route audit, presents the ability to collect fiber and commingled bottles, jars and cans each one time per month due to the extra storage capacity of the carts, keeping collection costs relatively the same as now. Another benefit would be the ability to add even more material to the program in the event of future disposal bans for cardboard. Lastly, the addition of carts would ease the municipality closer to full automation. This option has a net cost of \$231,359 based on \$84,355 in revenue and similar collection and transport times.
- ❑ In a dual stream system using a split body vehicle, the ratio of materials collected must be considered so that it does not fill disproportionately mid-route causing added transport. Additionally, a split body vehicle loses efficiency when both materials are not transported to the same location. Although, in theory, the net cost of this option appears to be \$134,365, there are many uncertainties which could quickly escalate expenses. Determining factors in this option include: whether or not additional minutes per route are available for the added transport and unloading based on actual times; and productivity and if the routes can truly be balanced to avoid mid route tipping time.
- ❑ In spite of the revenue differential, it appears that semi automated single stream recycling is the least cost option overall, by a narrow margin, with a net cost of \$227,145. Because all of the material is collected together in the same container and transported in the same body to the same location, this has the potential to reduce the number of routes, drivetime as well as unloading time.

- ❑ Municipal officials will have to determine if the one cart convenience of single stream is favorable over the two cart alternating method. Available vehicle capacity and public acceptance will likely guide the decision.
- ❑ Fully automated collection is not applicable in every community. Certainly there are areas in Monroeville which would be difficult to service in this fashion. However, there are enough suitable areas to explore the impact of transitioning one route to full automation. Done in conjunction with an automated waste route it could potentially eliminate 5 route days. Determining the streets and house counts to which this would apply is outside this scope of work. It is suggested that Monroeville examine routes for future consideration.
- ❑ It is most beneficial to initiate the transition to fully automated collection when trucks and other equipment are due for replacement. In some instances a phased in approach starting with semi-automation first can be more affordable.
- ❑ In order for Monroeville to be in compliance with Act 101, it must broaden the types of material accepted for collection to include all forms of leaf waste; provide a similar period of collection in the spring as it currently offers in the fall; offer a drop-off site to accept all forms of leaf waste throughout the year; and ensure that the leaf waste is processed.
- ❑ For the drop-off site it is suggested that the municipality offer a location that operates during weekend hours under the supervision of municipal personnel. During off hours, it is recommended that the area be secured and fenced to deter illegal dumping and contamination.
- ❑ The drop-off site should be convenient for residents and in an area that is easily monitored by staff. Some consideration should be given to the chipping and shredding of inbound material in order to reduce the volume for composting or to produce mulch. Material can be distributed to residents or utilized on Monroeville's properties.
- ❑ To make better use of the area for events such as HHW or E-Waste collection traffic flow, tractor trailer access, storage capacity and potentially paved areas should be addressed during the planning and development.

Monroeville at a glance

The Municipality of Monroeville occupies 20 square miles of land in Eastern Allegheny County. Located at the junction of the Pennsylvania Turnpike, the William Penn Highway and the Penn Lincoln Parkway, its access to three major roadways has been a contributing factor to the steady growth and development of the community since the 1950's.

While Allegheny County, in general, has experienced a population exodus, Monroeville has a higher than average homeowner retention rate and continues to see new housing starts. Today, Monroeville boasts over 12,000 housing units, with nearly 9,000 of them single family detached homes. According to the population projections of the US Census Bureau, approximately 28,000 people reside within the municipality.



The number of sub-divisions, condominiums and apartment dwellings are not the only thing that has increased. Commercial establishments have thrived in the area. In fact, Monroeville has long held a reputation as one of the major shopping districts in Western Pennsylvania. Aside from the extensive retail presence, the community also hosts major office complexes for corporate entities as well as small businesses.



Municipal Waste Indicators

As a community grows in population, its waste grows proportionately. Other factors can influence the degree by which that generation escalates. Studies have shown that income and lifestyle contribute significantly to the types and amounts of material found in the municipal waste stream. Age, employment, education and location all play an important role.

Prosperity typically accelerates municipal waste generation. People with greater disposable income tend to frequently purchase more things and discard items quicker than do those with less money. Households in Monroeville have an annual median income of roughly \$46,000, which is about 18% more than the average in Allegheny County and 5% more than in Pennsylvania. Coupled with direct access to material goods made possible by Monroeville's retail

district, this purchasing power and ability to discard and replace has an enhanced effect.

Similar to trends found in other upscale suburban neighborhoods, many residents have non-traditional employment situations. 3% of the workforce in Monroeville work from their homes. The existence of home offices has changed the composition of residential municipal waste. Office paper corrugated cardboard and trade magazines previously found only in commercial areas, are now commonly found in greater quantities in the suburban waste stream.

Waste Generation and Recovery

Determining the volume and types of materials in the municipal waste stream is crucial in planning for effective waste management systems. Understanding that information and its impact on the cost and success of future program development is even more important. Comparing local data to national and regional provides a logical benchmark for performance and provides insight into opportunities for improvement. Such a comparison was performed utilizing historical recovery data from Monroeville's annual reports and performance grant applications, as well as documented results from communities around the United States.

The Franklin Study

Since 1960, the United States Environmental Protection Agency has been tracking and monitoring municipal waste generation and characterization. This information is compiled and analyzed in a report commonly known as The Franklin Study. It presents information on the composition of the nation's municipal solid wastes and the amount of the various wastes that are generated, recovered and disposed. These figures serve as a basis for determining the expected composition of the various materials included in the municipal solid wastes generated in Monroeville. The Franklin Study also provides a foundation for comparing Monroeville's performance in recovering materials through recycling to the national norm. Data for 2005 from the Franklin Study was used as a basis for this analysis. This is the most recent data available. Since the data does not change substantially from year to year, the national data from 2005 was used as a basis of comparison to Monroeville's 2006 data.

In order to compare Monroeville's performance to the results of the Franklin Study, data from the study was analyzed to derive the figures that are representative and comparable to the recycling activity reported by Monroeville. This analysis is required because the Franklin Study groups the materials in the national solid waste profile in categories different from the

categories reported by Monroeville and other residential collection programs in Pennsylvania. Failure to make this distinction creates false projections of availability of material for recovery and processing. When programs and capital outlays are based on those assumptions costly mistakes are inevitable.

For example, Monroeville reports numbers for glass recycling that are primarily the result of collection of packaging (jars and bottles) in municipal waste. In contrast, the Franklin Study reports glass as the total of glass packaging, (10.92 million tons per year) plus glass contained in durable goods (an additional 1.83 million tons per year). Thus, figures from the Franklin Study used as a comparison for Monroeville's glass generated, recycled and disposed need to be the ones pertaining to glass containers/ packaging and not the total of all glass contained in the municipal waste stream.

Current Waste Management Program

Monroeville's current recycling program and the method of collection is presented in the following discussion. Using information from the Franklin Study, estimates for the amounts generated of each material designated for collection were calculated. A table follows that illustrates the results of those efforts.

Monroeville conducts a recycling program that includes both curbside and drop-off collection of recyclable materials. Leaf collection is seasonal. The municipality also monitors the reported results of some commercial recycling activities. Following is a description of how materials are collected in the municipality and how the program compares to national trends.

Residential Curbside Collection

Public works crews perform the curbside collection using Labrie 17 cubic yard packer bodies mounted on two 2002 Freightliner FL-70 chassis's. Residents place 20 gallon bins at the curb every other week for collection.

The curbside program collects clear and colored glass bottles and jars, bimetal and aluminum cans and plastic bottles #1 (PET) and #2 (HDPE). The materials are commingled and performance figures are available for the total collected materials but not for the individual components.

Using information compiled for the USEPA in the Franklin Study, expected generation and recovery of materials designated for recycling in Monroeville were calculated.

Glass

Of the total estimated annual quantity of waste glass generated nationally in 2005, only the portion in the form of clear and colored containers was generally available for recycling in residential collection programs. This figure was used in determining the proportion of waste shown as available discards in the glass category on the table. Based on population, it is estimated that 1,057 tons of waste glass were generated in 2006 in Monroeville. If recycled at the national recycling rate, about 267 tons would be expected to be recovered.

Aluminum

Of the 3.21 million tons per year of waste aluminum estimated to be generated nationally in 2005, only aluminum in the form of packaging was generally available for residential recycling programs. Thus, 1.90 million tons per year of aluminum in the form of beverage containers and similar packaging was included in determining the proportion of waste shown as available discards in the aluminum category on the table. Based on population it is estimated that 184 tons of waste aluminum packaging was generated in 2006 in Monroeville. If recycled at the national recycling rate, about 67 tons would be expected to be recovered.

Bimetal

Bimetal refers to tin cans which are over 99% steel. Bimetal cans are included in the Franklin study in the category of ferrous metal wastes. The estimated annual quantity of ferrous metal waste generated nationally in 2005 was 13.77 million tons per year. Of this, only 2.13 million tons per year of ferrous metal wastes was generated in the form of containers and other packaging. Based on population it is estimated that 206 tons of waste bimetal cans were generated in 2006 in Monroeville. If recycled at the national recycling rate, about 130 tons would be expected to be recovered.

Plastic

The estimated annual quantity of plastic waste generated nationally in 2005 was 28.91 million tons per year. Of this, 13.65 million tons per year of plastic in the form of packaging was included in determining the proportion of waste shown as available discards in the plastic categories on the table. Based on population it is estimated that 687 tons of waste plastic #1 and #2 were generated in 2006 in Monroeville. If recycled at the national recycling rate, about 65 tons would be expected to be recovered.

Overall Results for Commingled Materials

The amount of commingled material collected in the Monroeville recycling program is only reported as a total of all materials. The actual quantity of the

individual materials is undetermined. Thus, to compare the quantity of materials collected in Monroeville's curbside program to national figures as reported in the Franklin Study, it is necessary to compare the total sums of the materials and not the individual results. Monroeville's recovery of 531 tons for commingled materials slightly exceeds the national expected rate of 529 tons.

Table -1 Drop-off Collection Sites

Monroeville Drop-Off Recycling Locations	
Senior Citizen Center Gateway Campus	Garden City Plaza Garden City Drive
Hawkeye Park	North American Martyrs Church
Municipal Center 2700 Monroeville Blvd.	Fire Company # 3
Public Works Starr Road	Fire Company # 4

Residential Drop-off Collection

To supplement the curbside efforts a drop-off program for waste paper is conducted that includes eight collection locations. The sites are shown in Table-1. Services are contracted to a private contractor. The current service provider is Allied Waste. Currently the program is limited to newspaper and magazines, delivered by residents on a voluntary basis. Other types of waste paper are not included in this program.

Overall Paper

The estimated annual quantity of waste paper generated nationally in 2005 was 83.94 million tons per year. This figure includes 44.91 million tons per year of nondurable goods such as newspapers, magazines and other printed matter. Also included in this category are about 8.81 million tons per year of material in a form that is not generally available for recycling, such as paper plates, towels, tissue, etc. The other 39.03 million tons per year of waste paper is waste packaging. The largest category of waste packaging is OCC, old corrugated cardboard, generated at a rate of 30.93 million tons per year.

Newsprint

Recyclers commonly refer to old newsprint as ONP. Included in this category is newsprint and newspaper inserts since the two materials are generally mixed together when disposed or recycled. For the purpose of analyzing Monroeville's results, magazines were also included in this category, although they are often considered separately. The estimated annual quantity of ONP

generated nationally in 2005 was 12.05 million tons per year. This material constituted 4.90% of the total municipal waste generated and was recovered nationally at the rate of 88.9%. Residential sources generate about 85% of the ONP contained in MSW. Based on population it is estimated that 1,166 tons of waste ONP was generated in 2006 in Monroeville. If recycled at the national recycling rate, about 1037 tons would be expected to be recovered.

The estimated annual quantity of waste magazines generated nationally in 2005 was 2.52 million tons per year. This material constituted about 1.0% of the total municipal waste generated and was recovered nationally at the rate of 38.5%. Residential sources generate about 85% of the magazines contained in MSW. Based on population it is estimated that 251 tons of waste magazines were generated in 2006 in Monroeville. If recycled at the national recycling rate, about 97 tons would be expected to be recovered.

The total quantity of ONP and magazines reported as recycled was 182.9 tons, 16.1% of the expected recycling rate. It should be noted, however, that the amount recovered is typical for a drop-off program.

Commercial Sources

Corrugated Cardboard

Old corrugated cardboard is called OCC is the recycling trade. Material included in this category is primarily cardboard boxes. Also sometimes included are folding cartons, chipboard and paper bags. They were not included in this analysis. The estimated annual quantity of OCC generated nationally in 2005 was 30.93 million tons per year. Commercial sources generate about 90% of the OCC packaging contained in MSW. Based on population it is estimated that 2,994 tons of waste OCC packaging was generated in 2006 in Monroeville. If recycled at the national recycling rate, about 2,141 tons would be expected to be recovered. The quantity reported as recycled was 2,721 tons, 127.1% of the expected recycling rate.

Office Paper

Office paper includes high quality office paper such as stationary, copy paper and computer paper. The estimated annual quantity of office paper generated nationally in 2005 was 6.58 million tons per year. Based on population it is estimated that 637 tons of waste office paper was generated in 2006 in Monroeville. If recycled at the national recycling rate, about 399 tons would be expected to be recovered from all commercial and residential sources. The quantity reported as recycled was 103.1 tons, 25.9% of the expected recycling rate. The quantity of recycled office papers reported was from a single source. It is likely that additional material was handled by other sources, including entities other than conventional waste management firms, such as document shredders.

Yard Waste

Typically, yard waste includes grass clippings, garden residue, brush, branches, twigs, hedge trimmings and leaves. Currently, Monroeville conducts a leaf collection program in the fall, from late October to early December. All other yard waste materials are excluded. The quantity of leaves recovered during these collections is estimated at 110 tons per year. At all other times of the year Monroeville's yard waste, including leaves, is collected along with other municipal waste and is disposed at a landfill. The estimated annual quantity of yard waste generated nationally in 2005 was 32.07 million tons per year. Based on population it is estimated that 3105 tons of yard waste was generated in 2006 in Monroeville. At the national rate, Monroeville could expect to be recovering about 1922 tons. Based on the frequency of collection and typical generation rates, it is estimated that approximately 1114 tons of yard waste could be collected in Monroeville if people adhered to the program. Currently only 5% of the expected national recovery rate is reported by the municipality.

Analyzing Monroeville's Performance

Table 2 presents an analysis of Monroeville's municipal solid waste recovered for recycling as compared to national figures based on 2005 data for the Franklin Study, *Municipal Solid Waste in The United States: 2005 Facts and Figures*. The report is a periodic review of the national recycling activities that is conducted for and issued by the USEPA.

Column I in the table lists categories of materials in both the residential; and commercial segments of municipal solid waste (MSW).

Column II entitled "Expected Generation" presents the quantity of each material expected to be generated as waste in Monroeville if it were produced at the national rate as determined by the Franklin Study.

Column III entitled "Expected Recovery" presents the quantity of the material expected to be recovered in Monroeville if it were captured at the same rate as it is nationwide.

Column IV entitled "Reported Recovery" presents the reported recovery of the various materials as reported as recovered in Monroeville annual report to Allegheny County. Adjustments were made to account for commingled materials and yard waste.

Column V, the final column, presents the reported recovery as a percentage of the expected recovery if the materials were recycled at the national rate.

Table 2 – Comparison of Expected and Reported Recovery

Material	Expected Generation Tons Per Year	Expected Recovery Tons Per Year	Reported Recovery Tons Per Year	Percent of Expected Recovery
Residential Curbside:				
Glass	1057	267	-	-
Aluminum	184	67	-	-
Bimetal Cans	206	130	-	-
Plastic	687	65	-	-
Total Curbside:	2134	529	531	100.4%
Residential Drop-Off:				
Newspapers	1166	1037		
Magazines	251	97		
Total Drop-off	1417	1134	183	16.1%
Commercial:				
OCC	2994	2141	2721	127.1%
Office Paper	637	399	103	25.9%
Other:				
Yard Waste	3105	1922	110	5%

Assessment of Performance

The following preliminary conclusions are based on a review of the figures shown in Table 2.

- When compared to national norms, the existing curbside program is reasonably effective in recovering the specific items designated for recycling.
- The drop-off collection program, which is limited to newspapers and magazines, has demonstrated some margin of success. However, it leaves a considerable amount of newspaper, magazines and other waste paper uncollected. That it is less effective in recovering the maximum amount of material is particularly noticeable when compared to the relative success of the curbside program for other recyclables.

- The noticeably high rate of OCC recovery may be the result of the high density of commercial retailers in Monroeville. “Big box” chain stores are typically diligent in diverting this material from disposal.
- Given the concentration of offices within Monroeville, the recovery rate for office paper appears low. Activity may be underreported, as information from only one waste hauler was included in the report. Alternatively, it is possible that some office complexes simply do not comply with the Monroeville’s Recycling Ordinance.
- Leaves are collected for only a brief portion of the year. If collection periods are extended, and if all types of leaf waste or yard waste are included, the quantity collected could dramatically escalate based on national norms.

Opportunities for Improvement

Monroeville’s curbside collection program has been effective in capturing those materials designated for recycling at a rate comparable to national trends. Residents have demonstrated a reasonable willingness to separate and divert the current materials from disposal. However, that success is limited to recovery of aluminum and bi-metal cans, glass jars, as well as, #1 and #2 plastic containers. Additionally, although to a lesser degree, many residents are willing to separate and transport for recycling other materials to drop-off sites. Newspapers and magazines are currently collected in this fashion. The current rate of recovery coupled with the desire of many residents to recycle more suggests that if additional materials were added to the curbside program, similar results could be expected for those items.

Before the municipality commits to this course of action, it is important to explore the impact that such a change could have on residents, employees and the General Fund. Following is an outline of the issues Monroeville should review in the decision making process.

Feasibility Factors

In order to capture more material at the curb, Monroeville will need to make adjustments to its collection system. Several components of the system must be examined to determine if the return on more material justifies the cost and investment in its recovery. Certainly a top priority for municipal officials is to ensure that the equipment targeted for a program contributes to its operational efficiencies. Secondly, the collection methodologies should be user friendly while maintaining the health and safety of the laborer. Ultimately, after capital outlays, labor, fuel, maintenance, administration and revenue are considered, the net cost will be the determining factor.

Capacity

Currently, public works crews annually transport 530 tons of recyclable material collected from 9000 single family detached homes. Using Labrie 17 cubic yard packer bodies mounted on two 2002 Freightliner FL-70 chassis each vehicle collects 5.1 tons of material from 2250 homes per week. This is the equivalent of 4.54 pounds per home. The material is taken to Pittsburgh Recycling in Glenwood where it is sorted and processed for sale on the commodities market.

Assuming that Monroeville had 100% participation, each home could potentially place .099 cubic yards of material at the curb based on the use of a 20 gallon container with a conversion rate of .00495 cyds per gallon. Each vehicle then would collect 44.55 loose yards of material per day. If the vehicle had a moderate compaction ratio of 2.5:1, this would present approximately a full load, which at an average weight of 106 pounds per cubic yard for commingled material, would weigh 2.36 tons.

The inbound vehicle weights reported from Pittsburgh Recycling indicate that actual loads delivered from Monroeville commonly weigh from .66 tons to 2.2 tons depending on the time of year and when occasionally only four loads were delivered in a week. This is an average total of 1.01 tons per day per route, or about half the route potential. The tonnage is the equivalent of a 50% set-out rate, which is common in traditional curbside collection programs, where, other than mandates, no incentives have been provided to recycle.

From these statistics one could conclude that the equipment utilized in the current system does not typically reach maximum capacity. In fact, loads appear to be delivered half full. Therefore, it provides options for Monroeville to add more materials for curbside collection. It also offers evidence that route productivity could be adjusted to typical set-out rates allowing each vehicle to service more homes per day.

Capture Rate

The drop-off collection program, which is limited to newspapers and magazines, has demonstrated some margin of success. However, it leaves a considerable amount of newspaper, magazines and other waste paper uncollected. Currently nearly 1000 tons of newspapers and magazines in Monroeville are still disposed in landfills. A similar situation exists with other mixed paper. In most homes, junk mail, office and computer paper, etc. are commonly found in significant quantities. This is true to an even greater degree where one or more residents work from a home office. Residential sources generate about 25% of the mixed office paper contained in municipal solid waste. In Monroeville this represents approximately 160 tons.

According to data compiled by the USEPA, *Business Guide for Reducing Solid Waste; EPA/530-K-92-004; November 1993*, loose, unbaled newspapers

weigh 360-500 pound per cubic yard. When, compacted the density increases to 720 to 1000 pounds per cubic yard; a compaction ration of 2:1. A 12 inch stack of newspapers weighs approximately 35 pounds. If residents participate in the recycling of newspapers, magazines and other mixed paper at the same level as with metals, plastics and glass, then the municipality could expect to collect 9.91 pounds per home per pick-up, the equivalent of a 3.5 inch stack of newspapers. Based on an average of 450 homes per route, this would add 2.23 tons and approximately 12.39 loose cubic yards to each load. When compacted, this material will occupy 6.19 cubic yards or less. This represents about 36% of the current vehicle's 17 cubic yard body, which, according to the information provided, is on average operating at about half capacity. Thus, depending upon routing, sufficient capacity may exist in the existing vehicles to accommodate waste paper. Additionally, a 3.5 inch stack of paper would occupy 25% of the capacity of the 20 gallon recycling bins, which are approximately 14 inches in height.

The volume of material projected for recovery suggests Monroeville should acquire and distribute containers before it can expand its program. This would be essential if Monroeville opted for a dual or single stream program. The expected capture rate indicates that vehicle capacity is sufficient to incorporate mixed paper in a single stream recycling program.

Consumer Acceptance

It is common for local decision makers to use a cost-benefit analysis to determine the types and levels of services to provide to the public. With recycling, this is challenging because the operational costs of a curbside recycling program can typically be defined, but the benefits people get from the service are more intangible. Perceived or contingent value is one way to measure the benefits realized by residents. In order to translate that value into something more tangible, researchers and analysts often use consumers' "willingness to pay" as a factor.

User acceptance of a program is critical if it is to sustain participation and recover the maximum volume of material. Elements of a recycling program that require effort by the participants typically influence behavior and attitudes. The ease or difficulty in preparing materials; the number of materials that must be sorted prior to collection; the storage space for intervals between collections; the ease or difficulty in getting materials to the curb; and the frequency of collection can mean the difference between a successful or failed endeavor. These items either individually or combined have impact on service costs. Therefore, Monroeville will need to determine both the cost threshold and also the degree of convenience at which residents will consider the transition of mixed paper collection from drop-off to curbside as a benefit. The necessity for direct or indirect user fees and public tolerance for any increases will be determining factors.

Cost

According to information provided by municipal officials, the annual waste management budget is \$1 million. Transportation represents at least 60 -70% of the costs of most waste management programs. Therefore, operations managers are encouraged to perform route audits on a regular basis to evaluate vehicle performance, worker productivity, unintended driver modifications to route sequences and unbilled service stops. The municipality was unable to provide any route collection statistics. However, this information could play an important role at many levels as a move from drop-off to curbside collection is considered. Information regarding transport of the materials for processing was more forthcoming.

The Public Works Department did provide an educated estimate of costs to provide recycling services. Essentially, each route costs \$100,000 annually for a total of \$200,000 or \$48 per vehicle hour, based on a 40 hour work week. The turnaround time from the heart of Monroeville to Pittsburgh Recycling, including unloading of the materials is approximately 1.5 hours. The material is transported 5 times per week per vehicle for a total of 780 trip hours per year, and a cost of \$37,440. Monroeville generates \$7 per ton, or \$3715 annually, from the sale of the curbside material. Additionally, the drop-off program generates revenue of \$5285 from Atlas Paper. Therefore, for the overall program, the current net cost per home is \$21.22 per year or \$0.81 per pick-up. These costs are currently paid through the municipality's General Fund.

Monroeville already realizes revenue from the sale of its recyclable materials. The municipality should benefit from an increase in volume with added income not only from commodity sales, but also in the form of additional Act 101 Recycling Performance Grant funds. It will however also incur additional costs.

Based on the analysis of the projected capture rate and current vehicle capacity, the inclusion of additional materials in Monroeville's program will likely increase the number of loads collected and delivered and the time associated with those activities. Choices in equipment, collection methodologies, location of processing facilities and negotiated commodity rates must all be considered for the overall program to be cost effective.

Options

Municipal officials have a variety of options to consider both independently and in conjunction with one another. An entire overhaul of the current collection program may not be financially feasible at this time. However, failure to look at the long term impact of today's decisions could prove more costly in the near future. A more prudent approach might be to consider the waste management program much like the review of a planned residential development. While it is necessary for developers and planners to consider the

full build-out of a development, projects are typically broken down into smaller incremental phases. Each phase of construction is intended to compliment and strengthen what preceded it until, eventually; the cumulative effect is a functional community. The same process can be applied to planning a revamped infrastructure for collection and processing of municipal solid waste.

For example, the types of containers purchased now could either constrain or expand the municipality’s ability to take full advantage of vehicle capabilities available in future models. Focusing only on equipment purchase prices without considering the benefits of costlier features could add to the overall operational costs. Future productivity, injury prevention, insurance, payload, and material handling should be factored into the decision. Additionally, container and/or vehicle capacity not only factor into route size and frequency of collection, but also in the ability to comply with future regulatory mandates or shifts in commodity pricing.

The following narrative describes methods of collection most appropriate for Monroeville to achieve its goals and objectives. It offers commentary on equipment applications and compatibility. Short term and long range benefits are considered.

Collection Methodologies

Dual Stream

Dual stream collection is arguably the most common system utilized in municipal curbside programs. In this system, metal, glass and plastic containers are commingled together in one bin. Fiber (newspapers, magazines, junk mail, etc) is separated from the commingled material and placed either in another container, in the same container with a divider, in a bag or tied and bundled and placed next to the commingled container.



Dual Stream Collection Two Bins



Often lidded containers are used to protect the fiber from moisture and to prevent papers from blowing through the neighborhood. Containers with hinged lids are often preferred to reduce the incidence of lost lids after collection. Additionally, hinged lids can save laborers the few seconds it takes to remove and replace a lid. Some communities provide stacking bins, which can be used with a wheeled rack to facilitate easier transport of the bins to the curb.



Carts Represent More Capacity in the Same Footprint

Wheeled carts have become a popular alternative because they are seen to have numerous advantages. Carts have hinged lids, can be wheeled to the curb and typically have more storage capacity. Although the height of the carts makes them appear difficult to store, they actually occupy the same footprint or floor space as a traditional bin.

Cart with Divider



Primarily, though, the trend in using wheeled carts has been fueled by the ability to service these containers with semi or fully automated vehicles. The automation enables the driver to empty the container without having to lift it manually. In a fully automated vehicle the driver does not have to exit the cab to service the container, allowing one person to operate a route. This technology is favored by operations managers because of the savings in labor, reduction in injuries, fatalities, and worker’s compensation. The ability to reduce frequency and collect a greater variety of materials, because of greater storage capacity of the cart, are other benefits.

In all of the scenarios except that using a split or divided cart, residents must take a combination of containers, bags or bundles to the curb on the day of collection. Alternatively, residents must remember which material, whether commingled or fiber will be collected in alternating weeks and place the appropriate container at the curb.

When all materials are collected on the same day, items may be collected in two passes of a single vehicle, one pass of a single vehicle capable of collecting two streams, or by two vehicles each designated for a specific commodity.

Single Stream

The fastest growing trend in recycling is single stream collection. In this system, also referred to as fully commingled, all materials are placed into one container for curbside collection. Material is transported to a facility where it is sorted mechanically. Typically, because of the large volume and weight of materials placed at the curb for collection, carts and semi or fully automated vehicles are utilized for service. A few programs use traditional bins, but the potential for lifting injuries deters most operations managers from attempting it.

Single Stream Places All Materials Together in One Cart



Locally, two townships in Allegheny County and one in Butler County have successfully implemented single stream recycling programs in conjunction with a switch from unlimited waste collection to “pay as you throw”. The combination of the monetary incentive, provided from charging residents for the actual volume disposed and the convenience of single stream provided impressive results. Participation rates have grown in these communities from an average 50% set-out rate to a consistent 90% set-out. Additionally, recovery rates have increased from a low of 9%-15% to an average of 40%. The addition of mixed paper and corrugated cardboard to the previous mix of designated recyclables played an important role in these results.



Manual Collection

Currently, like most **Manual Dual Stream Is the Most Common Collection System** municipalities,

Monroeville implements a manual commingle collection system. Crews consist of a driver and either one or two helpers, who physically lift the recyclables into open body compaction vehicles. These systems have operated successfully for years. However, they do provide some drawbacks.

Split Body Vehicles Can Improve Productivity



It is not uncommon for residential collection crews to experience significant employee turnover because of the physical demands of the job.

Exposure to the elements, unpleasant material handling, repeated lifting and other hazards eventually take their toll on workers. The advantage of

continuing with a manual process is the lower replacement costs. Depending on model features and capacity, manual vehicles can be as much as \$100,000 less expensive than other options.

Split body vehicles capable of collecting both commingle and fiber in separate compartments often improve route efficiencies and cut labor costs in the right applications. Route size and distance to the processing facility will dictate the practicality of such a purchase. Balancing the volume of each material stream with the capacity and compaction capabilities of the split body is essential to ensure optimal performance.

Vehicles are available with either rear loading or side loading capabilities. Models with semi and fully automated features are often partnered with divided carts to maximize productivity.

Automated Collection

The technology to automate residential collection has grown since its introduction over a decade ago. There are variations on the degree to which automation replaces labor.

Semi Automation

Semi-automated vehicles provide a cart tipper which still requires a worker to exit the vehicle and attach the cart to the mechanical lifting device. Most operations still utilize a driver and a helper with semi-automation. Therefore it does not necessarily reduce labor hours in that respect. Nevertheless, it does significantly reduce shoulder and back injuries, resulting in huge savings in worker's compensation, elimination of down time, and costs associated with rehiring and training. The increased cart capacity, can also reduce route frequency

Semi Automation May Not Reduce Laborers



Full Automation

Full automation does cut labor costs in half because each vehicle requires only a driver to service the entire route. When compared to a manual dual stream collection system, the fully automated process has been shown to decrease overall costs by increasing productivity and minimizing on-the-job injuries. This is particularly true with single stream recycling.

In Western Pennsylvania, communities where automated routes have been piloted, productivity has doubled. Routes that previously serviced 500 homes with a driver and a helper are currently serviced by one driver collecting from 1200 homes. However, a large initial capital investment to overhaul the collection systems is required to realize the operational efficiencies.

Timing is everything in switching to automated collection. It is most beneficial to initiate the transition when trucks and other equipment are due for replacement. The startup costs of the switch-out will include items other than the equipment. Significant public education and outreach in repetitive and varied formats will be necessary.



Fully Automated Collection - More Homes in Fewer Hours with Less Manpower

Outlets and Revenue for Materials

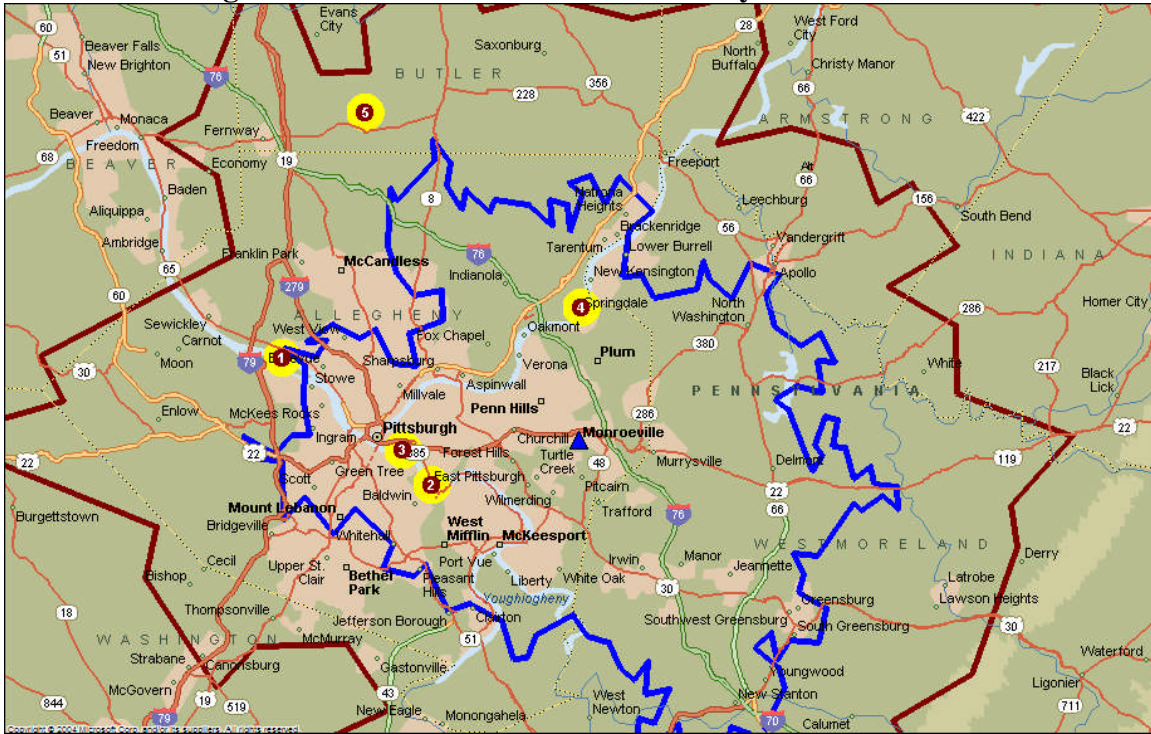
The current healthy state of the commodities market for recyclables presents opportunities for municipalities to generate revenue from their collected material. Monroeville currently receives \$7 per ton, or \$3715 annually from the sale of the curbside material. Additionally, it is paid an average of \$29 per ton or \$5285 for newspapers and magazines from the drop-off program after hauling costs have been deducted. These rates are paid by Pittsburgh Recycling and Atlas Paper, respectively. Assuming that the municipality would be paid the pre-hauling rate of \$60 per ton for mixed paper collected in a dual stream system, and if the current and future expected volume of paper was recovered, the paper income could increase to \$80,640. This would provide a total income of \$84,355.

Alternatively, inquiries were made to determine the local market value of the curbside materials if they were collected in a single stream system. Based on a casual quote of \$20 per ton, the municipality would realize total revenue of \$37,140.

Because transportation is the most significant cost factor in municipal programs, one must consider the value of the additional revenue against the cost of retrieving and delivering material to the processing facilities. Figure 1 illustrates the distance from the center of Monroeville to the processing facilities within reasonable driving distance. It also provides relative roundtrip drivetime based on speed constraints of a collection vehicle and an average tipping floor time of 30 minutes.

Firm pricing will not be provided by the facilities until municipal officials solicit a formal request. Additionally, for all but one of the available facilities, distances do not differ significantly. Therefore, a comparative analysis for each facility under each collection method is not provided. An assumption will be used that dual stream and single stream rates would be similar in the various processing facilities with such capabilities. This may or may not prove to be accurate in a true competitive bidding situation. However, it will provide Monroeville with a method of evaluating a transition from drop-off collection to curbside. Additionally, it will offer some comparative values in the methods of collection and equipment utilized based on the number of routes and trips required to deliver material for processing.

Figure 1 – Drivetime to Material Recovery Facilities



30 Minutes One Way

45 Minutes One Way

Table 3 – Material Recovery Facilities

Facility	Location	Capabilities	Roundtrip Drivetime & Unloading
1. Recycle Management Corporation	4100 Grand Avenue Neville, Island, PA (412) 771-4103	Single Stream	90 Minutes
2. Pittsburgh Recycling	50 Vespuccius St Pittsburgh, PA (412) 420-6000	Commingle	72 Minutes
3. Atlas Paper Service, LLC	2329 Wharton St & South 24th Pittsburgh, PA 15203	Paper	70 Minutes
4. Stanson Paper Processing LLC	876 R I Lampus Ave Springdale, PA (724) 275-7285	Paper	74 Minutes
5. TC Recycling LLC	120 Hutchman Rd Mars, PA (724) 625-9000	Single Stream	110 Minutes

Sample Scenarios

This report has presented a variety of collection methodologies, equipment applications and combinations that would be reasonable for municipal officials to consider. Without adequate route productivity data, it is impossible to accurately project in this report the true costs of any particular option. It is likely though that a review of different scenarios will reveal whether the transition from drop-off to curbside collection is feasible from a budgetary and customer perspective. In addition, it should provide a glimpse of favorable options given similar conditions.

Equipment and Labor Costs

In order to compare the various options, the current cost of collection and revenue receipts provided by Monroeville were used as benchmarks. It was unclear how the municipality allocated cost for vehicle replacement. Therefore, in all scenarios those costs are not included in the actual collection rate. These are important expenditures to consider and should be factored into any final decision. The cost of collection containers has been included in each collection rate where it is applicable.

Option A Dual Stream

Option A-1 Manual Dual Stream

From an equipment perspective, the simplest approach for Monroeville is to provide another bin to each household. At approximately \$8 per bin, distribution to 9000 single family detached homes would cost Monroeville \$72,000. This is a reasonable investment considering the life of a recycling bin is probably 10 years. There are, however, operational issues that should be considered.

Based on the lack of current available vehicle capacity, it is estimated that either the frequency of collection or the number of routes would need to double in a manual dual stream system. Because no productivity data was provided by the municipality, it is unknown how long it actually takes each crew to service the routes. Therefore, it is assumed that each crew works or gets paid for an eight hour day. To increase frequency or number of routes, it is likely that two additional vehicles must be acquired and two additional crews must be hired. A conservative approach would be to purchase two late model vehicles of similar design to those currently in use for an estimated total cost of \$120,000.

In any event, if the current cost of collection is \$48 per hour and vehicle hours are doubled, it would seem reasonable to expect that the cost of collection would also double. The cost to transport material to Pittsburgh Recycling is currently \$37,440. If the trips would double then it is reasonable to assume that the cost will be \$74,880. If the current overall budget were to double the total cost of collection and transport for processing would be \$400,000. With

potential material sales of \$84,355 the net cost of the program would be \$315,645. This represents an annual cost per home of \$35.07 or \$1.34 per pick-up, an increase of \$0.50 per pick-up.

Some thought was given to the possibility of establishing a transfer point in Monroeville. Here municipal vehicles could off load the fiber into a trailer, which would then be transported to a processing facility. Although the municipality may realize a savings in transport of \$37,440 by decreasing the number of trips to the processing facility, they would lose \$45,379 in revenue to compensate for the trailer haul rate. Total revenue would be \$42,691 with a net cost of \$319,869.

Aside from the cost, the disadvantage of this option is that Monroeville would still have limited capacity to add an even greater variety of material for curbside collection in the near future, particularly in the event that pending disposal bans will be enacted. Purchasing bins would not make it practical to initiate the first phase toward fully automated collection anytime soon.

Option A-2 Manual Dual Stream with Larger Capacity Split Body Vehicles

The potential may exist to consolidate routes through increased productivity, larger capacity split body vehicles to reduce costs, but to make that determination is outside this scope of work. The municipality will have to conduct route audits to determine if worker's are physically capable of servicing more homes in the same hours; if the compaction unit is used consistently to its full potential; that routes have been sequenced efficiently; and that they are run as routed.

While it is probable that costs in this scenario would still exceed revenue, there may be some opportunity to reduce two routes. Similar to Option A-1, this scenario would require the purchase of new traditional bins for each home at \$72,000. In addition, it would require purchase of two new or late model split body vehicles. The cost is estimated at from \$150,000 to \$425,000 depending on, make, model and features. Both of these equipment expenditures are eligible for Act 101 Section 902 Recycling Fund Grants.

One drawback of a split body is that the ratio of materials must be considered so that the vehicle does not fill disproportionately mid-route causing added transport. Additionally, it loses efficiency when both materials are not transported to the same location. Municipal officials would have to compare rates for fiber and commingle at various facilities as well as distances to assess if it would have a positive or negative impact on this methodology. A determining factor in this option is if an additional 45 minutes per route is available based on actual times and productivity.

To account for extra transport to a second facility and dual unloading, an additional 45 minutes was added to each route per day. At \$48 per hour this amounts to an additional \$18,720 or a gross of \$218,720. The net cost of the

option based on \$84,355 in revenue is \$134,365. More variables can impact this scenario than others can. Therefore, more analysis is recommended

Option A-3 Semi-Automated Dual Stream Alternating Weeks

This scenario would assume an investigation into the same route efficiencies discussed in Option A-2. Either vehicle purchases would be required, although with the added feature of cart tippers, or current vehicles could be retrofitted with cart tippers. The advantage that this option might possibly present would be the ability to collect fiber and commingle each one time per month due to the extra storage capacity of the carts. This could facilitate an alternating week collection, thus keeping collection costs relatively the same. Another benefit would be the ability to add even more material to the program in the event of future disposal bans for cardboard. Lastly, the addition of carts would ease the municipality closer to full automation.

Depending on number, make, model and other added features, vehicle purchase would likely be similar or just slightly more than Option A-2. To simply retrofit existing vehicles with cart tippers would be less expensive. A significant added expense for this option would be the purchase of two carts for each home; one cart for fiber recycling and one for commingle. For 9000 homes, two 65 gallon carts per home at approximately \$45 per cart would cost \$810,000

Carts, like the bins, and the vehicles, are Section 902 grant eligible. Many communities plan for the cart replacement by adding the cost of the cart into the monthly collection bill. The carts can be depreciated over 7 years, for an additional \$0.52 per pickup per home and a net cost of \$231,359 based on \$84,355 in revenue and similar collection and transport times.

Option B Single Stream

Option B-1 Semi-Automated Single Stream

Based on the revenue differential between the two systems, single stream collection does not look favorable on the surface. However, it is still worthy to explore simply to assess if savings from operational efficiencies would outweigh the decreased revenue. Because all of the material is collected together in the same container and transported in the same body to the same location, this has the potential to reduce drivetime as well as unloading time.

Much like Option A-3 that uses Semi-Automation for Dual Stream, this scenario would require the purchase of at least two new or late model larger capacity vehicles equipped with cart tippers with costs ranging from \$170,000 to \$425,000 depending on number, make, model and features. Alternatively, current vehicles could be retrofitted with cart tippers. Carts would also be required. To handle the total volume of fully commingled materials, it is recommended that 96 gallon carts be utilized. At \$50 per cart, the cost to provide one to 9000 homes is \$450,000. Further, recycling vehicle and cart

costs are Act 101 Section 902 Recycling grant eligible for 90 percent reimbursement. If the carts were depreciated 7 years the additional cost per home would respectively be \$0.29 per pickup per home and a net cost of \$227,145 based on \$37,140 in revenue and similar collection and transport times.

Option B-2 Fully Automated Single Stream

Fully automated collection is not applicable in every community. Certainly there are areas in Monroeville which would be difficult to service in this fashion. However, there are enough suitable areas to explore the impact of transitioning one route to full automation. Because of the anticipated increase in productivity, it is possible that one driver could provide service to 900 homes per day. If this were done in conjunction with an automated waste route the municipality could save 2.5 route days. Theoretically, the same vehicle could service homes for both waste and recycling resulting in a savings of 5 route days overall.

A purchase of one 96 gallon cart @\$50 per cart for 9000 homes would be \$450,000. One fully automated vehicle at a cost of \$250,000 per vehicle would also be necessary. However, the increase in productivity and savings in labor costs can often offset the investment. Similar to the other options equipment utilized for the collection of recycling, such as vehicles and carts, is eligible for 90 percent reimbursement through Act 101 Section 902 Recycling Grants.

Act 101 Leaf Waste Compliance

As an Act 101 mandated municipality, Monroeville is required to provide curbside collection of leaf waste. While the letter of Act 101 specifies that this collection must occur once per month, PADEP guidelines are more generous in the interpretation. According to the technical guidance, mandated municipalities must provide at least one curbside collection in the spring and one in the fall. Provided those are sufficient, the municipality may provide a drop-off point for the collection of leaf waste for the remaining periods of the year. (A copy of the guidelines is provided in Appendix A)

Currently, Monroeville conducts a leaf collection program in the fall, from late October to early December. It does not collect the full compliment of leaf waste which is defined as "*Leaves, garden residues, shrubbery and tree trimmings, and similar material, but not including grass clippings.*" The quantity of leaves recovered during these collections is estimated at 110 tons per year. Except for this brief seasonal collection, all leaf waste placed at the curb for collection is disposed at a landfill.

In order for Monroeville to be in compliance with Act 101, it must broaden the types of material accepted for collection to include all forms of leaf waste; provide a similar period of collection in the spring as it currently offers in the fall; offer a drop-off site to accept all forms of leaf waste throughout the year; and ensure that the leaf waste is processed.

Since Monroeville already provides one seasonal curbside collection, it would not be difficult to duplicate those efforts in the spring, albeit at an additional cost. For the drop-off site it is suggested that the municipality offer a location, which operates during specific limited hours, weekend hours preferably, under the supervision of municipal personnel. During off hours, it is recommended that the area be secured and fenced to deter illegal dumping and contamination. The drop-off site should be convenient for residents and in an area that is easily monitored by staff. Some consideration should be given to the chipping and shredding of inbound material in order to reduce the volume for composting or to produce mulch. Material can be distributed to residents or utilized on Monroeville's properties. If heavy traffic is anticipated, or if other activities, such as HHW or E-Waste collection events are planned for the same location, then traffic flow, tractor trailer access, storage capacity and potentially paved areas should be addressed in the planning and development.

Conclusions

Monroeville's desire to add mixed paper to the existing curbside collection program seems feasible. The anticipated revenue will not cover the cost of collection. In some scenarios, when route hours can be maintained at the current rate, the added revenue provides for a lower net cost. The least cost option presented is for semi-automated single stream collection. A close second is semi automated dual stream collection on alternating collection weeks. Equipment purchases will be necessary to accomplish the operational cost reduction. These will include a combination of, vehicles, cart tippers and wheeled carts. Municipal officials will have to determine if the one cart convenience of single stream is favorable to the two cart alternating method. Available vehicle capacity and public acceptance will likely guide the decision.

Upgrading the leaf waste collection program to comply with Act 101 guidelines appears to be easily accomplished. The municipality must add a curbside collection period in the spring similar to the one it already offers in the fall. Additionally, it should designate a parcel of property that can be secured and monitored to facilitate drop-off collection of leaf waste.

The intent of this report was to provide very basic comparisons of available collection methodologies. More detail is required to make absolute recommendations. Actual collection performance data, labor, fuel and maintenance costs, as well as equipment depreciation should be applied during

the final decision making process. Gathering that information is beyond this scope of work.

Route audits are the best way to accurately assess equipment applications, worker productivity, lost revenue and consumer participation. It would benefit Monroeville to make route auditing a regular routine to control costs and seek opportunities for added material recovery.



Nestor Resources, Inc.

Appendix A

PENNSYLVANIA'S ACT 101 LEAF WASTE COLLECTION REQUIREMENTS

Act 101, Section 1501(c)(1)(ii) and (iii), requires persons in mandated municipalities to separate leaf waste from other municipal waste generated at residential, commercial, municipal and institutional establishments. "Leaf waste" is defined in the Act and its regulations as "Leaves, garden residues, shrubbery and tree trimmings, and similar material, but not including grass clippings." Source separated leaf waste, as with other recyclable material, is to be collected at least once per month as set forth in Act 101 Section 1501(c)(2) and (3) and processed at Pa. DEP-approved composting facilities.

Act 101 mandated municipalities with programs that collect leaves only in the fall are not in compliance with the Act. Mandated municipalities desiring to establish leaf waste collection programs in compliance with Act 101 must, as a minimum:

1. Require by ordinance that leaf waste consisting of leaves, garden residues, shrubbery and tree trimmings, and other similar material are targeted for collection from residences and commercial, municipal and institutional establishments; and
2. Establish a scheduled day, at least once per month, when leaf waste is collected from residences; or
3. Establish a scheduled day, not less than twice per year and preferably in the spring and fall, when leaf waste is collected from residences, and facilitate a drop-off location or other collection alternative approved by Pa. DEP that allows persons in the municipality to deposit leaf waste for the purposes of composting or mulching at least once per month. The leaf waste drop-off location may be located in a neighboring municipality or at a private sector establishment provided that an agreement is in place to utilize that location and the municipality keeps residents and commercial, municipal and institutional establishments informed of the option at least once every six months.
4. Ensure that commercial, institutional and municipal establishments generating leaf waste have collection service.
5. Municipalities are encouraged to manage source separated Christmas trees as leaf waste for processing at Pa. DEP-approved composting facilities.



Nestor Resources, Inc.