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SKUMATZ ECONOMIC RESEARCH ASSOCIATES

ASHEVILLE – PAY AS YOU THROW (PAYT) OPTIONS ANALYSIS

Final Report, December, 2015

Prepared for:
City of Asheville

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Acknowledgements:

Sincere thanks to the staff at Asheville for their valuable assistance in understanding Asheville's system, and in working through alternatives for this study. Also, thank you to the SACEE committee for its astute questions and feedback on earlier stages of the analysis.

1. Executive Summary

1.1 Project Background

The City of Asheville is considering introducing a Pay As You Throw (PAYT) option for trash services to achieve several objectives:

- Increase recycling and diversion
- Provide a more equitable and incentive-based fee structure
- Provide a clear and potentially dedicated revenue source for solid waste services
- Provide options for lower service levels for customers on fixed income and others who need less service

The City hired Skumatz Economic Research Associates (SERA) to conduct a feasibility study and analysis of PAYT options for the City. SERA was tasked with:

- **Feasibility and comparison**: Identifying feasible options for PAYT in the City, and explore the suitability (operational, and cost-related) for the main options. Specifically, the City was interested in whether diversion rates would increase under PAYT; the relative cost-effectiveness of alternative PAYT systems; and the operational tradeoffs of alternative PAYT models.
- **Asheville household survey**: Conduct a broad-based survey of Asheville residents to understand their current trash and recycling behavior, and general acceptability of new programs and services, including PAYT
- **Case studies**: Providing case studies of PAYT communities to provide advice / lessons / examples for the City
- **Rate study**: Conduct the analyses on changes in trash and recycling behaviors that would occur with PAYT, and estimate the resulting rates that would be expected to be in place if a PAYT system is added.
- **Implementation**: Provide equipment and implementation advice. In addition to system-level implementation issues, the City was interested in the level of education / outreach required to implement a PAYT system, and the staff capacity to take that on.
- **Ordinance**: Provide input / feedback for ordinances related to the PAYT program.
- **Meetings**: Attend public and advisory committee meetings to review the results of the study.

SERA conducted this work between May and October 2015.

1.2 Findings and Recommendations

On a cost basis, customers appear to spend substantially more with a bag-based PAYT program than a cart-based program. The fees all ultimately come from customers. The calculations indicate that Asheville's citizens are better off spending their fees to pay for a re-usable can than on single-use bags. We find that the average cost per household is lower for a cart-based system than the bag-based program. A full-cost recovery PAYT cart-based system is projected to be less expensive than the full-cost recovery version of the City's current / status-quo non-PAYT system.

Furthermore, in simple terms, under a bag-based program, if a household needs to use ½ bag or more per week, then the cost per month equals the cost of purchasing the cart (spread over five years). They will only need to pay for that cart for 5 years and then carts commonly last up to 15 years. Under a bag system, that same (monthly and weekly) payment continues forever, so they pay considerably more in total for the bag program. Furthermore, we anticipate that the majority of households will need more than ½ bag per week, so the cost differential for the bag program is even higher.

The survey shows that customers prefer the option of a cart-based system over a bag-based option. A cart-based system is easier to explain to customers, simplifying outreach. Operations are simplest using a cart-based program, which continues automated cart collection, just using different sizes of carts. The bag-based program will presumably require some level of enforcement, yet we conservatively assumed no costs for this or any other operational changes needed for a bag-based program (distribution costs, for example). Still, the cart-based system was more cost effective.

The Waste Zero™ literature indicates recycling rates would be substantially higher under a bag-based program than a cart-based program. Those assumptions are aggressive and are not adopted within this study, assuming the rate differentials that are employed in this study. It is unrealistic to estimate that recycling rates will increase by 30%. It is likely that some of WZ's performance estimate comes from possible enhanced outreach programs. Enhanced outreach (including social marketing) can be conducted under either a cart- or bag-based program, and we assume outreach would be needed under either program. Differential costs are not assumed.[1]

The model estimates a higher recycling rate with the bag-based program; however, these marginal extra tons come at a substantially higher cost, and the higher recycling rate is not fully substantiated in statistical studies.

Implementation of a cart-based system requires the city to modify the billing program, and to purchase and distribute new trash carts. The City then owns the carts, which commonly last for a period of 15 years. The bag-based program would require a distribution system for the bags, and periodic monitoring / enforcement that the bags are being used. We recognize that the WasteZero™ (WZ) system takes a one-stop-shopping approach and the City's role in implementation could be small under this program.[2]

SERA recommends implementation of a cart-based PAYT system for the City.

Figure 1.1: Projected Revenue Requirements and Average Cost Per Household Per Month for PAYT Options

	Cart-based PAYT	Bag-Based PAYT
Revenue requirements	$7.04 million	$7.60 million
Cost per household per month	$18.75	$20.00
After 5 years when the carts are paid off	$18.15	$20.00

[1] SERA's research finds that outreach costs in communities across the US vary substantially (SERA 2001, 2011, 2015). Some communities spend as little as a dime or less per household per year. It is not unusual for household to spend $1-2 per household per year for strong-performing programs. We would expect the City would spend on the order of at least $2 per household for its outreach program introducing either the cart or bag system, but these costs (on the order of 10 cents per household for the first year, no incremental cost over current outreach thereafter) were not included in the calculations because they were small, and one-time. Spread over 5 years they were minimal.

[2] Should the City opt for the Waste Zero ™ bag-based program, the "best practices" outlined in the chapter on case studies should be reviewed prior to contracting.

Figure 1.2: Summary Results and Estimated Rates for Bags and Carts[3] (assuming full cost recovery)

	Status Quo	Cart-based PAYT option	Bag-based PAYT Option
Recycling Rate	21.0%	29.0%	31.5%
Rate 32 gallon / 10 gallon	$10.50	$12.10	$2.15
Rate 64 gallon / 30 gallon	$10.50	$21.10	$3.40
Rate 96 gallon	$10.50	$30.10	
Average Dollars per household per month under FULL cost recovery	$18.82	$18.75	$20.00
Incremental Dollars per Year for PAYT Options: Carts (annual increment for 5 years); Bags (annual increment into perpetuity)		$219.9K	$745.4K

Table note: Note that all rates should be rounded to the nearest dime or 25 cents for convenience. Each scenario raises the revenue needed to fully recover the cost of providing trash, recycling, and yard waste to households in Asheville, and to eliminate the City's General Fund subsidy.

[3] Note: Rates are rounded to the nearest nickel or dime. Note also that cart prices vary with the price of oil. It is unlikely that cart prices would increase more than 10% over the costs noted in this study. This variation would still result in savings for the cart-based program. However, even if the loaded cart prices were 20% more than our estimate, the additional cost for the cart program is less than $44K per year.

2. OVERVIEW OF PAYT

Over the last 20 years, a growing number of communities across North America have been using the user-pay principle (used commonly for water, electricity, and other services) for trash services. User-Pay, Variable-rate pricing, or "Pay As You Throw" (PAYT) is a strategy in which customers are provided an economic signal to reduce the waste they throw away, because garbage bills increase with the volume or weight of waste they dispose. PAYT is being adopted in thousands of communities to create incentives for additional recycling and waste reduction in the residential sector.

PAYT has become relatively common. Recent research (Skumatz et. al., 2015), indicates PAYT is available in more than 8,700 communities across the US, and more than 40% of the US population has access to some kind of PAYT option.[4] In the South there are PAYT programs in place in Florida, Georgia, North Carolina, Texas, Tennessee, and Arkansas, and less commonly in Alabama, Mississippi, South Carolina, and Virginia.

Definitions
For clarity, we define the following terms, assuming G=MSW Tons, R=Recycling Tons, and Y=yard waste or yard and food waste tons:

- Recycling rate, or percent recycled: (R/(R+Y+G))
- Organics rate, or percent composted: (Y/(R+Y+G))
- Diversion Rate (the sum of the recycling and organics rates): ((R+Y)/(R+Y+G))
- "Generation" or "generated tons": (R+Y+G)
- PAYT is Pay As You Throw.

2.1 Types of PAYT Options

PAYT programs are very flexible and have been implemented by communities in many forms. The most common types of PAYT programs are can programs, bag programs, tag and sticker programs, and hybrid programs. Other less common programs include are weight-based rates. Each program type – can, bag, sticker/tag, hybrid, and weight-based – is briefly summarized below.[5]

- **Variable Can or Subscribed Can.** In this program, customers select the appropriate number or size of containers (one can, two cans, etc., or 30–35 gallons, 60–65 gallons, etc.) for their standard weekly disposal amount. Rates for customers signed up for two- or three-can service are higher than rates for one-can customers. Some communities also have introduced mini-can (13–20 gallons) or micro-can (10 gallons) service levels to provide incentives for aggressive recyclers. These programs are becoming more and more common because they work very well with fully-automated collection trucks.

- **Bag Program.** In this program, customers purchase bags imprinted with a particular city or hauler logo, and any waste they want collected must be put in the appropriately marked bags. Bags

[4] Skumatz, Lisa A., Ph.D., Dana D'Souza, and Dawn BeMent, 2015, "PAYT / Variable Rates for Trash Collection: 2015 Update", Econservation Institute, Superior CO, prepared for US EPA Region 9, February.
[5] Skumatz, Lisa A., Ph.D., and David J. Freeman, 2006, Skumatz Economic Research Associates, Inc., Superior CO, prepared for SERA and USEPA Headquarters, December.

holding from 30 to 35 gallons are most common; some are smaller. Sales through community centers or grocery and convenience stores are most common (sometimes with commission) and minimize inventory and invoicing issues. The bag cost incorporates the cost of the collection, transportation, and disposal of the waste in the bag. Some communities charge all costs in the bag price; others charge a separate customer charge to reduce risks in recovering fixed system costs. These programs are more common in locations with barriers to fully-automated collection (on-street parking barriers, hills, overhead wires, alleys / narrow streets, etc.).

- **Tag or Sticker Programs.** These are almost identical to bag programs, except instead of a special bag, customers affix a special logo sticker or tag to the waste they want collected. The tags need to be visible to collection staff to signal that the waste has been paid for. Like the bag program, tags are usually good for 30-gallon increments of service. Pricing and distribution options are identical to bag programs.

- **Hybrid System.** This system is a hybrid of the current collection system and a new incentive-based system. Instead of receiving unlimited collection for payment of the monthly fee or tax bill, the customer gets only a smaller, limited volume of service for the fee (typically 1 or 2 cans or bags). Disposal of extra bags / cans beyond the approved base service requires use of bags or stickers, as described above. This system is attractive to communities as it requires no change in billing system, containers, or collection system, and the base service can be tailored to suit the community. Many customers see no change in bills; large disposers are provided an incentive to reduce. These programs are sometimes an end in themselves; other communities implement this program as a transition to a fully-variable program.

- **Weight-based System.** Called "Garbage by the Pound" (GBTP) in its earliest US test (Skumatz, 1989[6]), this system uses truck-based scales to weigh garbage containers and charge customers based on the actual pounds of garbage set out for disposal. On-board computers record weights by household, and customers are billed on this basis. Radio frequency (RF) tags, are affixed to the containers to identify households associated with the can weight for billing. These programs have been pilot-tested in the U.S., and implemented overseas. Certified scale systems are now available in the US; however, despite multiple pilot tests in North America, they are not in full scale use in US or Canadian communities (except one community charging by GBTP for commercial users).

- **Other Variations.** Some communities or haulers offer PAYT as an option along with their standard unlimited system. Waste drop-off programs, charging by the bag or using punch cards or other customer tracking systems, are also in place in some communities, especially in rural areas.

2.2 Pros and Cons of PAYT

Why are communities implementing PAYT? Well, certainly, strong diversion results have been reported by hundreds of communities across the US (Seattle, Portland Metro, San Jose, San Francisco, and many more). In addition, a study in Colorado to identify what strategies might be most fruitful for improving the state's recycling rate (Skumatz and Freeman, 2008)[7], the researchers found that PAYT is one of the top three features to which the leading states say they attribute their state's strong recycling performance.

[6] Skumatz, Lisa A., Ph.D., "Garbage by the Pound", Resource Recycling, 1989.
[7] Skumatz, Lisa A., Ph.D. and Juri Freeman, "Colorado Roadmap…", Skumatz Economic Research Associates, Superior, CO, prepared for Colorado CDPHE, 2008.

However, rather than relying on case studies alone, it is important for communities to have access to "transferable" data – statistically realistic information to provide expectations about what will happen if they implement PAYT. Data from more than 1,000 communities around the country was used to identify the impacts of PAYT above and beyond any other recycling or yard waste program differences, demographics, and other factors. The research showed the following impacts on residential solid waste:[8]

- Household disposal decreases by 16%-17%
- Increases in recycling of 5-6 percentage points (usually about a 50% increase in current recycling rates)[9] .[10]
- Increases in yard waste diversion of about 4-5 percentage points
- Source reduction of about 6% of generation[11]

The results indicate that, overall, a town with 100,000 tons of residential disposal could expect to see a reduction to about 84,000 tons. Recycling tonnage would increase by about 5,500 tons, and yard waste programs would see an additional 4,500 tons. About 6,000 tons would be avoided through waste prevention, based on the study's estimates.

Other impacts are also realized when installing PAYT.[12]

- **Cost impacts**: Based on detailed interviews, communities report that long term system costs are reduced; and the majority of communities in state surveys report short term system costs did not increase either. In two state surveys[13] (WI, IA), about two-thirds of the communities reported that short-term system costs were lower or stayed the same after PAYT was implemented. Only one-third reported increases. These results show you can make "sensible" choices in PAYT that minimize costs and "fit" well with the community.

- **Disposal Savings**: Don't forget that in addition to savings in disposal tipping fees (perhaps 16%, but net out the recycling and yard waste program cost impacts), the programs can also allow communities to delay building a new landfill, and this results in real financial savings. Reducing 16% of the disposal extends the lifetime of the facility by one-sixth – and similarly decreases the money that needs to be set aside for a new facility and for closure costs because the funds can be accumulated over a longer period.

- **Buying habits**: Reported results of customer survey research indicated 76% have purchasing decision-making affected by PAYT, and that PAYT has a demonstrable effect on waste-generation and buying habits.[14]

[8] Skumatz, Resource Recycling 9/1996, 8/2000, updated 2001, 2006, 2010, 2015.
[9] Analyzing Iowa communities, Frable, 1994, found an increase of 30% to 100% with an average of 50% increase in recycling tonnages.
[10] Interestingly, the SERA research shows the PAYT program provides similar diversion incentives for both curbside and convenient drop-off recycling arrangements, although most of the latter are in smaller communities.
[11] Skumatz, Lisa A., Ph.D., 2001, "Source Reduction Can Be Measured…", Skumatz Economic Research Associates, in Resource Recycling, 2001, and on websites (EPA, www.paytnow.org, etc.)
[12] From Skumatz, Lisa A., Ph.D., 2008, "Frequently Asked Questions about PAYT", Skumatz Economic Research Associates, Superior, CO., also available on www.paytnow.org website.
[13] Frable, 1994 for Iowa, and Wisconsin DNR studies (citation to be completed)
[14] Skumatz 1993, "Variable Rates for Municipal Solid Waste…", for the Reason Foundation, Los Angeles.

- **Bins set out**: Households put out fewer garbage bins for collection after PAYT is implemented – partly because of declines in tonnage, and partly because cans are "stuffed" (dubbed the "Seattle Stomp"). When Seattle moved to PAYT, the average 32-gallon units of service per household decreased from 3.5 to 1.0. Hoffman Estates (IL) decreased from 3.1 to 1.3 average number of 32-gallon units of service per household. Many communities state that after PAYT, their average household sets out between 1 and 1.5 32-gallon units of service (cans or bags). This is important for rate-setting, as number of units of service used (a figure which can vary) are the revenue element, not "households" (which tend not to vary much).[15]

- **Customer Satisfaction**: Multiple community surveys indicate more than 90% of customers are pleased with systems after they are implemented – and they don't want to return to the old system because PAYT is fairer.[16] However, the challenge is getting the systems accepted prior to implementation. Change is always difficult.

The research indicates that adding a PAYT program is the single most effective change a community can make to increase recycling. According to the research, PAYT increases recycling more than adding a new material, changing collection frequency, or many other potential program design or collection changes.

PAYT or variable rates programs provide a number of advantages for communities and residents:

- **Equity.** PAYT programs are fair: customers who use more service pay more.

- **Economic Signal.** Under PAYT, *behavior* now affects a bill, regardless of what disposal choices a household made. Without PAYT, avid recyclers paid the same as large disposers. PAYT provide a recurring economic signal to modify behavior, and allows small disposers to save money compared to those who use more service (and cost the system more).

- **Lack of Restrictions.** PAYT does not restrict customer choices. Customers are not banned from putting out additional garbage; but those who want to put out more will pay more.

- **Efficiency.** Variable-rate programs are generally inexpensive to implement and, unlike recycling programs, do not require additional pick-up trucks. They also help prevent overuse of solid-waste services. Rather than fixed buffet-style charges, which encourage overuse of the service, volume-based rates encourage customers to use only the amount of service they need.

- **Waste Reduction.** Unlike recycling programs alone, which only encourage recycling, PAYT reward all behaviors—recycling, composting, and source reduction—that reduce the amount of garbage thrown away. Source reduction is the cheapest waste management strategy and thus of the highest priority—and it is not directly encouraged by recycling and yard waste programs.

- **Speed of Implementation**: Pay-as-you-throw programs can be very quickly put in place—one community installed a PAYT program in less than three months (although most take longer).

- **Flexibility.** "Pay-as-you-throw" programs can be implemented in a variety of sizes and types of communities, with a broad range of collection arrangements.

[15] *Ibid.*
[16] *Ibid.*

- **Environmental Benefits.** Because they encourage increased recycling and waste reduction, PAYT programs are broadly beneficial to the environment.[17] The number of metric tons of carbon equivalent (MTCE) of emissions reduced by recycling the traditional "household mix" of recyclables (diverting from the landfill) is about 0.86 per ton of recyclables (the figure for metric tons of carbon dioxide equivalent, is 3.15 MTCO2e per ton recyclables)[18]. Applying current values of the cost of MTCO2E credits provides a value for the environmental benefits of recycling an additional ton of MSW. Another method of valuing the additional recycling is to calculate the market value associated with the recyclable, but disposed, materials. Some of the recycled material is worth more than $1,000 per ton; others (glass) much less.[19] An especially important point to realize is that solid waste programs can be both cheaper, and quicker to implement than other methods of achieving GHG reduction goals – even though energy and transportation receive the most attention for GHG goals. One community found that fully 40% of the first couple years of progress they had made in reaching sustainability goals had been attributed to their solid waste programs.[20]

- **Self-funding**: perhaps the greatest advantage of PAYT is that it is ultimately self-funding. Users pay, and the community does not incur any substantial on-going costs that it does not choose to.

However, there are also concerns about PAYT programs. The most frequently mentioned include:

- **Illegal dumping**: Research[21] shows illegal dumping is a bigger fear than reality[22], and is a problem in about 20% of communities – a problem that lasts about 3 months or less. Further, analysis of the composition of illegally dumped material finds only about 15% is household in origin and that the largest household component is bulky items or appliances (or "white goods"). Enforcement of illegal dumping ordinances usually keeps the problem at bay. PAYT programs should make sure to introduce methods for getting rid of occasional bulky materials through stickers, payments, appointments, or other methods.

- **Concerns about large families or the poor**: Large families pay more for groceries, water, and other services they use more than other households, and PAYT basically extends this to trash service. Note that large families have opportunities to reduce trash through recycling – opportunities that are not as readily provided in the use of food and other utilities. In some cases, communities provide "lifeline" discount rates for essential services like energy and telephone, etc., and these types of discounts can be extended to garbage fees through discounts or allocations of some free bins or bags. Special arrangements for poor or infirm are made in fewer than 10% of the communities with PAYT, but are included in communities with policies for

[17] A study that did these computations includes Skumatz and Freeman 2006, "2006 PAYT Update…", SERA / EPA.
[18] Figures calculated from EPA's WaRM Model, available on the web.
[19] An example of a study that conducted this type of analysis is Skumatz, Lisa A., and Dana D'Souza, 2015, "Colorado's Wasted Value: Recyclables Discarded in the Front Range and Rest of the State and their Dollar, Job, and GHG Impacts", Skumatz Economic Research Associates, Superior Colorado, May
[20] Skumatz, Lisa A., Ph.D., and Juri Freeman, 2006, "PAYT in the US: 2006 Update", Skumatz Economic Research Associates, Inc., Superior, CO, December.
[21] Skumatz, Lisa A., Ph.D., Hans Van Dusen, and Jennie Carton, 1994. "Illegal Dumping: Incidence, Drivers, and Strategies", Research Report Number 9431-1, Skumatz Economic Research Associates, Inc., Seattle WA / Superior, CO, November.
[22] It scores much higher as "concern" than real effect after the fact. For more information see Skumatz, Lisa A., Ph.D., 2001, updated "PAYT: Frequently Asked Questions", Skumatz Economic Research Associates, Inc., website, www.serainc.com, Superior, CO.

other subsidized utility services (historically, e.g., "lifeline" or discounted rates for phone, electricity, etc.).[23]

- **Revenue uncertainties**: The number of bags or cans of trash set out decreases dramatically with PAYT – due to reduced disposal AND stomping or compaction. Communities and haulers implementing PAYT need to adjust their expectations about the number of set outs in order to assure they cover the fixed costs of collecting solid waste. In addition, rate structures that are very aggressive can exacerbate the revenue risk issue, so "can is a can" rates can make it riskier to recover costs. "Can is a can" pricing means 64 gallons is twice as expensive as 32 gallons, and 96 gallons is three times the 32-gallon rate. Research indicates most of the recycling incentive is maintained even if the full cost differentials are 80% more for double the service.[24]

- **Administrative burdens / workloads**: Studies in Wisconsin and Iowa[25] indicate that workloads stayed the same or decreased in 60-70% of the communities implementing PAYT. Workloads during implementation will be increased (including calls) and temporary staff are likely to be needed.
- **Multifamily buildings**: PAYT is most tested in single family situations up to perhaps 8-unit apartment complexes. They are not widely tested in large multifamily buildings (with chutes), although some technologies are being developed.[26] However, multifamily buildings serviced by dumpsters receive a better volume-based building-wide incentive for recycling than single family household with a

Figure 2.1: Key Facts about PAYT / User Pay

- *PAYT programs are in place in thousands of communities – including those with a few hundred population as well as a majority of the largest cities in the US.*
- *PAYT is fairer than tax-based systems – and after implementation more than 95-98% of households prefer the new system.*
- *PAYT reduces residential trash disposal by one-sixth (about 17%). Analysis shows about one-third (6%) shows up as increased recycling, about one-third (5%) as increased composting, and one-third (6%) is "source reduced" or avoided generation (buying in bulk, etc.) (Skumatz Economic Research Associates, 1996, 2001, 2006, 2015)*
- *Implementing PAYT is the single most effective thing a community can do to increase the diversion from curb-side OR drop-off programs.*
- *Concerns about illegal dumping seem more fear than reality. Problems arise in fewer than 1 in 5 communities, and usually last less than 3 months.*
- *While significant differentials in rates between different can sizes are an important incentive, twice as much service does not need to cost twice as much in order to provide an incentive – a differential of 80% seems to generate most of the diversion impacts associated with more aggressive rates.*
- *Political issues are the main barrier in PAYT – technical issues (litter, equipment, administration, haulers, etc.) are rarely a bother and have solutions from around the nation.*
- *Bags / tags and hybrid systems take the least capital investment; can-based programs require multi-sized containers and billing systems.*

Source: Skumatz Economic Research Associates, Inc. (SERA) research

[23] Skumatz, Lisa A., Ph.D., 1995. "How Can Low Income Programs Work? Addressing Special Populations Under Variable Rates Systems", Research report 9508-1, Skumatz Economic Research Associates, Inc., Seattle WA / Superior CO.
[24] Low differentials don't provide a noticeable incentive, and if higher differentials won't be supported, then the PAYT system should not be implemented. For more information see Skumatz, Lisa A., Ph.D., 2001. "PAYT: Frequently Asked Questions", Skumatz Economic Research Associates, Inc., website, www.serainc.com, Superior, CO.
[25] Garth W. Frable and Michael Berkshire, "Pay-As-You-Waste: State of Iowa Implementation Guide for Unit-Based Pricing" East Central Iowa Council of Governments and Iowa Department of Natural Resources, Cedar Rapids, Iowa, January 1995.
[26] Skumatz, Lisa A., Ph.D., 1999. "Reaching for recycling in multi-family housing", (analyzing suggestions for incentives and progress in getting past collection barriers in MF), *Resource Recycling*, October.

non-PAYT system. The lesson is that PAYT should not be held up because it doesn't yet apply well to the multifamily sector.

Ultimately, it is anticipated that using PAYT to reduce the burden on the disposal system will lead to more efficient use of services, improved environmental performance and resource use, and lower long-run solid waste system management costs.

2.3 Choosing the Appropriate PAYT System

There are many system design choices related to PAYT; two key ones are:

- Bin vs. bag / tag / hybrid options
- Rate differentials or incentive levels to be provided.

System choice is driven by a number of factors. Relative amount of tonnage diversion caused by the different options is one of those factors. In early research, the consulting firm SERA used statistical approaches and data from a large number of communities to examine the recycling and diversion resulting from can vs. bag vs. tag vs. hybrid programs. The study[27] found that bag programs actually led to slightly higher diversion tonnages – all other factors held equivalent (community demographics, other programs in place, etc.). The authors speculated that this may result because a bag program charges for the amount (volume) of service actually ***used***, and the can program charges based on a volume ***subscribed, whether or not that container is filled on a weekly basis***. Therefore, if households have less garbage than a full can, they may not feel as strong an incentive to divert all their recyclables, since they are paying for that extra space anyway.

Reusable bins reduce the costs and waste generation associated with purchasing plastic bags.

2.4 Existing Research on Optimizing PAYT Design

It might be conjectured that the greater the financial incentive for decreasing trash can size (or the greater the penalty for higher service levels), the greater the recycling achieved. Even if this is true, there is considerable financial risk to a rate structure that becomes very "aggressive". Rates are designed to raise revenues sufficient to cover the cost of providing collection service. The cost structure for providing trash service is a high fixed cost and low marginal cost (or a low cost for collecting an extra pound or can of trash at a household). IF a system is to provide a substantial financial incentive to reduce trash volumes, then some of the cost of basic collection for low subscription levels ends up being subsidized – and the only place to get that subsidy is to assign higher costs to the large trash subscribers. The greater the price differential, the greater the transfer, and the greater the risk of not recovering all the revenues needed to fund basic collection.[28] We analyzed whether there is an optimum.

[27] Skumatz, Lisa A., "PAYT Rate Design…", Resource Recycling, 2003.

[28] There can be a concern about "subsidies" and paying fair shares. The residential sector as a whole is not necessarily subsidized under a PAYT system (unless a community *chooses* to subsidize it from general fund, commercial customers, or elsewhere). However, there are usually some subsidies of low users by high subscribers in order to create a more effective financial incentive under the PAYT system.

Balancing Incentive, Performance, and Risk[29]

Rate incentives and specifically, PAYT rate differentials can be a driver for successfully increasing diversion. In previous quantitative research[30] (Skumatz 2001, 2013 and others), it was found that a community can achieve the same recycling or diversion levels from a PAYT rate differential of 80% more for double the service. Less than this achieves less recycling – and the research indicates that an incentive or differential of less than 50% for double the service volume -- is much less effective. That implies a goal for effective PAYT price differentials is between 50% and 80% for double the service, with a bias toward higher levels.

The studies assess a community's incentives by comparing rates for 64 to 32-gallon service levels (including embedded recycling costs).

The study used data from a large nationwide database collected by the authors[31] and statistically analyzed a wide range of PAYT factors that might affect recycling, including system type, variations in incentive levels (differentials), and container sizes. One key factor that was systematically important to reaching higher levels of diversion was whether the community offered a mini- or micro-can option in a PAYT program – a 10 or 20 gallon container at a lower price. Mini-cans apparently work.

PAYT Rate differentials – How much is enough?

The study also investigated the break points at which PAYT incentive levels become effective. The question of how much rate incentive / percent increment is "enough" vs. potentially "too much" in a PAYT system is an important one. Having too little incentive leads to a lot of administrative and political effort for barely any recycling impacts compared to a flat rate, and a shortfall in the diversion potential and equity benefits associated with PAYT. But there are difficulties associated with too high an incentive as well. There were those early on (specifically in California) that expected to "more than double" the rates for double the (gallons of trash) service, arguing for the strongest possible diversion incentive. The two main areas of difficulty from this kind of "too high" rate incentive are:

- Potential to anger residents, leading them to increase litter / illegal dumping, and complain.
- Revenue uncertainty problems.

To explain the balancing act on the second issue, consider the following. Communities (and haulers) set rates to recover revenue requirements[32], and the cost of service is, in the largest proportion, the cost of getting trucks to the door, not the tonnage collected.[33] If too much of the cost of (collection) service is loaded onto the larger cans (which it must be if incentive-based rates are charged),[34] and the incentive is too successful, the system may mis-predict the number of customers signing up for larger cans, and the system runs a risk of not covering the basic costs of door-to-door service. The funds for the subsidy for

[29] This section relies heavily on a nationwide study by Skumatz, "Recycling Best Practices Study: Practical and Effective Methods to Move Recycling Forward", Skumatz Economic Research Associates, November 2013.
[30] Skumatz, "Maximizing Vr/Payt Impacts – Policies, Rate Designs And Progress", Resource Recycling, June 2001, and Skumatz, "Recycling Best Practices Study: Practical and Effective Methods to Move Recycling Forward", Skumatz Economic Research Associates, November 2013.
[31] Data collected by Skumatz Economic Research Associates (SERA), Superior Colorado, including programmatic, cost, demographics, and other data from more than 1,000 communities nationwide.
[32] Plus profit, for a hauler, or plus an allowed net income in some communities.
[33] The literature often suggests the collection cost is 80-90% of the rates charged for service. Obviously, this varies depending on labor rates and tipping fees. The inverse is that 10-20% of the cost of collection [is the tip fee / disposal part.
[34] PAYT are still rates that cover the cost of service for the class appropriately.

lower cans do not materialize. The farther that the rate design deviates from strict cost of service by size, the greater is the risk of under-recovery of costs.

It is best to find the rate optimum: high enough to provide a recycling incentive, but not so high that the system's economics are in jeopardy.

As a consequence, we conducted statistical work to analyze the impacts of different levels of incentives. The data from the PAYT communities around the country were used in regressions to assess the two ends: the cost at which rate incentives seem to "kick in" (increase recycling), and the differential at which no additional diversion incentive seems to result. We tested both dollar value differentials (between the 30 and 60 gallon containers), and the percentage differences (same container sizes – the percent extra charged for this "double the service" option).

Dollar differences of greater than $5-6 / month for moving from 30 to 60 gallon container sizes were significant and positive, adding substantial diversion (about 4-7 percentage points to recycling beyond those programs that charge less). The impacts did not increase a great deal with larger rate differentials, but the study did find that differentials in the $8-10 range were solidly at the high end of the range. The analysis of percentage differentials showed that the greatest additional recycling is achieved when the price for the 60 gallon container is between 50% and 80% more than the price of the 30 gallon container. This added nearly 9 percentage points of diversion. The recycling results were smaller for rate differentials outside this range.

The study notes that the analysis is based on "all together" rates – defined as no separate fees broken out – the total that the household sees. The study also assumes that, once the rate differential for 30 and 60 gallons is "set" (defined by dollars, or by percentage, but then translated into dollars), the same dollar differential is used for moving from 60 to 90 gallons – for each 30 gallon increment, excluding the setting of rates for a mini or micro can (about 20 or 10 gallons, respectively).

Communities with stalled recycling and PAYT should consider checking whether the rate differentials should be revised to be consistent with the research; higher recycling can be achieved if 50-80% differentials are charged for double the service (assuming small container sizes like 32 gallons are available).

Figure 2.2: PAYT Program Design Results (Source: Skumatz, Lisa A. Skumatz Economic Research Associates, statistical research, 2012-2014)

PAYT Program / Policy Factors	Range of Impact on Recycling Percentage (percentage points ADDED to existing recycling rate in town)[35]
Mini- or Micro trash can offered (10-20 gal)	Substantial increase
Optimal rate differentials moving from 30 to 60 gallons (dollar differentials)	Minimum $7; strong impacts $7-$12[36]. Note that these are monthly costs, so "per 32 gallon bag" fees would be divided by 4.3 to reflect weekly collection.
Optimal rate differentials moving from 30 to 60 gallons (percentage incentives)	50%-80% of 30 gallon rate[37]
Socio-demographic factors	
Low tipping fees	Less recycling
Large community	Less recycling

One-Part or Two-Part Pricing

The research above is based on analysis of the full price that the consumer sees – no matter how it is constructed. Communities have designed their rates in two main ways:

- Calculating rates in a combination fashion (with a selection of possible incremental fees for higher volumes as mentioned above); or
- Calculating a "stopping fee" or a base program fee (for recyclables, etc.), and then adding a separate price "per 32 gallons" of trash service (a base fee plus a fixed adder of a "bin is a bin"—or 32 gallons is 32 gallons -- for increments of trash service).

Whichever mechanism underlies the price that households see, the final result should be total rates that conform to the recommendations from the statistical study above – total rate differentials should aim to be 50-80% more for the total cost of the increment from 30-60 gallons, and that same dollar increment should be assigned to each 30 gallons above that. Increments should not be less than $7-12 for 32 gallons, according to the statistical research, if strong diversion is the goal.

Research on Typical Pricing for Bin and Bag PAYT Programs

Recent research was also conducted on can subscriptions and pricing differentials (Skumatz, et.al. 2013).[38] This study used data from national community surveys on solid waste and recycling conducted by the authors. The study focused on PAYT communities, and provided summary statistics on:

- Average prices charged for various subscribed can service levels (Figure 6.2); and
- Average prices charged for bag-based programs (Figure 6.3).

[35] The only other indicative finding was that hybrid programs may lead to higher recycling than bag or tag systems or can systems. This result is inconsistent, however. This is different from earlier results that indicated bag systems delivered higher recycling levels than can-based programs (Skumatz, Lisa A., SERA 2000).

[36] Differentials smaller than this value were less effective than $7 differentials, which tended to have negative signs, indicating the incentive was too small to be effective in increasing recycling rates. Similarly, the impact on recycling diversion decreased for dollar differentials higher than $11 or $12.

[37] This range had the highest recycling incentive, adding substantial percentage points of PAYT recycling performance; other differentials had lower impacts, controlling for additional impacts of mini/micro cans, low tipping fees, and large communities.

[38] Skumatz, D'Souza, and BeMent, (2013), "Can Subscriptions and Price Differentials in PAYT – White Paper", Skumatz Economic Research Associates, Inc., Superior, CO, 80027.

Figure 2.3: Average Prices Charged for Subscribed Can Service (From Skumatz, et.al, 2013)

PAYT w/ cans	Minican[39] (15-23 gal)	30-35 gallon	60-65 gallon	90-96 gallon	Add'l Can	Per "Bag" or "Tag" in addition
Count	29	55	57	60	5	19
Average	$18.15	$19.36	$29.49	$37.16	$9.61	$3.13
Min	$2.75	$5.50	$7.56	$10.80	$6.90	$0.50
Max	$28.23	$33.45	$65.00	$98.44	$15.00	$6.19
Ratio of average price compared to 32 gallon	94%	100%	152%	192%	50% (small sample)	16% (one-time, not 4.3 times)

The differentials between average prices (bottom row) are less than the recommended values for highest performance, but still show substantial variation for increases in volumes.

Figure 2.4 shows the results for respondents that answered that their community uses only bags for PAYT-based residential trash.

Figure 2.4: Average Prices Charged for Bag-Based PAYT Programs

PAYT w/ bags only	Bag (15-23 gal)	30-35 gallon	Per "Bag" or "Tag" in addition
Average	$1.17	$1.96	$2.33
Min	$0.60	$1.20	$1.00
Max	$2.50	$2.50	$3.30

Choosing the Best PAYT Option:

From an overall point of view, the research indicates that:

- Considering the perspective of maximizing diverted tonnages:
  - small PAYT containers enhance the diversion to recycling and organics containers (less than 30 gallons for a system with both recycling and organics collection)
  - In communities in which it is feasible to provide collection for organics, adding this collection will divert significantly more tons.
  - Assuring the price increment between container sizes is at least 80% (no less than 50%) for doubling the volume in a 30 vs. 60 gallon container, and making sure the cost differential is at least in the range of $7-12 per month.
  - Consider bag programs for slightly higher diversion, all else held equal

- From a cost-effectiveness point of view:
  - Consider every other week recycling collection; the savings from one fewer collection per week can be allocated instead to an organics collection program, adding on the order of 6 percentage point more diversion.
  - Consider every other week trash collection to further decrease costs, potentially reduce the inventory of containers needed, and reduce blow-overs of containers (larger containers collected less frequently will be stockier in design).

[39] Note there were not enough observations to publish results for microcan service levels.

    - Going to every other week trash will provide additional collection cost (truck stopping by) savings, and also drive more food waste to the organics collection.
    - Save money on containers by recycling large trash carts into recycling (or organics) bins through switches in the color of lids, or the use of decals.
    - Consider bag or hybrid options to eliminate the issue of financing new containers.
- Overall design elements include:
- Incorporate the cost of recycling into the trash bill and offer recycling at no additional fee – a basic design outcome; consider incorporating the cost of organics in the bill, if maximum diversion from the landfill is the goal.

However, factors like the types of collection vehicles, whether there are already containers in place, capital cost barriers to the purchase of new containers, presence of a billing system / mechanism, and other factors will affect the choice as well. The next chapter assesses which options may make most sense given Asheville's situation.

2.5 Implementing PAYT -- Tips for Success

The amount of time it takes to implement PAYT programs varies from as little as 3 months to communities that are still studying the system after several years. Frankly, although billing system delays or technical issues are sometimes a factor, technical issues are seldom the problem in implementing PAYT. PAYT programs have tremendous flexibility in their design and can usually be tailored to accommodate most concerns. Instead, political will is usually the largest stumbling block and source of delay for implementing PAYT programs. Recall, however, that once these programs are in place, more than 90% of residents prefer the new system. Many manuals available that provide steps, timelines, and tips for implementing PAYT.

Based on interviews with hundreds of communities nationwide what have implemented PAYT, published work by the consulting firm SERA has assembled the following tips.[40]

- **Pilot test**: Consider implementing the program in one area of the city first, and then spread to other areas. Learning lessons about subscriptions, set outs, containers, and other problems in ¼ of your town are much less expensive than making a mistake citywide.

- **Billing**: billing jointly with water service, if possible, can provide strong advantages. If the ordinance is arranged so that partial payments are assigned to solid waste first, then non-payments can lead to shutoffs of water service, a strong payment incentive. Bad debt is quite low under these systems.

- **Involve others in design**: Assembling a citizen or stakeholder committee to help assess and design the program can help sell the program to elected officials, and can make sure that the program addresses concerns of major stakeholders. Although this process may appear to slow down the decision-making, it can often speed it in later steps and can bring support for the program when it most needs it. Don't forget to meet with related city departments, including

[40] Skumatz, *Resource Recycling*, 8/97; multiple manuals

financial, billing, enforcement, customer service, police, and others that may be affected by PAYT changes.

- **Don't pile on other costs**: If you are just implementing PAYT, try not to pick that year to do a major renovation to transfer stations or other upgrades that are not visible to residents. The increased costs, whether or not they are due to PAYT will be blamed on PAYT and will undermine the buy-in for the program.

- **Determine whether to make changes at once or more slowly and design education accordingly**: Some communities argue that implementing many changes at one time confuses citizens and makes the education process difficult. Others argue that customers don't want to have to make decisions about solid waste in a piecemeal manner, and want to "deal with it once".

- **Education and outreach**: None of the towns interviewed wished they had done less education. This is a crucial component of a successful PAYT program.

- **Keep constant for one year:** If at all possible, keep the system and rates constant for at least one year to help build confidence in the program. Then the rates and program can be refined to account for unexpected outcomes.

- **Tracking / revising**: It is very important to track key indicators related to the program and its performance to assure that the PAYT program is achieving its objectives and that the program is sustainable. Items to track include container subscriptions or sales of bags / tags; enforcement issues; revenues; costs; time spent by various staff; tonnage changes by programs, etc. Use this information to gauge program progress, cost-effectiveness, and to provide a head's up for needed changes.

- **Keep key groups informed**: Use the monitoring information to provide feedback to program staff, elected officials, and others to keep them informed about program momentum and successes. Be sure to note problems and timely corrections as well, to make it clear you have a handle on the program and are making sure it is on track and as efficient and effective as possible.

3. Can PAYT Work in Asheville?

3.1 Asheville's Solid Waste Collection and Fee System / Context

Asheville's current solid waste system uses City staff to collect trash and recyclables from 30,000 households. Single family households receive trash service using city-owned 95 gallon carts.[41] Most of the service is provided using fully-automated side loading trucks, except for some areas that have obstructions or are difficult to access. If residents have extra trash or bulky items, these items are separately collected using a rear packer.

The City of Asheville contracts with Curbside Management, Inc. to collect recyclables on an every other week basis. Single stream recyclables are collected in 95 gallon carts. Although recycling is not mandatory, the service fee is embedded in taxes and the bill, and about 80% of households participate in the program. There is also a drop-off site at the Buncombe County transfer station.

There is a brush and leaf collection program, and the materials go to Danny's Dumpsters as a compost additive, or sent to a mulch yard.

The City diverts about 8,160 tons of recyclables, and 8,500 tons of brush/yard waste per year. About 22,300 tons are delivered to the landfill annually. The city's current diversion rate is 21% for recycling, and 43% when organics (yard waste) diversion is added.[42]

Households are billed for service on an every other month basis on their water bills. The service fee is $10.50/month, and is anticipated to increase to $14 next year. Over the past several years, the City has been increasing the environmental fees charged to customers to begin to move the solid waste system closer to full cost recovery through fees and an enterprise fund model. Rates moved from $3.50 to $7 to $10.50 between 2013 and 2015.[43] This study is meant to identify the options for implementing a PAYT system in the year 2017.[44] This has allowed the general fund subsidy (from property taxes) for solid waste services, recycling, and white goods to decrease from $4.8 million annually, to $3.6 million, $2.4 million, and $1.2 million[45], with PAYT representing the move to zero subsidy and the approximate $6 million annual budget paid from user fees.

Citizens are very interested in and aware of recycling, and participate at high rates. The City Council has a strong interest in reducing waste output, and established a goal to reduce tonnage sent to landfill by 50% by the year 2035. The Council is interested in PAYT, with the caveats that the system must be sensitive to the financial impact on citizens, and to public perception.

[41] About 8% of Asheville households have 65 or 35 gallon cart for space considerations, but pay the same rate.
[42] The figure was computed as (recycling tons divided by the sum of recycling, organics, and trash).
[43] City staff also proposed a possible move to $14.00 in 2016.
[44] See City of Asheville Staff Report, March 24, 2015, "Proposed Solid Waste Fees, Fiscal Year 2015-2016 Budget".
[45] The memo indicates that the actual shortfalls may be about $2.48 million under the $7 option and $1.38 million under the $10.50 fee.

Asheville staff and the SACEE committee[46] have looked into PAYT, and examined two main PAYT systems – the cart-based model and the bag-based model. The comparison in SACEE's memo concluded that:

- The cart based model would be simpler to communicate to households and would cause little disruption in current collection.
- The bag program would divert more waste, have a greater financial benefit to the City, but be more complicated for collection, implementation, and enforcement.

Because of their interest in greater diversion, SACEE recommended the bag-based program, but noted that if the bag program wasn't supported, they were in favor of either type of PAYT system.

3.2 Analysis of Two PAYT Alternatives

The current collection system lends itself to three main PAYT systems:

- Cart-based system;
- Bags in carts; or
- Hybrid system.

The hybrid system is the least suitable, because the base carts in Asheville are so large. If Asheville's system currently provided service in 32 or possibly 64 gallon carts, then appending a bag-based program for "extras" beyond the base cart size would be an inexpensive model. However, it would have two negative caveats: first, it would not lead to significantly greater recycling, because households would only receive the financial recycling incentive on the trash *beyond* the basic trash can volume, and second, it would complicate and significantly slow the automated collection because the bags would, by definition, not be included in the containers. Therefore, two options remain:

- Cart-based PAYT, usually delivered in 32, 64, and 96 gallon carts with different, incentive-based fees, and
- Bags in carts, and the City has been approached by Waste Zero™ (WZ) as a possible vendor / implementer.

How the systems work:

Under a cart-based program, customers would select a cart size that meets their needs and provide that information to the City. If a citizen does not reply, a (policy-derived) default sized cart is delivered. The recurring monthly rate (billed every other monthly on the water bill) is assigned to the household based on cart size. Collection continues as it has, using automated trucks for the bulk of collection. The cart size is self-enforcing.[47]

Under the bag-based program, the City may purchase bags on an ad-hoc basis, from vendors, or may enter into a contract with a vendor on a longer term basis, presumably based on an RFP process. The city or the vendor will establish a network of locations at which households can purchase the specially-logoed bags (with City logo). The distribution network usually consists of grocery stores (to provide the bags where people commonly go), convenience stores (to assure they can obtain bags early in the

[46] See 2/24/15 Memorandum from SACEE to City council, PED Committee, entitled "Pay As You Throw".

[47] If customers need to put out extra waste, a simple bag-based or tag-based option is usually introduced. However, more communities have moved to an extra fee put onto the bill based on a hauler report of extra material beside or out the top of the container, recorded on-route on a route sheet or via photograph, etc.

morning if needed), and potentially City Hall. The bags must be restocked periodically.[48] Customers purchase the bags, which include the cost of the bags plus the cost of collection and disposal of the waste (and collation / management of recycling and other related programs). The bags are put into their current 96 gallon trash containers, which are collected using the current collection system and trucks.

Under both systems, we assume a short (3 month) increase in customer service calls may result.

We analyzed both these options in detail.

3.3 Modeling the Cost and Recycling Impacts of the Two PAYT Models for Asheville

The modeling work was conducted to address the following topics – comparing the cart-based option with the bag system.

1. Tonnage diversion impacts from the PAYT Incentive
    - Changes in tipping fee costs from diversion
2. Expenditures for collection – trash and recycling
3. Derivation of Cart-Based Costs
    - Purchase of new carts for the PAYT system and financing
    - Estimate of distribution of carts needed by size based on volume distribution, diversion reductions, and compaction effects
4. Derivation of Bag System Costs
    - Estimate of number of bags needed by size based on volume distribution, diversion reductions, and incentives
    - Cost of bags and distribution
5. Rate and household cost computations
    - Revenue requirements / revenues needed to be raised by the two systems
    - Non-rate revenue sources, if any
    - Remaining revenues to be raised by rates
    - Rate computations and scenarios
    - Cost per household comparison

3.3.1 Tonnage impacts

Both cart- and bag-based PAYT systems are expected to increase Asheville's recycling substantially; in fact, that is one of the main goals of considering a PAYT program. PAYT leads to increased recycling, but the literature[49] shows it also leads to increases in diversion of yard waste / organics, and to source reduction as well.[50] The SERA literature estimates the "generic" or average impacts to be 17% increase in diversion overall, consisting of about 6% in recycling, 5-6% in organics, and 6% source reduction. These figures are derived from SERA statistical analysis of data from hundreds of communities with and without PAYT, and the analysis is designed to "control for" effects that are not PAYT – including

[48] According to the case studies described later in the document, WasteZero™ takes care of restocking and establishing the distribution network for the City.

[49] Skumatz, Lisa A., "Source Reduction Can Be Measured: PAYT as an Example", 2001, *Resource Recycling*

[50] Generally considered to be in the form of more donations to charitable organizations rather than throwing things away, getting things repaired rather than disposing, buying items with less packaging, etc.

demographics, differences in the design of recycling programs, and so on. The resulting impacts are transferable effects – and what the average incremental impact of introducing a PAYT program would be – across all types of PAYT programs. Note that these impacts are expressed as percentage points of diversion – that is, as a percent of generation.[51] Expressed in terms of increases in recycling, the data indicate increases in recycling tonnage of 50% or more from the introduction of PAYT and these figures are consistent with the 6% of generation figures noted earlier.

WZ argues that a bag-based PAYT system leads to much higher levels of recycling than a can-based system (15 percentage points for can-based PAYT and 30 percentage points for bag-based programs). SERA has published information that suggested that there may be higher levels of recycling from a bag-based system; however, while there was an apparent increase, the differences were not statistically significant from zero, and bag impacts were not twice as high. Where WZ has seen high levels of recycling increases, it may be in their selection of communities[52], or it may reflect measurement differences. In any case, our analysis assumes more conventional figures for the recycling impact, although we do provide a "benefit of the doubt" extra impact to the WZ program.[53]

Asheville is a special case. The City already diverts very high levels of the available organics, and no changes are anticipated in that program; therefore, unlike the usual PAYT case, it would be unrealistic to expect substantial additional organics diversion from either PAYT system. In addition, the City is poised to recycle more; there is interest by residents (see the Chapter on Survey Results). We deviated from the "average" impacts because of Asheville's green ethic, and the fact that the incentive will largely have to be realized through recycling rather than organics (given the relatively high organics diversion from seasonal programs). We assumed conservative values for the diversion from source reduction.

For the modeling work, we assumed:

- Recycling diversion increase: 8 percentage points for the cart program; 10.5 percentage points for the bag program
- Yard waste diversion increase: 1 percentage point for each program.
- Source reduction impact: 4 percentage points for each program.

This results in:

- Recycling rates of 29% for the cart program, and 31.5% for the bag program, up from the current 21%
- Diversion rates (recycling plus yard waste) of 51.8% from the cart program, and 54.3% from the bag program
- An additional 4% tons are diverted from landfill for both programs, due to the source reduction impact.

[51] combination of diversion and landfilling in the denominator

[52] WZ may be using impact data from programs that were previously underperforming. Asheville has a respectable 21% recycling rate already and is not underperforming for a community without PAYT. WZ may also attribute extra impacts to additional education, but education can be provided under both the WZ and the cart-based option. The measurement difficulties are akin to those from another program. According to Skumatz, 2010, in *Resource Recycling*, Recycle Bank™ noted high levels of change partly because they combined the impacts of larger recycling containers and the RecycleBank™ incentives combined, plus their program targeted dramatically underperforming communities.

[53] Although we use a conservative difference, given that the statistical analysis of large-sample data do not support substantial differences.

The tonnage cost impacts – estimated by calculating the tonnages shifted from the landfill to these different programs times the tipping fees for disposal vs. diversion – result in the following savings.

- ⇨ $219K in tipping fee savings for the cart-based system and
- ⇨ $267K in tipping fee for the bag-based program.
- ⇨ Recycling rate 29% for cart program
- ⇨ Recycling rate 31.5% for bag program

3.3.2 Collection Costs

The cost of providing collection – absent the tipping fee differences calculated above – was also estimated. Normally, we would expect recycling costs may increase, because the number of households recycling might increase, and the greater stops would affect routes, etc. However, the City has a contract that already incurs a per-household charge that covers practically all households. Brush collection is similarly charged / delivered. Trash collection "stopping charges" would also remain fairly constant under the new system for the base collection. There would be no changes in trash collection systems under the cart-based collection; the automated truck would just be lifting three different sized carts using the same equipment. No changes were modeled for the "hard to access" areas, as the City currently has a cart-based system. The use of different sized carts makes the system "self-enforcing" with no extra work for the drivers.[54]

It is expected that there would be several differences in costs for the bag-based program, particularly as it relates to enforcement. To provide incentives to households, households will need to know that their use of the pre-paid bags will be enforced. However, specially-logoed bags in cans are not easily seen by the drivers until the carts are tipped. Drivers will need to observe the carts dumping (presumably by looking at cameras) to assure that the households are using legal bags. This may slow routes; we assumed it would not, to be conservative.

Collection costs results:

- ⇨ The same for both systems.

3.3.3 Cart-Based PAYT Container and Other Costs

Cart Costs:

Cart costs include purchase, assembly/delivery, and maintenance. We assumed maintenance was a wash: the City must maintain the carts under the current system, and would also maintain the same number under the bag-based system, since bags would still be placed in roll carts.

New 32- and 64-gallon carts will be needed for the cart-based PAYT system. The number of new carts needed depends on the behavior change that occurs under the incentive-based PAYT program. Information from two sources, including the rate study, was used to identify the cart distribution that Asheville residents will need, and the costs that the City will incur for those carts:

[54] There could be occasional enforcement actions if customers make "silos" out of their disposal – having waste overflowing in a way that needs an enforcement action, or that makes it difficult for the automated collection truck to pick up the container or material. This is a tiny minority of cases based on research from other communities.

- Rate study / volume distribution analysis: SERA used a starting distribution of the percent of customers that use different percentages of volume (effectively, gallons) of the trash cart. The distribution was derived from set out surveys SERA has conducted in communities across the nation. We normalized the distribution by matching up the median volume from the City of Asheville. With this baseline, we reduced these volumes to estimate what would happen after the introduction of PAYT using three steps: reduction because of more recycling, more yard waste diversion, and more source reduction. We then performed a fourth adjustment that allowed for compaction of waste within the cans as well. Customers will have incentives to stuff the cans a bit in order to save money and keep to a smaller cart size. After making these calculations, we derived an "after PAYT" gallons distribution. We then grouped this distribution into the percent of households that could use a 32 gallon can, a 64 gallon can, and those needing 96 gallons of service. The resulting estimated distribution was 31% on 32 gallons, 53% on 64 gallons, and 16% on 96 gallon carts.

- Survey: A second source of information was the trash and recycling survey we conducted of Asheville residents. One of the questions asked households to select the size of container they would need. Although the survey was not statistical, it did receive responses from a large number of City households. The resulting distribution from this source was 50% on 32 gallon, 36% on 64 gallons, and 14% on 96 gallons.

Our selection of the final distribution used in the rate study considered both these sources. We had concerns about using the survey results without reservation because a review of the survey respondents had a very high tendency to compost, and tended to have higher education levels than the average City resident. Our knowledge of other communities implies that, under these conditions, the survey responses would be biased toward lower can sizes. Using our professional judgment, and comparing to distributions resulting in other communities, we ultimately adopted an average of the values (rounded a bit) from these two sources. The resulting distribution is provided below, along with the number of carts what would need to be purchased, and their costs. We assume the 96 gallon carts would be carried over to the new system and would not need to be replaced.

- ⇨ Estimated trash cart size distribution: 40% on 32 gallons, 45% on 64 gallons, and 15% on 96 gallons.
- ⇨ Percent and number of new carts needed: 40% 32 gallon minus the 1% that already have 32 gallon containers (39%), plus 45% 64 gallon containers minus 8% of households that already have them (37%). A total of 76% of households will need new carts, and we assume we will need 3% extra stock for backup, for a total of about 23,815 new carts.
- ⇨ We gathered data on costs for containers including assembly and delivery. Assuming 32 gallon carts cost $40, and 64 gallon carts cost $50, the purchase price for containers is $1.1 million. Based on markets, we assumed the value of the extra 96 gallon carts is essentially zero.
- ⇨ Spread over 5 years, at 3% interest (conservative), the annual cost is $220K for the purchase of containers. Note that the containers are expected to last 10-15 years (many cities are finding even longer lifetimes). A case could be made to spread the costs over a longer period; we assume a conservative 5 years, a figure that is in relatively common use in the industry.

Again, we assume other cart costs (e.g. maintenance, cart washing, etc.) would be the same whether Asheville keeps the current system or introduce the bag-in-cart system. No incremental costs for these items are included.

Other Costs:

The other main costs for the cart-based PAYT system relate to a new billing system. Refinements to the billing system are estimated to cost $15,000. This will allow the system to bill three different rates (depending on cart size) on a recurring basis. The cost of this expense is spread over 5 years, for an annualized cost of about $3,000.

- ⇨ The annual incremental cost for these costs for the cart-based PAYT program is $223K for the first 5 years, and zero thereafter. Cart replacements would occur as they would for any of the programs after that period.[55]

3.3.4 Bag System Purchase / Distribution Costs

Multiple steps were also needed to estimate the number and size of bags that households would use under the potential new bag-based PAYT program.

- Total tonnage divided by weight per bag: We divided the total trash tonnage per household per month by an average weight per bag (20 pounds) to derive the number of bags per month and week. Using an average weight of 20 pounds, this resulted in 4.5 bags per month or 1 bag per week.

- Translate PAYT cans sizes into number of bags: In this option we translated the 32 gallon can into 1 (32-gallon) bag, assumed a 32 gallon bag would fit 1 32 gallon bag, a 64 gallon would fit two bags, and the 96 gallon cart would be equivalent to three 32-gallon bags. Multiplying times the subscription levels identified in the cart-based analysis, we estimate an average of 1.7 bags per week per household.

Our selection for the estimated number of bags sold used a point between these two estimates, or 1.5 bags per household per week, for a total number of bags sold of 2,382,000 per year.

Many of the communities in which bag programs operate allow for two sizes of bags. If we assume two sizes that Waste Zero uses in other communities, 10 gallons and 30-35 gallons, we have several sources for identifying the distribution of bag sales between these two sizes. Using the cart and gallon distribution from above, we find about 9% of the customers could use a 10-gallon bag on a weekly basis. Waste Zero's presentation estimates a split of about 40% / 60% for small vs. large bags. Interviews with other communities with bag system indicate totals of perhaps 35% on smaller bags. Using a blend of these sources, we project estimates of 25% on the smaller bag, and 75% on larger bags.

To estimate the cost to supply the bag program (like the purchase of PAYT carts), we need the cost per bag for logoed bags of an appropriate thickness (not yet the fee charged to households – that follows in later). Calls to bag manufacturers and to WZ and WZ communities identified approximate wholesale cost estimates of about $0.20 for the smaller bags, and about $0.35 each for bags of the larger size. Other possible "adders" to this cost include:

[55] New carts would be needed periodically for the bag in a can program, or for the basic Asheville automated collection program. There is no on-going difference in cost assumed going into the future once the difference sized cans are purchased in the first period.

- Distribution or other premiums to the bag company
- Extra route time for inspection of bag compliance
- Extra route time to pick up bags.

To be conservative, and because reliable numbers were not available for these costs, we assumed all these potential extra costs were zero.

⇨ The annual incremental cost for bags for the bag-based PAYT program is estimated to be $745K per year, on-going.

One additional discussion point might be made regarding the incremental costs to households. If the households decide to put trash directly into the WZ bags, they might be able to buy fewer in-home Hefty™ or other in-home bags, saving some costs to the household. However, this potential behavior would not affect either the revenues to the City or the costs and expenditures for WZ bags. [56]

3.3.5 Rate and Household Cost Computations

The subtotal, or net of all these changes for the cart program vs. the bag-in-a-cart program provides an estimate of the incremental revenues to be raised by each PAYT option. The total estimated revenue requirements for the two system are listed below.

Figure 3.1: Revenue Requirements and Average Cost Per Household Per Month for PAYT Options

	Cart-based PAYT	Bag-Based PAYT
Revenue requirements	$7.04 million	$7.60 million
Cost per household per month	$18.75	$20.00
After 5 years when the carts are paid off	$18.15	$20.00

Although we assume tipping fee savings prefer the bag program (by about $45K per year), the on-going annual cost of bags ($745K) compares unfavorably to the cost of cans spread over 5 years ($223K), and the additional can costs stop after 5 years.

[56] This is possible. We have not seen studies providing estimates of this behavior. Traditionally, it has been assumed that household kitchen and bath bags end up going inside the logoed plastic PAYT bags, leading to no savings in avoided bags, (and as a corollary, the full amount of extra plastic in the landfill). However, this argument has been raised in the Asheville case, and we provide a discussion of this possible effect in this section. The most realistic assumption would be that this might occur for a share of the small bags – the ones that would potentially fit in standard 13-gallon kitchen trash cans. Given that household trash carts are usually stored in the garage or possibly behind the home, it is unlikely that households would bring trash directly there into the large bags on a regular basis. If all 25% of the smaller bags were replacing bags already bought by customers, and those bags cost $0.15 each. The estimate of $0.15 comes from approximate grocery store prices. We are somewhat unsure whether the small heavier logo-ed bags will cost only five cents more, but these are the estimates that were obtained from vendors (conservative assumptions used). The savings (a kind of household "take back") would be about $91K per year. If we assume half the bags sold replaced Hefty-type bags, then the household savings would be about $179K per year. For rate purposes, we cannot delete these costs. For considering the net costs at the household level, some version of these costs may be able to be subtracted. From the perspective of the household, we could potentially subtract between zero to $91K to $180 K from the bag fees to reflect household savings from avoided purchase of in-home Hefty™-type bags. On a per-household basis the calculations show it is still cheaper for households to use a cart-based system, even consider in the "net" costs.

We conducted computations of the rates that would arise from these results as well. These rate study computations estimate the rates that would be required for each service level to recover the total revenues needed to run the system. Using the conservative assumptions employed above, the rates are presented below, including rates for 32, 64, and 96 gallon carts under the cart-based PAYT option, and for 10 and 32 gallon bags under the bag-based option. These rates do not embed any extra for net income for the City or extra profit for the bag company.

Figure 3.2: Summary Results and Estimated Rates for Bags and Carts[57]

	Status Quo	Cart-based PAYT Option	Bag -Based PAYT Option
Recycling Rate	21.0%	29.0%	31.5%
Rate 32 gallon cart / 10 gallon logoed bag	$10.50	$12.10	$2.15
Rate 64 gallon / 30 gallon	$10.50	$21.10	$3.40
Rate 96 gallon	$10.50	$30.10	
Average total cost per household per month (full cost recovery)	$18.82	$18.75	$20.00
Incremental Cost per Year: Carts (5 years); Bags (perpetuity)		$220K	$745K

Note that all rates should be rounded to the nearest dime or 25 cents for convenience. Each scenario raises the revenue needed to fully cover the cost of providing trash and recycling and brush service to households in Asheville, and to fully come off the City subsidy.

3.3.6 Cost Recovery Calculations

The City was interested in understanding the rates that would arise if the City were to use a more gradual approach to removing the City subsidy. Figure 3.3 below provides the rates that would arise if the City cost recovery was 100% (zero subsidy), to as low as 50% cost recovery. Note, however, that the two scenarios that show 60% and 50% cost recovery (presented in italics) would be unlikely to divert the amount of tonnage we estimated; the lower cost recovery reduces the incentive levels between rates, and would likely be insufficient to change behaviors to the level we estimated in this study.

[57] Note: Rates are rounded to the nearest nickel or dime. Note also that cart prices vary with the price of oil. It is unlikely that cart prices would increase more than 10% over the costs noted in this study. This variation would still result in savings for the cart-based program. However, even if the loaded cart prices were 20% more than our estimate, the additional cost for the cart program is less than $44K per year.

Figure 3.3: Rate computations under alternative rate recovery percentage assumptions

	Rates under various levels of cost recovery	100%	90%	80%	70%	60%	50%
Can	Total needed per HH for full cost recov-cans	$18.75	$18.75	$18.75	$18.75	*$18.75*	*$18.75*
Scenario	Budget transfer (in thous/yr)	$0	$704	$1,407	$2,111	*$2,815*	*$3,518*
Can	Money to be raised from rates per avg HH/Mo	$18.75	$16.88	$15.00	$13.13	*$11.25*	*$9.38*
Scenario	Can Rates-32 gal	$12.04	$10.83	$9.63	$8.43	*$7.22*	*$6.02*
Can	Can rates-64 gal	$21.07	$18.95	$16.85	$14.75	*$12.64*	*$10.54*
Scenario	Can rates - 96 gal	$30.10	$27.07	$24.07	$21.07	*$18.06*	*$15.06*
Bags	Total needed per HH for full cost recovery-bag	$20.02	$20.02	$20.02	$20.02	*$20.02*	*$20.02*
Scenario	Budget transfer (in thous/yr)	$0	$751	$1,502	$2,253	*$3,005*	*$3,756*
Bags	Money to be raised from bags per avg HH/Mo	$20.02	$18.02	$16.02	$14.01	*$12.01*	*$10.01*
Scenario	Bag rate - small	$2.12	$1.92	$1.70	$1.49	*$1.27*	*$1.07*
Bags	Bag rate - large	$3.39	$3.07	$2.72	$2.38	*$2.03*	*$1.71*

Table Note: The two scenarios that show 60% and 50% cost recovery (presented in italics) would be unlikely to divert the amount of tonnage we estimated; the lower cost recovery reduces the incentive levels between rates, and would likely be insufficient to change behaviors to the level we estimated in this study.

3.4 Cost-Related Findings and Conclusions on PAYT Options

The essential cost-based differences between the two PAYT options are itemized below:

- ⇨ Assume higher recycling rates (about 2.5 percentage points more; 29% vs. 31.5%, from current 21%) from a bag program[58]
- ⇨ Lower tipping fees for the bag based program (about $45K per year)
- ⇨ Higher total costs for purchase of containers than bag costs, but given the 15 year lifetime of cans, spreading these costs over even a conservative 5 years leads to a substantially lower incremental "containers" cost for the cart-based program at $223K per year (stopping after 5 years) vs an on-going $754K per year for bags.
- ⇨ In any case in which households buy at least ½ bag per week on a bag that is disposed in the bag-based system, they are spending the same as the monthly contribution toward a 15-year cart, and those cart costs cease after 5 years. [59]

A more detailed discussion of the differences follows:

- The base case finds costs are higher for the bag-based system than the can system (assuming can costs are spread over 5 years). We find the cost is $1.50 extra per month for the bag system, and they would have paid off the cans in about 3 years, as opposed to the 5 years in the can system – and they will keep paying for bags annually.

- Any customer putting out ½ bag per WEEK (0.58 bags) is essentially spending the same on bags as they would have spent for the $1 per month that buys a multi-sized cart in 5 years[60].[61] The

[58] However, note that statistical studies do not identify a significant difference; this is a conservative assumption.

[59] 35 cents to 50 cents each boxed in 100 units from multiple well-known manufacturers on the web. Waste Zero cites 1.5 mills as an important quality considerations and we used this thickness in our cost comparisons. 35 cents is the COST noted when we called Waste Zero's customer service staff.

[60] $55 delivered divided by 60 months is less than $1 per month; interest pulls it up to roughly $1 per month for 5 years. $1 divided by 40 cents per bag, pays back =2.5 bags/mo, or 0.58 bags/week.

[61] To be very conservative, we could assume that persons would not need to buy kitchen bags at 15-20 cents each for brand name bags. We could net out the savings from kitchen bags people may not need to buy, but that would only apply to households using the small bags; 30 gallon bags will not fit in kitchen garbage cans (usually 13 gal); 10 gallon bags could. The model allows modeling of costs net of customer savings. However, as long as net costs for households exceed about 8 cents, costs for the bag program are higher. Depending on the share of households that give up using a bag, the payback varies, but not to 10 or 15 years.

carts last a minimum of 10 years and are usually expected to last 15. With a bag fee they keep paying for the bags well after carts would have been paid off. We predict people will use more bags than this, and will be paying an extra fee that would have paid off carts in about 3 years.

- We find the estimate of extra recycling for bags vs. cans is unrealistic (twice as many tons proposed by the bag company in their materials to Asheville) or may possibly apply only in communities with previously weak recycling, which Asheville is not. Our statistical work using many communities around the country implies there might be a little more diversion from bag programs, but the difference is small, and most importantly, it is not statistically significant in the models. We provide a generous 2.5 percentage points more recycling as a conservative case.[62]

- Operational changes arise with bag-based programs. Extra plastic is put into landfills that would not otherwise arrive; this will vary with the share of customers that put bags in bags (excluding the thicker plastic of the logo-ed bags). Waste Zero indicates perhaps 20% continue to put bags in bags / 80% do not. This depends on the offering of small bags that will fit in kitchen containers, and the relative pricing assumed between small vs. large bags. Education is somewhat more complicated. A bag program can be considered for the occasional "extra" waste customers may need during holidays, parties, etc.

- Web research indicates that the cost of a 1.5 mill 32 gallon bag is about 35-50 cents in 100-unit boxes. Waste Zero's customer service staff suggest their sales cost is about 35 cents. Based on a few case studies with Waste Zero customers, it appears this varies somewhat. One community willing to share costs is charged 15 cents and 30 cents respectively for 15 and 30 gallon bags. Another is charged 13 cents and 22 cents for their 15 and 30 gallon bags (bigger city). We are not certain if there are other elements of the negotiation or fees. In simple terms,[63] as long as the net cost of the total of bags put in the cans is more than 23 cents per week (1 dollar divided by 4.3 weeks per month), the cost of the bag program is higher. That would be 23 cents if one bag is set out, 15 cents if 1.5 bags are disposed, 11 cents for 2 bags per household per week, etc.

From a cost standpoint, the cart-based PAYT program is less expensive for Asheville households. There was some discussion in the Waste Zero™ documentation that the City would gain extra revenues from the WZ system. Whether the revenues are raised from bag fees or cart fees, the revenues ultimately come from Asheville residents. Either the bag or cart-based program can set rates to recover the minimum revenue requirements listed above, or add fees needed to fund related programs like litter or other waste-related initiatives. Both systems are able to draw the solid waste system off the general fund subsidy – in whole or part, as illustrated in Figure 3.3 – and provide revenues that reduce the general fund subsidy. The modeling assumes higher recycling from the bag-based program. The tipping fee differences relative to the container cost comparison makes it clear that substantial differences would be needed to nullify the cart / bag cost differences, and statistical analysis does not support assumptions of large recycling incentive differences.

The results of the case studies and the Asheville customer survey are discussed in the next section, providing feedback related to operational and system preference issues.

[62] We find that introducing a mini can option provides a substantially larger effect than the bag effect.
[63] Excluding billing costs for the can program, and distribution or enforcement costs for the bag program.

4. Summary of Results from Surveys and Case Studies

4.1 Asheville Survey Results

Asheville's trash and recycling services survey received more than 1,100 responses. This is a large number of responses and provides strong feedback that can be used to improve the efficiency and effectiveness of the City's trash and recycling services.[64] Full responses to the survey are included in the appendix.

Carts are set out regularly, and recycling carts are more full than trash: About 70% of respondents reported setting out their residential curbside trash carts are set out weekly and 87% set their recycling carts out every other week (frequency of recycling collection is bi-weekly) (Q2). Respondents report that recycling carts are far more likely to be upwards of 75% full, if not overflowing on collection day, whereas trash carts are typically less than 50% full when collected (Q4).

Multifamily recycling is under-utilized or unavailable: Almost every response from renters in multi-family structures (14% of total responses) indicated that they never recycle. In many cases recycling services are not provided by their building owner or property manager.

The standard materials are recycled well, but there may be misunderstandings about what to do with food containers and styrofoam: The following materials were mostly disposed of via big blue curbside bins: glass/plastic bottles, plastic tubs, plastic clamshell containers, restaurant to-go containers, aluminum/tin/steel cans, milk cartons, cardboard, cereal boxes, pizza boxes, newspaper, and other paper. There are materials for which customers seem confused about the proper destination, and additional education may be needed. This includes potentially-eligible recycling materials that ended up in the trash with some frequency include, and non-recyclables being put in the blue bin. The materials, with the percent put in blue bin, followed by put in trash, follow. Milk cartons (86% / 12%), plastic clamshell containers (79% / 19%), restaurant to-go containers (64%/ 38%), pizza boxes (70% / 31%), plastic bags / other packaging (31% / 27%), and Styrofoam (22% / 62%).

Households use the Hard to Recycle Events: The two most unique categories of material were electronics and paint cans, which were mostly disposed of through Hard to Recycle Events, or other recycling options. Electronics are also highly reused/donated, whereas a lot of paint cans simply end up in the trash.

Asheville generates a great deal of yard waste: Survey responses indicated that almost all residents have either a lawn, mature trees, a garden, or shrubs at their house, with only 5% reporting no lawn or yard at all. While most residents have these natural amenities, a majority of them reported that they are only really generating yard waste in the spring and fall. Yard waste comes in two forms: grass clippings and tree/plant trimmings. Grass clippings are typically composted at the place of residence, whereas tree/plant trimmings are usually put on the curb for City brush collection (Q8).

[64] However, note that the survey is indicative, not statistical, because it was not a random survey, but a broad-outreach survey. Because of this, we do not report percentages for many of the responses, but do report majorities and directions.

There are very high levels of composting in Asheville: Households reported composting grass clippings, yard waste, and food waste. More reported composting organic materials at home than putting them in the trash[65], and about one in one in six said they put the food down the garbage disposal. Of all the various organics generated, only food waste had a high trash disposal rate (just under 50%) (Q5).

Households are satisfied with the current services; education might need more work: Overall, survey responses revealed that more than 85% of residents are at least somewhat satisfied with current curbside garbage/recycling service. Residents felt more neutral about the availability of recycling drop-offs, brush collection, bulky item collection, responsiveness of garbage service to issues, and garbage rates compared to the value of service. The main areas of dissatisfaction for Asheville residents are the local recycling education programs and the hazardous materials program (Q11). About 53% of respondents are at least somewhat dissatisfied with the hazardous materials program, if not unaware of the program, and 26% are unaware that any sort of recycling education program even exists.

Residents don't see barriers to recycling in Asheville, but would like expansions and more clarity about acceptable materials, and more recycling in parks: Most survey responses indicated that Asheville residents already recycle a lot and generally feel no barriers to waste diversion. However, some residents reported that the main barriers to recycling include: not enough materials being accepted, lack of knowledge of what can and can't be recycled, and doubt of whether or not the materials are truly being recycled (Q13). A majority of Asheville residents feel that both the trash and recycling services fit all of their needs, although they would like to see more recycling in public areas, especially parks.

Desire for weekly recycling pickup, more recycling centers, and a curbside organics program: Question #12 asks if there are any changes that could be made to improve respondent satisfaction with trash and recycling opportunities or services in The City of Asheville. Residents were provided with an open-ended response opportunity. The most common responses were that Asheville residents would like a weekly recycling option, more recycling centers/drop-off locations, and an option for the curbside collection of organics like food waste and yard trimmings. Other common responses include the establishment of multifamily recycling, a stronger effort with recycling education, and a more convenient electronics and hazardous waste diversion program.

Residents would like more organics service, but are concerned about cost: While most survey responses expressed low interest in a cheap, basic trash service, and high interest in the expansion of curbside organics (for yard or food waste), Asheville residents are seemingly split on their willingness to pay for more organics service. The survey showed that the community is leaning slightly towards not being willing to pay for extended organics service (Q14). About half of the survey responses indicated that they would take advantage of a curbside food waste program if offered by the city, with only 24% reporting that they definitely would not (Q10).

Asheville residents back the recycling goals and are interested in "green": The survey revealed that Asheville is a city that places a high importance on being green, and just over 80% of its residents believe that the community should increase its recycling goal regardless of market prices because recycling is an easy way for residents to "do good" for the environment. Although Asheville places a high priority on recycling regardless of market conditions, the survey indicated that residents still want the cost of trash service to be as low as possible and priced to cover recycling as well (Q15).

[65] In most surveys, we find home composting levels are much lower than the figures reported in Asheville.

Residents prefer the cart-based PAYT option over the Bag option: The most appealing system to Asheville residents is a variable cart system, utilizing either a 32 gallon or 64 gallon roll cart (Q17). If a cart system was implemented almost 50% of respondents said they would use a 32 gallon roll cart and 37% said they would use the 64 gallon size. Survey results indicated that under a bag type program, residents would only produce up to two large bags of trash per week, and they are not very interested in pursuing a bag-based system (only 12% support). In order to consider increasing recycling and diverting other materials to decrease trash, residents reported that they would need to experience an increased per month savings of somewhere in the range of $6-$10, with a significant threshold resting at $9 savings per month. However, many survey responses (32%) stated that increased savings per month would have no effect on diversion, regardless of the dollar amount (Q19).

Asheville residents support more Recycling services: While Asheville residents seem to oppose paying more for services, they still overwhelmingly support all of the program and operational changes for Asheville's waste management system proposed on the survey (minimum of 72% support for any given program). In particular, survey results indicated strong support for: adding more materials to the curbside recycling program (93%), multifamily recycling (78%), more recycling in public areas (85%), and events focused on hard-to-recycle materials and achieving zero waste (87% and 79% respectively)(Q20).

Asheville Residents are willing to pay around $6, per month, for additional services: We received more than 600 open-ended responses to Q21, which asked how much Asheville residents would be willing to pay, per month, for proposed extended service(s) (the survey discussed organics and other options). Some of the responses reported that they weren't sure because they don't completely understand everything that goes into program costs and revenues. For those that responded, 20% reported they weren't willing to pay more; one third stated they would be willing to pay between $1 and $4 extra per month, a little more than one-third were willing to pay between $5 and $10 more per month, and ten percent said they would be willing to pay more than $10 monthly for expanded services.

Electronic Outreach is considered effective: According to the survey, the best ways to keep the community informed about Asheville's waste services and events are via email (56%), the city website (42%), the newspaper (40%), or social media (37%)(Q22).

Reiterated the desire for more recycling centers, curbside organics composting, and recycling education and outreach events: Question #29 asks respondents to share any other comments regarding trash and recycling service in The City of Asheville. Only 23 responses were received, but the comments are very similar to those received for question #12. Recurring themes for this question include: more recycling centers, opposition to a bag-type program, the need for organics composting, improvement of the hard-to-recycle materials program, and more recycling events/education. Other common responses focused on initiating multifamily recycling and establishing a community reuse/freecycle program for disposed materials that still have utility.

The demographic characteristics of the survey respondents: All of the above survey responses were gathered from single family homes. Most of these residents reported they own their homes and have lived in Asheville somewhere in the range of about 5-20 years. The respondents were generally older, as is common in surveys, but the demographic spread in the survey was still fairly even. The majority of survey respondents indicated they had received at least four years of college, if not an advanced degree. Few of the survey respondents speak a primary language other than English at home. (Q23-Q28)

4.2 Lessons and Best Practice from Case studies

Detailed individual case studies on PAYT communities – cart based and bag-based -- are included in the Appendix. In this section of the report, we review highlights and lessons learned. There were many lessons and best practices about both PAYT program implementations in general and more specifically when Waste Zero was the PAYT bag and / or other service vendor that we will discuss below. We asked about overall lessons and advice, and some is applicable to Asheville now; other information may be valuable if Asheville changes it system in the future.

PAYT program implementation

- When deciding on a PAYT program, it's important to speak with communities within your geological region and determine potential problems and what works well in your area.
- Make sure that program administrators understand the PAYT program.
- Most residents don't like and don't want change and tend to complain about it. Therefore, the more education, outreach, and easily-accessed information available to residents about the PAYT program and enforcement well before implementation, the better. In fact every respondent said education was the most important element to success and ease of implementation. This can be achieved through mailings, public hearings, Town / City meetings with the Commissioners on-board, neighborhood meetings, local media, calendars, resource guides, email updates, bill inserts, cart flyers, door to door outreach, door hangars and web sites. It's important that all of the aforementioned items be in both English and Spanish. One Town put a free PAYT bag stuffed with program information inside every recycling bin. Therefore residents would see the information when they used the bag. Citizen-driven programs are more easily accepted and supported as well. It's important to expect it to take time to get the program kinks worked out, and to gain acceptance. Also with PAYT bag programs, it takes time and effort to get the vendors who will be selling and / or ordering the PAYT bags on board as well. After several years, most of the residents are happy with their PAYT programs and consider them a fair alternative.
- Some respondents recommend only making one change at a time. In other words don't implement both residential and commercial PAYT programs or make changes to recycling or organics programs at the same time. This decreases the confusion and ensures that the City / Town won't be overwhelmed by resident and business responses and problems.
- Be prepared to collect a lot of extra trash the month before PAYT program implementation because people will "clean out" in preparation for having to pay for service.
- Transitioning from a tax-based program to a user-fee one can cause a lot of confusion, especially if it's made gradually. Therefore it's recommended that this change should be made when the program is implemented.
- As a result of PAYT programs, residents reduce their trash by recycling more, buying "more frugally", composting and using garbage disposals. This can decrease trash service needs, collection frequencies, and number of trash trucks required, which can lead to savings in collection costs.
- It's a good idea to hire a full-time compliance officer and customer service representative before the program is rolled out since many residents will be upset and complain when their non-compliant trash isn't collected. In one case, initial residential non-compliance led to collection crew non-compliance since they were afraid of being reprimanded by managers. This eventually led to better training programs for employees.

- Initially many residents sign-up for wrong sized carts which results in a lot of cart switching early in the programs. So it's important to allow and plan for this adjustment period.
- In some areas, there are a lot of college students and renters who don't understand that you have to have PAYT stickers for extra bags and don't like to have to buy extra stickers, or don't understand how the PAYT system works. They therefore become very frustrated and complain. Additional or periodic re-education can be helpful in these situations over the years.
- There are often initial problems with illegal dumping especially on commercial properties / dumpsters. One respondent commented that people "do strange things with their trash" and will dump it in unusual places. Therefore it's important to be ready to track down offenders (by looked for identifying trash), issue warnings, and even hand out fines for non-compliance.
- Offering incentives for PAYT program participants like free recycling and / or organics collection for any resident that participates in the PAYT program, first set of PAYT bags are free, or free indoor organics container can help with acceptance.

PAYT Bag Program specific lessons / suggestions

- It's very important that the City doesn't try to recoup the full cost of PAYT bag program because you will lose business to private haulers that offer larger totes for a couple of more dollars per month because people go for the convenience of a larger container. So make sure the program pricing is enough less than that of private haulers to keep people in the program.
- Have many extra bags available during implementation period because people tend to overestimate how many they will need and will over-buy.
- On day of implementation, it's a good idea to pre-drive each route and observe what is set out; if incorrect bags, then you can knock on doors, educate, and give out another free bag.
- Be very fastidious on bag inventory controls – watch for vendors trying to "cheat the system" by not paying for bags, and be willing to remove them from the program.
- Be sure to have a City employee available on weekends for emergency bag delivery – vendors always blame the municipality if they don't have any bags, even if it's because they didn't order them in time for delivery.
- Keep an "emergency supply" of bags at a City office so they can restock vendors if necessary. One municipality has seen that residents will go to vendors that have bags before ones that don't and will often purchase other items while they are there.

Waste Zero PAYT Bag specific lessons

- One suggestion was that if the City is going to enter into a contract with Waste Zero, they should require at least a 3 year price guarantee for bag costs.
- Research indicated that their bag prices appear to increase yearly.
- Higher levels of service are too expensive for one City.
- One Town didn't want to give up monetary control and makes sure this in reflected in their contract. This City preferred to do the invoicing to the outlets selling bags, rather than having Waste Zero do this task and then passing the money to the Town.
- Several respondents would be open to using another vendor if the option was available.
- Waste Zero handles bag quality problems well and in a timely fashion.

5. Findings and Recommendations

On a cost basis, customers appear to spend substantially more with a bag-based PAYT program than a cart-based program. The fees all ultimately come from customers. From a payback perspective, Asheville's citizens are better off spending the funds on a re-usable cart than on single-use bags. In simple terms, in any case in which households buy at least ½ bag per week on a bag that is disposed, they are spending the same as the monthly contribution toward a 15-year cart, and the cart-based costs cease after 5 years, but the bag costs continue into perpetuity.

The survey shows that customers prefer the option of a can-based system over a bag-based option. A cart-based system is easier to explain to customers, simplifying outreach. Operations are simplest using a cart-based program, which continues automated cart collection, just using different sizes of carts. The bag-based program will presumably require some level of enforcement, and we conservatively assumed no costs for this or any other operational changes needed for a bag-based program (distribution costs, for example).

The Waste Zero™ literature indicates recycling rates would be substantially higher under a bag-based program than a can-based program. Those assumptions are aggressive and are not adopted within this study, assuming the rate differentials that are employed in this study. It is unrealistic to estimate that recycling rates will increase by 30%. It is likely that some of WZ's performance estimate comes from possible enhanced outreach programs. Enhanced outreach (including social marketing) can be conducted under either a cart- or bag-based program, and we assume outreach would be needed under either program. Differential costs are not assumed.[66]

The model estimates a higher recycling rate with the bag-based program; however, these marginal extra tons come at a substantially higher cost, and the higher recycling rate is not fully substantiated in statistical studies.

Implementation of a cart-based system requires the city to modify the billing program, and to purchase and distribute new trash carts. The bag-based program would require a distribution system for the bags, and periodic monitoring / enforcement that the bags are being used. We recognize that the WasteZero™ system takes a one-stop-shopping approach and the City's role in implementation could be small under this program.[67] Implementation steps for the City are summarized in the Appendix.

SERA recommends implementation of a cart-based PAYT system for the City.

The City may select between full cost recovery right away, or phased in recovery. From a customer relations point of view, phased in recovery would maintain customer satisfaction and reduce rate shock.

[66] SERA's research finds that outreach costs in communities across the US vary substantially (SERA 2001, 2011, 2015). Some communities spend as little as a dime or less per households per year. It is not unusual for households to spend $1-2 per household per year for strong-performing programs. We would expect the City would spend on the order of at least $2 per household for its outreach program introducing either the cart or bag system, but these costs (on the order of 10 cents per households for the first year, no incremental cost over current outreach thereafter) were not included in the calculations because they were small, and one-time. Spread over 5 years they were minimal.

[67] Should the City opt for the Waste Zero ™ bag-based program, the "best practices" outlined in the chapter on case studies should be reviewed prior to contracting.

The model identifies the budget impacts from multiple options at the bottom. A phased in approach may be allowed, however note that higher subsidies also lead to a slightly muted diversion incentive for customers.

Figure 5.1: Summary Results and Estimated Rates for Bags and Carts[68]

	Status Quo	Cart-based PAYT	Bag-based PAYT
Recycling Rate	21.0%	29.0%	31.5%
Rate 32 g cart / 10 gal bag	$10.50	$12.10	$2.15
Rate 64 gal cart / 30 gal bag	$10.50	$21.10	$3.40
Rate 96 gal cart	$10.50	$30.10	
Average cost per household per month at FULL COST recovery	$18.82	$18.75	$20.00
Incremental dollars per year (for carts, the difference is for 5 years; for bags, into perpetuity)		$219.9	$754.4K
Percent of total system costs raised from the rates	56%	100%	100%

The rates that would need to be charged under options ***other*** than full cost recovery are shown in Figure 5.2. The figures for 50% and 60% cost recovery are for computational purposes only. See Table Note.

Figure 5.2: Rate computations under alternative rate recovery percentage assumptions

	Rates under various levels of cost recovery	100%	90%	80%	70%	60%	50%
Can	Total needed per HH for full cost recov-cans	$18.75	$18.75	$18.75	$18.75	*$18.75*	*$18.75*
Scenario	Budget transfer (in thous/yr)	$0	$704	$1,407	$2,111	*$2,815*	*$3,518*
Can	Money to be raised from rates per avg HH/Mo	$18.75	$16.88	$15.00	$13.13	*$11.25*	*$9.38*
Scenario	Can Rates-32 gal	$12.04	$10.83	$9.63	$8.43	*$7.22*	*$6.02*
Can	Can rates-64 gal	$21.07	$18.95	$16.85	$14.75	*$12.64*	*$10.54*
Scenario	Can rates - 96 gal	$30.10	$27.07	$24.07	$21.07	*$18.06*	*$15.06*
Bags	Total needed per HH for full cost recovery-bag	$20.02	$20.02	$20.02	$20.02	*$20.02*	*$20.02*
Scenario	Budget transfer (in thous/yr)	$0	$751	$1,502	$2,253	*$3,005*	*$3,756*
Bags	Money to be raised from bags per avg HH/Mo	$20.02	$18.02	$16.02	$14.01	*$12.01*	*$10.01*
Scenario	Bag rate - small	$2.12	$1.92	$1.70	$1.49	*$1.27*	*$1.07*
Bags	Bag rate - large	$3.39	$3.07	$2.72	$2.38	*$2.03*	*$1.71*

Table Note: The two scenarios that show 60% and 50% cost recovery (presented in italics) would be unlikely to divert the amount of tonnage we estimated; the lower cost recovery reduces the incentive levels between rates, and would likely be insufficient to change behaviors to the level we estimated in this study.

[68] Note: Rates are rounded to the nearest nickel or dime. Note also that cart prices vary with the price of oil. It is unlikely that cart prices would increase more than 10% over the costs noted in this study. This variation would still result in savings for the cart-based program. However, even if the loaded cart prices were 20% more than our estimate, the additional cost for the cart program is less than $44K per year.

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Appendix A – PAYT Implementation

A description of what the future pay-as-you-throw cart-based systems would look like in Asheville is included below:

Collection:

- The City will continue the same trash collection routes, schedules, and frequencies
- Changes for the city collectors may be based around occasional overflow trash and bulky item collections
- The PAYT program will not impact the current contracted recycling haulers unless recycling volumes increase enough to affect routing. Current costs are designed around a per-household charge, so costs would stay the same. At contract renegotiation time there may be an effect, but this would be the same whether cart or bag-based PAYT trash is selected.

Containerization:

- Collection will continue to be automated. Households will be given the option of various sized carts (32-gallon, 64-gallon, 96-gallon, or a combination of multiple carts)
- The City must finance the new (32 and additional 64 –gallon) carts and deliver them to the residents. Some of the current 96-gallon trash carts can be re-purposed for trash (about 15%); most will have no use or no secondary market unless they are retained for recycling or potentially for a green waste or yard scraps collection program.
- The default size for new accounts should be 64-gallons of trash service and 96 gallons of recycling service
- Collection of MSW and recycling will continue to be weekly and every other week, respectively

Cart Purchasing and Fees:

- The introduction of a PAYT program with different cart sizes will require the purchase of a variety of sizes of containers. Because the City already owns and has distributed 96-gallon carts (and a few 64- and 32-gallon carts), not quite all of the containers will need to be funded and replaced. Asheville can handle the purchase of carts one of several ways.
    - *Bill in advance for service.* This provides some money in advance to help pay for implementation (although not much in advance) – and it also helps address the "bad debt" issue. Service can be stopped if payment is stopped, but the payment for

the service delivered has already been paid. This strategy does complicate rebate computations when households change service level, or move.

- *Inter-fund loans*. Borrowing from a department with cash, paid back over time through the part of the rate fee covering cost of containers, has worked in a number of communities. The payback rate can be set by the department ($1 per month per household for about 5 years; the containers last 10-15 years in the field, but the city can arrange its own repayment schedule). After repayment is complete Asheville may elect to use the funds for reducing rates, funding additional recycling or other options, etc.
- *Bonds, Grants, or Outside Loans:* These are other options for funding the purchase of containers and can come from a variety of sources.

- If pre-billing and/or an inter-fund loan can be arranged, we believe that will be the best option for Asheville. We have provided information on the percent of containers of different sizes that will be needed, but a pilot or phased roll-out would provide even more certainty on this. In addition, having customers "sign up" in advance for a can size can also help in ordering.

Cart Exchanges:

- The most common approach to cart exchanges is one free switch within the first 3-6 months, and $15-20 per switch thereafter. This assures households get "on the right size", and allowing it in a limited time helps figure out which sizes are needed and allows the community to move carts around first, and re-order second. It also covers the associated costs.
- It is important to note that a cost later on can create a barrier to households "downsizing" their carts, sending a mixed signal to generators. Under PAYT the goal is to have households maximize their recycling / diversion and minimize their trash disposal. We recommend the following: a free switch in the first 3-6 months either up or down, free downsizing exchanges[69] (you shouldn't need a maximum per year, but could limit to one), and a fee to exchange "up" in size (a bit higher than "cost of service to help subsidize the cost of downsizes).

Rates and Billing:

- Continue billing through the City water bills on an every other month basis with a line item for trash service. Unlike the current fixed uniform amount, households will now be billed on a recurring basis based on their household's subscription level. Under PAYT there will be a recurring bill with the rate depending on subscription level (no bad debt)
- Rates recommended include a significant rate differential in order to encourage diversion and source reduction (*see discussion in the body of the report*).
- In order to meet high-disposal periods (parties, holidays, guests visiting) overflow bags should be made available *(see 'overflow' below)*

[69] If downsizes are free, the cost to change a cart might need to increase to $25 or so.

Recycling:

- The current recycling system stays as is, collected every other week and embedded in the trash rates.
- The City should consider making 96-gallon carts available for second recycling containers to households that request it at no additional cost to households. Many survey respondents reported that their recycling carts are *full* to *overflowing* on average. The addition of a PAYT program will require more room for residents to store recyclables.
- Residents requesting more than 96-gallons of recycling service will continue to be billed more, per the computed rate table

Facilities:

- No change in solid waste or recycling processing facilities

Trash Overflows and Bulky Item Collection

- Under the new PAYT program residents will be required to place all items for collection in the subscribed cart or a pre-paid City logo emblazoned bag, overflow items not in pre-paid bags will not be collected
- To ease the implementation process we recommend that households with overflow items will only be 'tagged' for the 3 months of the PAYT program. The overflows *will* be collected during the transition period and the residents will be given a tag on their cart informing them of the new program requirements. Once the 3 month transition period is over the non-bagged overflow will not be collected.
- The overflow bags must be priced at a minimum of about $4.50-5 each to be certain that using 4.3 per month is more expensive than signing up for an additional cart of service (see main body of the report for "cart" rate differentials).
- Residents will be provided with 2-4 (to be discussed) overflow bags per year included in with the bill payment; additional bags will be made available for purchase at City facilities, on-line, through the mail, and perhaps through local convenience or grocery outlets (to be discussed). This could be administered without bags if necessary (recorded by collection staff), but makes the billing system more complicated.
- Residents will be provided with one Bulky Item collection tag per year included with bill payment
- Residents will be charged for additional Bulky Item collections similarly to the overflow system mentioned above.

Other programs:

- Consider organics and other refinements in the future. No changes to other programs.

Administration

- The City should dedicate 0.5 FTE to oversee the implementation of the program for the first year. This includes outreach and education prior to launching the program, changing and trouble-shooting the billing system, answering phone calls (first three months of the program primarily, when additional temp staff will be needed), ordering carts, working with staff for cart delivery and change-outs, and monitoring ongoing process
- After the first year implementation is completed no additional FTEs will be required to monitor and maintain the program

Marketing the Program:

- Outreach and education are integral to program acceptance. The largest concerns reported in the survey include confusion about how the program would be implemented, illegal dumping, and what the new rates would look like. The City should host a series of public forums to discuss the new program and help allay any fears and misperceptions about the program. The outreach effort should include press releases, town hall meetings, on-line information, list serves and close cooperation with neighborhood civic associations, green non-profits, or other organizations. We recommend the City review information on social marketing as another avenue for improved outreach on the PAYT system.
- To maximize the effectiveness of the program, we believe a renaming of the program may be useful. The term "Pay as you throw / PAYT" may not resonate well with residents or decision-makers. A locally tailored name that avoids the word "pay" may lead to a more successful implementation (we are using "Recycle & Save" in some locations)

Figure A.1: Potential Cart-based PAYT Implementation Steps

PAYT Rate System Details	Description
What	Rates for smaller trash service are lower, and are subsidized by larger service levels in order to provide significant-enough differential to act as an incentive to reduce trash disposal and subscription levels. Each household signs up for a set level of trash collection and receives a 32, 64, or 96 gallon cart. All trash must fit in the cart. A small service level (32 gals must be provided, and fees for more trash service cost more. The default service level is 64-gallons of trash collection. Overflow trash must be placed in pre-paid bags in order to be collected, 2-4 bags are included annually as part of paying the bill / starting the account and additional bags are available for purchase. One bulky collection per year is included in with the account; additional collections are available similar to the overflow bag program. 96-gallon carts are made available for recycling service. Recycling collection and processing contracts are not affected.
Why	Modify rates so residents pay different rates for different amounts of trash service, providing a recycling and source reduction incentive and increasing the equity of the solid waste rates. Also helps bring solid waste to an enterprise, full-recovery revenue model.
Who	SF, duplexes, townhomes (households paying residential rates)
Facilities issues	None. Trash and recycling both go to same location as current system.
Equipment	Different-sized (or multiple) containers are needed for trash. Recycling continues to use its larger (96-gallon) single stream carts. Containers are purchased by the City and financed or can be leased and repayment is included in the rates that are billed every other month. SERA estimates 85% of households may need new (smaller) trash containers; perhaps 40% may need 32-gallon versions. If there is storage space and if the City is consider containerized organics collection in the future, the 96 gallon carts should be saved if at all possible. If not, there is very little market value. Some (retrofitted with decals) could be provided to households with overflowing recyclables.
Staff Effort / Admin	Billing is modified to provide recurring billing for different cart levels (if carts). Current line itemed billing system has the potential to work well with a PAYT program. We also recognize there will be a one-time cost to assign households to the proper trash cart size in the billing system so they can receive the proper (recurring) bill. We recommend assigning a 64 gallon container as the "default" for those

PAYT Rate System Details	Description
	customers not responding to requests (as it is the most common size expected to be requested), and asking households to call / notify only if they want a different sized cart. This reduces data entry. We estimate roughly half the households (55%) will need subscription changes to be entered into the billing system, and recommend using efficient processes (reading in spreadsheets, or other methods). SERA estimates the City will need temporary staff for 3 months surrounding the implementation of the program in year 1, on-going monitoring can be done with existing staff.
Cost	SERA assumed the container costs would be spread over 5 years, and these costs are included in the cost estimates. The report provides the total budget cost. Containers could be financed through inter-fund borrowing or bond finance to spread the cost over time and recover costs from the customers' rates. We assume the City will have one-time costs of perhaps $1.00-$2.00 per household for the year for incremental cost for outreach and education for the new system.
How Paid?	All costs will continue to be recovered through the new PAYT fees.
Potential Impacts	The PAYT program is estimated to increase recycling from 21% to 29% (3,200 new tons). This is an 8 percentage point increase in residential recycling. Organics diversion is also expected to increase 1 percentage point and 4% source reduction is also expected, decreasing landfilled tons further.
Implementation Steps – Political & informational	• Find champion for PAYT, and find champions in the community to help get the word out. Work with elected officials / staff to gather buy-in. • Hold public hearings to educate residents, gauge support / opposition, discuss barriers, and others • Discussions with collection staff to identify any potential program barriers; refine design elements as needed with staff and elected officials • Pass ordinance
Implementation Steps – *1-3 months*	• Design public outreach campaign stages – initial for information, staged for needs related to understanding options, recycling options available, rate differentials, how to make the program work for households, and the design of cards or other outreach materials to be used to select cart sizes (with return date). Messaging describes new program, why implemented, costs under new program and explain PAYT pricing, guide to selecting new services / levels. Define a default service level for unreturned cards – or request return of cards only if they do not want the default service level (tentatively set at 64 gallons). • After approval, issue initial public outreach/education • Review current billing system and determine steps for switching to a recurring variable rate; issue contract or conduct in-house modifications (can usually be integrated into existing system if it has the capability for water bills, and other services). Prepare forms for data entry for default and customer-requested initial service levels. Billing system will also need to be able to bill for cart exchanges and potentially "extra bags" of waste for overflow. If the last cannot be accommodated, consider a simple bag-based overflow option. • Review study and survey to confirm likely subscriptions (for more granularity, consider conducting set out survey to assess likely subscriptions) • Conduct initial cart sourcing and get specifics for costs and lead time needed. Interview cart manufacturers. Prepare / issue an RFP for cart purchases (ask for guaranteed delivery dates). Counts per size are estimated with final counts to be provided at time of

PAYT Rate System Details	Description
	award). After about 1 month, evaluate RFPs (and guarantees for delivery dates), get approval of selected vendor, select / notify vendor, and confirm delivery dates to Asheville for the carts, and delivery dates to customer service addresses (vendor or city). Note: the number of carts ordered (about 24,000) affects manufacture / delivery times; this number should not be a big lag (this size an order may take 2 months or so, depending on manufacturer backlog). Cart manufacturers offer services in addition to just manufacturing carts. Many will warehouse carts when they arrive in your city, and they will assemble them and deliver to service addresses. Each community's needs are different, but it may be easiest and cheapest to have all cart logistics handled by the cart manufacturer. Bids for these services should be solicited. • After confirming costs of carts, finalize new rates and publicize so customers can start thinking about behavior change • Mail communication piece to residents asking them to select desired cart size; allow 30 days for return of cards. Broad outreach via newspaper and emails, etc. Specialized outreach via mailer / return card sent to households or web survey signup using code on a postcard, or use cart hangers / door hangers or other means.
Implementation Steps – *3-6 months*	• Cut off further acceptance of post cards and freeze the delivery list. This is your final count by size to be manufactured and delivered by the cart manufacturer. • Refine order of containers based on customer replies. If cart lead time is long, City may order perhaps 2/3 of the needed carts in a first stage (prior to return cards) with a planned / negotiated second stage that "corrects" the initial distribution based on household container size requests received. • Continue education on program; hire and train temporary staff to process return cards, answer calls to the City about the program; prepare basic Q&A materials for city council to keep next to their phones so they answer questions about the program consistently and correctly
Implementation Steps – *6-9 months*	• Container delivery to city; assembly / delivery to service addresses begins. Duration of the delivery effort will depend on how fast the selected manufacturer can make and deliver carts and how many people they have delivering carts (assuming they deliver to service addresses). • Change rates / bills • Continued Education; provide clear messaging about cart changes, fees, etc. Expect to continue use of temporary staff for calls for up to 3 months. • Begin collection under the new PAYT program. The implementation of collection under the new system may need to be phased in as carts are delivered. • Deliver cart exchanges as requested • Monitor / refine / track

General information on cart costs and add-ons.

- Cart costs: 32, 64, 96: about $40, $45, and $50, but varies with market. Costs seem lower right now; these costs vary, and some are quoting prices tied to the oil market on delivery / manufacture date.
- Imprints, each cart: $1
- Freight: $1, $1.25, and $1.75 respectively for the three sizes.
- Assembly: $0.50 each
- Delivery to service address: typical is $3.50 each
- Recently communities have cited delivered costs in the $40-$50 range.

Figure 1: Aggressive Bag-based PAYT Implementation Schedule (1 year; many communities take longer)

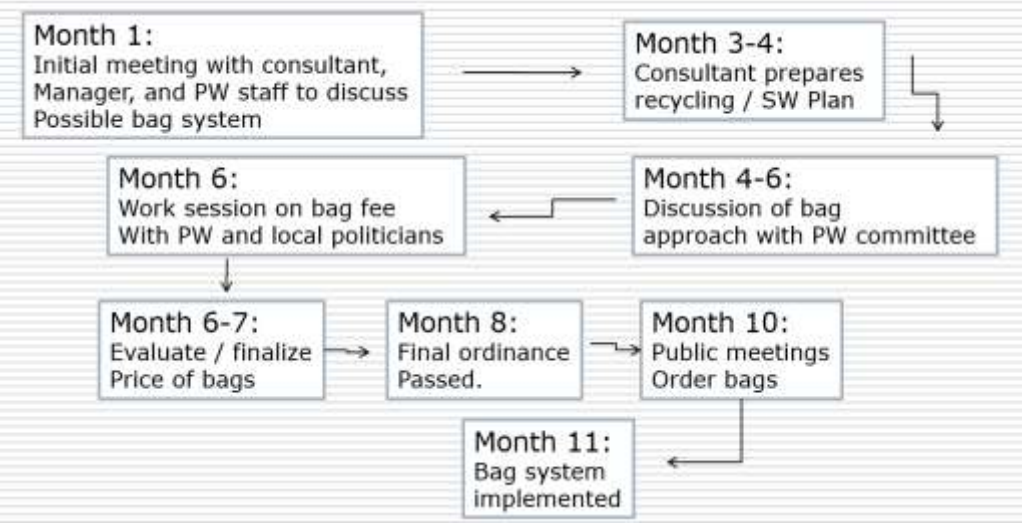
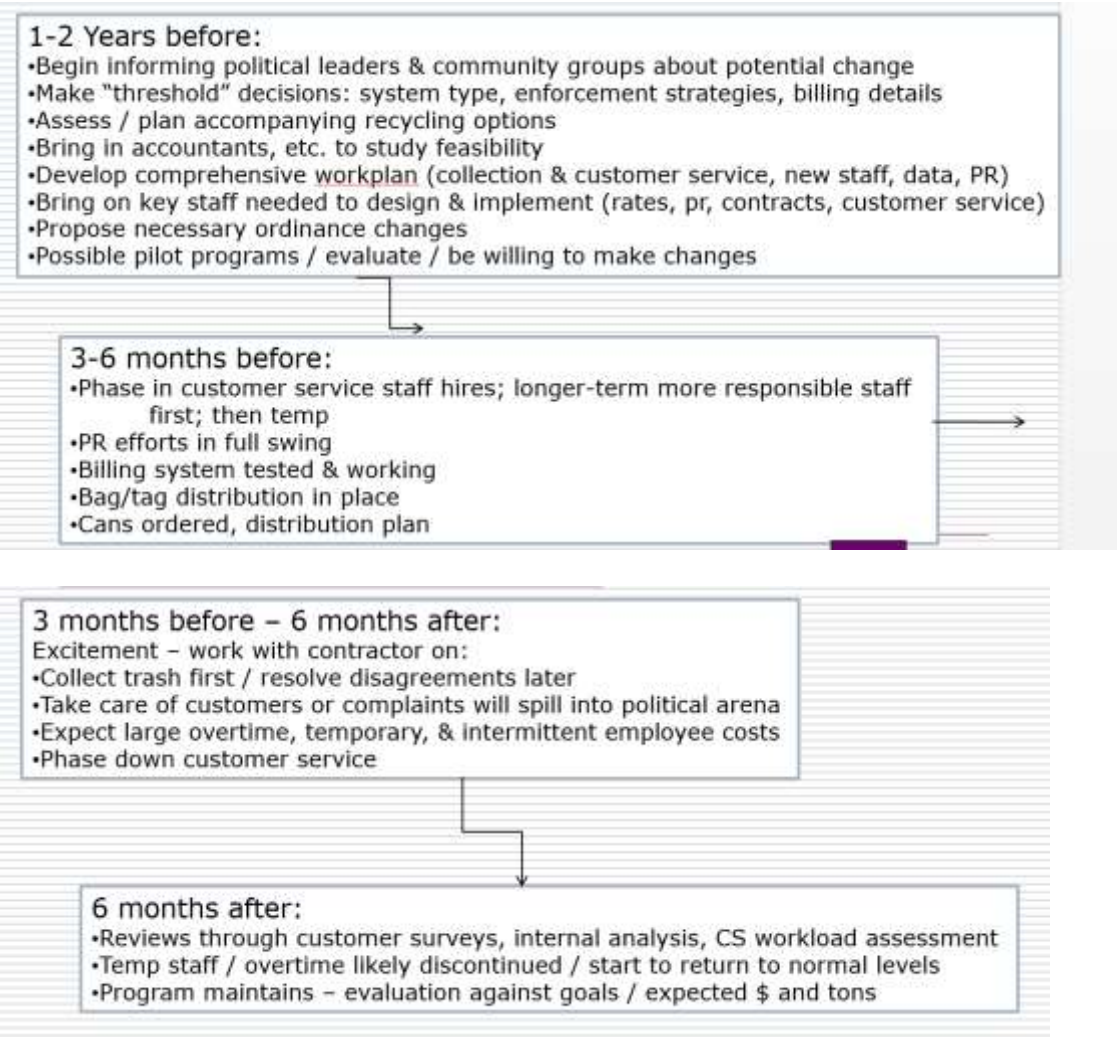


Figure 2: Typical Can-based PAYT Implementation Schedule



Appendix B – PAYT Case Studies

There are more than 8,700[70] PAYT programs across the United States, with programs in place in the South in Florida, Georgia, North Carolina, Texas, Tennessee, and Arkansas, and less commonly in Alabama, Mississippi, South Carolina, and Virginia. Several case studies of the cart and bag-based PAYT programs are provided below.

B.1 Cart-Based PAYT Case Studies

Wilmington, NC

Current PAYT Cart with Sticker Option

- Population 112,067, HHs receiving trash service 30,000
- PAYT cart program implemented 1992
- Municipal hauler for trash, recycling, yard waste, and bulky
- Semi-automated weekly curbside collection of trash and yard waste, every other week recycling
- Solid Waste Division is funded by an enterprise fund with revenues based mostly on monthly solid waste fees
- Trash Carts: 95 gallon for $26.29/Mo, 35 gallon for $21.36/Mo, and Orange Trash Stickers 12 at $1.25 each
- Recycling Carts: 95 gallon and 35 gallon
- 23,000 HHs (77%) subscribe to 95gal cart, 7000 (23%) HHs subscribe to 35 gallon cart
- $400,000 savings the first year
- DNK% decrease/increase in any tonnages because data lost from long time ago and he hasn't been able to find it anywhere, and they kept annexing HHs onto service so numbers kept changing
- Recycling rate went from 2% in 1991 to 21% currently (1991 rate calculated from County tonnages / population in 1991)
- Disposal rates in County went from 1.21 tons per person to 1.18 tons per person from 1991 to 1993 (city was 45% population in County)
- In 2014 22,661 tons trash, 6095 tons recycling, and 11589 tons yard waste collected
- In 2013, they went to a larger recycling cart, and about 500 HHs then switched to smaller trash cart
- Citizen-driven program because of high costs of existing solid waste program, so increased acceptance
- Were able to drop trash service needs from twice per week to once, renegotiated contract
- Initially residents signed-up for wrong sized carts which resulted in a lot of cart switching - originally 35% HHs subscribed to smallest 40 gallon cart

[70] Skumatz et.al., 2015, "PAYT / Variable Rates for Trash Collection: 2015 Update", Econservation Institute, Superior CO, prepared for US EPA, February.

- Also there are many college students and renters who don't understand that you have to have PAYT stickers for extra bags, so they are frustrated and people don't like to have to buy extra stickers
- Currently residents are satisfied with PAYT cart program, but some still tend to have too small of a trash cart that they overload and then get angry when it's not picked up.

Current Downtown PAYT Bag Program for Commercial and few Residential

Residential

- Base rate of $22/Mo;
- 20 gallon PAYT bags
- Get 10 bags / Mo no charge
- Municipal collection 7 days per week

Commercial

- Base rate determined by number of municipal pick-ups per week – ranges from 2X/wk $27.51/Mo to 2x/day collection 7 days/wk $144.61/Mo
- 40 gallon PAYT bags
- $1.50 / bag, disposal fee and tip fee included in cost of bags
- 20,000 bags sold to businesses per year
- Cost to city to purchase the bags ~$0.25 to $0.30 per bag

Other Comments

- Would love to get rid of this bag program, but can't because of logistics, it's the only program that will work
- Downtown PAYT bag program for Commercial and Residents – problems with overstuffing and exceeding the 50 lb. weight limit, since businesses put food scraps in the bags. Often the bags weigh up to 150 lbs. Then bags burst and this creates litter. Animals also rip the bags apart. Businesses often run out of bags on the weekend when there isn't any option to get more, so they can't get rid of their trash.

Athens-Clarke County, GA

Current PAYT Cart with Sticker option for own cart and Sticker option for extra bag

- Population 115,453, HHs receiving trash service 9,549 which includes 1008 backyard customers
- PAYT cart program implemented 1995
- Municipal hauler for trash and recycling, collected on same day; private franchised haulers can be contracted by resident as well
- Automated weekly curbside collection of trash and recycling
- Carts: 1 64 gallon and 1 96 gallon for $50.60/Mo, 2 64 gallons for $37.60/Mo, 64 gallon for $21.60/Mo, 32 gallon for $17.60/Mo, 21 gallon for $15.60/Mo; are also Backyard rates and size options available (resident must provide own can for these and use appropriate sticker for level of service); Stickers for extra bags are $2 each
- Recycling cart 96 gallon with 32 gallon for elderly or disabled
- Participation rate in 1998 69%

- Transitioned from tax-based fee to a user fee with PAYT program
- 48% decrease in trash tonnages
- 72% increase in recycling tonnages
- Citizen-driven program, so increased acceptance
- County was able to reduce its trash truck fleet by 2 trucks which led to decrease in collection costs
- Initially residents thought they were being double charged as they transitioned from tax-based to user fees, and were very confused as it was done over 18 month period. Suggest that communities make this transition immediately rather than gradually
- Initial residential non-compliance led to collection crew non-compliance since they were afraid of being reprimanded by managers; this led to better training programs for employees; many residents were upset and complained when their non-compliant trash wasn't collected; the lesson from this was to hire a full-time compliance officer and customer service representative before the program is rolled out
- Recommend making the only change implementing the PAYT program – don't do both residential and commercial programs or make changes to recycling or organics programs at the same time
- Residents are reducing trash by buying "more frugally", composting and using garbage disposals
- Keys to success were education and outreach via mail, local media, calendars, resource guides, email updates, bill inserts, cart flyers, door to door, door hangars, web site, and dual language – English and Spanish; allowed time for kinks to be worked out
- Currently residents are satisfied with PAYT cart program and view the overall process as positive and rewarding

B.2 Waste Zero (WZ) Case Studies

Decatur, GA

Current Waste Zero PAYT Bag Program

- Population 19,334, HHs receiving trash service 6000
- PAYT bag program implemented 1998
- Municipal hauler for trash and yard waste, private contracted hauler for recycling
- Manual weekly curbside collection of bags, but from side of house for elderly
- $240 sanitation fee included in property taxes for collection of trash, recycling, yard waste, furniture, appliances, and street sweeping
- Solid Waste program operated as an enterprise fund and sale of bags covers disposal costs
- Bags available to residents in rolls of 10 for sizes: 33 gallon for $14.45, 15 gallon for $6.96, and 8 gallon for $4.07 or $1.45, $0.70, and $0.41 per bag respectively
- Town purchased 118,979 33 gallon bags, 273,478 15 gallon bags, and 120,698 8 gallon bags in 2015 at a cost of $0.238 per 33 gallon bag, $0.147 per 15 gallon bag, and $0.141 per 8 gallon bag from Waste Zero
- Recycling 18 gallon bins at no charge or $80 for purchase of 95 gallon cart from hauler, or resident can supply their own
- Small trash "carts" used to collect bags, empty into 2 centrally-located sanitation trucks
- $150,000 annual savings in disposal costs

- 42% decrease in trash tonnages
- 79% increase in recycling tonnages, recycling rate increase from 10.7% to 22%
- 98% current recycling participation rate
- 33% increase in compost tonnages
- Originally some residents requested a "fairer" type of program
- Residents didn't like change at first – need more clarity and information
- Keys to success were education and outreach via mailings, public hearings, town meetings run by Commissioners, neighborhood meetings, local media, and web site
- Initial problem with illegal dumping on Commercial properties / dumpsters – tracked down offenders (looked for identifying trash), warnings given and problem decreased after 3-6 months
- Currently residents are satisfied and "happy" with PAYT bag program

PAYT Program with bags purchased from Waste Zero and delivered to City:

- No contract with Waste Zero
- City would purchase bags from another bag vendor if they had cheaper prices since they need to generate money for the solid waste program to break even (enterprise fund)
- City orders bags from Waste Zero and Waste Zero delivers them to the City – need to allow 6 weeks for delivery, but Waste Zero will work with them if they need them faster by providing partial order, etc.
- City stores the bags and delivers them to their vendors
- City sells the bags to vendors
- Vendors sell the bags to residents, no taxes or additional fees
- New Waste Zero Program available – with bag storage, delivery, and invoicing available; would increase City costs by $0.05 per bag or about $30,000 to $40,000 per year to convert their services to new program, which is too expensive for City to consider
- Bag prices seem to increase yearly, are somewhat dependent on cost of petroleum
- Suggestion if entering into a contract – get at least a 3 year price guarantee for bag costs
- Minor problems with bag shipments containing defective bags – City or vendors just swaps them out, it's easy and no problems getting costs recouped by Waste Zero

Shrewsbury, MA

Current Waste Zero PAYT Bag Program

- Population 35,608, HHs receiving trash service > 10,000
- PAYT bag program implemented 2009
- Municipal hauler for trash and recycling
- Weekly curbside collection of trash bags
- Solid waste program –City subsidizes, 40% of costs come from tax levy
- Bags available to residents in packages of 5 for sizes: 33 gallon for $7.50 and 15 gallon for $3.75, or $1.50, and $0.75 per bag respectively
- Town purchased 682,200 bags in FY 2015 at a cost of $0.258 per 33 gallon bag and $0.158 per 15 gallon bag from Waste Zero
- Recycling is collected every other week for no charge if participate in PAYT bag; residents can purchase a 22 gallon container for $11, or use their own container up to 32 gallons with a free Town Recycling sticker affixed (if participating in PAYT)

- $14,509 savings in trash collection costs in the first year, FY 2009
- 33% decrease in trash after first year, 11% decrease after the second year
- Trash decreased from 10,700 tons in FY 2008, to 7100 tons in FY 2009, to currently 6400 tons in FY 2015
- 17% increase in recycling after first year
- Increase in Recycling Rate to constant 33%
- Recycling increased from 3057 tons in FY 2008, to currently 3086 tons in FY 2015

Best Way to implement program:

- Speak with communities within region – Town studied programs in the immediate area and determined potential problems and what worked well
- Very important, don't try to recoup full cost of PAYT bag program because you will lose business to private haulers that offer larger totes for a couple of more dollars per month because people go for convenience of larger container – so made sure to keep cost below $12 / month because haulers price in around $15 / month
- Have many extra bags available during implementation period because people tend to overestimate how many they will need and will over-buy
- Provide lots of education and publicity about the program – they put a free PAYT bag stuffed with program information inside every recycling bin, that way residents had to see the information to use the bag
- On day of implementation, Town pre-drove each route and observed what was set out; if incorrect bags, then they knocked on doors, educated, and gave out another free bag
- Be very fastidious on bag inventory controls – watch vendors trying to "cheat the system"; the Town has only been shorted ~$1000 in all the years by vendors not paying for bags; have had to shut down a few vendors for non-payment
- Be sure to have a Town employee available on weekends for emergency bag delivery – vendor will always blame the Town if they don't have any bags, even if it's because they didn't order them in time for delivery
- Keep "emergency supply" of bags at Town office so can restock vendors if necessary – Town has seen that residents will go to vendors that have bags before ones that don't and will often purchase other item while they are there
- Make sure program administrator knows what they are doing
- BE PREPARED for a lot of extra trash to be set out the month before PAYT program implementation because people will "clean out" in preparation for having to pay
- Enforcement and fines are important because people "do strange things with their trash" – people will drop off trash at other locations, but Town will dig through it and fine the offenders

Other comments

- Incentive for program: Town offers free recycling collection for any resident that participates in the PAYT bag program
- Residents think the PAYT bag program is a fair system since you only pay for the amount of trash you dispose of and get free recycling

PAYT Bag program with bags and some additional services purchased from Waste Zero: storage and delivery only, NO invoicing

- How it works with Waste Zero: in July the Town estimates how many of each type of bag to purchase from Waste Zero, WZ manufactures the bags and stores them at a distributor, vendors order bags from WZ and the distributor delivers the bags to vendors, the Town invoices the vendors and collects the money, the vendors keep the money from the bag sales; the Town doesn't pay vendors to sell the bags, they do it as a community service and aren't allowed to add any taxes or mark-ups to the sale
- City bills vendors for bags and gives them 30 days to pay
- Town wanted control of the money, so in contract Town invoices vendors, rather than WZ invoicing
- Town renegotiates bag prices every year, but WZ bag prices increase every year: initially FY 2009, 15 gal bag was $0.134 and 33 gal bag $0.226, and now are $0.158 and $0.258 respectively
- WZ owns 85-90% of the bag business in MA, and thus is "the only show in Town", so have limited negotiating power
- Would go with another bag vendor if available and price was right
- Billing: WZ sends list of vendors and what they ordered to Town every Wednesday, along with delivery confirmations; Town sends invoices to vendors along with copy of WZ paperwork and delivery confirmation; paperwork helps vendors process the payments very quickly; twice per month the Town runs a report showing vendor payments; any vendor that is 30 days overdue gets sent a notice, and payment usually occurs quickly
- Bags: Town purchases 1.5 mil drawstring bags that hold a little more trash than regular or tie-tab bags and are stronger than the 1.0mil ones since people tend to stomp on them to fit as much as possible
- Are occasional problems with the quality of bags – "thin and chintzy" and pull-strings can be a problem; however they just return them to WZ and there haven't been any problems with bag replacement

Gloucester, MA

Current Waste Zero PAYT Bag Program

- Population 29,393, HHs receiving trash service 13,000
- PAYT bag program implemented 2009; PAYT tag program 1990 (first PAYT program in State)
- City-contracted hauler for trash and recycling
- Weekly curbside collection of trash bags and recycling
- Solid waste program – portion of costs included in property taxes and sale of bags almost covers disposal costs
- Bags available to residents in packages of 5 for sizes: 36 gallon for $10.00 and 15 gallon for $5.00, or $2.00, and $1.00 per bag respectively
- Town purchased 480,000 36 gallon bags and 32,000 15 gallon bags in 2015 at a cost of $0.286 per 36 gallon bag and $0.158 per 15 gallon bag from Waste Zero
- Mandatory recycling
- Recycling bin available from City at no charge for the first, $5 for the second, or resident can use their own container with free recycling sticker attached
- More than $1,000,000 savings in disposal costs over the program's first 5 years
- 29% decrease in trash after first year
- 8% increase in recycling after first year from 23% to 31%

- Initially was a normal transition to get vendors on board with program; they have 22 locations where residents can purchase PAYT bags which is more than most places
- Initially people weren't really happy with new PAYT bag program and it took time for them to adjust because previously old established PAYT Tag program (first PAYT program in State 1990) which wasn't as limited since the carts with tag could hold more trash
- Lots of education and public outreach about the PAYT program, and enforcement are keys to success

PAYT Bag program with bags and additional services purchased from Waste Zero: bag storage, delivery, invoicing of vendors, and deposits of payments to City

- Contract with Waste Zero: one year contract with 2 one-year extensions; expiring soon
- Every year the City checks the State Bid list for bag prices before determining renewal of contract
- Using newer Waste Zero services – they do everything: manufacture bags, store bags, deliver bags to vendors, invoices vendors, deposit money from vendors
- City orders and pays for stock of bags from Waste Zero, WZ then manufactures and stores the bags; vendors order bags from City stock at WZ, WZ invoices vendors and delivers bags to vendors, and then pays City for bags the vendors ordered
- Only problem has been that sometimes the bags are defective; but WZ puts a run number on the bags, so if there are problems they can pull them and re-order; there haven't been any problems with WZ replacing the defective bags

Appendix C – Rate Study and Excerpts from the Model

Asheville

PAYT Rate Options Scenarios - Can Vs. Bag

Constructed by Skumatz Economic Research Associates, Inc.

Voice 303/494-1178; skumatz@serainc.com - DRAFT Sept 2015

12/10/2015 14:26

Summary Results

	Status Quo	Cans	Bags
Recycling Rate	21.0%	29.0%	31.5%
Rate 32 g / 10 g	$10.50	$12.04	$2.12
Rate 64 gal / 30 ga	$10.50	$21.07	$3.39
Rate 96 gal	$10.50	$30.10	
Avg $/hh/month	$10.50	$18.75	$20.02
$/yr: Carts (5 yrs); Bags (perpetuity)		$219,888	$745,384

100% <== Summary figures at this percent cost recovery; see bottom of ta

				Status Quo	Option 1: Cans	Opt 2:Bags in Cans
Table Calculated at 100% cost Recovery	Status Quo			PAYT Year	PAYT Cans	PAYT Bags
	2014	2015	2016	2017	2017	2017
Homes	29,838	30,226	30,619	31,017	31,017	31,017
Small Businesses	2,500	2,533	2,565	2,599	2,599	2,599
Trash collection points	30,072	30,468	30,864	31,265	31,265	31,265
Recycle / YW collection points	26,667	27,018	27,369	27,725	27,725	27,725
TONNAGE FLOWS						
Trash collected	22,276	22,566	22,859	23,156	17,898	16,887
Recyclables	8,163	8,269	8,377	8,486	8,486	8,486
Yard Waste	8,472	8,582	8,694	8,807	8,807	8,807
Existing Source Reduction	0	0	0	0	0	0
Percent recycling from PAYT	0%	0%	0%	0%	8.0%	10.5%
Percent YW from PAYT	0%	0%	0%	0%	1.0%	1.0%
Percent SR from PAYT	0%	0%	0%	0%	4.0%	4.0%
New Recycling diverted (PAYT)	0	0	0	0	3,236	4,247
New YW (PAYT)	0	0	0	0	404	404
New SR (PAYT)	0	0	0	0	1,618	1,618
Generation incl. Source Red'n (collection)	38,911	39,417	39,929	40,448	40,448	40,448
Percent recycled	21.0%	21.0%	21.0%	21.0%	29.0%	31.5%
Percent Recy & YW	42.8%	42.8%	42.8%	42.8%	51.8%	54.3%
Percent source reduction	0%	0%	0%	0%	4%	4%
TIP FEES						
Tip fee - landfill per ton- with overhead	$47.00	$47.00	$47.00	$47.00	$47.00	$47.00
Tip fee - recyclables, per ton						
Tip fee - organics, per ton	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Landfill Tip Fees	$1,046,972	$1,060,583	$1,074,370	$1,088,337	$841,198	$793,671
Recycl Tip Fees	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Organics tip fees	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total tip fees	$1,046,972	$1,060,583	$1,074,370	$1,088,337	$841,198	$793,671
Change in Tip fees from Status Quo 2015			$13,788	$27,754	-$219,385	-$266,912
Landfill - tons/hh/mo	0.062	0.062	0.062	0.062	0.048	0.045
Recycling - tons/hh/mo	0.023	0.023	0.023	0.023	0.023	0.023
Organics - tons/hh/mo	0.023	0.023	0.023	0.023	0.023	0.023
EXPENDITURES - COLLECTION						
City overhead (set cost recovery ratio at left 0-	$930,000	$930,000	$930,000	$930,000	$930,000	$930,000
Trash collection Costs excl LF ($9.16/hh;3.35n	$2,258,533	$2,288,459.92	$2,318,210	$2,348,347	$2,348,347	$2,348,347
Recycling Collection costs excl tip ($3.54/hh;1	$1,277,455	$1,294,280.64	$1,311,106	$1,328,151	$1,328,151	$1,328,151
Brush Collection costs excl tip(3.64/hh - 1331.5	$1,313,541	$1,330,842.24	$1,348,143	$1,365,669	$1,365,669	$1,365,669
Total Coll'n cost needed	$5,779,529	$5,843,583	$5,907,459	$5,972,166	$5,972,166	$5,972,166
Collection plus Landfill and tipping costs	$6,826,501	$6,904,165	$6,981,830	$7,060,503	$6,813,364	$6,765,837
Average per household monthly cost to here	$18.92	$18.88	$18.85	$18.82	$18.16	$18.03
Annual savings for City compared to 2015 (sav=negative)			$77,664	$156,338	-$90,801	-$138,328

EXPENDITURES						
NEW COSTS - CANS						
Current household can sizes						
32 gal					1%	
64 gal					8%	
96 gal					91%	
Calculating customers on can sizes after PAYT						
Average trash weight per collection					22.0	
Estimated subscriptions based on volume distribution calcs (Opt1)						
Percent on 32 gal - est	0	0	0	0	31%	
Percent on 64 gal - est					53%	
Percent on 96 gal - est					16%	
Estimated subscriptions based on survey results (Opt2)						
Percent on 32 gal - est					50%	
Percent on 64 gal - est					36%	
Percent on 96 gal - est					14%	
Selected subscriptions -- based on above inputs (Used)						
Percent on 32 gal - est					40%	
Percent on 64 gal - est					45%	
Percent on 96 gal - est					15%	
New Cans Needed						
32 gal					39%	
64 gal					37%	
96 gal						
Percent unused 96s					75%	
Cost per 32 gal with delivery					$40	
Cost per 64 with delivery					$50	
Cost per 32 with delivery					$50	
Can Inventory backup - premium for PAYT					3%	
Cost for cart purchases					$1,099,442	
Total number new trash carts needed					23,815	
Repurpose X% 96 gal carts to YW					0	
Value per repurposed or sold cart					0	
Net container purchases					$1,099,442	
Spread acorss X years					5.0	
Financing cost					3%	
Annual cost allocated for cart purchase					$219,888	
OTHER NEW COSTS - CONTAINERS						
Refined billing system					$15,000	
Years to spread					5	
Annualized cost for billing system					$3,000	
Wash Carts (not a new cost)					0	
Maintenance on carts at 25 cents/mo ($95K)- not a new cost					$0	
Subtotal PAYT by Can New Costs					$222,888	

BAG COSTS						
Average weight of trash per bag						20
Number of bags needed per household per month						4.5
Calculated per week						1.0
OR Number of bags per week based on 1,2,3 bag cans						1.7
Selected bag count per week - selected average						1.5
Total number of bags sold per year						2,381,843
Percent on 10 gallon bag						9%
Percent on 32 gal bag						91%
Percent needing 10 gal from survey						40%
Percent needing 30 gal from survey						60%
Selected percent on 10 gal						25%
Selected percent on 30 gal						75%
SUPPLY COST per 10g logo-ed bag (not RATE) - (to WZ or other firm) (NOTE to user - can set as "net" of other bags not used)						$0.200
SUPPLY COST per 30g logo-ed bag (not RATE) - (to WZ or other firm) (NOTE to user - can set as "net" of other bags not used)						$0.350
Bag Firm (WZ or other) Premium on Bags						0%
Bag Firm (WZ or other) premium on bags (if cents per bag)						$0.000
Extra route time for inspection of violations (camera)						0
Extra route time to pick up bags						0
Subtotal, Payments to Bag Firm/yr (WZ or other)						$745,384
Netting out savings in HH kitchen bag reductions						
Percent reducing bag use						50%
Number of bags saved per household reducing - per WZ Bag						1.00
Cost per bag saved (hefty type)						$0.150
Household savings in bags						$178,638
Effective net cost for bags						$566,746
Subtotal, Gross Bag Costs						$745,384
Subtotal - SELECTED (net or gross) Bag Costs, annual						$745,384
Pct net over gross (savings from hefty bags)						24%
REVENUES TO BE RAISED						
Revenue requirements Col'n plus tipping fees	$6,826,501	$6,904,165	$6,981,830	$7,060,503	$6,813,364	$6,765,837
New Can costs					$222,888	$0
New bag costs					$0	$745,384
New outreach costs						$0
New programmatic costs, transfers, other costs for City						$0
Other payments (WZ, etc.)						$0
Total revenue requirements	$6,826,501	$6,904,165	$6,981,830	$7,060,503	$7,036,252	$7,511,221
Average cost per household per month	$18.92	$18.88	$18.85	$18.82	$18.75	$20.02
NON-RATE REVENUE SOURCES						
General fund subsidy	$2,500,000	$1,230,512	$0	$0	$0	$0
Solid waste fee per month	$7.00	$10.50	$14.00	$14.00		
Revenues from solid waste fee	$2,526,041	$3,838,968	$5,185,166	$5,252,573	$0	$0
Percent revenue recovery from rates	37%	56%	74%	74%		
Total Revenues from non-rate sources	$5,026,041	$5,069,480	$5,185,166	$5,252,573	$0	$0
REMAINING TO BE RAISED FROM RATES						
Total Revenues to be raised from rates	$1,800,460	$1,834,685	$1,796,663	$1,807,930	$7,036,252	$7,511,221
Avg per HH per month to raise from rates	$4.99	$5.02	$4.85	$4.82	$18.75	$20.02

CALCULATING RATES						
Rates for PAYT Cans						
Assumed increment for extra 32 gal					75%	
Average cost per household to recover					$18.75	
Calculated Rates						
32 gal					$12.04	
64 gal					$21.07	
96 gal					$30.10	
Average gallons subscribed					55.8	
Rates for Zero Waste Bags						
Assumed increment for big bags vs. small						1.6
Pct on 10 gal						25%
Pct on 30 gal						75%
Calculated Rates						
10 gal						$2.12
30 gal						$3.39
Cost per household - ALL services	$18.92	$18.88	$18.85	$18.82	$18.75	$20.02
Percent Increase over 2015			0%	0%	-1%	6%
Cost per household - ALL services minus OH	$16.34	$16.34	$16.34	$16.34	$16.28	$17.54
Incremental cost per marginal recycling ton					-$6.91	$69.96

Appendix D – PAYT Ordinance Outline / Elements

Typically, it is not possible to bar other service providers from establishing a trash hauling business in a community, even though the City provides service – and charges all residents for that collection service. Therefore, if a PAYT provision is put in place, it is prudent to pass an ordinance assuring that other providers will not undercut the City's incentive-based rate system and reduce the recycling that was a key objective of the change to PAYT. The following elements are recommended for the PAYT ordinance in Asheville.

The ordinance can assure that any new haulers comply with the same rules the City is imposing on itself, and helps assure the city achieves its goals of 1) increased recycling, and 2) more equitable and incentivizing rates, is to pass "recycling and PAYT" ordinance. This is important because:

- It retains a level playing field for haulers
- It retains choice for customers.

The key elements of this ordinance[71] are described below. A sample ordinance[72] is also provided below.

D.1 Elements of a Successful, Comprehensive PAYT Ordinance

Based on a study of ordinances in more than 100 communities and counties, we suggest the following key elements for a comprehensive and successful ordinance – geared toward establishing the rules for any residential haulers that may decide to enter the Asheville market.

Key Elements of the Ordinance[73]

- **Safety Issues**: Requirements for truck and operator safety issues, avoiding leakage, etc.
- **Recycling Opportunities**: All haulers providing service within the community's/county's boundaries must:
    1. offer curbside recycling to every single family (or up to X-plex) household with garbage service;
    2. provide recycling service at least every other week;
    3. must collect at least a base set of materials that the community lists (usually newspaper, waste paper, cardboard, chipboard / paperboard, aluminum and steel / bimetal cans, glass bottles, and #1 and #2 plastics, but the list will vary based on your local markets / MRF); and
    4. must provide recycling container(s) that are at least 64 gallons in total size, and are covered (preferred);
- **Fees and PAYT**: The cost of the recycling program must be embedded in the trash rate, with no separate charge, fee, or line-item for recycling. The cost for trash service must be in a PAYT structure. The PAYT system must:

[71] Examples of necessary ordinances and the process are found on www.payt.org or www.paytwest.org.

[72] Thanks to assistance from Constance Hornig, Esquire on the preparation of the Model Ordinance language and this summary of RFP steps and schedule.

[73] See sample PAYT ordinances from other towns and counties on www.payt.org or www.paytwest.org; or use the template ordinance your town may want to adapt and adopt. These are the same elements that are important for state-level PAYT legislation.

1. Offer, as its smallest container, a container no larger than 32 gallons, and must offer service in 32 gallon increments above this service;
2. The cost of the trash container service must be set so that, throughout the service levels available, double the service volume cannot cost less than 80%[74] more in total to the household.[75]
3. The community should establish auditing rights.

- **Reporting and Audit Authority**: The community should require haulers to report the trash and recycling tons collected within the community's boundaries, with reporting at least quarterly. This will allow the community to monitor progress in recycling. Establishing the authority to audit compliance with the ordinance is also important.
- **Educational responsibilities**: The community should designate minimum requirements for frequency of recycling education (e.g. requiring haulers to provide annual outreach or mailers to customers).[76]

Advantages of a Local PAYT Ordinance:

- Covers all haulers, establishing a level playing field for haulers (which they are generally satisfied with) and the new programs bring them business opportunities;
- Better levels of service for residents;
- Better participation and diversion from recycling and other programs;
- More equitable rates;
- Safety, health, and other benefits to the community.

D.2 Model Local Recycling / PAYT Ordinance

The following template[77] "local ordinance" for PAYT may address the key issues for Asheville. Of course, review by City attorneys and minor modifications will be needed before presentation before the Council.

[74] The community may, of course, set a different percentage increment. This value – 80% -- is based on statistical studies that balance two objectives: 1) providing a strong recycling incentive, and this value was found to provide almost the same recycling incentive to households as rates that double for double the service; and 2) backing off from very aggressive rates to recognize the fact that the largest cost in providing trash or recycling service is getting the truck to the door – arguing for flatter rates. This differential tries to provide incentives, but also help decrease the risk of not covering fixed costs of the operations. If a community selects a lower percentage, be careful to provide enough incentive to modify behavior – perhaps not less than 50% extra.

[75] For example, if a 32-gallon container costs $10/month, then a 64-gallon container would cost $18, and a 96 gallon container would cost $26, etc. Note that the ordinance sets rate structure, but not rate levels, and thus, is not rate-setting. Haulers may increase the level of the rates they need in order to cover the cost of recycling and the PAYT rate structure.

[76] Often the best programs have both the hauler and the community providing education to households. This establishes the portion for which the hauler is responsible. This can augment community outreach efforts and provide a coordinated message.

[77] Source: Skumatz and Freeman, "Increasing Recycling Now! Implementing Recycling and Pay As You Throw (PAYT) Ordinances, Legislation, or Contracting – Practical Guide and Model Language", Skumatz Economic Research Associates, Inc. Superior, CO, August 2008.

AN ORDINANCE OF THE [insert name of THE GOVERNING BODY] OF [insert name of LOCAL JURISDICTION[78]], REGARDING IMPLEMENTATION OF VARIABLE RATES FOR COLLECTION OF SOLID WASTE & CURBSIDE RECYCLABLES BY SERVICE PROVIDERS OPERATING IN THE [insert name of LOCAL JURISDICTION]

ORDINANCE NO. 20XX-x

SECTION 1. [Chapter x] ___of the [local jurisdiction code] is added as follows:

101. **FINDINGS.** The [GOVERNING BODY[of the]LOCAL JURISDICTION] makes the following findings:

(a) **Disposal of wasted resources.** In 2007, residents and businesses in this [LOCAL JURISDICTION] discarded over _____ tons of materials for disposal, or ____ pounds per capita. (These materials are referred to in this [Chapter], as "municipal solid waste".) But an estimated ___% of these discarded materials and could be reused, recycled or put to other beneficial use, resulting in significant energy and resource savings.

[(b) **Green house gas or non-beneficial disposal.** An estimated ___% of these discarded materials are disposed in landfills that do *not* collect and burn discharged landfill gases and therefore emits green house gases into the atmosphere. An estimated __% of those discarded materials are disposed in landfills that collect and burn, but do not *recover* landfill gases for beneficial purposes or generate power. As these landfills reach permitted capacity, it is becoming more difficult and expensive to site, permit and develop new landfills][79].

(c) **Variable Rates: disposal diversion incentive.** Increasingly, state and local governments across the United States and the world require that waste generators pay **variable rates** (or PAYT / Pay as You Throw)**:** charges for refuse and garbage collection services that incrementally increase with disposed refuse and garbage volume (such as 32, 64 or 96 gallon carts) or weight, with lesser or no charges for recyclables and / or organics collection services, to encourage recycling and discourage disposal. Variable rates do not necessarily reflect actual operational costs but rather constitute behavioral incentives (or disincentives) proportionate to the waste they discard.

(d) **Avoided disposal cost component of variable rates.** Diverting materials from disposal saves and reduces disposal costs, both operating and capital. [Landfill capacity is preserved and landfill life extended, deferring siting, design, permitting and construction costs for new cells.] Therefore, the incremental portion of variable rates represents not only the incremental operational and capital costs of collecting, transporting and disposing of more materials, but also an avoided cost of disposing of those diverted materials.

(e) **[LOCAL JURISDICTION] responsibility.** The responsibility for protecting the public health and safety through responsible municipal solid waste management has historically been the responsibility of [LOCAL JURISDICTION].

(f) **Fairness of paying for use.** Increasingly, other local governments are funding municipal solid waste management costs through service fees proportionate to use, as is done for water, sewer and electric utilities. Residents and businesses generally perceive that paying for one's own service, and not subsidizing some one else's greater service, is equitable. In order for customers to see the cost savings they realize from discarding less, and recycling more, it is important that municipal solid waste services are itemized on customers' bills, and that billing is relatively frequent (not annual or semi-annual).

[78] Such as "City Council" or "County Board of Supervisors".

[79] Adapt this finding to local disposal options.

102 [**LOCAL JURISDICTION] POLICY.** In order to provide generators of municipal solid waste with the financial incentive to divert municipal solid waste from disposal by source reduction, reuse, recycling or other beneficial use, the [GOVERNING BODY] declares that it is [**LOCAL JURISDICTION]** policy to establish and charge variable customer charges for municipal solid waste collection, transportation and disposal services.

103 **REFUSE AND GARBAGE SERVICE LEVEL OPTIONS.** Every public or private provider of residential refuse and garbage service must offer each of its customers the option to subscribe to different levels of service with different capacities of refuse and garbage containers, such as 32, 64 and 96 gallon carts. For residential customers, one option must be small, the approximate capacity equivalent of a 32 gallon cart. If a customer does not exercise its option, the provider may establish a default level of service, such as a 32 gallon cart.

104 **MANDATORY RECYCLABLES SERVICE.** Every municipal or private provider of residential refuse and garbage service must offer each of its residential customer's curbside recyclables collection service at least every other week, in lidded containers no smaller the 64 gallons capacity. The [insert APPLICABLE ADMINISTRATOR[80]] may define "residential" for purposes of this Chapter[81] and promulgate regulations governing additional recyclables collection service specifications and standards, such as prescribing the types of recyclables that the provider must collect (for example, newspaper, waste paper, cardboard, chipboard / paper board, aluminum and steel / bimetal cans, glass bottles and #1 and #2 plastics). .

104. **VARIABLE RATES.** Every provider of residential refuse and garbage collection service must charge variable rates described in Section 101(c) for the corresponding level of service. To the extent permitted by the State constitution and applicable law, the provider may structure its incremental charges on either a cost-basis or incentive-basis.

105. **INCENTIVE STRUCTURE OF VARIABLE RATES**

(a) **Prescribed variable rate increments.**

(1) Multiples prescribed by service providers. As a condition of any permit, license or franchise to collect residential recyclable materials or as an obligation under any contract to collect residential recyclables materials[82], the permittee, licensee, franchisee or contractor must structure the increments of its variable rate at a prescribed multiple of the smallest level of service offered, such as increment equal to 80% or more of the charges for a 32 gallon cart (for example, $10 for a 32, $18 for a 64 and $26 for a 96 gallon cart, respectively).

(2) Multiples prescribed by [LOCAL JURISDICTION]. The [GOVERNING BODY] by resolution may prescribe a specific multiple applicable to all permittees, licensees, franchisees or contractors uniformly. However, that prescription of a specific multiple may not be construed as regulating or in any way setting the underlying service rate multiplicand, which the provider may establish and set in its sole discretion.

(b) **Remittance to [LOCAL JURISDICTION].** Subject to any preconditions or prohibitions under applicable law, the [LOCAL JURISDICTION] may require a permittee, licensee, franchisee or contractor to

[80] such "Director of Public Works", "Director of Natural Resources" or "Director of Health"

[81] or alternatively:

- "Residential" has the meaning provided in INSERT RELEVANT LOCAL CODE CITATION, such as Section XX of the City/County Code" or
- "Residential means "related to detached, single family homes or duplexes, other than condominiums or townhouses."

[82] Or alternatively, implementation merely as a local law /code requirement: "Every public or private provider of municipal solid waste collection service. . . ".

remit to the local government the incremental variable rate receipts that the permittee, licensee, franchisee or contractor collects from customers. The local government may establish rules and regulations governing the collection, holding and remittance of the incremental variable rate receipts held by the permittee, licensee, franchisee or contractor prior to remittance, including, without limitation, provision of security bonds.

105. **CUSTOMER NOTICE.** Every public or private provider of residential municipal solid waste collection service must give each of its customers written notice of service options and corresponding variable rate charges upon commencement of service and at least annually thereafter.

106. **IDENTIFICATION OF MUNICIPAL SOLID WASTE SERVICE CHARGES.** If any public or private provider of residential municipal solid waste collection service bills any customer for more than one service (such as municipal solid waste collection and water services), on each bill the provider must clearly identify the variable rate charges for municipal solid waste services and itemize them separately from charges for other services.

107 **COMBINATION OF REFUSE AND RECYCLABLES COLLECTION CHARGES.** On each bill, every public or private residential of municipal solid waste collection service that provides both refuse and recyclables collection service must combine charges for refuse and recyclables collection service and may not itemize them separately, one from the other.

108. **BILLING FREQUENCY.** Every public or private provider of residential municipal solid waste collection service must bill each of its customers at least quarterly, once every 3 months.

110 **REPORTING.** Every public or private provider of residential municipal solid waste collection service must keep records of the weight or volume of refuse and garbage, and recyclables that it collects and disposes or diverts. A [LOCAL JURISDICTION] may also require by law or regulation, each provider collecting municipal solid waste in the [LOCAL JURISDICTION]'s jurisdiction to report those weights or volumes to the [LOCAL JURISDICTION] no less than quarterly and in the format that the [LOCAL JURISDICTION] requests.

110. **[LOCAL JURISDICTION] COMPLIANCE AUDIT.** A [LOCAL JURISDICTION] may audit a municipal solid waste provider's subscription, billing and other relevant records to determine whether or not the provider has complied with the provisions of this Chapter at the provider's office located nearest to the [LOCAL JURISDICTION] during hours that the office is open for business, on at least one week's notice.

109. **DEFINITIONS.** The following words used in this chapter have the meanings ascribed to them in [INSERT CROSS REFERENCE TO A PROVISION OF ANY EXISTING LAW THAT DEFINES MSW TERMS]: [municipal solid waste, [LOCAL JURISDICTION], refuse, garbage, recyclables, residential, source reduction, disposal, etc.]