

# Dual Stream Recycling Program Considerations and Costs

Springfield Township  
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**SCS ENGINEERS**

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# 1 PROJECT DESCRIPTION

Springfield Township (Township) is an Act 101 mandated recycling community. The Township collects single-stream recyclable materials curbside from residents on a weekly basis. Springfield Township is part of the Montgomery County Recycling Consortium (Consortium) that comprises seven municipalities, which includes Hatboro Borough and the following Townships: Abington, Cheltenham, Plymouth, Upper Dublin and Upper Moreland. The Consortium owns a transfer station in Abington Township where recyclable materials collected by each member municipality are consolidated prior to being transported to a processing facility. The Consortium contracts with a private company to operate the recycling transfer station, transport materials for processing, and process and market the materials. Approximately 15,000 tons of recyclable materials are brought to the transfer station annually by Consortium members.

The Township, along with other consortium members, experienced an increase in their processing rate for recyclable materials of nearly 37 percent from \$98.78 per ton to \$135 per ton. In addition, the cost to dispose of residue from recyclable materials increased from \$80 to \$84 per ton. The rising processing and collection costs, together with contamination issues and the depressed recycling market, requires a closer examination of the way the Township and other consortium members collect and process recyclable materials.

Recycling technical assistance for Springfield Township includes evaluating the operational and financial impacts of transitioning single-stream recycling programs to dual stream. In this type of a program, paper/fiber materials are collected separately from plastic bottles, metal cans, and glass containers to maximize the sales value of the material and reduce contamination. This project is one of several recycling technical assistance studies that will address recycling issues in Montgomery County. The objective of all studies is to transition Consortium member recycling programs into cost-effective and sustainable programs that serve the needs of residents and comply with the Pennsylvania Municipal Waste Planning, Recycling and Waste Reduction Act of 1988 (Act 101).

## 2 SUMMARY OF WORK

This section summarizes the tasks completed for this project.

### **Task 1 – Data Collection and Site Visit**

The project team prepared and submitted a data request to obtain recycling program data. Data and information provided program understanding and helped frame the approach for the project. The project team traveled to Springfield Township to meet with staff to discuss project details. The project team filled in data gaps on recycling collection program specifics. This site visit included field observations of recyclable material collection operations at Springfield Township along with other consortium member programs.

### **Task 2 – Identify Operational Needs/Changes**

For this task, the project team identified and described collection program modifications and changes that would be required to transition to a dual-stream collection program. Collection program aspects to be reviewed will at a minimum include rolling-equipment needs, staffing requirements, container upgrades, and operational/logistic conditions.

### **Task 3 – Estimate Costs**

Planning level costs were estimated to understand the financial implications of potentially transitioning single-stream recycling programs to dual-stream. Costs are based on the operational needs/changes identified as part of Task 2.

#### Task 4 – Final Report

Information, data, and recommendations identified as part of Tasks 1-3 are included in this report.

### 3 CURRENT PROGRAM

The seven municipalities that comprise the Consortium each provide direct solid waste and recycling collection services to residents in their respective jurisdiction. Recyclable materials are collected using municipal equipment and collection crews. Six of the seven municipalities collect materials using a single stream collection program. The seventh municipality, Abington Township, utilizes a dual stream collection system whereby paper materials (including cardboard) are collected in one cart while plastic containers, metal cans, and glass bottles are collected separately in a different cart.

Consortium members direct-haul single-stream recyclable materials to the Consortium owned recycling transfer station located at 1030 Fitzwatertown Road in Abington Township. Abington Township, operating a dual-stream collection program, direct hauls their mixed containers to the recycling transfer station while paper is transported to their Public Works Facility for consolidation in transfer trailers for shipping to Newman and Company, Inc. in Philadelphia. After consolidation of single stream materials at the transfer station into open top trailers, recyclable materials are transported to Total Recycle, Inc. in Birdsboro where the materials are then sorted, baled, and marketed.

**Table 1** summarizes the characteristics of each Consortium member’s municipal recycling program. SCS Engineers estimates that collectively the Recycling Consortium operates 76 recycling collection routes. In 2019, the Consortium diverted nearly 15,000 tons of recyclable materials. **Figure 1** provides a visual summary of recycling collection operations by Consortium members.

Table 1. Consortium Member Recycling Program Specifics

Consortium Member	Households Serviced	Program Type	Automated or Manual	Containers	Collection Frequency	Routes Operated per Day	Collection Days per Week	Total Routes	2019 Recycling Quantities (tons)
Abington <sup>1</sup>	18,200	Dual Stream	Automated	35 or 65 gallon carts	Weekly	6 (3 paper, 3 commingled)	5	30	2,910
Cheltenham	9,467	Single Stream	Automated	35, 65, or 95 gallon carts	Weekly	3	4	12	3,008
Hatboro	2,200	Single Stream	Manual	32 gallon containers	Weekly	1	4	4	660
Springfield	6,900	Single Stream	Manual	32 gallon containers	Weekly	1	5	5	2,222
Upper Dublin <sup>2</sup>	8,500	Single Stream	Automated	64 gallon carts	Weekly	2	5	9	2,803
Plymouth	4,900	Single Stream	Manual	32 gallon containers	Weekly	2	4	8	1,265
Upper Moreland	7,200	Single Stream	Automated	96-gallon carts	Weekly	2	4	8	2,029
<b>Totals</b>	<b>57,367</b>							<b>76</b>	<b>14,897</b>

<sup>1</sup> Abington's annual per household recovery is low because paper materials are diverted to another processor.

<sup>2</sup> Upper Dublin operates a cardboard only collection route one day per week in addition to two recycling routes four days per week.

Figure 1. Collection Operations by Consortium Members



Springfield Recycling Collections



Upper Dublin Recycling Collections



Abington Recycling Collections



Abington Paper Consolidation at the Public Works Facility



Tipping Recyclable Materials at the Recycling Transfer Station in Abington



Typical Curbside Recycling Collection



## 4 COLLECTION METHODS

There are three main types of curbside recycling collection programs operating in the United States today. These include single stream, dual stream, and source separated. All Consortium members, with the exception of Abington Township, have implemented a curbside single stream recycling program. Abington Township operates a dual stream collection program. No Consortium member operates a source-separated program. Brief descriptions of each recycling collection method is included below.

- **Single Stream** – All designated materials accepted as part of a recycling program are collected mixed together in the same container. This is often the simplest program for municipalities and residents. Municipalities use one collection crew and truck to pick-up the materials from each household. Residents are not required to separate materials by type. Single stream recycling programs require significant education of residents on what materials to place in the recycling bin. Costs of these programs can be higher as the materials require significant processing in order to prepare them for market.
- **Dual Stream** – In a dual stream recycling program, all paper materials, including cardboard, newspapers, junk mail, and any other recyclable paper is separately collected in a recycling container. Recyclable containers comprised of glass, plastic, and metal are collected in a separate recycling bin or compartment apart from paper. Operational costs for a dual stream recycling program can be higher than single stream as additional equipment and staff may be necessary to operate the program. However, materials collected through a dual stream program often require less processing than single stream materials. A dual stream program is more complicated for residents as they must separate paper from commingled containers.
- **Source Separated** – In a source separated recycling program, designated recyclable materials are collected separately at the curb in a compartmentalized truck. Most curbside recycling programs started as source-separation. These programs result in very clean streams of materials as collection staff sort or carefully inspect materials prior to placement in a truck. Due to advances in collection technology, particularly with respect to worker safety, source-separation of recyclable materials is being phased out. Another drawback of source separation is the inconvenience to residents in that all designated materials must be kept separate.

A nearly 37 percent increase in single stream material processing costs has prompted the Consortium to explore the potential of transition existing single stream recycling programs to dual stream. The next section of this report identifies and discusses three dual stream recycling program options for Consortium members to consider.

**Table 2** compares the impacts of different types of curbside recycling programs on municipal operations, costs, and residents.

Table 2. Impacts of Different Recycling Collection Methods

Overall Considerations	Characteristic	Collection Method		
		Single-Stream	Dual-Stream	Source Separation
Operations	Staffing	Driver and collectors	Driver and collectors	Driver and collectors
	Equipment	Materials mixed in one truck	Paper and commingled materials in separate trucks or one split-body truck	Compartmentalized truck; must be separate compartment for each unique material stream
	Pace/Speed	Fast	Fast/medium	Slow
	Automated vs. Manual Collection	Typically automated, but some manual	Either automated or manual	Manual collection only
Cost	Collections	Low	High	High
	Contamination	Varies	Varies	Typically low
	Processing	High	Medium; some single-stream MRFs provide price breaks	Low; materials often can be baled immediately with no processing
Residents	Convenience	High	Medium	Low
	Education	High	High	High

## 5 FINDINGS

SCS Engineers identified three options for transitioning Consortium single stream recycling programs to dual stream. Each program has its benefits and challenges that are provided in this section. Also included in this section are planning level cost estimates for transition single stream recycling programs to dual stream on a per route basis.

### OPTION 1: ALTERNATING EVERY OTHER WEEK COLLECTION

#### Overview

**Option 1** includes the implementation of an alternating every other week collection program. In this type of a program, materials are collected on an alternating every other week collection schedule whereby paper and cardboard materials are collected one week and commingled glass, metal, and plastic containers are collected together the following week. This option is likely to have the least amount of impact on collection operations in that Consortium members would not have to procure additional equipment or hire additional staff to complete collection activities. The same collection equipment and staff can be used to collect the materials on alternating weeks. **Table 3** summarizes the impacts of establishing an alternating every other week collection schedule for different types of recyclable materials.

Table 3. Impacts of Establishing Alternating Every Other Week Collection Schedule

Requirement	Impact
Staffing	Little to no impact; no reduction or expansion of collection staff is anticipated
Vehicles/Trucks	No additional collection vehicles needed; existing vehicles can collect materials in an alternating dual stream collection program
Carts/Containers	Requires issuing each household another container so that paper and container streams can be kept separate
Equipment Maintenance	Little to no additional vehicle maintenance expected as mileage driven would be negligibly impacted; increased number of collection containers (two per household) will require additional container supply and maintenance needs increasing costs
Routing	Rerouting of trucks may be needed to balance service stops and maximize truck capacity

## Benefits

Implementing an alternating every other week collections schedule for paper and commingled containers has the following benefits:

- **Limited Impacts on Staffing** – Of the three options considered for dual-stream collection, this option will have the least impact on staffing. Most Consortium members have dedicated staff that provide curbside collection services. Current collection staff would continue to provide recycling collection services of the small amount of material. Instead of collecting one week’s worth of generated recyclable materials each week, the collection crew would collect two weeks’ worth of either paper/fiber materials or commingled containers on a rotating basis. SCS expects neither a reduction in staff nor the need for additional staff to collect materials.
- **No Additional Vehicle Capital Expenses** – Similar to staffing, an alternating collection schedule would not require additional collection vehicles in order to complete collection activities. This assumes that both the paper and commingled containers are collected the same way with the same vehicle.
- **Cost** – With limited impacts on labor and equipment, as discussed above, an alternating every other week collection program is likely to be the least costly option for dual stream collection.

## Challenges

Despite an alternating every other week collection schedule having minimal impacts on labor and vehicle needs and therefore offering a lower cost option for dual stream collection, there are challenges to this type of a program.

- **Resident Confusion** – Implementing an alternating every other week collection schedule takes a once simple task for residents, hauling one recycling container to the curb each week, into a complicated task of requiring residents to take the right container of materials to the curb on a rotating schedule. Transitioning to a more complicated collection program is likely to draw criticism and pushback from residents that must now keep track of alternating material collection schedule. Different recycling containers for each stream will need to be distinct so they can be easily identified by residents as to what materials should be placed in the container.
- **Additional Collection Containers** – An alternating every other week collection schedule requires residents to use two separate recycling containers – one for paper and one for commingled containers. Consortium members will need to provide a separate distinct recycling container for the second stream of materials. Carts and containers are a significant expense and the shift to an alternating collection schedule essentially doubles the cost for carts/containers. Additionally, Consortium members will need to label and distribute these containers to residents. Doubling the number of carts/containers in the community incurs the additional expenses of maintaining inventory and cart maintenance.
- **Increased Public Education and Outreach** – A permanent and sustained public education and outreach program is critical to the success of any recycling program. With an extra layer of complexity of an alternating every other week collection program, each Consortium member will need to allocate additional resources into their public education and outreach program to ensure residents understand the alternating every other week program. Education must occur prior, during, and after the implementation of the new program. It will be necessary to create and publish an annual collection schedule documenting what weeks are designated for paper collection and what weeks are designated for commingled containers collection.
- **May Require Rebalancing of Routes** – An alternating every other week collection schedule may require municipalities to adjust their collection routes in order to balance collection needs and maximize the capacity of each collection vehicle. Generally, paper/fiber comprise over 50 percent of the curbside material mix and may require shorter routes because collection vehicles will reach capacity quicker.

## Costs

Transitioning to an alternating every other week collection dual stream program is estimated to be the least costly option for Recycling Consortium members. SCS developed planning level cost estimates for implementing an alternating every other week collection program for both an automated and manual collection program. Note that costs are estimated on a per route basis.

### Automated

The following three tables summarize the costs of implementing an automated every other week dual stream recycling collection program where fiber and commingled containers are collected on alternating weeks.

- **Table 4 – Alternating Every Other Week Collection – Automated Overall Costs:** It is estimated that an automated alternating every other week collection program (paper collected one

week and commingled containers collected the next) will cost about \$68,400. The additional costs are primarily for procuring and distributing an additional cart to residents for the second stream of recyclable materials.

- **Table 5 – Alternating Every Other Week Collection – Automated Amortized Costs:** Amortizing the capital costs of the new carts at four percent over a 10 year period will cost \$7,217 per year or \$72,168 over 10 years.
- **Table 6 - Alternating Every Other Week Collection – Automated Costs Per Route:** Overall the cost of implementing an automated alternating every other week collection program is estimated to be about \$16,217 per year for each route. This includes estimated operational costs and amortized capital costs.

Table 4. Alternating Every Other Week Collection – Automated Overall Costs

Cost Item	Description	Alternating Every Other Week Collection <sup>2</sup>		
		# of Units	Unit Cost	Total Cost
Labor <sup>1</sup>	Driver	0	\$95,000	\$0
	Collectors	0	\$0	\$0
Equipment	Vehicle	0	\$350,000	\$0
	Carts/Containers	990	\$60	\$59,400
Operations, Maintenance and Repair	Vehicle Maintenance and Repair	0	\$30,000	\$0
	Vehicle Operations (fuel)	0	\$12,000	\$0
	Cart Assembly and Distribution	900	\$7	\$6,300
	Cart/Containers Maintenance and Repair	900	\$3	\$2,700
	Other	0	\$0	\$0
<b>TOTAL</b>				<b>\$68,400</b>

<sup>1</sup> Labor costs provided by Upper Dublin Township.

<sup>2</sup> Assumptions include:

- Fully automated collection of materials.
- Requires a second recycling cart at each household; assumes each household already has one cart.
- 900 households per route plus 10 percent additional carts as back-up.

Table 5. Alternating Every Other Week Collection – Automated Amortized Costs

Collection Program	Alternating Every Other Week Collection
	<b>Trucks</b>
Capital Cost	\$0
Rate	4.0%
Period	8
Monthly Cost	0
Annual Cost	0
<b>Total Cost</b>	<b>0</b>
	<b>Carts</b>
Capital Cost	\$59,400
Rate	4.0%
Period	10
Monthly Cost	(\$601)
Annual Cost	(\$7,217)
<b>Total Cost</b>	<b>(\$72,168)</b>

Table 6. Alternating Every Other Week Collection – Automated Costs Per Route

Cost Item	Alternating Every Other Week Collection
Capital Cost - Truck	\$0
Capital Cost - Carts	\$7,217
Labor	\$0
Operation, Maintenance, and Fuel	\$9,000
<b>Total Annual Cost Per Route</b>	<b>\$16,217</b>

## Manual

The following three tables summarize the costs of implementing a dual stream recycling collection program where paper and commingled containers are manually collected on alternating weeks by collection staff.

- **Table 7 – Alternating Every Other Week Collection – Manual Overall Costs:** It is estimated that implementing an alternating every other week manual collection program will cost \$36,400. The additional costs are primarily for procuring and distributing an additional non-wheeled container to residents for the second stream of recyclable materials.
- **Table 8 – Alternating Every Other Week Collection – Manual Amortized Costs:** Amortizing the capital costs of the new non-wheeled containers at four percent over a 10-year period will

cost \$3,742 annually or \$37,420 over 10 years.

- **Table 9 - Alternating Every Other Week Collection – Manual Costs Per Route:** Overall, the cost of implementing an alternating every other week manual collection program is estimated to be about \$9,342 per year. This includes estimated operational costs and amortized capital costs.

Table 7. Alternating Every Other Week Collection – Manual Overall Costs

Cost Item	Description	Alternating Every Other Week Collection <sup>2</sup>		
		# of Units	Unit Cost	Total Cost
Labor <sup>1</sup>	Driver	0	\$76,200	\$0
	Collectors	0	\$72,800	\$0
Equipment	Vehicle	0	\$250,000	\$0
	Carts/Containers	770	\$40	\$30,800
Operations, Maintenance and Repair	Vehicle Maintenance and Repair <sup>1</sup>	0	\$13,000	\$0
	Vehicle Operations (fuel) <sup>1</sup>	0	\$7,000	\$0
	Container Distribution	700	\$6	\$4,200
	Cart/Containers Maintenance and Repair	700	\$2	\$1,400
	Other <sup>3</sup>	0	\$0	\$0
<b>TOTAL</b>				<b>\$36,400</b>

<sup>1</sup> Costs provided by Springfield Township.

<sup>2</sup> Assumptions include:

- Manual collection of materials.
- Requires a second recycling container at each household; assumes each household already has one container; container is not budgeted to include wheels.
- 700 households per route plus 10 percent additional containers as back-up.

Table 8. Alternating Every Other Week Collection – Manual Amortized Costs

Collection Program	Alternating Every Other Week Collection
	<b>Trucks</b>
Capital Cost	\$0
Rate	4.0%
Period	8
Monthly Cost	0
Annual Cost	0
<b>Total Cost</b>	<b>0</b>
	<b>Carts</b>
Capital Cost	\$30,800
Rate	4.0%
Period	10
Monthly Cost	(\$312)
Annual Cost	(\$3,742)
<b>Total Cost</b>	<b>(\$37,420)</b>

Table 9. Alternating Every Other Week Collection – Manual Costs Per Route

Cost Item	Alternating Every Other Week Collection
Capital Cost - Truck	\$0
Capital Cost - Carts	\$3,742
Labor	\$0
Operation, Maintenance, and Fuel	\$5,600
<b>Total Annual Cost Per Route</b>	<b>\$9,342</b>

## OPTION 2: CONTINUED WEEKLY COLLECTION SCHEDULE

### Overview

For **Option 2**, Consortium members would implement a dual stream collection program that mirrors the current program operated by Abington Township. In this program, Consortium members would retain their current collection schedule, but rather than operate one single-stream recycling truck, two separate trucks and collection crews would collect recyclable materials from residents. One truck would be designated the paper/fiber truck while a separate truck and crew would collect commingled containers. This type of a program significantly increases the costs of a recycling program. **Table 10** summarizes the impacts of establishing a collection program whereby paper and



commingled containers are collected separately the same week. The following section summarizes the benefits and challenges of this type of a dual stream collection program.

Table 10. Impacts of Separate Weekly Collection of Paper and Commingled Containers

Requirement	Impact
Staffing	Additional collection staff is required
Collection Vehicles	Additional collection vehicle is needed
Carts/Containers	Requires issuing each household another container so that paper and commingled containers streams can be kept separate
Equipment Maintenance	Increased additional vehicle maintenance expected as mileage driven may be doubled and the increased number of collection containers (two per household) require additional container supply and maintenance needs, increasing costs
Routing	Rerouting of trucks may be needed to balance service stops and maximize truck capacity

## Benefits

- **Continued Service Level** – In a program where both streams of recyclable materials are collected weekly, Consortium members maintain the high-level of service that residents in all municipalities are accustomed.
- **Additional Recycling Capacity** – This type of a dual-stream collection program actually increases the capacity of residents to recycle. Residents would have separate dedicated containers for both paper and commingled containers that give them more capacity for the placement of recyclable materials. For example, rather than collecting only one 95-gallon recycling cart, each residential property would have another cart to facilitate increased recycling.
- **Improved Aesthetics** – The additional recycling capacity this program would facilitate has the potential to improve neighborhood aesthetics by reducing the need for residents to set boxes and bags of recyclable materials next to their cart or container. This has the potential to reduce windblown litter that results when materials do not fit inside the recycling cart.
- **Less Complex Collection Schedule** – This program provides for a simple collection schedule in that both containers of recyclable materials can be placed at the curb at the same time and frequency for pick-up. No separate calendar or schedule is needed as in an alternating schedule.

## Challenges

The challenges of a dual-stream collection program where both streams of materials are collected weekly mainly come from the added costs of having additional trucks and collection crews operating in the community each week including:

- **Increased Labor Costs** – Additional recycling staff is required in order to collect the paper/fiber and commingled material streams separately. This would include one additional staff operating a truck plus additional staff for the manual collection of materials.
- **Increased Vehicle Costs** – With the addition of a second stream of recyclable materials to collect separately, additional collection vehicles will be required. Consortium members will still need to maintain reserve trucks for unexpected breakdowns, etc., so using existing reserve vehicles are not considered a sustainable solution to collect the second stream of recyclable materials.
- **Increased Container Costs** – Similar to the alternating every other week dual-stream collection program described above, this program also requires the procurement of additional carts or containers to issue to residents further increasing the capital costs.
- **Increased Potential for Accidents/Workers Compensation Claims** – This type of a program increases risk for accidents and injuries to staff. Increasing, and in some cases doubling, the number of trucks and collection crews on the road increases the risk for equipment damage and workers compensation claims due to injuries, particularly for municipalities that operate a manual collection program.
- **Increased Public Education and Outreach** – Much like in an alternating every other week collection program, extensive education prior, during, and after the implementation of the new program is required.
- **Potential Rebalancing of Routes** – This type of a program may require rebalancing recycling collection routes to confirm efficiency and equitable collection activities among different routes and crews.

## Costs

Transitioning to an automated collection program where both paper and commingled containers are collected weekly will increase both recycling program capital and operational costs. SCS developed planning level cost estimates for Option 2.

### Automated

The following three tables summarize the costs of implementing an automated dual stream recycling collection program where paper and commingled containers are collected separately each week.

- **Table 11 – Weekly Collection – Automated Overall Costs:** It is estimated that a dual stream automated weekly collection program will cost about \$555,400 for each daily route. The costs are for an additional truck driver, automated collection truck, and second recycling cart for each household.

- **Table 12 – Weekly Collection – Automated Amortized Costs:** Amortizing the capital cost of a new truck over eight years at four percent will cost \$51,195 annually or \$409,560 over eight years. Amortizing the capital costs of new carts over 10 years at four percent will cost \$7,217 annually or \$72,168 over 10 years.
- **Table 13 - Weekly Collection – Automated Costs Per Route:** Overall the cost of implementing an automated two-stream weekly collection program is estimated to be \$204,412 per year. This includes estimated operational costs and amortized capital costs.

Table 11. Weekly Collection – Automated Overall Costs

Cost Item	Description	Separate Weekly Collection <sup>2</sup>		
		# of Units	Unit Cost	Separate Weekly
Labor <sup>1</sup>	Driver	1	\$95,000	\$95,000
	Collectors	0	\$0	\$0
Equipment	Vehicle	1	\$350,000	\$350,000
	Carts/Containers	990	\$60	\$59,400
Operations, Maintenance and Repair	Vehicle Maintenance and Repair	1	\$30,000	\$30,000
	Vehicle Operations (fuel)	1	\$12,000	\$12,000
	Cart Assembly and Distribution	900	\$7	\$6,300
	Cart/Containers Maintenance and Repair	900	\$3	\$2,700
	Other	0	\$0	\$0
<b>TOTAL</b>				<b>\$555,400</b>

<sup>1</sup> Labor costs provided by Upper Dublin Township.

<sup>2</sup> Assumptions include:

- Fully automated collection of materials.
- Requires a second recycling cart at each household; assumes each household already has one cart.
- 900 households per route plus 10 percent additional carts as back-up.

Table 12. Weekly Collection – Automated Amortized Costs

Collection Program	Separate Weekly Collection
	<b>Trucks</b>
Capital Cost	\$350,000
Rate	4.0%
Period	8
Monthly Cost	(4,266)
Annual Cost	(51,195)
<b>Total Cost</b>	<b>(409,560)</b>
	<b>Carts</b>
Capital Cost	\$59,400
Rate	4.0%
Period	10
Monthly Cost	(\$601)
Annual Cost	(\$7,217)
<b>Total Cost</b>	<b>(\$72,168)</b>

Table 13. Weekly Collection – Automated Costs Per Route

Cost Item	Separate Weekly Collection
Capital Cost - Truck	\$51,195
Capital Cost - Carts	\$7,217
Labor	\$95,000
Operation, Maintenance, and Fuel	\$51,000
<b>Total Annual Cost Per Route</b>	<b>\$204,412</b>

## Manual

The following three tables summarize the costs of implementing a manual dual stream recycling collection program where paper and commingled containers are collected separately each week.

- Table 14 – Weekly Collection – Manual Overall Costs:** It is estimated that a weekly manual dual stream collection program will cost \$528,200 for each daily route. The costs are for an additional truck driver, two collectors, rear-load collection truck, and a second recycling container for each household.
- Table 15 – Weekly Collection – Manual Amortized Costs:** Amortizing the capital cost of a new truck over eight years at four percent will cost \$36,568 annually or \$292,543 over eight years. Amortizing the capital costs of new containers over 10 years at four percent will cost \$3,742 annually or \$37,420 over 10 years.

- **Table 16 - Weekly Collection – Manual Costs Per Route:** Overall the cost of implementing a manual weekly collection program is estimated to be \$287,710 per year. This includes estimated operational costs and amortized capital costs.

Table 14. Weekly Collection – Manual Overall Costs

Cost Item	Description	Separate Weekly Collection <sup>2</sup>		
		# of Units	Unit Cost	Separate Weekly
Labor <sup>1</sup>	Driver	1	\$76,200	\$76,200
	Collectors	2	\$72,800	\$145,600
Equipment	Vehicle	1	\$250,000	\$250,000
	Carts/Containers	770	\$40	\$30,800
Operations, Maintenance and Repair	Vehicle Maintenance and Repair <sup>1</sup>	1	\$13,000	\$13,000
	Vehicle Operations (fuel) <sup>1</sup>	1	\$7,000	\$7,000
	Container Distribution	700	\$6	\$4,200
	Cart/Containers Maintenance and Repair	700	\$2	\$1,400
	Other <sup>3</sup>	0	\$0	\$0
<b>TOTAL</b>				<b>\$528,200</b>

<sup>1</sup> Costs provided by Springfield Township.

<sup>2</sup> Assumptions include:

- Manual collection of materials.
- Requires a second recycling container at each household; assumes each household already has one container.
- 700 households per route plus 10 percent additional carts as back-up.

Table 15. Weekly Collection – Manual Amortized Costs

Collection Program	Separate Weekly Collection
	<b>Trucks</b>
Capital Cost	\$250,000
Rate	4.0%
Period	8
Monthly Cost	(3,047)
Annual Cost	(36,568)
<b>Total Cost</b>	<b>(292,543)</b>
	<b>Carts</b>
Capital Cost	\$30,800
Rate	4.0%
Period	10
Monthly Cost	(\$312)
Annual Cost	(\$3,742)
<b>Total Cost</b>	<b>(\$37,420)</b>

Table 16. Weekly Collection – Manual Costs Per Route

Cost Item	Separate Weekly Collection
Capital Cost - Truck	\$36,568
Capital Cost - Carts	\$3,742
Labor	\$221,800
Operation, Maintenance, and Fuel	\$25,600
<b>Total Annual Route Cost</b>	<b>\$287,710</b>

### OPTION 3: SPLIT CART/TRUCK COLLECTION

#### Overview

**Option 3** includes implementing a dual stream collection program using a split cart and truck system. In this option, Consortium members with automated recycling programs issue new recycling containers to residents that are split into two compartments, each with a separate lid to contain the materials. One side of the cart is designated for paper/fiber materials while the other side is designated for commingled containers. In split cart systems, the side designated for paper materials is often larger than the compartment for the commingled containers to reflect that paper comprises a larger portion of the recycling stream than containers. Split carts are collected by a specialized truck that contains a split body to keep the two streams of materials separate.

For Consortium members that collect materials manually, residents would be issued a second separate recycling container (similar to Options 1 and 2) to accommodate the two streams of materials. Both containers would be manually collected and placed in the same specialized truck with a split body that is designed to keep the two streams separate. Split carts are generally designed for automated collection programs only and are not compatible with manual collection programs at this time.

Figure 2 provides visuals of the equipment for a split cart/truck collection system.

Figure 2. Split Container Collection Equipment



Example Split Container for Paper and Containers



Berkley California Split Cart Recycling Truck



Collection of Split Cart Recyclable Materials

## Benefits

- **Continued Weekly Collection Service** – A split cart/truck collection program allows Consortium members to continue their high level of service residents have come to expect.
- **Maintain Current Labor** – In a split cart/truck collection program, Consortium members can continue operations without the need for additional collection staff to support the program. Automated programs will still only require one driver to operate a truck. In a manual program, the same collection staff (one driver, two collectors) that picks-up materials single stream can collect the two streams. However, since collectors will be picking-up two containers per household instead of one (as in single stream) there may be a need to adjust and rebalance routes to improve collection efficiency. There may be times when additional collection staff are necessary due to high material volumes (i.e. holidays).
- **One Container for Both Streams** – In an automated program, residents will still only have one recycling container to place materials.

## Challenges

- **Specialized Equipment and Vehicles** – Split carts and trucks are specialized equipment with additional features that have the potential to malfunction and result in downtime and repair costs. Before implementing a split cart and truck system, Consortium members will need to identify a reputable supplier of equipment and understand the turnaround time to receive replacement parts. In these systems it is important to have back-up equipment should primary equipment malfunction.
- **Container Collection** – This program will require Consortium members to collect existing recycling containers once they become obsolete in a split cart program. This will require communication with residents on when to place the old containers at the curb, staff time devoted to picking up the containers, and potential costs for disposal and/or recycling of the old containers.

## Costs

SCS developed planning level cost estimates for implementing weekly automated split cart and split truck recycling collection program. In addition, planning level cost estimates are provided for a manual split truck collection program as using split carts in manual programs is generally not feasible at this time.

### Automated

The following three tables summarize the costs of implementing an automated dual stream recycling collection program where paper and commingled containers are collected simultaneously in split carts and split trucks.

- **Table 17 – Split Cart/Truck Collection – Automated Overall Costs:** It is estimated that a dual stream split cart/truck automated weekly collection program will cost \$545,640 for each daily route. The costs are for procuring specialized split carts and split truck to collect both streams simultaneously.



- **Table 18 – Split Cart/Truck Collection – Automated Amortized Costs:** Amortizing the capital cost of a new truck over eight years at four percent will cost \$58,509 annually or \$468,068 over eight years. Amortizing the capital costs of new carts over 10 years at four percent will cost \$10,103 annually or \$101,035 over 10 years.
- **Table 19 - Split Cart/Truck Collection – Automated Costs Per Route:** Overall the cost of implementing an automated split cart/truck weekly collection program is estimated to be \$131,092 per year. This includes estimated operational costs and amortized capital costs.

Table 17. Split Cart/Truck Collection – Automated Overall Costs

Cost Item	Description	Split Cart/Truck Collection <sup>3</sup>		
		# of Units	Unit Cost	Total Cost
Labor <sup>1</sup>	Driver	0	\$95,000	\$0
	Collectors	0	\$0	\$0
Equipment	Vehicle	1	\$400,000	\$400,000
	Carts/Containers	990	\$84	\$83,160
Operations, Maintenance and Repair	Vehicle Maintenance and Repair	1	\$35,000	\$35,000
	Vehicle Operations (fuel)	1	\$12,000	\$12,000
	Cart Assembly and Distribution	900	\$7	6,300
	Cart/Containers Maintenance and Repair	900	\$4	3,780
	Other <sup>3</sup>	900	\$6	5,400
<b>TOTAL</b>				<b>\$545,640</b>

<sup>1</sup> Labor costs provided by Upper Dublin Township.

<sup>2</sup> Assumptions include:

- Fully automated collection of materials.
- Requires a new specialized split body truck and new split cart that must be procured for each household
- 900 households per route plus 10 percent additional carts as back-up.

<sup>3</sup> Cost to collect existing recycling carts from each household that will be obsolete in a split cart/truck program.

Table 18. Split Cart Collection – Automated Amortized Costs

Collection Program	Split Cart/Truck Collection
	<b>Trucks</b>
Capital Cost	\$400,000
Rate	4.0%
Period	8
Monthly Cost	(4,876)
Annual Cost	(58,509)
<b>Total Cost</b>	<b>(468,068)</b>
	<b>Carts</b>
Capital Cost	\$83,160
Rate	4.0%
Period	10
Monthly Cost	(\$842)
Annual Cost	(\$10,103)
<b>Total Cost</b>	<b>(\$101,035)</b>

Table 19. Split Cart Collection – Automated Costs Per Route

Cost Item	Split Cart/Truck Collection
Capital Cost - Truck	\$58,509
Capital Cost - Carts	\$10,103
Labor	\$0
Operation, Maintenance, and Fuel	\$62,480
<b>Total Annual Cost Per Route</b>	<b>\$131,092</b>

## Manual

The following three tables summarize the costs of implementing a manual dual stream recycling collection program where paper and commingled containers are collected manually in a split body truck. Although an automated system can accommodate a split cart, a manual collection program would require materials to be placed in separate containers. Thus, each stream of recyclable materials is collected manually from two different containers.

- **Table 20 – Weekly Split Truck Collection – Manual Overall Costs:** It is estimated that a weekly manual dual stream split truck collection program will cost \$387,600 for each route. The costs include a new specialized split body collection truck and associated operational expenses (i.e. maintenance and fuel) and second recycling container for each household.
- **Table 21 – Weekly Split Truck Collection – Manual Amortized Costs:** Amortizing the capital cost of a new split body truck over eight years at four percent will cost \$43,881 annually or

\$351,051 over eight years. Amortizing the capital costs of new containers over 10 years at four percent will cost \$3,742 annually or \$37,420 over 10 years.

- **Table 22 - Weekly Split Truck Collection – Manual Costs Per Route:** Overall, the cost of implementing a manual weekly split truck collection program is estimated to be \$100,223 per year. This includes estimated operational costs and amortized capital costs.

Table 20. Split Truck Collection – Manual Overall Costs

Cost Item	Description	Split Truck Collection <sup>2</sup>		
		# of Units	Unit Cost	Total Cost
Labor <sup>1</sup>	Driver	0	\$76,200	\$0
	Collectors	0	\$72,800	\$0
Equipment	Vehicle	1	\$300,000	\$300,000
	Carts/Containers	770	\$40	\$30,800
Operations, Maintenance and Repair	Vehicle Maintenance and Repair	1	\$35,000	\$35,000
	Vehicle Operations (fuel)	1	\$12,000	\$12,000
	Container Distribution	700	\$6	\$4,200
	Cart/Containers Maintenance and Repair	700	\$2	\$1,400
	Other <sup>3</sup>	700	\$6	\$4,200
<b>TOTAL</b>				<b>\$387,600</b>

<sup>1</sup> Labor costs provided by Springfield Township.

<sup>2</sup> Assumptions include:

- Manual collection of materials.
- Requires a new specialized split body truck.
- 700 households per route plus 10 percent additional carts as back-up.

<sup>3</sup> Cost to collect old carts/containers from residents.

Table 21. Split Truck Collection – Manual Amortized Costs

Collection Program	Split Truck Collection
	<b>Trucks</b>
Capital Cost	\$300,000
Rate	4.0%
Period	8
Monthly Cost	(3,657)
Annual Cost	(43,881)
<b>Total Cost</b>	<b>(351,051)</b>
	<b>Carts</b>
Capital Cost	\$30,800
Rate	4.0%
Period	10
Monthly Cost	(\$312)
Annual Cost	(\$3,742)
<b>Total Cost</b>	<b>(\$37,420)</b>

Table 22. Split Truck Collection – Manual Costs Per Route

Cost Item	Split Truck Collection
Capital Cost - Truck	\$43,881
Capital Cost - Carts	\$3,742
Labor	\$0
Operation, Maintenance, and Fuel	\$56,800
<b>Total Annual Route Cost</b>	<b>\$104,423</b>

## SUMMARY

Overall, the per route cost of transitioning a single stream recycling program to dual stream varies widely depending on the type of program implemented. The lowest cost option is to transition to an alternating every other week collection program where paper materials are collected one week and commingled plastic, metal, and glass containers are collected the following week. The more costly option is to collect both streams of recyclable materials weekly using two separate collection crews. **Table 23** compares the costs (operational and amortized capital) of all scenarios evaluated this study. Note it does not include costs of education that will be required to successfully transition the program.

Table 23. Summary of Per Route Costs for Each Collection Scenario

Collection Program	Alternating Every Other Week Collection	Split Truck Collection	Separate Weekly Collection
Annual Cost Per Route - Automated	\$16,217	\$131,092	\$204,412
Annual Cost Per Route - Manual	\$9,342	\$104,423	\$287,710

## ADDITIONAL CONSIDERATIONS

In addition to the operational and financial considerations provided in this report, it is important that Consortium members address all potential impacts of modifying existing recycling collection programs. Two additional issues that must be considered prior to making the decision to switch to dual stream include existing markets and education. These issues are discussed more in depth in other Consortium recycling technical assistance studies.

- **Markets** – Available markets will impact the decision of transitioning existing single stream recycling programs to dual stream. The transition to dual stream must be accompanied by using a market that rewards the Consortium for providing materials that do not require as extensive processing as single stream materials. For Southeast Pennsylvania, this may include working with a single-stream processor that is willing to provide the Consortium with a price discount as some materials (i.e. paper) may avoid the sort line and be directly baled upon delivery.
- **Education** – Any modification to a recycling program requires significant education of the public. This includes educating residents prior to the change, during implementation, and ongoing throughout the new program.

## 6 CONCLUSION

Overall, there are both benefits and challenges of transitioning a single stream recycling program to a dual stream program. The transition is feasible, but will cost Consortium members differently depending on the type of dual stream program implemented. The least costly method is to implement an alternating every other week collection program whereby paper and commingled materials are collected separately on alternating weeks. The most costly dual stream recycling method is to use separate equipment and collection staff to collect both streams of recyclable materials on the same day. A third option, using a split cart/truck to collect both streams simultaneously, is estimated to cost about \$104,000 per route for a manual program and \$131,000 for an automated system (**Table 23**). It is important for the Consortium to identify and work with a partner that provides financial incentives and benefits for making the transition to dual stream. These incentives and benefits should cover the costs of transitioning recycling programs to dual stream as well as provide additional cost savings to make recycling programs more sustainable.