City of Fayetteville North Carolina

Final Report
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Report to the City of Fayetteville, NC for a Comprehensive Solid Waste Study

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SOLID WASTE
MANAGEMENT
CONSULTANTS

GBB provided this report working in association with:

Draper Aden Associates
Engineering • Surveying • Environmental Services

GERSHMAN, BRICKNER & BRATTON, INC.

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City of Fayetteville NC Report

1 Executive Summary

1.1 Introduction to the Project

Through a competitive consulting solicitation, the City of Fayetteville (City) hired Gershman, Brickner & Bratton, Inc. (GBB), along with GBB's subcontractor Draper Aden Associates (DAA), to complete a Comprehensive Solid Waste Study (hereinafter "Report"). The Request for Proposal (RFP) issued by the City requested a city-oriented evaluation which the City described as the Part 1 review, and then a regional analysis which was described as Part 2.

The City requested GBB to evaluate the effectiveness and efficiency of current solid waste management services. The City, with a population of approximately 210,000 residents, provides collection of residential garbage, residential yard waste, bulky items, dead animals, and rolling carts. The City serves an estimated 61,000 single family residential households collecting garbage, yard waste, bulky items, and managing carts. The City also manages a curbside collection contract for recyclables. All commercial locations and multi-family dwellings individually subscribe to private waste haulers.

In Part I of the project, the consultant conducted an analysis comparing the City's current waste hauling services with neighboring municipal solid waste services and regional private waste hauling services. The analysis included operational and equipment costs, services, efficiencies, and customer service such as call-backs. The consultant also assessed the value-added aspects of municipal services, the benefits and limitations of solid waste workers as City forces versus private-sector employees, and evaluated the software and on-board communications tools used by the City. The consultant then used this information and comparative analysis to provide a series of recommendations concerning the direction of the City's solid waste management with recommendations addressing the following:

- Benefit of initiating synergistic waste disposal partnerships;
- Fiscal cost-benefit of outsourcing solid waste collection operations;
- Operational adjustments to optimize current resource utilization; and,
- Modifications to increase efficiency and cost-effectiveness of recycling and material recovery.

A significant task in Part I, which was actually the first task to be completed, was a waste characterization study, also called a waste sort. GBB proposed a single-season, one-week "snapshot" study that identified both the components of the waste sent for disposal, as well as the materials source-separated by residents for recycling. This approach will allow the City to gain as much value as possible from the study in an economical manner.

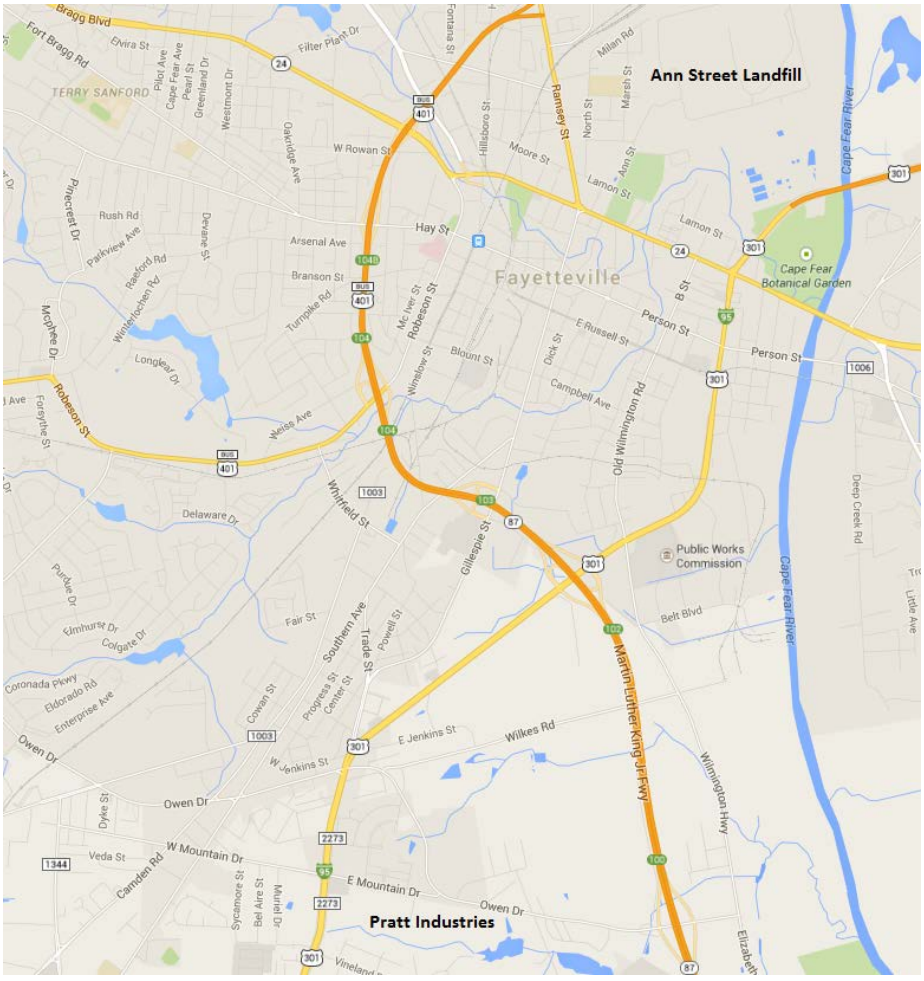
Part II of the project called for GBB to review potential regional waste programs, including regional costs and institutional issues related to developing a Waste-to-Energy (WTE) project with Fort Bragg. GBB also was contracted by the city to include the consideration of a mixed waste processing facility (MWPF), which could serve to glean further recyclables from the "garbage", while potentially preparing a higher heating value (HHV) fuel for a WTE facility.

Upon completion, the comparative analysis and series of recommendations from the project are intended to provide the City of Fayetteville with the requisite background, research and technical

understanding to make informed planning decisions regarding future solid waste programs, partnerships and operations.

The City is located about 50 miles south of Raleigh, the capital of North Carolina. The City Department of Environmental Services (ESD) provides all waste collection services, except for residential recyclables, which it contracts to Waste Management to perform. The City disposes the trash collected at the Cumberland County landfill. Recyclables are delivered for processing to the Pratt Industries MRF, located in the city. These two facilities are located on Figure 1.1.

Figure 1.1 – City Facility Locations



1.2 Waste Characterization Introduction

1.2.1 Introduction

For the City of Fayetteville, a waste characterization study was completed the week of March 23–27, 2015. Two key streams, residential garbage and curbside recyclables, were sorted. Data from this review provided information to support other tasks in the Report. GBB has completed many MSW-related waste composition studies around the US. With contemporary goals to increase recycling and diversion away from landfilling, the city was interested to know the fundamental composition of the garbage and

recyclables. GBB developed a detailed protocol for the waste sort, which was completed with assistance of both city and county staff. The quantity and characterization of the trash and recyclables streams generated by city residents during that week-long period, at a level of confidence in excess of 90 percent, was developed through the sorting of almost 10,000 pounds of trash and over 2,000 pounds of recyclables.

The waste sort was conducted adjacent to the county landfill in the BCH Building at the location noted in Exhibit 1.1. The physical arrangement of the sort area layout consisted of the sort table surrounded by the load-out containers (96-gallon carts) labeled to receive each of the specifically identified and sorted materials.

Exhibit 1.1 - Location of Field Sort Site within the BCH Building

During this 5-day period, the discarded trash and recyclables were systematically collected from around the city by ESD collection vehicles and the samples were hand-sorted into 30 separate categories of materials with each constituent weighed. During each day of the city collection program, approximately 75 trash carts and 75 recycling carts were randomly selected for sorting from the front of homes that set-out both carts. With the sorting area set-up depicted in Exhibit 1.2, this selection identified materials from representative homeowners that, by their set-out, had also elected to actively participate in the city recycling program.

Exhibit 1.2 - Set-up of the Waste Sort Stations and Material Containers

As a result of this week-long waste sort, GBB found that 24.7% of all the material in the trash cart stream was potentially recyclable material and that 22.2% of the material in the recycling carts was found to be "residual" or garbage materials and not recyclable based on the material standards of the Pratt MRF.

Also, during the entire week of the waste sort, 889 tons of trash was delivered from residential collection routes in the city to the county landfill, and another 165 tons of recyclables were collected by Waste Management and delivered to the Pratt Industries MRF. For this specific week, the total represented a diversion rate of 16% for the city during that week, which was lower than the 21.6% diversion rate found specifically during the week-long sort study.

Based on the total tons delivered from city residential collection routes to the landfill during the sort study week, the make-up of the trash showed an estimated 35 percent of the city trash disposed at the county landfill that week had the potential for recovery or diversion through a recycling stream.

While the sort information is good data, GBB cautions the city waste sort only included only a one-week snapshot of the city's waste stream, and was not the typical four-season waste sort that is normally conducted before the final implementation of new and very expensive disposal technologies, such as a mixed waste processing facility, or any other unique solid waste facility planning or project implementation.

1.2.2 Recommendations

While this was only a one-week waste sort, and not a more extensive four-season activity, it is clear that the guidelines and/or requirements for the set-out of recyclable materials into the recycling carts are not being followed by all of the recycling program participants. Also, a significant amount of recyclable materials is still being placed into the trash cart. GBB recommends that the city, along with Pratt Industries, review the public relations information that has been created and consider using some of the

information presented in this Report to initiate a targeted public relations campaign to improve the quantity and the quality of recyclables set out by the city households.

The current business arrangements of paying Waste Management for recyclables collection services, as well as the city charge associated with trash going into the county landfill, are not "tonnage" oriented. Rather, they are "charge per household" oriented. Therefore, creating more acceptable recyclables per household does not increase or decrease those two city cost elements at this time. However, the city does share in recyclable material revenues through their current contract with Waste Management. Thus, the more tons of recyclables set out by city residents will create more rebate funds for the city. Also, creating less trash into the county landfill does have environmental benefits and will help preserve space within the permitted landfill for future use. Any targeted public relations campaign to improve the quantity of recyclables should also address the environmental benefits of less landfilled materials.

The city should begin to monitor the "fullness" of the 35 gallon recycling carts as that cart size is typically the minimum size for a single stream recycling program. Charging extra for a larger cart might, in some cases, be acting as a detriment to more recyclables being placed out for the recycling service. If the recycling cart is full before collection, recyclables may just be getting thrown into the larger trash cart for weekly convenience and necessity. After a fullness data review, a small "Recycling Habits and Cart Use Study" centered on resident field interviews might be appropriate to consider in this regard.

There is a significant difference in the allowable material inputs to a single-stream MRF (like the Pratt MRF) versus a MWPF (like that in Montgomery AL), as well as the marketable materials that are created and sold. Based on the waste sort information, GBB recommends a side-by-side review be developed of the acceptable Pratt single-stream input streams and the Pratt marketable materials, and compared this with the same input/output information based on the current experience at modern MWPFs, such as at the Montgomery Al location.

1.3 Municipal Hauling and Collection Services Benchmark

1.3.1 Introduction

A benchmarking of seven (7) North Carolina municipalities with similar solid waste collection services was conducted as part of this study. The benchmarked municipalities were selected, in part, based on population, proximity, and solid waste disposal funding availability. The explanatory information collected provides a high-level observation of the key similarities and variances in the benchmarked solid waste collection programs. All of the cities that were benchmarked have four basic core collection programs; residential refuse, residential recycling, bulk item, and yard waste and brush and leaf collection. Additionally, they all provide cart service for refuse and recyclable collection, and most have some sort of containerized yard waste program. All cities provide 96-gallon trash carts and use either automated side loaders, rear load packers or a combination of both to collect curbside trash.

All benchmarked cities provide single stream recycling with carts with a mix of public and private providers. Four (4) benchmarked municipalities (Durham, Greensboro, High Point and Wilmington) provide 96-gallon single stream recycling carts for every-other-week (EOW) collection. A significant dissimilarity we found is that Fayetteville uses mostly 35-gallon carts for weekly recyclable collection. Four communities provide public-provided every other week recycling in 96-gallon carts, whereas Fayetteville and Winston-Salem provide contracted weekly recycling.

Table 1.1 - Comparable Residential Recycling Systems (1)

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro	Durham	Wilmington
What services are included in the Residential Recycling category?	Private curbside residential collection	Private curbside residential collection	Curbside Residential	Curbside Residential	Curbside Residential	Curbside Residential	Voluntary curbside Single Stream collection
Public or private collection	Contracted with Waste Management	Contracted with Waste Management	Public	Public	Public	Public	Private subscription service
Single stream or Dual Stream Recycling	Single Stream	Single Stream	Single Stream	Single Stream	Single Stream	Single Stream	Single Stream
Cart Size	35- Gallon	96-Gallon	96-Gallon	95-Gallon	96-Gallon	96-Gallon	96-Gallon
Number of Collection Points	60,527	77,553	38,357	35,544	80,640	69,800	22,000
Annual Tons Collected -FY2014	9,280	12,671	5,538	8,827	18,123	13,700	7,104
Recyclable Material Pounds per Household per Week	5.90	6.28	5.55	9.55	8.64	7.55	12.42
Curbside Recyables as a % of all tons managed	12.1%	14.0%	11.7%	22.6%	13.8%	17.6%	16.3%
Frequency of collection (e.g. 1/week?)	Weekly	Weekly	Weekly	Every other week	Every other week	Every other week	Every other week

(1) Partial summary extracted from Table 4.6 of this Report

1.3.2 Recommendations

The city should seek transition to an every-other-week (EOW) program using larger carts. A large cart will provide greater capacity and provide for an expansion of additional material as the recyclables market allow. GBB recommends that the city assess the potential for EOW recyclables collection that takes into account the current contractual situation and also considers the potential for city-provided recyclables collection.

1.4 City of Fayetteville's Solid Waste Resource Allocation and Costs

1.4.1 Introduction

A review of staff resources and costs for each of the key waste-related activities provided as services to the citizens of the City was conducted. The review consisted of allocation of equipment, labor, set out requirements and procedures for managing the solid waste collected. ESD provides collection for single-family of up to seven (7) households in a building. The programs include curbside residential collection of trash, recyclables, bulky item pick up, yard waste and include special services such as dead animal pick up, cart maintenance and delivery.

The department is authorized to use 75 full time and seven (7) temporary employees to provide solid waste collection services and average 148-164 weekly routes. The Department uses 67 vehicles maintained by PWC's Fleet Services. Automated side load collection trucks are used for weekly trash service. Yard waste collection uses rear load packers and workers must rip and tear bags when yard waste is not containerized in carts or homeowner cans.

Trash collection consists of 32 total front line vehicles of these, 22 vehicles are listed as routed trucks, with ten (10) vehicles identified as spares. The spare factor for the frontline collection equipment, minus any supervisory trucks, is 45%. Trash collecting trucks cost an average $15,000 /year. Additionally, spare Trash truck maintenance cost the city approximately $150,000 annually.

The average ASL trash load of approximately nine (9) tons is for the 24 cubic yard Heil packer truck body is well within capacity for compacted MSW. Our review indicates that the ASL trash trucks are currently averaging 1.2 disposal loads per day. The trucks are utilized as designed, considering limitations of collection hours available due to the operating hours at the county landfill and start times. GBB notes approximately 33% of the ASL loads in CY 2014 were above the average with 50% of those loads between 9 and 11 tons and the other 50% between 11 and 13 tons.

Until the recent installation of FleetMind, reliable metrics or historic numbers at the daily and route level were not available to provide more details on the truck disposal times vs. loads and productivity findings. This Report used four weeks over four seasons for a high level evaluation of productivity statistics.

GBB noted a high number of spare front line collecting trucks illustrated in Table 1.2. Spare Trash trucks make up 45% of the front line collecting trucks, compared to industry standards of 10%-15%.

1.4.2 Recommendations

GBB recommends that ESD and Fleet Services work in partnership to reduce spare trash trucks to three (3) for a spare factor of 12%, reducing trash maintenance expense by approximately $100,000 annually. In addition, reduce yard waste spare trucks by one (1) by to 11% spare factor (2 spares), could also reduce yard waste maintenance almost $20,000.

Utilizing FleetMind for real-time route productivity and customer service analysis will allow the ESD to make route adjustments sooner to further reduce costs and to complement customer service initiatives. GBB recommends that ESD personnel fully implement FleetMind as soon as possible, and to have this technology on each front line collection vehicle.

Table 1.2 - Trash Vehicle Asset List

No.	Year	Vehicle No.	Description	Primary use	Body Manufacturer	Type	Routed/ Spare/ Other
1	2011	4071	2011 FREIGHTLINER M2-106	Garbage	Loadmaster	STR	Routed
2	2007	4040	CRANE CARRIER	Garbage	Loadmaster	RL	Routed
3	2008	4056	CRANE CARRIER	Garbage	Loadmaster	RL	Routed
4	2008	4057	CRANE CARRIER	Garbage	Loadmaster	RL	Routed
5	2009	4063	CRANE CARRIER	Garbage	Loadmaster	RL	Routed
6	2011	4069	2011 MACK TRUCKS LEU600	Garbage	Loadmaster	RL	Routed
7	2011	4070	2011 MACK TRUCKS LEU600	Garbage	Loadmaster	RL	Routed
8	2011	4072	2011 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
9	2012	4073	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
10	2012	4075	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
11	2012	4076	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
12	2012	4077	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
13	2012	4079	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
14	2012	4080	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
15	2013	4081	2013 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
16	2013	4084	2013 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
17	2013	4085	2013 FREIGHTLINER 108SD	Garbage	Heil	RL	Routed
18	2014	4089	2014 MACK TRUCKS LEU600	Garbage	Labrie	ASL	Routed
19	2014	4090	2014 MACK TRUCKS LEU600	Garbage	Labrie	ASL	Routed
20	2014	4091	2014 MACK TRUCKS LEU600	Garbage	Labrie	ASL	Routed
21	2014	4092	2014 MACK TRUCKS LEU600	Garbage	Labrie	ASL	Routed
22	2006	2099	2006 FORD F350 XL SD	Garbage		Utility	Routed
23	2005	4030	2005 FREIGHTLINER M2-106	Driver	Heil	STR	Spare
24	2008	4048	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
25	2008	4053	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
26	2008	4058	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
27	2008	4059	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
28	2009	4064	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
29	2012	4078	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Spare
30	2013	4082	2013 MACK TRUCKS LEU600	Garbage	Heil	ASL	Spare
31	2013	4083	2013 MACK TRUCKS LEU600	Garbage	Heil	ASL	Spare
32	2007	4035	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
33	2009	2123	2009 FORD F150	Garbage Spvr		Pick up	Other
34	2009	2124	2009 FORD F150	Garbage Spvr		Pick up	Other
35	2009	2124	2009 FORD F150	Garbage Spvr		Pick up	Other

ASL- Automated Side Loader

RL- Rear Load Packer

STR- Small Truck Route

With the addition of the final three (3) automated side loaders (ASL), trash collection will become fully automated. GBB recommends conducting a city-wide route optimization every five years and/or when operating parameters have changed as they have now. In addition, fully utilizing FleetMind tracking and reporting to track actual set-out rates, and other operating parameters will maximize efficiency.

As trash collection has become fully automated, the ability to transition older rear load packers into the yard waste program has been eliminated as rear loaders are retired. As the city moves forward a plan will be needed to address replacing yard waste collection vehicles and/or how to provide yard waste service. GBB recommends mothballing the spare trucks for the short term as a result of reducing spare trucks to use as replacements for older rear loads ready to be retired. GBB recommends the city work with the county to accept and local retailers to sell biodegradable paper lawn bags and eliminate the use of the plastic bags. This will reduce labor costs associated with ripping and tearing bags. Also the ESD should develop a plan to modify yard waste collection in the near future before the city's rear load fleet becomes too costly to maintain, thus increasing the cost of the program.

1.5 Private Hauling and Collection Services Benchmark Study

1.5.1 Introduction

The City sought to understand its ability to provide some, if not all, of the solid waste services currently provided by city forces as a competitor with the solid waste private sector. Numerous pressures fall onto the municipal staff to make sure the city residents are receiving the best of services at the most competitive of costs.

GBB attempted to collect data from municipalities within close proximity with Fayetteville, however gathering data from private companies in a highly competitive industry is a challenge. GBB was able to gather and evaluate data from six (6) communities of varying sizes around the state where services were provided by a mix of private contractors and by the municipality itself. Those areas and companies reviewed included: Brunswick County- Waste Industries; Cornelius- Republic Services, Inc.; Fayetteville- Waste Management, Inc.; Huntersville- Advanced Disposal; Siler City- Waste Management, Inc. and Winston-Salem- Waste Management, Inc. Those that did participate supplied the total price for services and did not isolate costs between the services, as it is often considered proprietary, and communities will request an all-in price, as they do not plan to contract with separate haulers.

As summarized in Table 1.3, the cost of service varies widely among comparable NC communities for the types of services provided with outsourced collection services. Trash collection services are similar in nature, bulky items are collected at a variety of frequencies, and five of six municipalities provide weekly containerized yard waste. All municipalities in this review provide single stream curbside recycling in carts. There are notable differences in the size of carts and frequency of collection.

The City provided solid waste services in FY14/15 at an annual net cost of $217.42/household ($18.12/household/month) this includes ESD one-time capital expenses and outside source revenue. Without the one-time capital expenses (FleetMind and parking lot) the net monthly cost would be $17.34/household. This net cost also includes additional city-provided services of bulk collection, rapid response, special services such as dead animals, services that are not provided by other community's solid waste departments.

Notable findings of this effort is EOW recycling is conducted by four of the six municipalities, yard waste collection may or may not be included as part of a contract and bulk item bulk item collection is city-provided.

Table 1.3 - Representative NC Municipalities with FY14/15 Private Hauler Contract Cost

	Fayetteville	Winston-Salem	Brunswick County(2)	Siler City(2)	Cornelius(3)	Huntersville(3)
Contracted Hauler	Waste Management	Waste Management	Waste Industries, Inc.	Waste Management	Republic Services	Advanced Disposal
Private Services Provided(1)	RC1	RC1	T, RC2	T, RC2	T, RC2, YW	T, RC2, YW
Number of Collection Points	60,527	77,533	81,516	2,890	9,600	18,660
Annual Residential Refuse Tonnage	45,732	52,054	75,443	3,072	7,400	12,120
Annual Recyclables Tonnage	9,280	12,671	4,454	245	2,086	3,833
Recycling Rate Garbage and Recyclables only	16.9%	19.6%	5.6%	7.4%	22.0%	24.0%
FY14/15 Monthly Contract Refuse Price/ per Household	$0.00	$0.00	$12.27	$14.41	$16.18	$13.34
FY14/15 Monthly Contract Recycling Price/ per Household	$2.91	$2.89	$0.00	$0.00	$0.00	$0.00
FY14/15 Total Annual Price/Household	$34.92	$34.68	$147.24	$172.92	$194.16	$160.08
FY14/15 Total Annual Contract Price/Household	$2,113,603	$2,688,844	$12,002,416	$499,739	$1,863,936	$2,987,093

(1) T= Weekly Trash, RC1= Weekly Recycling, RC2= Every Other Week Recycling, Weekly YW= Yard Waste

(2) Recycling price included in Refuse price

(3) Recycling and Yard Waste included in Refuse price

1.5.2 Recommendations

GBB as noted earlier, recommends the City investigate the potential gains of transitioning to EOW single-stream recycling with larger carts to reduce the overall cost of collection. This should also increase the City diversion rate. With a modest 20% increase of the current amount of recyclables collected, this would push diversion to over 20 percent. GBB has seen the amount of recyclables increase by as much as 40% when communities have transitioned to larger carts and EOW collection.

1.6 Estimated Value of Value-Added Services

1.6.1 Introduction

Value-added services have an unlimited range, and typically are determined by the municipality according to their needs, long standard operating procedures, and local tradition or politics regarding charitable giving, special event services, etc. The City sought to understand estimated value of services currently provided by the ESD, which are not normally included in a typical service agreement with a private contractor.

GBB found that the City provides numerous value-added services that may not be apparent as to the intrinsic value they provide. In addition, sometimes city-provided services become a program that people are reluctant to give up as they have been in place for so long that change may cause temporary heartache. Table 1.4 summarizes examples of Value-Added Services.

The information gathered shows the ESD is providing a majority of value-added services at better costs than the private sector, with the exception of collecting recycling from City-owned facilities and recyclables drop off sites.

Table 1.4 - Estimate of the ESD Value-Added Services

ESD Value-Added Services	Description of the Activity	Private Hauler Estimated Cost	City Estimated Value
Emergency Response Activities	Estimated private hauler cost per cubic yard impact on the City with private hauler bulky Item collection, leaving the City without bulk item collection equipment. For natural disaster debris collection formally handled by the ESD.	$12.50/cy	$4.03/cy
Special Event Support	Private hauler special event support for festivals, parades, cleanups, etc.	$95,000(1)	$24,519 annually
Pick-up of recyclables from City owned facilities	Estimated private hauler cost per location for the collection of recyclables from all City-owned buildings,athletic facilities and the City's 5 recycling drop-off sites by City staff. Waste Management would still provide the $11/ ton rebate.	$2.91 per location(2)	$23,000 annually
Rapid Response Resolutions	This program includes first responders to quickly resolve collection related complaints in the field.	Part of contractual cost	$75.53 per resolution
Local vs. Regional Call Center	Call Center transitioned out of Environmental Services in February 2014 and is now managed by Corporate Communications	N/A	N/A
Intra-Dept Equipment Loans	Examples are ESD borrowing leaf collection trucks for loose leaf collection; loaning grapple trucks for debris clean up	N/A	$185,000/ truck
Annual United Way/ Heart Association employee Contributions	Intangible value private haulers have similar programs; privatizing will reduce City's overall contributions	Unknown	$2,357
Promotions of Recycling Programs	There currently are no programs such as Recycle Bank or recycling Perks in Fayetteville. Implemnting a program can increase local community and ESD revenue.	$151, 000	$151,000
Illegal Dump Remediation	This program mitigates an average of 10 illegal dumpsites per week, helping keep Fayetteville clean and beautiful.	$65,000	$21,000

(1) Based on current contract cost
(2) Assumes hauler will add on each facility using current contract price

1.6.2 Recommendations

GBB recommends keeping the emergency response service in place. While it may be an unbudgeted cost, outsourcing the service would be as well. However, with city personnel and equipment already in place, the City has the ability to be on-the-streets the day after a disaster to rapidly clear streets for emergency personnel and utility companies, getting the City back on its feet sooner. This also provides a moral victory as residents hear and see things happening immediately following a disaster.

The cost to collect recyclables from city-owned facilities is expensive compared to the potential private hauler cost per unit. GBB recommends that the City negotiate with Pratt Industries to match the rebate structure for city-owned facility recyclables that Waste Management receives from Pratt Industries. While this will not cover the cost of collecting the material from city facilities, it will at least make it more palatable.

Based on this study, the better option would be for the City to negotiate with Waste Management to provide recycling services at city facilities and drop-off sites. They already have the trucks on the street and could tuck this service into their existing routes. This could be done immediately and would greatly reduce the cost of this one-off service.

1.7 City Employee Benefits and Limitations versus Private Hauling Companies

1.7.1 Introduction

Management of employees can be very different between the public and private sector and individuals have different expectation when making decisions to join either a public or private sector organization. The City wanted to identify the difference in benefits and limitations for employees employed by the City versus a private solid waste collection firm.

GBB's analysis involved conducting interviews with department leadership and other stakeholders including reviewing private sector benefit programs to develop a summary of benefits and limitations for employees of the ESD as compared to private refuse firms.

The city provides ESD employees an extensive wage and benefits package that include, but are not limited to, health and dental benefits, paid time off, retirement, discipline policies, promotion, quality of life programs, etc. that are beneficial to city employees that are not available with private sector solid waste companies.

City employees may earn two (2) fewer vacation days over the length of their employment, however, they also have the ability to accrue their vacation time and carry it over from one year to the next with a maximum of 35 days kept on the books. The private sector typically has a "use it or lose it" vacation policy.

Based on the review of benefits, the city does offer a robust benefits package that is very rewarding and comparable to the private sector. It should not be considered a limitation to hiring and keeping quality employees in the ESD.

Table 1.5 provides the observation on vacation leave benefits that allow employees to accrue leave that does not happen in the private sector.

1.7.2 Recommendations

GBB does not recommend any changes to existing packages. Often employees perceive they are earning less than their private sector counterpart on their base wage/ hourly rate. However, this is not always the case. The additional time off, health and welfare benefits, and retirement benefits are not always readily apparent. GBB recommends ESD conduct a wage rate study to ensure the base wages stay comparable to the private sector and also provide an extensive review of the benefits package to illustrate to potential new hires and current employees the benefits of city employment and how it adds to their spending power.

Table 1.5 - Number of Days of Vacation Leave Comparison

	0-3 years	3-5 years	5-10 yrs	10-15 years	15-20 years	20+ years
City of Fayetteville(1)	10	12	14	16	18	20
City of Fayetteville Accruable Leave	25	25	25	30	30	35

	1 year	2 -8 years	8-15 years	N/A	15+ years	N/A
Private Sector A as of 2012(1)	5	10	15		20	
Private Sector B as of 2012(1)	5	10	15		20	
Private Sector accruable	0	0	0	0	0	0

(1) Full-time, regular employees working 40 -hour work weeks are eligible for vacation leave

1.8 Equipment and Vehicle Maintenance Cost Comparison

1.8.1 Introduction

Under this task, GBB focused on maintenance activities to compare municipal and private vehicle and equipment maintenance cost data with that of the city operations. It was critical to understand the procedures for maintenance, such as utilization of staff mechanics versus outsourcing and warranty work.

Data from the comparable municipalities was used to estimate the cost of equipment and vehicle maintenance borne by the City to generate a cost summary. An attempt was made to estimate the vehicle and equipment maintenance costs of identified North Carolina private sector haulers. Due to the highly competitive nature of the solid waste industry, the private haulers were reluctant to provide data. Therefore, the GBB Project Team cataloged publicly available data to provide a summary spreadsheet of data collected for use in the analysis as summarized in Table 1.6.

Fayetteville's Fleet Services Department (Fleet Services) repairs the majority of vehicles during the day when the sanitation vehicles should be running. When a solid waste collection truck breaks down the repair is made one full shift cycle later, as the needed repair is made during the day. Preventative maintenance work is typically done on Wednesday, so as not to interrupt the ESD collections. Tire repairs are completed at the ESD facility by Fleet Services. If repairs need to be outsourced, Fleet Services uses local and regional truck repair services.

No comparable municipalities' solid waste departments repair their own vehicles and outside of Fayetteville, most lease their vehicles from the respective Fleet Services department, with the lease cost including capital, repair and maintenance expenses.

Table 1.6 - Comparable Public Maintenance Costs

Item	Equipment & Vehicles, By City	Fayetteville(1)	Winston-Salem	Greenville	High Point	Greensboro	Durham(2)	Wilmington(3)
1	Collection Points	60,527	77,553	38,357	35,544	80,640	69,800	31,253
2	Are Vehicles Leased	No	Yes	No	No	Yes	Yes	Yes
3	Vehicle Inventory	67	79	51	39	63	72	33
4	Households per Vehicle	903	981	752	911	1,280	969	947
5	Average Age of Fleet (Years)	9.5	8.7	7.4	9.6	7	5.5	9.1
6	Hourly Labor Rate for Solid Waste Vehicles(1)	$61	$50	$60	$60	$52	$59	$68
7	Parts and Material Mark-up %	20%	26%	25%	0%	25%	5%	10%
8	Sub-Let/ outside shop Mark-up %	20%	13%	15%	0%	5%	5%	0%
9	Mark -up on Fuel(4)	No	No	No	No	No	No	Yes
10	Annual Maintenance Budget for Vehicles	$1,500,000	$350,000	$1,708,220	$1,718,555	$5,409,810	$475,200	$1,121,597
11	Average Annual Maintenance Cost per Vehicle	$22,388	$4,430	$33,495	$44,066	$85,870	$6,600	$33,988
12	Average Annual Cost per Collection Point	$24.78	$4.51	$44.53	$48.35	$67.09	$6.81	$35.89
13	Other comments on this activity	Public Works Commission Fleet Services maintains vehicles.	Fleet Services maintains equipment.	Fleet Maintenance Division maintains equipment.	Fleet Services maintains Vehicles	The Equipment Services Division maintains the City fleets departments(Excl. Fire Dept.). Vehicle budget includes lease expenses.	The Fleet Management Department is responsible for all services related to the City of Durham's vehicles. Budget is for parts only.	Fleet Services Department centralizes the expenditures for maintenance.

(1) FY14/15 Maintenance Budget
(2) Items 10-12 are parts cost only; Budget is for parts only; Fleet Services only bills the departments for parts, no labor
(3) FY15/16 Maintenance Budget
(4) No Fayetteville mark-up from Fleet Services; but a 10% mark-up if from City fuel depot.

1.8.2 Recommendations

To reduce maintenance costs, ESD has to work closely with Fleet Services to develop quality maintenance practices by both ESD and Fleet Services. It is recommended that warranty items be carefully tracked to ensure the full benefit is realized. All warranty is not on a new vehicle, as there may be warranty opportunity missed due to replacement parts on older vehicles as well as outsourced repairs. Large national haulers track warranty with a goal of capturing at least 10% of repair costs as warranty work. It is recommended that the ESD implement more detailed maintenance and cost tracking based on these observations.

The private sector repairs vehicles on the second shift after the day is completed, and keeps a skeleton crew on during the day to handle road calls and major repair projects. GBB recommends that the City shift the work on the ESD collection trucks to the second shift. This would allow sanitation vehicles to be repaired at night versus waiting a full shift cycle, reducing downtime, the use of spare trucks, and cost. This will require cooperation between the two departments with both mutually benefitting.

GBB recommends two practices to reduce downtime due to Regen issues. First, it is recommended to keep an extra filter or two in-house at Fleet Services, so that the filter can be swapped out between vehicles while the dirty filter is cleaned. Second, ESD should partner with the engine manufacturer who

can provide operator training at little or no cost. This will provide drivers the knowledge to properly regen a truck on the street. The combination of both of these practices will keep trucks rolling rather than parked, waiting on the filter to be cleaned and returned.

1.9 Projected Efficiencies and/or Costs Using Software and Technology

1.9.1 Introduction

Over the past ten years, many new technological devices and computer-based systems have been introduced into the waste industry to improve performance, track data and help benchmark general performance of labor/equipment in providing waste and recyclables collection. This task resulted in the overview of the state of software use by ESD and provided information about the new software and communications tools being installed on the City vehicles.

Prior to 2007, ESD collection routes were scattered across the city as previous annexations took place and new subdivisions were built. The ESD purchased route optimization software in 2007 to optimize routes. ESD continues to use RouteSmart today, to adjust routes, and as-needed, to address equipment breakdowns, provide helper trucks, and service new areas. It is also used where a quick and efficient temporary or permanent reroute is needed.

ESD has recently purchased FleetLink Virtual OBC On-Board Waste Package-GD4010 Flat Screen Kits and Virtual OBC On-Board Waste Package – Entry Level Tablet Kits. Based solely on the fuel and maintenance cost reported in FY14/15, the projected annual department savings from the use of FleetMind could range from approximately $30,000 to $60,000 for the three primary city-provided waste services. Table 1.7 illustrates the potential range of annual savings for the ESD with the use of FleetMind.

Table 1.7 - Combined Trash, Yard Waste and Bulky Item Collection Fleet Average Annual Savings

	FY 14/15 Expense (1)				FleetMind Estimated Savings		
	Trash	Yard Waste	Bulky Item	Combined	2.6% Low Est.	3.4% Average Est.	5.2 % High Est.
Miles	253,226	134,734	94,842	482,802	12,553	16,415	25,106
Gallons	56,180	34,833	23,087	114,100	2,967	3,879	5,933
Fuel $$	$176,388	$107,453	$71,732	$355,573	$9,245	$12,089	$18,490
Repair $$	$725,907	$217,264	$142,428	$1,085,599	$28,226	$36,910	$56,451
Fuel and Repair $$	$902,295	$324,717	$214,159	$1,116,454	$29,028	$37,959	$58,056

(1) 19 Garbage, 11 Yard Waste and 7 Bulky Item front line collection trucks from Section 5 that have both fuel and repair cost listed.

FleetMind technology will provide both improved customer service and savings in customer service time. With the deployment of the FleetMind system, the Customer Service Representative (CSR) does not need to call the truck driver. All the GPS data and event data is uploaded from the truck's FleetLink Mobile System to the office's FleetLink route system in real time. The CSR is enabled to answer the citizen's questions in real time. With mobile computer technology, there is simultaneous customer service improvements and cost savings.

1.9.2 Recommendations

GBB recommends ESD employees get proficient in the use of FleetMind. Encourage all personnel involved with customer service at both the ESD and Corporate Call Center to bring forth ideas in a stakeholder setting on how FleetMind could be used in their role to fully utilize its functionality.

GBB recommends the use of the FleetMind BIN Monitor function to pinpoint the geocode location of a cart versus the centroid of the property to allow for more accurate service verification and reduce the likelihood of misses.

Alternatively, RFID could provide the information without human interaction in the field. RFID technology is currently not being considered by ESD due to its cost versus ROI. GBB recommends further investigation of the cost vs. benefit to potentially incorporate it for service verification and cart inventory management.

GBB recommends the city consider the use of RouteSmart, in combination with FleetMind, to efficiently route the bulky item work orders on a daily basis. This will reduce time/miles, and give the bulky item crews the ability to complete more stops on a daily basis, improving customer service.

1.10 Service Delivery Privatization

1.10.1 Introduction

The effort of this task was to develop a data base of current services that may identify more cost effective methods of service delivery, identify potential opportunities for improved efficiency and effectiveness. This resulted in identifying constructive and actionable findings and recommendations.

For the city, a field visit was completed February 4-5, 2015. During the field visit GBB conducted interviews with department leadership and other stakeholders to understand current practices that are applied to solid waste collection in the city. GBB reviewed service agreements the city has with third parties and also reviewed the city public relations program and website with respect to solid waste system information and clarity of the information presented to the public. This work resulted in an economic analysis and recommendations for privatization of certain or all services.

ESD provides a variety of solid waste collection services including automated weekly collection of household trash, on call bulky item, weekly yard waste, and a private contractor providing weekly collection of recyclables. Also provided by ESD staff are specialized services such as scheduled bulk collection, dead animal collection, seasonal leaf collection, C&D collection, and cart delivery and maintenance.

All the cities benchmarked for this Report receive curbside recycling from private haulers. Four (4) of six (6) cities receive both private curbside refuse and recyclables collection and two (2) of six (6) private contractors provide services for all three; curbside refuse, recycling and yard waste. None of the private companies reviewed provide bulk item collection. Three of the six municipalities have five days per week contracted trash collection, while the other three have four days per week contracted trash collection.

The city entered into a recyclables collection agreement with Waste Management on April 9, 2008 for an initial fee of $2.62/residential unit. Over the past seven (7) years, the rate has increased 9% to

$2.91/residential unit. The initial term ran from July 1, 2008 through June 30, 2013 with two additional 2-year terms of which WM is currently in the first extension which is set to run through early June, 2015.

In addition to a review of the WM contract, GBB also conducted a preliminary analysis of the City actually pulling in-house the current recyclables collection program. Based on the number of city households requiring weekly service and ASL hourly collection capability, it was determined that twelve (12) collection trucks would most likely be required for this once-per-week collection. Using the city costs developed for the current fleet of newer ASL vehicles that are collecting trash, it was determined that the service with 12 new ALS's would cost 20% more for the City to provide than the current WM contracted costs. If a weekly city recyclables collection service could be done with only 11 ASL's, the annual cost estimate is estimated to be 10% greater than the current WM contracted cost. These estimates also assumed that the city would receive the full $22/ton rebate that Pratt is currently crediting to WM for each ton delivered to their single-stream MRF.

Table 1.8 illustrates the cost of city- provided solid waste collection services at a monthly estimated net of $18.12/household, which includes the County tax of $48/year. Privatizing both trash and recycling services, with the city still providing yard waste and bulky item services, the potential monthly net cost is estimated to be $22.52/household. If the city decides to privatize trash, recyclables and yard waste collection, with the city still providing bulky item pick up, the potential monthly net cost of service is estimated at $21.94/household. The City is providing solid waste collection services at a lower cost than other communities that have outsourced a significant portion or most of their collection services. GBB notes that the estimated cost of service is effected by waste volume, disposal costs, type of service and number of collection points, private hauler operating costs and other variables vary among private contractors and in the individual municipalities.

Table 1.8 - Estimate of Fayetteville Cost

Item	Service and Cost	City's Current Monthly Cost with Recyclables Collection Outsourced (1)	Monthly Cost per Household with Trash and Recyclables Collection Outsourced(2)	Monthly Cost per Household with Trash, Recyclables and Yard Waste Collection Outsourced(3)
1	Trash Collection/Household/Month	$5.58	$13.34	$14.76
2	Recyclables Collection/Household/Month	$3.23	$0.00	$0.00
3	Yard Waste, Brush and Leaf Collection/Household/Month	$2.00	$2.00	$0.00
4	Bulky Item Collection/Household/Month	$1.81	$1.81	$1.81
5	Net Administration and Non-Program Costs/Household/Month	$2.29	$2.29	$2.29
6	County Disposal Charges/Household/Month (for Landfill and Compost site-related services)(4)	$4.00	$4.00	$4.00
7	County Additional Disposal Charges/Household/Month(5)	$0.12	$0.12	$0.12
8	**Estimated Gross Cost of Solid Waste Services/Household/Month**	**$19.04**	**$23.44**	**$22.86**
9	Estimated income/Household/Month to City for ESD Provided Services, if applicable(6)	($0.92)	($0.92)	($0.92)
10	Estimated Monthly Net Cost/Household	$18.12	$22.52	$21.94
11	**Estimated Annual Net Cost to City with Outsourced Services(7)**	**$13,159,996**	**$16,359,852**	**$15,936,812**

(1) From Table 11.2. (gross costs items 1-8 and net cost item 10) City's cost/ household to provide waste collection services
(2) From Table 11.1 using the average contract price of $13.34 for Brunswick County and Siler City for combined trash and recycling services
(3) From Table 11.1 using the average contract price of $14.76 for Cornelius and Huntersville for trash, recycling and yard waste collection
(4) Assumes County Disposal Charges (for Landfill and Compost site-related services) stays in place with private collection
(5) Assumes there would still be landfill charges associated with bulky item disposal not covered by $48 County Fee
(6) Assumes all outside income from Table 11.2 (Items 9-12) are still available with private collection
(7) Estimated Annual Net Cost to City based on (item 10) Estimated Monthly Net Cost/Household x 60,527 households x 12 months

1.10.2 Recommendations

As stated earlier, GBB recommends the city evaluate the potential to provide EOW single-stream recyclables collection in lieu of weekly collection. Should the City decide to outsource, GBB recommends contracting out the collection services only, and direct the waste loads be discharged at the county landfill and have the city continue to pay the County's $48/household/year assessment as a Solid Waste Fee. This fee helps finance the operation of the county solid waste facilities. Also, it appears that a full cost accounting study would be helpful to provide data on how the county-city financial relationship would financially need to evolve if these city services were privatized.

Based on GBB's review of the alternative city costs to conduct the current recyclables collection activities by ESD owned/operated vehicles, versus the WM contracted cost, the projected costs per household do not currently generate any savings to justify a capital investment by the city of over $3 million in additional ASL trucks and the hiring of a dozen additional city employees as drivers, plus a supervisor, to provide such services.

Two items that would be immediately beneficial to the city, which Waste Management (WM) does not seem to be providing under the current contract, are:

1) Per Section 2. A.6 Public Awareness Program, WM is to participate in a Public Awareness Program with assistance of the City. WM is to work with the city to establish a mutually agreeable cost effective program. Part of this program is a semi-annual meeting with the ESD and the Public Information Office; and

2) Per Section 13.04 Documentation, information seems to be lacking related to weights, set-out rates and complaint calls that are to be submitted as part of the WM semi-annual meeting.

Regardless of the above discussion, and opportunities presented more fully in Section 11 of this Report, the findings for this Report show the ESD is operating cost effectively and GBB considers it not cost effective to privatize additional collection services at this time, with the only exception being the possible addition the recyclables collection from city-owned facilities based on the current WM collection programs and as described in Section 6 of this Report.

1.11 Call-Back Comparison to Industry Standards

1.11.1 Introduction

Customer service is a very subjective topic. Ask 100 people what customer service means to them and you will probably receive 100 different answers. Case in point, the UNC School of Government survey of solid waste collection services measures both collection complaints and valid collection complaints. However, to improve service it must be tracked and measured. The City wanted to compare its percentage of valid complaints to the recommended industry standards.

Measuring missed collections is arguably one of the most important indicators of the city's ability to satisfy the resident's service delivery expectations. This effort assumed that a service error is the same as a missed pick-up/missed collection point.

To help the City of Fayetteville understand how their service call-back compares to industry standards, the GBB Project Team conducted an analysis of Fayetteville's Service call-backs per location percentage,

analyzing available data gathered from the City by service type for the City's approximately 60,500 homes. Simultaneously, GBB conducted an analysis of industry service standards, reviewing available data from both the benchmarked public sector and private sector solid waste industry leaders used to drive world-class service performance. This effort resulted in a summary of valid service call-backs as compared to recommended industry standards.

During FY13/14, the City estimated the number of residential waste collection service errors to be 3.60 per 10,000 collection points. This is equivalent to one miss for every 16,813 households (that is, approximately 22 misses/week). The ESD tracks its return trips and associated costs to collect trash. For the first six (6) months of FY15, the City estimated that the cost, referred to as a "Go-Back", was $75.53/trip. Using this estimate, the City is set to spend $85,600 to collect residential trash misses. Not only does a miss provide a negative customer experience, it also adds costs to collecting. Go-back costs should not be considered a part of doing business.

Waste Management sets its acceptable standard of performance for missed pickups (MPU) at 1 MPU or less per 1,000 customers for all services on a weekly basis. Based on the size of the city, this is equivalent to an allowable 60.5 MPU's per week for all three services (refuse, bulky item, and yard waste) in the City of Fayetteville. However, based on Waste Management standards, the city is doing a good job of providing customer service.

1.11.2 Recommendations

GBB recommends setting and managing goals, and incorporating a set of best practices as illustrated in Section 12. It is recommended that service errors not be classified as valid or not. Investigate all services errors to determine the root cause and address the real reason behind it. Track and address errors down to the employee level which means more than the driver, and includes customer service and ESD personnel alike.

GBB recommends the continued use of FleetMind and Cityworks® as these software applications are already used by the City, and will achieve the quickest results to provide improved solid waste services.

1.12 Regional MSW Analysis and Recommendations

1.12.1 Introduction

While the City of Fayetteville has the ability to collect, process, recycle and/or dispose of residential waste through their own programs or with contracted services, the nearby location of U.S. Army Fort Bragg, and the potential to consider working with other local communities in close proximity to the City, begs the question of regional cooperation for a better and/or more economic waste program. Part II of the Report investigated the potential for a cooperative environment starting with potential regional options and also the review of larger recycling, waste-to-energy (WTE) system options and even the use of regional cooperative landfill programs.

1.12.2 Conclusions about Regional Waste Generation and Disposal

The eight regional counties shown in Figure 1.2 have nearly 380,000 households (US Census 2013 est.) with Cumberland County the most populous with 121,226 households and Fayetteville representing 63% of that total County population. The ESD provides waste collection services to over 65,000 households,

more than 50% of the households in Cumberland County. A review of the tons of MSW generated in each nearby county is provided in Table 1.9.

Figure 1.2 - Fayetteville Region Disposal Locations

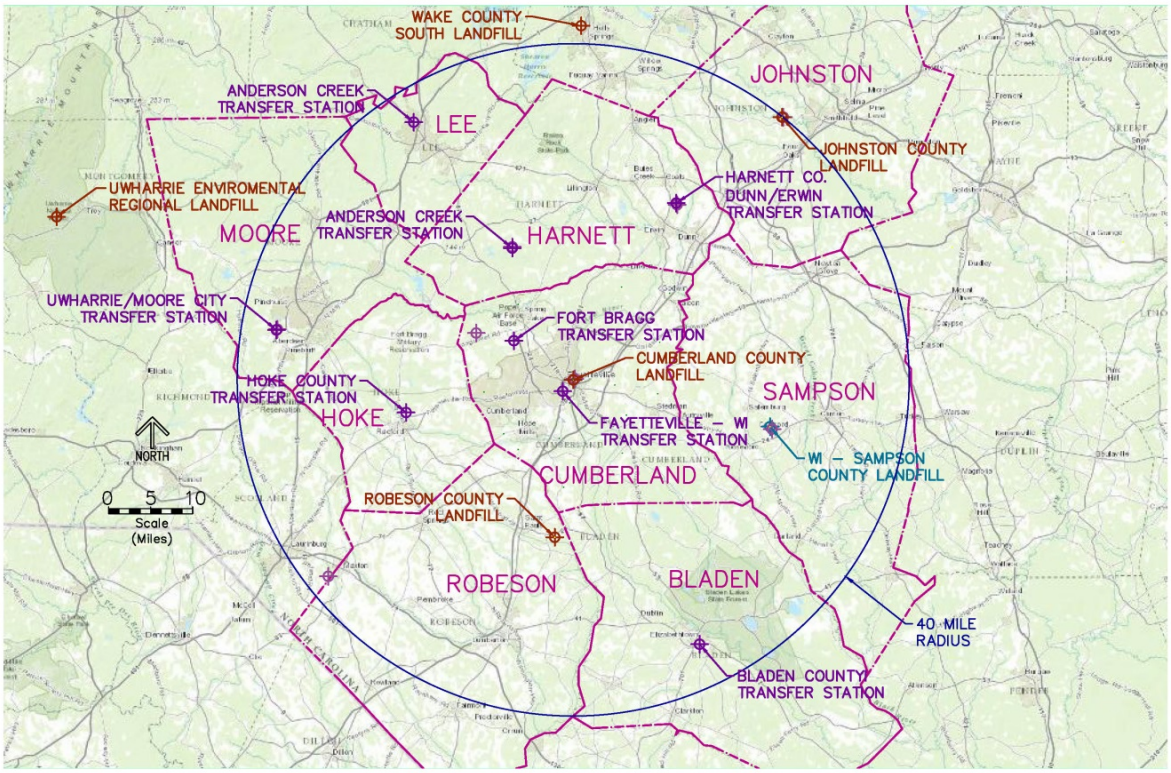


Table 1.9 - Regional MSW Quantities, by County

County	Total MSW Produced (Tons)
Cumberland	294,026
Bladen	35,836
Hoke	23,894
Harnett	52,743
Johnston	125,629
Lee	48,409
Moore	52,581
Robeson	71,062
Sampson	43,574

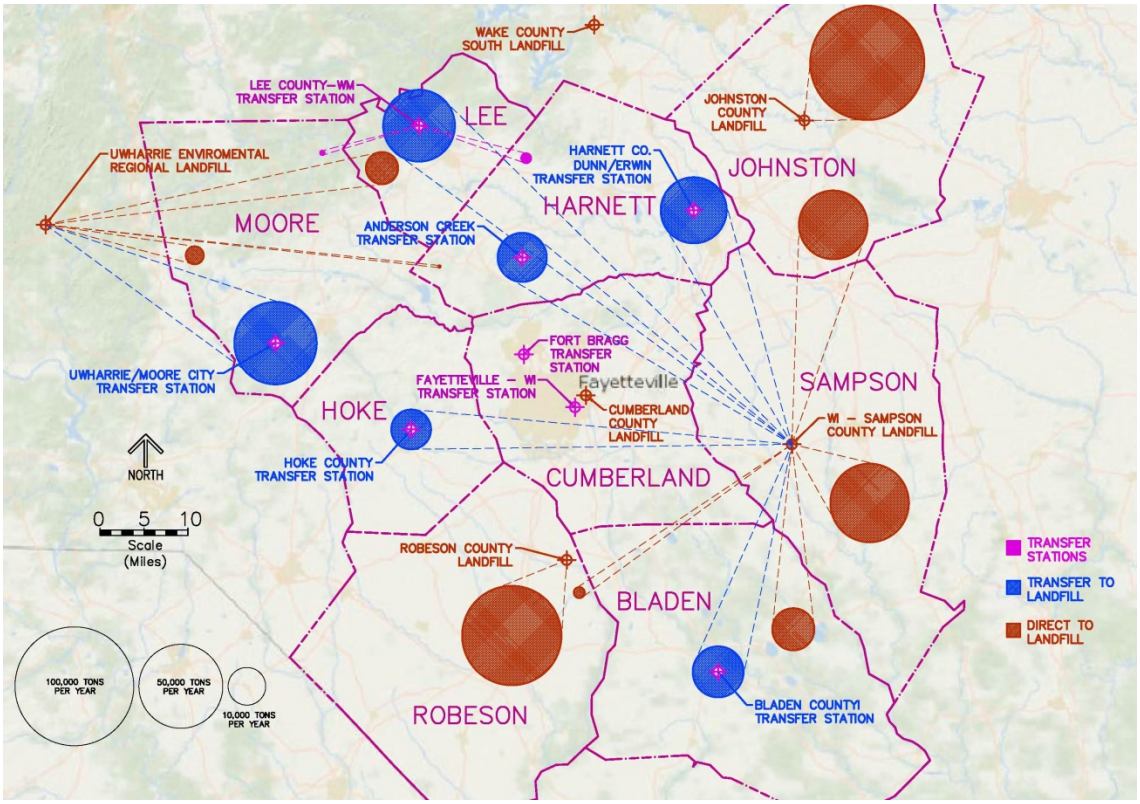
Source: NC Data (NCDENR FY12-13)

There are five major regional landfills in the region, with three county-owned landfills and two private landfills. Robeson, Johnston and Cumberland Counties own their landfills and most of the residential waste from those counties go to these respective landfills. The two major private landfills are the Waste

Industries-Sampson County Landfill (WI-Sampson County) to the east of Cumberland County, and the Uwharrie Environmental Landfill to the west of Moore County. Nearly all of the remaining commercial and residential waste in the region goes to these two large private landfills, with the majority going to the WI-Sampson County landfill.

Figure 1.3 illustrates the flow of MSW waste in the surrounding counties to Cumberland, and to which landfill the waste ends up, either directly or via transfer station.

Figure 1.3 - Regional MSW Generated and Where it Goes



A high percentage of the regional commercial waste is disposed at the WI-Sampson landfill, although this represents only a portion of the total waste disposed at this large 3,000 TPD permitted landfill.

Fort Bragg has a Net Zero Waste goal by 2025 and a Net Zero Energy goal as well. The solid waste currently generated on the base is about 25,000 to 30,000 ton per year.

1.12.3 Conclusions about Waste-to-Energy and Alternative Conversion Technologies

As it pertains to Fort Bragg involvement in the regional evaluation, based on their strict Zero Waste and Zero Net Energy military programs, Fort Bragg should (1) not be considered as a waste supplier to any long-term regional project opportunity, and (2) should not be considered as either a potential steam or power market from any possible regional waste-to-energy project.

As it pertains to any other waste-to-energy project in the region, the availability of low cost regional landfills and low energy and power prices does not currently present any economic opportunity for this technology for a regional program.

Reviewing the current state of advanced conversion technologies, GBB also concludes that while a myriad of different technologies are advancing and have shown commercial size technologic viability, the lack of longevity, operational experience, high expense and potential issues with by-product stability and revenue values, continues to be a deterrent to current implementations in the United States. Thus, this is not a regional opportunity at this time.

GBB received in-County waste flow information from DENR summarizing their FY12/FY13 annual facility reports. Table 1.10 presents the waste quantities and the destination locations for in-County generated waste sources. This table indicates that almost 300,000 tons were generated and managed by the six methods described. Of that total, the County landfill received approximately 114,000 tons, which was 39% of the total indicated on the state report. Materials moving through the WI Transfer Station were a close second at 106,000 tons and 36% of the total. About 16% of the waste reported appears to have been hauled directly to the WI Sampson County landfill without going through the WI transfer station. In the DENR report, Fort Bragg was noted as having generated 25,000 tons during that year in FY12/13.

Table 1.10 - Cumberland County NC Waste Destinations for FY12/FY13

Location-Disposition		Tons per Year	% of the Total
1	Cumberland County Landfill	114,619	39.0%
2	Fort Bragg Tranfer Station	24,504	8.3%
3	City of Fayetteville-WI Transfer Station	106,111	36.1%
4	Uwharrie Env Landfill	541	0.2%
5	Other Hauls to WI-Sampson County Landfill	46,868	15.9%
6	Other Hauls to Outside the County	1,385	0.5%
Total MSW Generation		**294,026**	**100.0%**

Due to several unique circumstances found within the city and county, one technology offering that does appear to provide a great opportunity to consider is a modern mixed waste processing facility (MWPF) which greater expands the production of recyclables versus the current single-stream MRF. While the city has a third collection bin for yard waste, this material is not directly considered in this discussion but could be integrated as an add-on as part of a later application. However, some small quantities of yard waste still end up in the trash container and are included in the organics commodity amounts reviewed in this Report.

1.12.4 Potential for Enhanced Recycling Opportunities with a MWPF

GBB's estimate of the current city total recyclables diversion rate, which is the percentage of the total recovered recyclables as a percentage of all the generated residential materials collected in both the trash and recyclables bins, is only 16 percent of the total waste stream. As depicted in Table 1.11, the cost of the current curbside recyclables collection and processing system, including an allocation of the city rebates from the value of recyclables, is costing city residents an estimated $242 per ton. This is approximately six times higher than the posted $40 per ton tipping charge at the county landfill.

Table 1.11 - Estimated Citywide Recyclables Collection and Processing Costs, $/Ton Basis

Description	(Cost)/ Credit	Units	Tons	Total
Cost/ Home	($3.23)	60,527		($2,346,027)
WM CY 2014 Rebate to City	$11.00		9,280	$102,080
Net Cost Reduction by Elimination of Curbside Collection of Recyclables				**($2,243,947)**

Estimate of the Actual Tons of Recyclables Setout by City Residents	**9,280**
Actual Cost Per Ton for Current Curbside Collection/Recycling Rrogram	**($241.80)**

Cost/ Home	($3.23)	60,527	FY 13/14	($2,346,027)
WM CY 2014 Rebate to City			8,613	$0
Net Cost Reduction by Elimination of Curbside Collection of Recyclables				**($272.38)**

For a broader and potentially more cost effective opportunity for the city, GBB received in-County waste flow information from DENR summarizing their FY12/FY13 annual facility reports which include waste destinations as well. The following table presented the waste quantities and the destination locations for in-County generated waste sources at that time. That information noted that of almost 300,000 tons generated in the year, only about 40% of the in-county generated waste goes to the county landfill and over 50% went to the private WI-Sampson County landfill.

Based on the current waste origin and supply logistics, GBB evaluated four options providing a combination of annual capacities, with all considered the trash tonnages from the city going to the existing County landfill. The two options that considered using the existing single-stream MRF and building a new second facility to just process the trash were not as cost competitive. With only a small percentage of recycling going on in the City, and the high cost of the current program, the integration and absorption of the current city-recyclables material into two options developed as a "one-cart-for-all" collection system, that delivered all of the materials into a new MWPF, were both extremely cost competitive waste disposal options and, at the same time, obtained significantly higher recycling rates.

A brief overview of each option is as follows:

1. Option 1 assumed that the current Pratt MRF continued to receive the city-generated curbside recyclables and all of the trash currently going directly to the County landfill would be processed through a MWPF. Any resultant residue from either the MRF or the MWPF would go to the county landfill;

2. Option 2 assumed that all of the city-generated trash and recyclables, as well as the recyclables and county trash going into the county landfill would be processed in a MWPF. The city-system waste collection would became a “one-cart-for-all” collection program;
3. Option 3 was similar to Option 1 in that the Pratt MRF would continue to receive the city curbside recyclables, however, the MWPF would also receive and reprocess the MRF residue to have a second chance at removing additional recyclables; and
4. Option 4 was similar to Option 2 with all of the countywide trash going into the MWPF with a city-wide one-cart-for-all program instituted; plus, as a sensitivity, the MWPF would competitively attract another 50,000 TPY of waste generated in the County that is currently being landfilled out of the County, either by direct haul or use of the private transfer station.

Based on the GBB preliminary evaluation, significantly more recyclables are generated and less demand for County landfill space consumption is possible with Options 2 and 4. For the Option 2 regional city-county program, GBB estimates over 45,000 tons per year or recyclables could be captured versus the about 9,000 tons from the combined city single-stream and county drop-off programs now. If additional commercial waste could be economically attracted to the MWPF, over 60,000 tons per year of recyclables could potentially be generated based on the GBB estimates. This provides an increase in recyclables of over 400 percent countywide.

Due to the close proximity of the city to the county landfill, and the ongoing active waste collection routes that already exist, the Report suggests that the potential siting of a MWPF be considered for location at or near the County landfill. While the preliminary GBB capital cost estimate for is $30 to $35 million for a completely new MWPF, GBB estimates that the use and conversion of the existing BCH building could potentially provide a $7 to $9 million reduction in this initial cost due to savings in site development and facility construction costs. This provides a strategic cost advantage usually not seen when you are talking about a nominal 80,000 square feet building.

GBB has reviewed the potential weight for a one cart collection system to handle the volume and weight of the mixed trash and recyclables for a MWPF opportunity. The data shows that a household in the city sets out an average of 34.6 pounds of MSW (trash and recyclables) per week. Our analysis also showed that the ASL trucks have the weight capacity with their two loads per day to handle a single cart with the aggregated MSW waste stream. Therefore, the compaction ratio for the trucks would not be expected to hinder load size or customer service.

The route time spent collecting may not increase as the ASL trucks would still service only one cart per household like they typically do for trash now. However, collection costs may slightly increase if the location of a potential MWPF were not at the landfill, as disposal distance could increase from that mileage to the county landfill.

Since the current estimates indicate actual city collection operation could be over more than one shift, the processing of waste received from routes later in the work-day and processed soon thereafter at the MWPF should not be an issue.

By adding both the current trash and recyclables streams together, which is a key consideration with a MWPF to save money and increase recyclables through mainly mechanical systems, the City could eliminate the need for the citywide recyclables collection service which is quite expensive. A typical MRF generates recovered and marketable materials that have a value of more than $100 per ton. The city currently only receives $11/ton as a rebate for their recyclables feedstock delivered to the MRF.

The current full private curbside recycling program, with Waste Management as the collector and Pratt Industries as the processor/recycler, costs the city, on average, almost $242 per ton. It is estimated that at least 90% of this cost basis could be eliminated by a MWPF.

A detailed cost review has been completed of each of the four MWPF options described in the Report. Table 1.12 provides a comparative review of the key summary data, including the potential cost impacts associated with (1) elimination of the separate recyclables collection program and instituting a one-cart-for-all collection system using the city ASL, (2) presenting the financial benefit if the existing BCH building, for example, could be made available as the MWPF site, and adding the cost of a $45 per ton landfill cost for the specific residue that is generated from each of the four options that were evaluated.

Table 1.12 - Cost Summary Estimate of the MWPF Options Evaluated

		Comparison - CY 2018 Assumed 1st year of Facility Operation			
Item	Option	1 (continues use the MRF)	2 (uses a new MWPF)	3 (continues use the MRF)	4 (uses a new MWPF)
1	MWPF Feedstock Available @ 2%/Year Growth	122,039	137,957	124,692	191,017
2	Recovered Materials Created from MWPF	37,205	48,163	37,332	64,935
3	Estimated % of Input Tonnage Recovered for Product Sales	30.5%	34.9%	29.9%	34.9%
4	MWPF Total O&M on a $/Ton Processed Basis	$40.86	$39.69	$40.86	$38.52
5	Value of Products per All Tons Processed at MWPF	$38.00	$43.51	$37.31	$43.51
6	Net Cost per All Tons Processed w/o Capital Debt Cost or LF Disposal of Residue	$2.86	($3.03)	$3.54	($4.99)
7	Net Cost per All Tons Processed for Capital Debt Cost	$15.63	$13.83	$15.30	$10.26
8	Net Annual Cost for the MWPF, $/Ton Handled	$18.49	$10.01	$18.84	$5.13
9	Collection Adjustment Savings (credit to projected MWPF tonnages)	$0.00	($16.11)	$0.00	($11.63)
10	Net MWPF Costs with Collection Savings assumed as One-Cart-For-All Credit	$18.49	($6.10)	$18.84	($6.50)
11	Assumed Landfill Cost at $45 per Ton for Residue (Cost based on all MSW to MWPF)	31.28	29.29	31.53	29.70
12	Net Costs Including Residue Disposal at Existing County Landfill	$49.78	$23.19	$50.37	$23.20
13	Potential Building Construction Retrofit Credit, if Cost Reduction Occurred	($6.74)	($5.97)	($6.60)	($4.79)
14	Net Costs Assuming Reuse of Existing Large Processing Building	$43.03	$17.22	$43.77	$18.41

As summarized in Table 1.12, GBB estimates that the net cost of the Option 2 MWPF would be approximately $35 per ton under normal cost circumstances. Even with a 10% cost contingency, this is still under the current posted landfill cost and is estimated to provide five times the amount of total recyclables than the current MRF.

This previous MWPF cost number does not address two of the other strategic circumstances present that will make this alternative option even more cost effective. Deleting the $2 million per year extra collection cost is equivalent to a savings of about $16 per ton of all MSW going to the Option 2. This is a significant savings and strategic because the city only has a short-term contract and the city has not invested in any vehicles to perform the work. Thus, all of these costs terminate with the end of the service contract.

The baseline cost for Option 2 is a “greenfield” facility costing $31 million creating $1.9 million per year with a 25 year debt service. Instead of a completely new structure, GBB has allocated a preliminary cost of $5 million in design and retrofit costs to modify and use the BCH building. If this savings were realized, this would reduce the Option 2 MWPF by another $6 per ton. There is over $5 million of capital

amortized into a yearly payment equivalent for the building for 25 years. This annual "allowance" can be for a combination of direct retrofit costs and/or an associated annual lease payment to the county. The estimated costs, including any lease payments proposed by the county, would be part of a more detailed financial review of this opportunity if the city and county want to explore this option at the BCH site in greater detail as a result of this Report.

Additionally, GBB wishes to note that other benefits could potentially accrue from the implementation of a MWPF including:

- Reduced GHG emissions produced in the region from the recycling, versus continued burial, of the waste in the county landfill;
- Reduced collection trucks- less wear and tear on city and county road ways, increased safety, and less dependence on fossil fuels
- Convenience- no more homeowner separation of recyclables, or items thought to be recyclable that are actually contaminants to a single-stream MRF and become residue that is landfilled;
- Only one waste cart set-out to deal with, which increases homeowners space and trips to the curb;
- Less waste going into the landfill extended the life of the very strategically located site;
- Achieving a higher level of recycling with minimal public relations and 100% participation in the program; and
- Possibility of MWPF acting as a catalyst for a shared collection service plan between the county and city and act as one entity under further reducing overhead costs.

1.12.5 Recommendations

As would be expected in a very competitive industry, there is a lot of misinformation going around about the ability of MWPF's to both perform at expected levels, and to generate marketable commodities. Therefore, if this advanced recycling concept is all of interest to the city and county, GBB encourages members of the leadership and city-staff to travel to locations and talk to your peers and see these projects in operation first-hand. You would then be able to formulate your own opinions about the interest as well as merits of continuing to evaluate a MWPF.

While the Report puts forth the current BCH building as the optimum facility location, GBB has not specifically talked to the County or evaluated the current use and sizing opportunity of the large BCH building for its potential to be retrofitted to accommodate a MWPF. However, because of the initial use of the building, this is not deemed a technical detriment.

GBB is not as familiar with the county budget and cost details as we are with the city. Thus a review of all the county costs centers for potential savings and/or reconfiguration should be undertaken if the concept of a MWPF advances for further consideration.

Finally, it is worth keeping in mind what the regional business development manager of ReCommunity stated in a formal presentation at a recycling conference in Wilmington DE on April 7, 2015. The company, with 32 MRF's and headquartered in Charlotte NC, gave a presentation and one slide was titled: No Conflicts: A "Pure Play" Model. The last bullet point on that particular slide stated the following:

"We don't own collection trucks, landfills or paper mills because if we did, our decisions would not be based solely on maximizing recovery and revenue for communities."

2 Introduction to the Project

The City of Fayetteville, NC issued a Request For Proposal (RFP) to hire a consultant to evaluate the effectiveness and efficiency of current solid waste management services. The City provides collection of residential garbage, residential yard waste, bulky items, dead animals, and rolling carts. The City serves over 60,000 single family residential households collecting garbage, yard waste, bulky items, and managing carts. The City also manages a curbside collection contract for recyclables. Commercial locations and multi-family dwellings individually subscribe to private waste haulers.

The City wanted to hire a consultant to complete a comprehensive solid waste study. In Part I of the project, the consultant would conduct an analysis comparing the City's current waste hauling services with neighboring municipal solid waste services and regional private waste hauling services. The analysis was to include operational and equipment costs, services, efficiencies, and customer service such as call-backs. The consultant was also to assess the value-added aspects of municipal services, the benefits and limitations of solid waste workers as City forces versus private-sector employees, and evaluate the software and on-board communications tools used by the City. The consultant was then to use this information and comparative analysis to provide a series of recommendations concerning the direction of the City's solid waste management. The recommendations were to outline:

- Benefit of initiating synergistic waste disposal partnerships;
- Fiscal cost-benefit of outsourcing solid waste collection operations;
- Operational adjustments to optimize current resource utilization; and,
- Modifications to increase efficiency and cost-effectiveness of recycling and material recovery.

A significant task in Part I was to conduct a waste characterization study. Due to the term of the study, a single-season, one-week "snapshot" study was approved to identify both the components of the waste sent for disposal and the materials source-separated by residents for recycling. The Part I efforts were to develop and provide information to allow the City to gain as much value as possible from the study in an economical manner.

Part II of the project called for the consultant to review potential regional waste programs, including regional collection efforts and estimated costs and institutional issues related to developing a Waste-to-Energy (WTE) project with Fort Bragg. GBB's contract with the City also included in the analysis consideration of a mixed waste processing facility, which could serve to glean further recyclables from "garbage" while potentially preparing a high heating value (HHV) fuel for a WTE facility.

Upon completion, the comparative analysis and series of recommendations from the project will provide the City with the requisite background, research and technical understanding to make informed planning decisions regarding future solid waste programs, partnerships and operations.

3 City Waste Stream Characterization

3.1 Introduction

Part of the field activities associated with the Report was to perform a waste characterization (Waste Sort), to assist in analyzing possible changes to solid waste and recyclables collection and processing systems in Fayetteville. The Waste Sort separately analyzed the residential waste and recyclables streams by physically sorting the material into 30 separate categories and analyzing each material category's weight as a percentage of the total.

The residential waste curbside collection program consists of City residents placing trash in a City-owned 96-gallon roll out cart at their residence and setting them out at the curb on their collection day. The ESD collects the residential curbside waste four (4) days per week: Monday, Tuesday, Thursday and Friday. About 15,000 single-family households are collected per day by running an average of 15 trash routes daily. The collected material is disposed of at the County's Ann St. Landfill.

The residential curbside recycling collection program consists of the ESD managing the curbside collection of Recyclables through a vendor contract with Waste Management (WM). WM runs an average of 10-12 recycling routes per day, mirroring the trash collection days, collecting the recyclable material generated and set out by residents in City-owned 35-gallon or 96-gallon wheeled carts. WM unloads the collected recyclable material at a Materials Recovery Facility (MRF) owned/operated by Pratt Industries. The 35-gallon carts are the default size for City residents and make up the vast majority of the carts. However, when a resident needs a larger cart, they can call the City Customer Service to have the 35-gallon cart replaced with a 95-gallon size for a nominal charge.

As described in the following paragraphs, the Waste Sort analysis was conducted on both the residential curbside waste and recyclable streams.

3.2 Waste Sort Timing and Events

The overall timing of the key events associated with the Waste Sort are provided in Table 3.1, the sampling activity included five (5) days of analysis at the County's Ann Street Landfill.

Table 3.1 - Waste Sort Timing

Activity Description	Start Date	End Date
Held Internal Kick-off Meeting	February 4, 2015	
Developed Waste Characterization Protocol & Health and Safety Plan; Submitted to the City for review and finalization	February 4, 2015	March 4, 2015
Set Up Site (including City delivery of carts)	7:00 a.m. March 23, 2015	
Conducted Sort	9:00 a.m. March 23, 2015	3:30 p.m. March 27, 2015

The weekend preceding the sampling week was used for equipment purchase and travel to Fayetteville from Fairfax, Virginia. Waste Sort daily activity typically began at 7:00 a.m. and ended at 4:00 p.m. There was a 30-minute break for lunch each day. Sort week timing and activities are shown in Table 3.2.

Table 3.2 - Daily Activity during the Waste Sort Week

Aggregator Truck Activity for The Collection of Trash and Recyclables					
	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Started Cart Collection	6:30 a.m.	6:30 a.m.		6:30 a.m.	6:30 a.m.
Delivered Material	11:00 a.m.	11:00 a.m.		11:15 a.m.	11:15 a.m.
Loadout/LF or Pratt (1)	Tuesday	2:00 p.m.	2:00 p.m.	2:00 p.m.	11:15 a.m./Saturday

(1) The aggregator trucks after delivering waste stream, were loaded with the post sorted material to haul to the landfill or Pratt Industries as deemed appropriate

Waste Sort Activity					
	Monday(1)	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Sort Started	9:00 a.m.	7:00 a.m.	7:00 a.m.	7:00 a.m.	7:00 a.m.
	Training	Sorting	Sorting	Sizing/Sorting	Sorting
Conducted Sort - 1	Monday Trash	Monday/Tuesday Recyclables	Tuesday Trash Carryover	Sizing Materials	Thursday Trash Carryover
Conducted Sort - 2		Tuesday Trash		Thursday Recyclables	Friday Trash
Optional Sorts, As Time Permitted				Thursday Trash	Friday Recyclables
Sort Completed	4:00 p.m.	4:00 p.m.	4:00 p.m.	4:00 p.m.	3:30 p.m. - done and all clean-up had occurred

(1) Delayed start was due to setup, sorter training and no waste streams to sort while aggregator trucks were collecting the day one materials

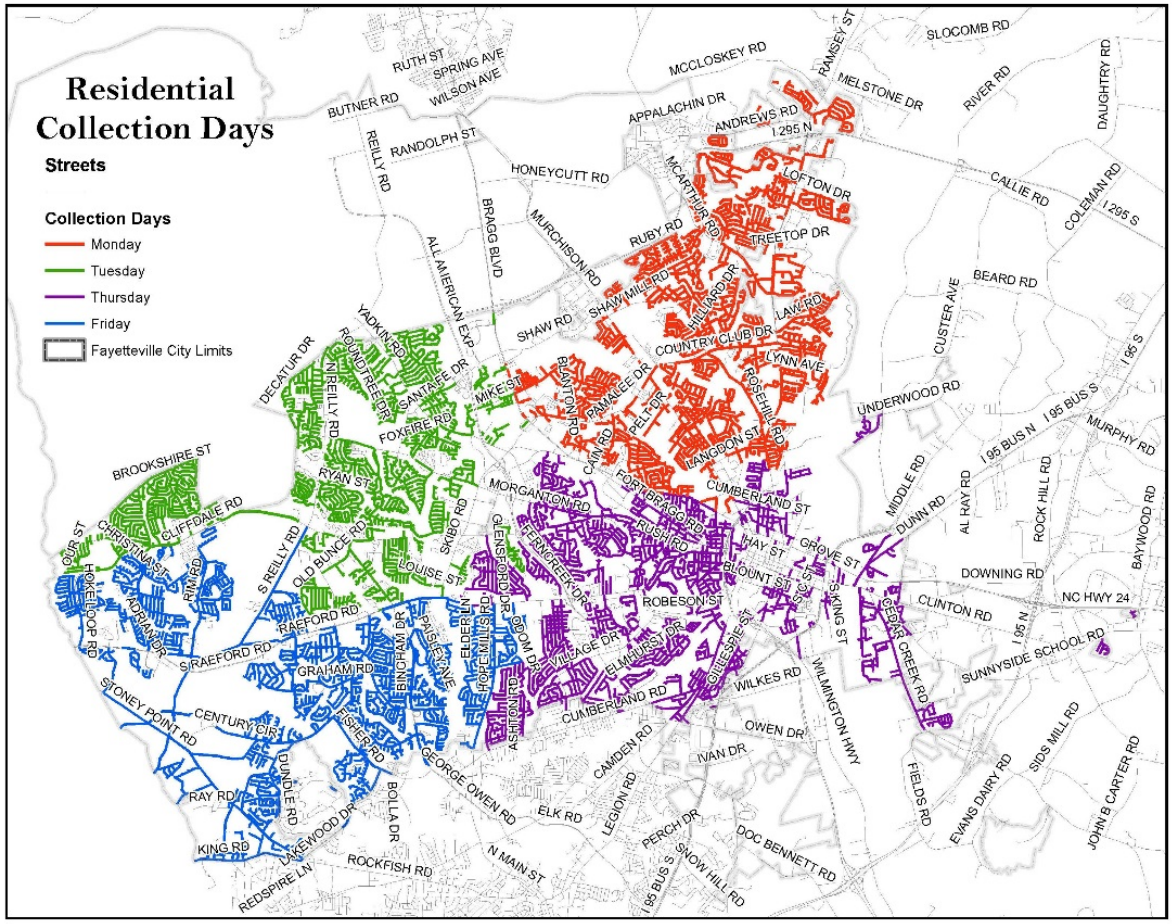
3.3 Home Selection/Sample Sizes

The waste sort materials came from approximately 75 homes (75 waste carts and 75 recycling carts) each day, collected by the City. Figure 3.1 shows the collection map for the entire City, broken down by the four primary collection days.

Each of the City's four collection days have about 15 routes. For each collection day, and based on the broad demographic selection for each collection day, the City chose approximately 15 streets to be sampled with five (5) to eight (8) homes collected from each of these streets. In street selection, the goal for each day, and eventually the week, was to collect from homes that are representative of the diversity of waste generator home types and economic levels throughout the City. On each day, the City chose the route to follow while also providing a pair of dedicated "aggregator" trucks, one for waste and the other for recyclables, with the most time-effective collection route.

The two aggregator trucks had a list of routes, streets, and minimum number of households they were required to collect from each day. Attachment G shows the forms used by the City to record the location and number of carts collected for each of the four collection days, with the listing of streets and number of homes actually sampled.

Figure 3.1 - Map of City Collection Days



As indicated in Table 3.3, the Waste Sort aimed to sort 75 carts of trash and recyclables each day. The daily number of 75 carts of each type per day was derived from the "industry standard" that approximately 10,000 pounds of total trash and recyclables called for by the ASTM Standard #D5231 methodology for selecting a "statistically significant" number of samples for waste characterization. Based on GBB's calculations, to achieve a 90% confidence level, approximately 10,000 pounds of trash material and approximately 2,000 pounds of recyclables should be sorted.

Table 3.3 - Calculations of the Number of Carts and Weight for the Waste Sort

	FY13/14 Annual Tons (1)	Tons per Week	Pounds per Week	City Households in Program	Pounds per Household per week	Assumed Number of Sample Carts per Service Day	Number of Pounds. per Day	Number of Pounds per Week
Trash	53,756	1,034	2,067,538	60,527	34.16	75	2,562	10,248
Recyclables	10,327	199	397,192	60,527	6.56	75	492	1,969
Total								**12,216**

(1) Estimated Tons from City Budget Information

As the week progressed, the diversion of recyclables from the trash cart on the final day of the Waste Sort (Friday) caused the total tonnage of waste sorted to fall slightly below the projected total of 10,000 tons. As noted on Table 3.4, the recyclables tonnage increased each day, to over 800 pounds on Friday. Over the course of the week, the average number of pounds of trash per household was 32.67 (slightly below our projected weight, based on the prior year's total performance) and the average number of pounds of recyclables per household was 9.02 (slightly above the projected weight). Table 3.4 shows the total tonnage of trash and recyclables sorted throughout the week, and the recycling rate demonstrated on each day.

Table 3.4 - Actual Carts and Tons Collected and Sorted

	Waste Carts	Waste Cart Tonnage	Recycling Carts	Recycling Cart Tonnage	Total Tonnage	Recycling Rate
Monday, March 23	75	2,927.6	75	520.0		15.1%
Tuesday, March 24	75	2,249.5	75	653.4		22.5%
Thursday, March 26	75	2,582.5	75	703.3		21.4%
Friday, March 27	75	2,040.5	75	830.4		28.9%
Total Carts	**300**		**300**			
Total Pounds		**9,800.0**		**2,707.1**	**12,507.1**	**21.6%**
Total Tons		**4.90**		**1.35**	**6.25**	

Once the waste from these households was collected each day, the driver from each aggregator truck signed off on the respective forms that they had collected from 75 homes. With this methodology, GBB was able to verify the waste and recyclables' origin, as well as the total daily trash and recyclables quantity.

3.4 Project Staffing

The Waste Sort was conducted in the BCH building located at the County landfill, and was staffed for five days with the labor complement described in the following paragraph. Several City ESD staff members visited the site Tuesday with local media.

GBB staff had lead responsibility for planning the sorting event, and for interacting with County personnel whose cooperation was needed throughout the field data collection. The GBB Field Supervisor was responsible for managing the sorting area, including crew management, sorting productivity and accuracy, assisted with data recording, and cleaning up at the end of the day. GBB also provided a Health and Safety Supervisor for the Waste Sort. This staff member was responsible for managing work site health and safety, served as backup to the GBB Field Supervisor in managing the sorting area, helped to monitor sorting productivity and accuracy, data recording, and helped with sort area clean-up at the end of the day. Temporary workers from Fayetteville-based Cape Fear Staffing and Labor Finders served as Waste Sort labor.

On Monday, March 23, before the trash and recyclables arrived, GBB reviewed the Health and Safety Plan with the sorting crew, trained the sorters as to their specific roles, discussed the overall objectives of the entire week-long project, and ensured that all participants were provided with sufficient personal protective equipment (including Tyvek suits, face masks, and cut-resistant gloves).

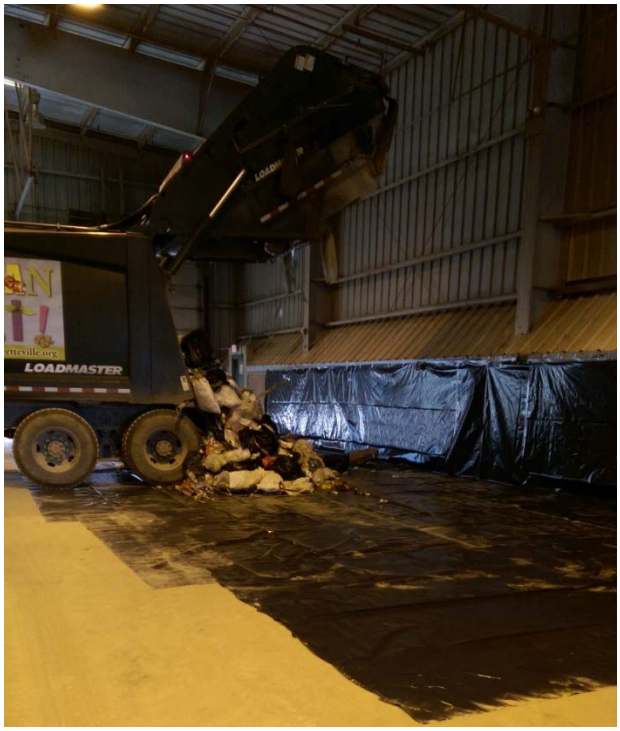
3.5 Waste Sorting

The Waste Sort was conducted adjacent to the landfill in the BCH Building at the location noted in Exhibit 3.1. The physical arrangement of the Sort Area Layout consisted of the sort table surrounded by the load-out containers (96-gallon carts) labeled to receive each of the specifically identified and sorted materials. The sorting tables were constructed on-site, using ¾ in x 4 ft. x 8 ft. sheets of plywood placed on wooden sawhorses, and fitted with bumper material.

Exhibit 3.1 - Location of Field Sort Site within the BCH Building

At approximately 11:15 a.m. Monday, Tuesday, Thursday, and Friday, each of the trash and recyclables aggregator trucks came into the BCH building, and backed up to a designated tipping area. As seen in Exhibit 3.2, GBB affixed protective sheeting to the floor and the wall of the BCH building. There, in two separated piles, the trucks tipped the accumulated trash and recyclables each morning. The sorting crew sorted each 75-cart pile at a time, according to the schedule in Table 3.2. The material to be loaded into 96-gallon carts was brought over from the piles.

Exhibit 3.2 - Discharging and Stockpiling of Materials to be Sorted



The carts were then wheeled to the sorting tables, and each cart was dumped onto 4' x 8' sorting tables. With the sorting crew and the sorted materials carts located as shown in Exhibit 3.3, the materials were sorted into categories to provide information about what was recyclable, unburnable, and likely to cause changes in heating value. Materials were sorted into the categories noted in Table 3.5 (a definition of each of the material categories is shown in Attachment F). Specific interest was in the level of recyclables still being placed in the trash cart and the level of non-recyclables (trash) that was put into the recycling cart.

All plastic bags used to stockpile trash or recyclables in the carts, as well as other containers found in the samples, were opened and the contents separated and sorted into the individually-marked 96-gallon carts surrounding the sort table. Sorters were instructed to specialize in certain material groups based on where they stood in relation to the sorting tables and carts. In this way, sorters became knowledgeable, in a short period of time, as to the characteristics of their individual material category.

Exhibit 3.3 - Set-up of the Waste Sort Stations and Material Containers

Table 3.5 - Material Categories

Category	Sort Material List	Number
Paper	Newsprint	1
	Office Paper	2
	Corrugated Cardboard, Kraft Paper	3
	Paperboard	4
	Other Dirty Paper	5
Plastic	PET	6
	HDPE	7
	Polystyrene	8
	LDPE	9
	Other Rigid Plastic	10
	Mixed Dirty Plastic	11
Glass	Clear	12
	Green	13
	Brown	14
	Blue	15
	Other	16
Metals	Ferrous	17
	Non-Ferrous	18
Organics	Yard Waste	19
	Food Waste	20
	Misc. Organics (bath and diaper)	21
Special Wastes	Rubber	22
	Textiles	23
	HHW	24
	Tires	25
	Appliances & Batteries	26
	Used Oil	27
	C & D	28
	Fines	29
	Misc. Nonorganic	30

Just before an individually marked material 96-gallon carts becomes too full to add more sorted materials, or too heavy to carry, the Waste Jockey (or another sorter) brought the container to the Post Sort Area to be weighed. With the weight recorded, the contents were emptied into a City supplied 96-gallon cart and stored for loading into the original “aggregator” truck when it returned to the sort site. An additional cart was provided while the individually-marked container was being weighed so sorting could continue. After being weighed, recorded and dumped, the individually-marked container was returned to its place beside the respective sort table.

The Field Supervisor and Health and Safety Supervisor monitored the quality of the sorted material containers as each sample was sorted, rejecting (and pointing out to the sorters) materials that may be improperly classified. Open containers allowed the GBB sort team to see the material at all times. Quality control was also performed during the weighing process. Exhibit 3.4 shows a cart full of one of the constituent materials that had been sorted by the sorting crew. The materials on the sort tables were manually sorted until a mixed remainder of minus two-inch "Fines" material was left. The Fines were dumped from the sort table into a container and weighed at the appropriate time.

Exhibit 3.4 - Example of a Sorted Trash Constituent in Cart Awaiting Weighing

3.6 Characterization Study Results

Table 3.6 and Table 3.7, as well as Figure 3.2 and Figure 3.3, show summary data of material category distribution for the week. All weights shown are in pounds. Several samples of HHW and used oil were present, but did not register a measurable weight. These were noted, but are displayed as "zero" weight in the summary tables.

The week-long sorting of the City trash found that within 9,803 pounds, an estimated 2,416.55 pounds, or 24.7% of all the material in the garbage cart stream was recyclable material.

Based on the detailed sorting of the recyclables placed into the "Recyclables Cart", a total of 605.45 pounds, or 22.2% of the material in the recyclables stream, was found to be "residual" or garbage materials.

Table 3.6 - Characterization Data: Trash Carts Sorted

Total Trash Sorted for the Week, By Constituent

Category	Constituent	Total Week, Pounds	Total Week, %
Glass	Blue Glass	25.25	0.3%
	Brown Glass	85.05	0.9%
	Clear Glass	182.05	1.9%
	Green Glass	27.00	0.3%
	Other Glass	42.40	0.4%
Paper	Cardboard	205.55	2.1%
	Newsprint	212.05	2.2%
	Office Paper	37.25	0.4%
	Other Dirty Paper (1)	1,066.90	10.9%
	Paperboard	451.05	4.6%
Metal	Ferrous Metal	218.30	2.2%
	Non-Ferrous Metal	144.45	1.5%
Plastic	PET	274.00	2.8%
	Rigid Plastic	85.65	0.9%
	Film Plastic	881.35	9.0%
	Mixed Dirty Plastic	378.45	3.9%
	HDPE	48.05	0.5%
	Styrofoam	157.30	1.6%
Organic	Food	1,156.20	11.8%
	Yard Waste	226.10	2.3%
	Misc. Organic (bath & diaper)	630.35	6.4%
Other	Appliances and Batteries	98.05	1.0%
	C&D	361.75	3.7%
	HHW	84.15	0.9%
	Misc. Nonorganic	776.50	7.9%
	Fines	1,308.95	13.4%
	Rubber	119.45	1.2%
	Textiles	511.25	5.2%
	Tires	5.10	0.1%
	Used Oil	2.75	0.0%
	TOTAL Trash Sorted	**9,802.70**	**100.0%**

Quantity of Recyclables Found Within the Sorted Trash That Could be Pratt Single Stream MRF Input Material

Category	Constituent	Total Week, Pounds
Glass	Blue Glass	25.25
	Brown Glass	85.05
	Clear Glass	182.05
	Green Glass	27.00
	Other Glass	42.40
Paper	Cardboard	205.55
	Newsprint	212.05
	Office Paper	37.25
	Other Dirty Paper (1)	0.00
	Paperboard	451.05
Metal	Ferrous Metal	218.30
	Non-Ferrous Metal	144.45
Plastic	PET	274.00
	Rigid Plastic	85.65
	Film Plastic	0.00
	Mixed Dirty Plastic	378.45
	HDPE	48.05
	Styrofoam	0.00
Organic	Food	0.00
	Yard Waste	0.00
	Misc. Organic (bath & diaper)	0.00
Other	Appliances and Batteries	0.00
	C&D	0.00
	HHW	0.00
	Misc. Nonorganic	0.00
	Fines	0.00
	Rubber	0.00
	Textiles	0.00
	Tires	0.00
	Used Oil	0.00
	TOTAL, Pounds	**2,416.55**
TOTAL, Recyclables as % of Sorted Trash		**24.7%**

(1) Very much subject to the specifications of the S-S MRF and there end market specification for baled fiber

Figure 3.2 - Graphic Representation of Trash Characterization Data

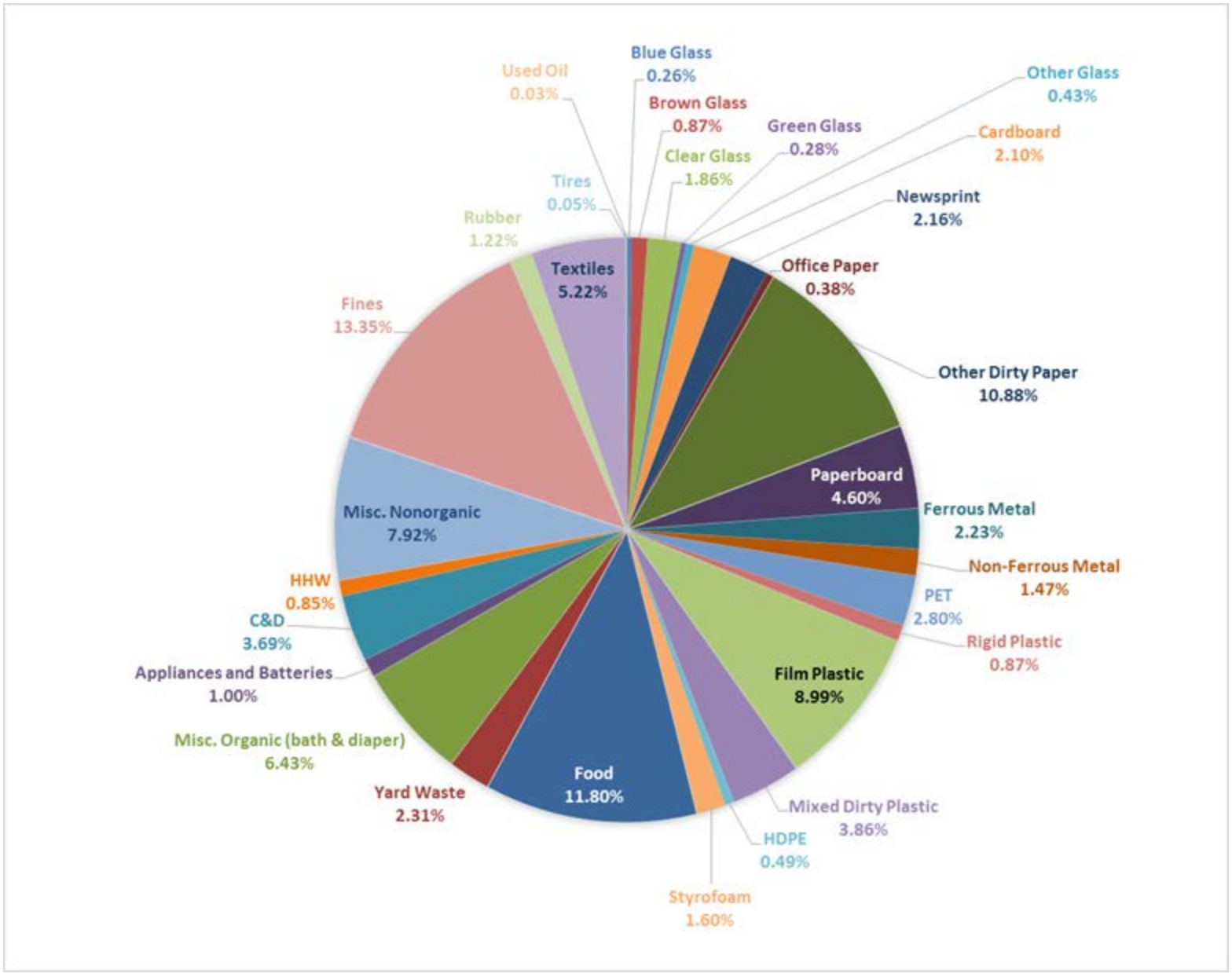


Table 3.7 - Characterization Data: Recyclables Carts Sorted

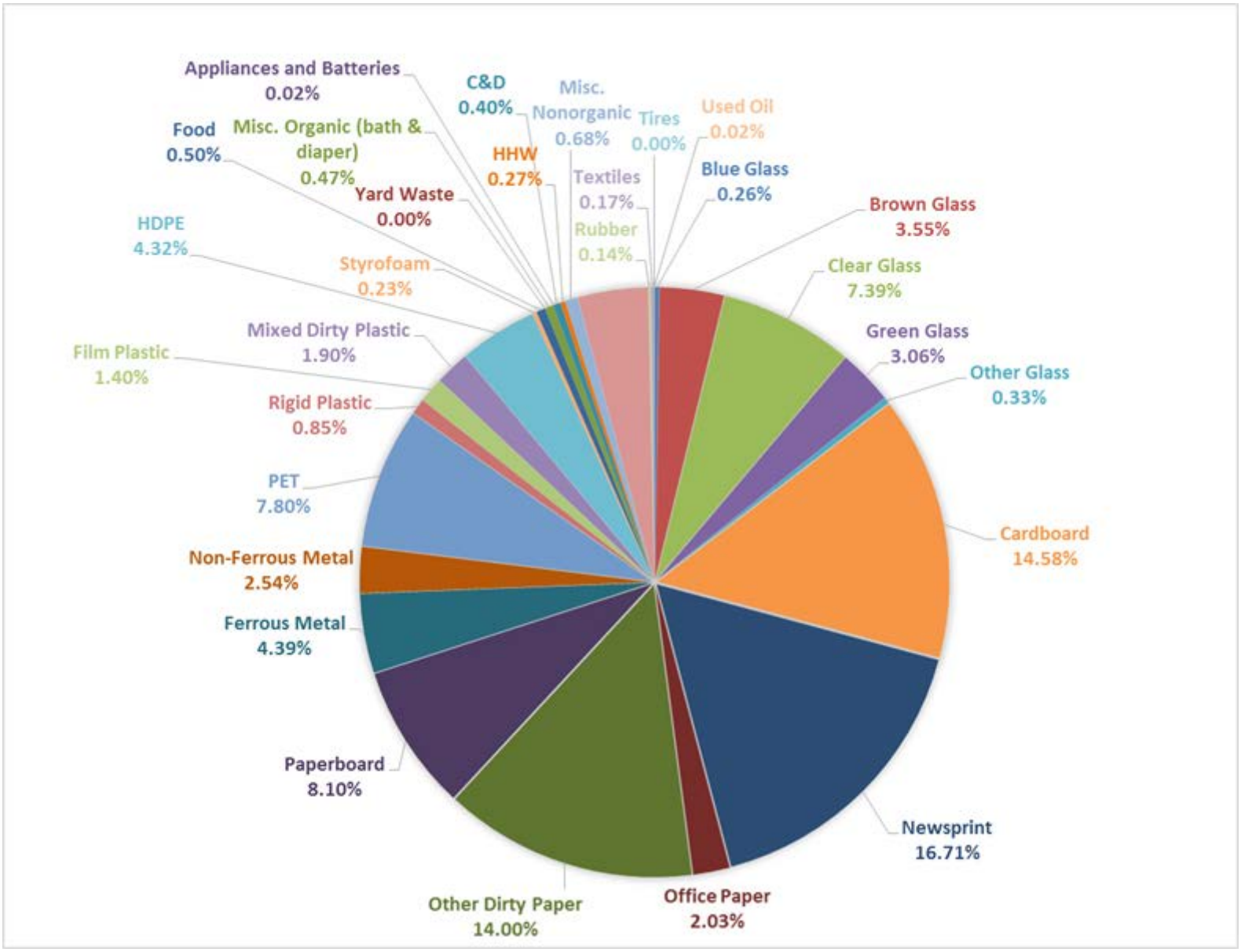
Total Recyclables Sorted for the Week, By Constituent

Category	Constituent	Total Week, Pounds	Total Week, %
Glass	Blue Glass	7.05	0.3%
	Brown Glass	96.95	3.6%
	Clear Glass	201.6	7.4%
	Green Glass	83.55	3.1%
	Other Glass	9.1	0.3%
Paper	Cardboard	398	14.6%
	Newsprint	456.05	16.7%
	Office Paper	55.35	2.0%
	Other Dirty Paper	381.95	14.0%
	Paperboard	220.95	8.1%
Metal	Ferrous Metal	119.8	4.4%
	Non-Ferrous Metal	69.45	2.5%
Plastic	PET	213	7.8%
	Rigid Plastic	23.25	0.9%
	Film Plastic	38.25	1.4%
	Mixed Dirty Plastic	51.8	1.9%
	HDPE	117.8	4.3%
	Styrofoam	6.3	0.2%
Organic	Food	13.6	0.5%
	Yard Waste	0	0.0%
	Misc. Organic (bath & diaper)	12.7	0.5%
Other	Appliances and Batteries	0.45	0.0%
	C&D	10.9	0.4%
	HHW	7.3	0.3%
	Misc. Nonorganic	18.6	0.7%
	Fines	106.35	3.9%
	Rubber	3.9	0.1%
	Textiles	4.7	0.2%
	Tires	0	0.0%
	Used Oil	0.45	0.0%
	TOTAL Recyclables Sorted	**2729.15**	**100.0%**

Quantity of Trash Found in the Sorted Recyclables That Should Become Residue from the Pratt Single Stream MRF

Category	Constituent	Total Week, Pounds
Glass	Blue Glass	0
	Brown Glass	0
	Clear Glass	0
	Green Glass	0
	Other Glass	0
Paper	Cardboard	0
	Newsprint	0
	Office Paper	0
	Other Dirty Paper	381.95
	Paperboard	0
Metal	Ferrous Metal	0
	Non-Ferrous Metal	0
Plastic	PET	0
	Rigid Plastic	0
	Film Plastic	38.25
	Mixed Dirty Plastic	0
	HDPE	0
	Styrofoam	6.3
Organic	Food	13.6
	Yard Waste	0
	Misc. Organic (bath & diaper)	12.7
Other	Appliances and Batteries	0.45
	C&D	10.9
	HHW	7.3
	Misc. Nonorganic	18.6
	Fines	106.35
	Rubber	3.9
	Textiles	4.7
	Tires	0
	Used Oil	0.45
	TOTAL, Pounds	**605.45**
TOTAL, Trash as % of Sorted Recyclables		**22.2%**

Figure 3.3 - Graphic Representation of Recyclables Characterization Data



In addition to the sorting process, on Tuesday, the Health and Safety Supervisor selected approximately ten (10) individually-marked categories to be "sized". A review of the material sizing consisted of a selected material container being dumped on a tarp, and its contents separated into three size increments: <6", 6" – 16", and oversized. Each increment was also weighed. Table 3.8 shows the resultant breakdown, by percentage, of material in each increment (in the sample taken) that was identified in each size range. An illustrative photo of one of the materials, and the sizing grid, is presented as Exhibit 3.5.

Table 3.8 - Sizing Data

Material	Trash	**Trash Sort, Sample Material Sizing Summary**			
Day Generated	Tuesday 3/24/15				
Day Sorted	Thursday 3/26/15				
Sample No:	**Type of Material**	**Total Wt., lbs.**	**% <6"**	**% 6" - 16"**	**% >16"**
1	Newspaper	19.6	1.02%	98.98%	0.00%
2	cardboard	16.4	0.00%	56.10%	43.90%
3	textiles	16.2	0.00%	50.62%	49.38%
4	PET	10	8.00%	92.00%	0.00%
5	Styrofoam	3	13.33%	86.67%	0.00%
6	glass	13	12.31%	87.69%	0.00%
7	paperboard	20.2	11.88%	88.12%	0.00%
8	rigid plastic	8	20.00%	80.00%	0.00%
9	appliances	13.6	0.00%	100.00%	0.00%
10	ferrous	27.2	36.03%	25.74%	38.24%
11	HDPE	7.6	10.53%	89.47%	0.00%
12	non ferrous	14.4	30.56%	69.44%	0.00%

Exhibit 3.5 - Example of Sorted Material Placed on Sizing Grid

3.7 Waste Stream Analysis

Based on the total tonnage of City material brought to the Landfill by City collection vehicles or to Pratt Industries by WM during the week, GBB developed an extrapolation of the sampling and sorting data to the overall waste and recycling stream – as generated and as disposed. During the study week, 888.74 tons of waste was delivered from residential collection routes in the City to the County landfill and 165.35 tons of recyclables were delivered to Pratt Industries. This total represents a diversion rate of 16% for the City during the week, which was lower than the 22% diversion rate found for the sort study homes.

Based on the total tonnage delivered to the recycling and disposal facility, Table 3.9 presents an estimate of the total waste composition as-generated, before it is separated by residents into the trash and recycling streams.

Table 3.9 - Estimated Waste Composition As-Generated During Sort Week

Category	Constituent	Recyclables (%) - (1)	Recyclables (Tons) -(1)	Garbage (%) - (2)	Garbage (Tons) - (2)	Total Tons	As-Generated Composition (%)
		100.0%	**165.4**	**100.0%**	**888.7**	**1054.1**	**100.0%**
Glass	Blue Glass	0.3%	0.4	0.3%	2.3	2.7	0.3%
	Brown Glass	3.6%	5.9	0.9%	7.7	13.6	1.3%
	Clear Glass	7.4%	12.2	1.9%	16.5	28.7	2.7%
	Green Glass	3.1%	5.1	0.3%	2.4	7.5	0.7%
	Other Glass	0.3%	0.6	0.4%	3.8	4.4	0.4%
Paper	Cardboard	14.6%	24.1	2.1%	18.6	42.7	4.1%
	Newsprint	16.7%	27.6	2.2%	19.2	46.9	4.4%
	Office Paper	2.0%	3.4	0.4%	3.4	6.7	0.6%
	Other Dirty Paper	14.0%	23.1	10.9%	96.7	119.9	11.4%
	Paperboard	8.1%	13.4	4.6%	40.9	54.3	5.1%
Metal	Ferrous Metal	4.4%	7.3	2.2%	19.8	27.0	2.6%
	Non-Ferrous Metal	2.5%	4.2	1.5%	13.1	17.3	1.6%
Plastic	PET	7.8%	12.9	2.8%	24.8	37.7	3.6%
	Rigid Plastic	0.9%	1.4	0.9%	7.8	9.2	0.9%
	Film Plastic	1.4%	2.3	9.0%	79.9	82.2	7.8%
	Mixed Dirty Plastic	1.9%	3.1	3.9%	34.3	37.4	3.6%
	HDPE	4.3%	7.1	0.5%	4.4	11.5	1.1%
	Styrofoam	0.2%	0.4	1.6%	14.3	14.6	1.4%
Organic	Food	0.5%	0.8	11.8%	104.8	105.6	10.0%
	Yard Waste	0.0%	0.0	2.3%	20.5	20.5	1.9%
	Misc. Organic (bath & diaper)	0.5%	0.8	6.4%	57.1	57.9	5.5%
Other	Appliances and Batteries	0.0%	0.0	1.0%	8.9	8.9	0.8%
	C&D	0.4%	0.7	3.7%	32.8	33.5	3.2%
	HHW	0.3%	0.4	0.9%	7.6	8.1	0.8%
	Misc. Nonorganic	0.7%	1.1	7.9%	70.4	71.5	6.8%
	Fines	3.9%	6.4	13.4%	118.7	125.1	11.9%
	Rubber	0.1%	0.2	1.2%	10.8	11.1	1.0%
	Textiles	0.2%	0.3	5.2%	46.4	46.6	4.4%
	Tires	0.0%	0.0	0.1%	0.5	0.5	0.0%
	Used Oil	0.0%	0.0	0.0%	0.2	0.3	0.0%

(1) From Table 3.7 - Based on the Waste Sort, the contents of the Recyclables Carts that would be delivered to the Pratt Single Stream MRF for processing/recovey.
(2) From Table 3.6 - Based on the Waste Sort, the contents of the Trash Carts that would be delivered to the County Landfill for disposal.

Based on the total tons delivered from City residential collection routes to the landfill during the sort study week, Table 3.10 shows an estimated 316 additional tons of material during the sort week had the potential for recovery or diversion into the recycling stream. This is an estimated 35 percent of the City trash disposed at the County landfill that week.

Table 3.10 - Estimate of Additional Diversion Potential for City Trash

Total Week's Tons Delivered by City to Landfill (Tons)	**888.74**
Constituent Material	**Additional Tons (1)**
Blue Glass	2.29
Brown Glass	7.71
Clear Glass	16.51
Green Glass	2.45
Other Glass	3.84
Cardboard	18.64
Newsprint	19.23
Office Paper	3.38
Other Dirty Paper (2)	96.73
Paperboard	40.89
Ferrous Metal	19.79
Non-Ferrous Metal	13.10
PET	24.84
Rigid Plastic	7.77
Film Plastic	0.00
Mixed Dirty Plastic	34.31
HDPE	4.36
Styrofoam	0.00
Food	0.00
Yard Waste	0.00
Misc. Organic (bath & diaper)	0.00
Appliances and Batteries	0.00
C&D	0.00
HHW	0.00
Misc. Nonorganic	0.00
Fines	0.00
Rubber	0.00
Textiles	0.00
Tires	0.00
Used Oil	0.00
TOTAL	**315.82**

(1) Based on the week's Trash quantity delivered by the City to the County Landfill during the Waste Sort period and the projected Recyclables in Trash stream that could potentially be placed into the Recycling Carts for delivery to Pratt MRF.

(2) Very much subject to the specifications of the Single Stream MRF and there end-market specification for baled fiber

3.8 Other Observations During Sampling Activity

While not always apparent in the sorted sample waste, some observations of general delivered waste characteristics made by GBB staff while viewing the dumping of selected loads include:

- In Tuesday's waste there were many bundled newspapers that appeared to have come from a paper route or a store.
- The majority of HHW recovered was in the form of paint and paint cans. Most paint cans were at least one-third full, and still wet. They came in with other materials that appeared to be from small home renovation projects.
- There were a large number of textiles in the waste. Residents should be made aware of reuse and donation opportunities, as many of these textiles were in good condition.
- There was synthetic hair present in every day's trash, which can cause problems in processing machinery if not properly sighted.
- Sorting labor and staff noted that one barrier to increasing recycling is the size of the residential recycling carts. They also noted that they are unwilling to pay to receive a second or larger cart.
- There was a very small amount of blue glass, often one or two bottles in a single day's waste load, and only a few more in recycling.
- Almost all trash was bagged, and recyclables were loose.
- The majority of the Rubber category weight is due to shoes, which should also be diverted for donation and reuse, as most were in good condition.
- Though small in weight, there was a large volume of films and Styrofoam in the recycling loads each day.

3.9 Summary

GBB cautions the City that the City-required waste sort included a one week snapshot of the city's waste stream and not the typical four- season waste sort that is normally conducted for implementation of new disposal technologies such as a mixed waste processing facility or for solid waste planning purposes.

4 Benchmarking of Municipal Hauling and Collection Services

4.1 Introduction to this Section of the Report

This section of the report presents a summary of services and cost data for the Environmental Services Department (ESD) City of Fayetteville, North Carolina and compares it to six (6) similar solid waste collection programs in comparably sized North Carolina municipalities. The summary of services section is followed by a summary of economics which includes explanatory information on the varying costs between the benchmarked municipalities.

4.1.1 Background to the Section

The City seeks to compare its solid waste programs with similar communities in North Carolina that offer similar services.

The data is compiled in a series of tables, listed by program services. Each table is accompanied with explanatory information that provides high-level observations of the key differences or anomalies in the various solid waste collection programs for each of the following five service areas:

- Residential Refuse Collection,
- Central Business District Collection,
- Bulk Item Collection,
- Brush and Leaf Collection, and
- Yard Waste/Leaf Collection, and Residential Recycling.

The data provided in table format presents extensive information from the other six (6) municipalities. Due to the extensive amount of information presented in the tables herein, each of tables as titled are provided separately on 11" X 17" paper in Attachment I to ensure readability of the information and all data and numbers are visible. To generate the comparable data-sets, the project team attempted to collect as much data from the identified municipalities as was provided by the City of Fayetteville. However, as seen in the accompanying tables, this was not possible in all situations. But for the most part, all of the other entities were very cooperative in sharing their services structures and costs, and expressed interest in the final product for their own inspection and review purposes.

4.1.2 Benchmark Municipalities Overview

The six comparable North Carolina municipalities benchmarked were selected, in part, based on population, proximity, and solid waste disposal funding availability. The cities reviewed included the following:

- Winston-Salem,
- Greenville,
- High Point,
- Greensboro,
- Durham; and
- Wilmington.

4.1.3 Comparable City Profiles

Fayetteville

Fayetteville is the county seat of Cumberland County and the sixth largest municipality in the state with a population estimated at 210,468. The City encompasses 147.7 square miles and is also contiguous to Fort Bragg, a major U.S. Army installation northwest of the city. The Environmental Services Department (ESD) manages the logistics for the daily operations of waste collection crews and associated equipment needed to serve 60,527 residential households.

Winston-Salem

Winston-Salem is the fifth largest city in the state with a population estimated at 236,441. The Sanitation Department manages the logistics for the daily operations of collection crews and associated equipment needed to serve 77,533 residential households within the 132.40 square miles that make up the city.

Greenville

Greenville is the county seat of Pitt County and the tenth largest city in the state with a population estimated at 89,130. Encompassing only 26.3 square miles, the Sanitation Department manages the logistics for the daily operations of collection crews and associated equipment needed to serve 38,357 residential households.

High Point

High Point is the ninth largest city in the state with a population estimated at 107,741. The Environmental Services Department manages the logistics for the daily operations of collection crews and associated equipment needed to serve 35,544 residential households.

Greensboro

Greensboro is the third largest city in the State with a population estimated at 279,639 which encompasses 131.20 square miles. Field Operations Department manages the logistics for the daily operations of collection crews and equipment needed to serve the 80,640 residential households.

Durham

Durham is the county seat of Durham County and the fourth largest city in the state with a population estimated at 245,475. Durham encompasses 94.90 square miles and their Sanitation Department manages the logistics for the daily operations of waste collection crews and essential equipment needed to serve the 69,800 residential households.

Wilmington

Wilmington is the county seat of New Hanover County and the eighth largest city in the state with a population estimated at 112,067. Wilmington encompasses 41.5 square miles with their Solid Waste Division managing the logistics for the daily solid waste operations, including collection crews and associated equipment needed to serve 31,253 their residential households.

4.2 Residential Trash Collection

The City of Fayetteville collects from 60,527 households one time per week, excluding Wednesday and weekends. City crews collect trash in 96-gallon roll out carts from single-family homes, duplexes and triplexes (up to 7 units on a single parcel) built on public and private streets. Trash is collected using 12 automated side loaders and 3 rear-loaders. Household trash must be bagged before placing into the cart. Fayetteville's refuse personnel also assist with excess debris collection. The residential waste collection program is responsible for daily pickup of curbside garbage generated by residents. This program includes first responders to quickly resolve collection related complaints in the field. ESD staff also collects dead animals on roadways and those found at residences, if they are placed along the curb.

The City Solid Waste Fee of $40 per year for each household is included in the County tax bill. The County tax bill also includes a $48 per year household charge for landfill disposal costs associated with refuse, yard waste and bulky items. As shown in Table 4.1, the City of Fayetteville's total refuse cost is $88.58 per ton, this number does not include the $48/household annual solid waste fees or additional disposal cost for non-compliant loads, outside source income such as transfer station revenue or County and State rebates. The City refuse total cost per Household is $66.93 per year. All figures are based on Table 4.1 that presents a detailed comparison of each of the seven (7) municipalities residential refuse collection programs.

All cities provide carts and use a variety of trucks to provide service. There are three once-a-week service frequencies that provide either four or five days per week collection. Wilmington had been using rear load trucks exclusively until FY 2015 when they began converting to automated trucks. No city noted is using CNG vehicles for collection services.

Wilmington is the only city noted that requires the residents to use an orange sticker for extra bags of trash left out of the cart. A couple of cities provide dead animal collection at businesses, in addition to curbside. Greenville is the only city to charge customers a monthly fee on their respective utilities bill.

Fayetteville residential refuse service also assists with excess debris collection on an as-needed basis. As quantified, the residential refuse collection and disposal costs range from a low of $103.56/ton to a high of $259.16/ton. The annual cost range for Refuse Collection and Disposal is $66.93/household to $203.09/household.

Table 4.1 - Comparable Residential Trash Collection Systems

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro(1)	Durham	Wilmington
If handled by City which department is involved?	Environmental Services Department	Environmental Health - Sanitation Department	Public Works - Sanitation Division	Public Services Dept. - Environmental Services Department	Field Operations	Solid Waste Management Department	Public Services- Solid Waste Division
What services are included in the Residential Trash Collection category?	Collection of Trash in 96 Gallon Carts from Single Family Homes, Duplexes and Triplexes built on public streets	Collection of Trash in 96 gallon carts from Single family; multi-family and small businesses that generate the same amount of trash as a residential unit.	Curbside service uses a City-approved 64-gallon rollout cart at Single family and small businesses; City collects weekly from rear load containers at multi-family units	Household collection in 96 gallon carts completed by City, contract for container collection at multifamily residences. Deceased animals are collected in one of two ways: Residents may place the animal in a heavy plastic bag and place in the garbage cart for collection on the regularly scheduled collection day; or Residents may place the animal at the curb in a heavy, plastic bag for collection.	Residential trash collection using 90-gallon roll-out trash carts by City crews.	Services the majority of its customers with automated trucks. Weekly pickup of 96 gallon carts for residents and limited businesses.	Curbside trash pick up for residential and commercial customers; carrion (dead animal) service to veterinary offices, commercial seafood establishments and City streets. A choice of two trash cart sizes is available, a 95-gallon and a 35-gallon cart. Household trash must be bagged and in the city rollout cart/container.
Is your Curbside Collection Public or Private (Contracted)?	Public	Public	Public	Public	Public	Public	Public
Number of Collection Points	60,527	77,533	38,357	35,544	80,640	69,800	31,253
Annual Tons of Trash collected- 2014	45,732	52,035	23,771	27,854	55,000	47,500	22,475
What is your frequency of collection (e.g. 1/week)?	1 time per week, no Wednesday or Weekends	1 time per week, no Wednesday or Weekends	1 time per week Monday- Friday	1 time per week; Monday - Thursday	1 time per week, no Wednesday or Weekends	1 time per week, Monday- Thursday	1 time per week Monday - Friday
Number of weekly garbage routes	60	100	24	52	72	72	36
What are the number of FTE's Positions assigned to this work (e.g., Drivers, Helpers, etc.)	32	94	19	20	27	50	33
What type and number of equipment is dedicated to this work?	35 total vehicles, rear loaders and automated side loaders	16 rear load packers trucks, 9 automated trucks	3 rear load packers trucks, 3 automated trucks	9 automated side loaders	3 rear load packer trucks, 23 automated side loaders	8 automated trucks with lift arm, 9 rear packer trucks and 2 semi-automated side loaders	12 rear load packers; no automated; 1 pick-up truck
How does this work overlap with other collection services?	Personnel assist with excess debris collection	Does not overlap	Does not overlap	Does not overlap	Does not overlap	Does not overlap	Does not overlap
How are customers billed?	Solid Waste Fee of $40 per household per year included in county taxes	No fee, tax based	Combined monthly utilities billing - gas, water, sewer, electric and trash via paper or email.	No fee, tax based	No fee, tax based	No fee, tax based	As of July 1, 2014, the fee for the regular sized (maxi) cart is $26.29 per month and the mini cart fee is $21.36 per month. A minimum of 12 stickers at $1.25 each must be purchased at one time.
FY 2015 budget for Residential Trash- Expense	$4,051,159	$6,970,610	$5,000,427	$6,243,734	$5,224,567	$3,446,583	$3,851,835
Landfill Disposal Charge per ton	$0	$36	$33	$35	$44	$31	$59
Trash Disposal Cost	$0	$1,873,260	$784,443	$974,890	$2,420,000	$1,472,500	$1,326,025
Gross Trash Disposal Cost(2)	$4,051,159	$8,843,870	$5,784,870	$7,218,624	$7,644,567	$4,919,083	$5,177,860
Total Trash Cost as $ per Ton	$88.58	$169.96	$243.36	$259.16	$138.99	$103.56	$230.38
Trash Total Cost per Household per Year	$66.93	$114.07	$150.82	$203.09	$94.80	$70.47	$165.68
Other comments on this activity	County tax bill includes $48 per year per household for landfill disposal costs of Trash and Bulky Items	All garbage must be bagged, no loose garbage in carts; the city provides dead animal collection Monday through Saturdays; Animals are collected from the streets only; animals must be in a bag and curbside. Collections are also made at Animal Hospitals and Fish Markets for a fee.	Curbside Service- $14.50 / month; Multi-Family Service- $14.50 / month; Premium Backyard Service-$43.55 / month; Premium Backyard service is no longer available to new connections; $5.00 monthly fee for each additional rollout cart; Ordinance requires resident to buy cart from City includes delivery.	Customers must use a City-approved roll-out garbage cart. Rollout carts which are not out when the truck passes, will not be collected until the next regularly scheduled pickup day. To buy a garbage cart: $57 delivered; may purchase a second garbage cart for a maximum of two (2) garbage carts per household. Backdoor service available for Garbage only. Tipping Fee =$33/ton + $2/ ton tax.	The majority of residential waste collection is performed with automated curbside waste collection vehicles servicing 90-gallon roll-out trash carts; additional carts-$50. a limited number of neighborhoods are approved for manual collection where residents must provide their own 32-gallon trash can. When filled with trash, cans should weigh less than 50 pounds. Existing townhome communities that receive private trash collection service may be eligible to convert to City service. Most crews work four-day weeks, with no collection activities on Wednesdays	Operate a Household Hazardous Waste Center and transfer station. The disposal fee at Republic's Uwharrie landfill is $31 / ton.	E-waste disposal is funded in this account; The monthly rates include weekly trash and yard waste collections, bi-weekly recycling, as well as bulky item collection upon request. Extra bagged trash that does not fit in your cart requires the purchase of orange extra trash stickers.

(1) Number of Routes from UNC School of Government Report for FY12/13

(2) Collection cost only, City disposal cost is embedded in the $48/Household/Year fees, City does not pay a separate disposal cost

4.3 Central Business District

Fayetteville and Greenville are the only two cities that do not provide a true Central Business District (CBD) collection program. Both have allowed the CBD to be an open market for private contractors to compete for solid waste services. Table 4.2 presents a detailed comparison of our findings with respect to CBD collection programs.

The City of Greensboro has the most robust CBD program of the cities reviewed. Greensboro offers a variety of commercial trash and recycling services to businesses and attached housing communities within their City limits. Wilmington's commercial establishments in the Central Business District can elect municipal trash collection from trash bags instead of carts. The cost of service, as well as the fees charged to CBD businesses, varies depending on how the costs and revenues are budgeted for those cities that provide service to their CBD.

Table 4.2 - Comparable Central Business District Collection (CBD) Systems

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro	Durham	Wilmington
What services are included in the CDB category?	No City service provided, all third party commercial arranged by businesses.	Garbage and Recycling for businesses and residences in the CBD; special events cleanup; uses crew who also clean sidewalks, empty trash receptacles and maintain other common areas	No City service provided, all third party commercial arranged by businesses.	3 month per year hub of activity for furniture industry. City services 96 gallon garbage carts only. Large Commercial containers are picked up by commercial companies.	7 days/wk. manual trash collection, 5 days/wk. large waste container, yard waste by appt., 3 days/wk. recycling, bulk by appt. Commercial-based waste program. Downtown Greensboro Inc.(DGI) also operates the Clean and Green Team. This team works seven days a week to address cleanliness and maintenance issues in Downtown. They pick up litter, remove graffiti, water plants and perform other similar duties.	downtown is 5 days per week	Includes collection from 250 brick trash receptacles and city collected 276 accounts;; commercial establishments and city Streets; clean up activities for various city Festivals; Commercial establishments in the Central Business District can elect City of Wilmington trash collection from trash bags instead of carts.
Public or private collection in the CBD	Open Market	Public	N/A	Open Market for large containers	Public	Public	Public (Using Carts/Bags) & Private Front Load Container (Front Load)
Number of Collection Points	Unknown	2,000	N/A	180	268	14	276
Annual Tons collected from CBD	0	902	N/A	N/A	304	Unknown	854
Frequency of collection (e.g. 1/week?)	N/A	daily	N/A	4 days Monday-Thursday	7 days per week	Monday through Friday	2 times per week up to 2 times per day; 7 days per week
Number of routes	Unknown	1	N/A	1	3 routes total in the CBD district area; semi-auto trash, recycling and glass collection.	2	Run three (3) routes per day seven x week
What are the number of FTE's Positions assigned to this work (e.g., Drivers, Helpers, etc.)	N/A	6	N/A	1	4	0	10
Equipment dedicated to this work	N/A	1 rear load packer truck and one pick up truck with lift gate	N/A	split packer recycling/trash	3 rear loader packers	1 front load and 1 rear loader	Two 6cy mini packers; one flat bed; two pick up trucks
How does this work overlap with other collection services?	N/A	Leaf and brush collection overlaps within the CDB	N/A	N/A		Recycling same day	Does not over lap
How are customers billed?	N/A	N/A	N/A	Switching to Enterprise Fund, some tax based and some by user fee, monthly fee of $8.00	Semi-auto fees are tax based. Special CDB fee provides extra revenue dollars	tax base	Monthly Fee
FY 2015 budget for CDB- Expense	N/A	$488,570	N/A	$81,000	$1,246,045	$57,414	$1,011,551
Revenues (CDB Customers pay City)	N/A	$0.00	N/A	$0.00	($75,000.00)	$0.00	($258,000)
Landfill Disposal Charge per ton	N/A	$36	N/A	$35	$44	$0	$0
CBD Trash Disposal Cost	N/A	$32,472	N/A	$0	$13,376	$0	$0
Gross CBD Disposal Cost	0	$521,042	0	$81,000	$1,184,421	$57,414	$753,551
Total CBD Trash Cost as $ per Ton	N/A	$577.65	N/A	N/A	$3,896	$0	$882
CBD Trash Total Cost per CBD Unit per Year	N/A	$260.52	N/A	$450	$4,419	$4,101	$2,730
Other comments on this activity	Parks and Recreation empty solar powered waste receptacles downtown	(2,000 estimated) Businesses that receive once-a-week hand collection of garbage qualify to participate in the Small Business Curbside Recycling Program; Businesses (including churches, nonprofit organizations) that are ineligible for the City's program are: 1) those that use a Front Load Container for garbage collection; 2) those located in the Central Business District receiving hand collection of garbage six days a week.	N/A	Currently the waste collection is funded by tax base. However, beginning this year a fee of $8 per month will be charged to fund the program. There is overlap this year to building funds by the collection $8 per household.	Businesses that only generate 2 96-gallon trash containers or less can use residential garbage collection. One green roll-out trash can is provided at no charge. A second can may be purchased for $70. If a business generates more trash than can be enclosed in these two containers, the business must make arrangements with a private trash hauler. (Revenue only from ABC collection fees). The three rear loader trucks are multiuse. The average route takes approximately 2 hours to complete. A single truck may collect bagged trash, dump at TS, then go back and collect glass only which is taken to the MRF.	Business Recycling Program	Bag It Program- color coded bag system for solid waste disposal and recycling service offered to 116 residential and 160 commercial customers; 714 tons from accounts + 140 ton public trash cans

4.4 Bulk Item Collection

Fayetteville's bulky item collection program allows all residential items that will not fit in a cart or bag to be placed curbside for an additional collection. Items include, but are not limited to, furniture, mattresses, limb piles, construction debris, and metal items, such as swing sets, grills and bicycles. The trucks used for this City service have a grapple boom and an open bed with their volume measuring from 20 to 40 cubic yards of waste capacity. The City also collects homeowner construction debris and debris piles generated from move-outs for an additional fee.

This bulky item program is essential during weather-related events, as they serve as the first responder to remove debris from the streets to clear the way for public safety vehicles to respond in a timely manner. The bulky item program cleans up illegal dumpsites throughout the city and is reported to mitigate an average of five (5) illegal dumpsites per week. This program also assists in collections for special events such as the Fayetteville Beautiful annual citywide cleanup, Cross Creek cleanup, the Dogwood Festival, the International Folk Festival and the All-American Marathon. The bulky item collection program is replacing their 20 cubic yard grapple trucks with 40 cubic yard grapple trucks that will provide greater capacity and the scaling will result in fewer trips to the disposal facility and improved customer response time.

The City total bulky item cost is estimated at $705.51/ton, which is equivalent to $21.59/household annually. All cost figures are based on the information compiled in Table 4.3 which presents a detailed comparison of bulk item collection programs for each of the benchmarked municipalities.

There are several noteworthy differences in the bulky item collection programs. For instance, in the City of Winston-Salem, bulky items are picked up by the city crews only during their annual neighborhood area cleanup which is typically scheduled between March 2 and September 4. Winston-Salem, Greenville and Durham exclude construction debris from collection. High Point residents can rent a Red Box for $100 to discard bulky items. Highpoint has added an $8/month fee to help offset the cost of their program.

Durham will allow up to three bulky items to be placed at the curb on the normal household collection day. Durham’s residential garbage crews note bulky items on the curb and the next day a bulky waste crew will come back to pick up the identified materials. Durham's bulk item crews also collect brush that is too large for yard waste crews to pick up. Durham residents get two bulk pickups per year.

Greenville and High Point do not have a separate expense for their bulky waste service. The five cities that do budget the service as a separate expense see costs for total bulky item collection and disposal ranging from $30.83/ton to $705.51/ton with an annual household cost range from $5.72/household to $44.90/household.

Table 4.3 - Comparable Bulk Item

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro	Durham	Wilmington
What services are included in the Bulk Item Collection category?	The Bulky Item program collects all items placed curbside and generated by residents that will not fit in a cart or bag. Items include, but are not limited to, furniture, mattresses, limb piles, construction debris, and metal items, such as swing sets, grills and bicycles. The trucks used for this operation have a grapple boom and an open bed measuring from 20 to 40 cubic yards. Owner-generated construction debris is be picked up for a $50 fee per.	Bulky items will be picked up by the city crews only during annual neighborhood area cleanup, scheduled sometime between March 2 and September 4; they do not mix bulky items with yard waste, recyclables or brush; items the city can collect include: mattresses, appliances, furniture, carpet and toys. Items not acceptable for collection include: electronic waste, yard waste, wood, lumber, building material, glass, tires, car parts, paint, oil drums, cement, rocks and hazardous or infectious waste.	Bulky trash pick up is available by appointment only. This includes any items that will not fit inside the 96 gallon garbage cart.	Residents can rent 4x8x14 "red box" for $100. this is picked up by a separate truck using a 14 yard roll off container. City will drop off and pick up. Public multifamily is collected by City (Bulky?). All commercial accounts OBW is private.	Bulk Trash consists of items that are too big to fit in your green trash container, such as furniture, mattresses, swing sets, and lawn mowers (drained of gas / oil). Bulk trash items are collected every other week; Large appliances are collected by appointment.	Up to three bulky items can be placed on the curb the same day as your normal household collection for garbage and recycling, weekly. Residential garbage crews note bulky items on the curb and the next day a bulky crew will come back to pick it up. Residential pickup of bulky items and brush too large for yard waste crews to pick up. 21 sites around the city have a large container for businesses to dump waste.	Call in service for municipal collection of bulky items, such as appliances and furniture
Public or Private Bulk Container Collection	Public	Public	Public	Public	both (Public and Private by who)	Public	Public
Number of Collection Points	60,527	77,533	38,357	35,544	80,640	17,500	31,253
Annual Bulk Item Tons Collected 2014	1,852	2,400	Not Available, rolled up into trash	Not Available, rolled up into trash	43,000	2,118	2,012
Frequency of collection (e.g. 1/week?)	Call Ahead Service	Once during collection period	Weekly (some twice a week)	Weekly	Bulk trash items are collected every other week	Weekly	By appointment only.
Number of routes	5	26 (completed 1 per week March - September)	1	5	8	4	8
What are the number of FTE's Positions assigned to this work (e.g., Drivers, Helpers, etc.)	6	36	0	3	17	4.4	7
Equipment dedicated to this work	6 grapple trucks	5 knuckle booms, 16 small dump trucks (dump trucks and knuckle boom trucks overlap as needed with brush collection).	1-2 knuckkle boom trucks. These are pulled from yard waste/brush serivce as they receive calls from residents requesting pick ups.	3 trucks fitted with a boom and grapple bucket	1 knuckle boom, 8 rear load packers. Knuckle boom used as needed for commercial customers. Does not run.	4 grapple trucks	Two 25 yard rear loaders
How does this work overlap with other collection services?	First responder to remove debris assists in collections for special events such as the Fayetteville Beautiful annual citywide cleanup, Cross Creek cleanup, the Dogwood Festival, the International Folk Festival and the All-American Marathon.	(this work force overlaps with brush collection as only one route is run per week)	Same personel is used for leaves, brush, and yard waste.	No	routes cross with roll out carts, some locations receive both services	No	Does not over lap
Are Customers billed and how are customers billed?	Cost embedded in County Solid Waste Fee for bulk	Charged annually based on size of container and frequency of collection	$14.50 monthly Trash Fee includes bulk collection	$8 per month	Fees- billed via the Water Dept.; Large appliances are collected by appointment.	$72 per year for two bulk pickups and yard waste	Included in monthly fee
FY 2015 budget for Bulky Item Collection- Expense	$1,315,186	$1,784,240			$4,240,645	$720,089	$633,620
Landfill Disposal Charge per ton	$0	$46	$33	$35	$44	$31	$59
Bulky Item Disposal Cost	$0	$110,400			$1,892,000	$65,658	$118,708
Revenues	($8,580)	($1,451,040)			($4,806,920)	$0	$0
Gross Disposal Cost	$1,306,606	$443,600			$1,325,725	$785,747	$752,328
Total Bulky Item Cost as $ per Ton	$705.51	$184.83			$30.83	$370.99	$373.92
Bulky Item Total Cost per Household per Year	$21.59	$5.72			$16.44	$44.90	$24.07
Other comments on this activity	Revenue is derived from 45 tons of metal taken to OmniSource(included in 1,852 tons); This program mitigates an average of 5 illegal dumpsites per week; property owner is charged a $100 move out fee for large piles of debris left behind;one grapple truck is a spare	Bulky items such as carpet, appliances, furniture, mattresses, etc., will be picked up by the city crews during annual neighborhood cleanups, scheduled during March through August, at no other time will city crews collect bulky waste. Bulky item collection is for single family residences, NOT businesses or apartments.	City does not pick up construction and demolition/building debris; Bulky Item Collection not budgeted separately.	Residents can rent 4x8x14 "red box" for $100. this is picked up by a separate truck using a 14 yard roll off container. City will drop off and pick up.	11 men working 10 hour shifts; The collection truck uses a mechanical arm to lift the discarded appliance. Solid waste crews will collect small amounts of construction debris from do-it-yourself home improvement projects. The collection of building materials is limited to two 32-gallon containers per job. Debris from jobs performed by professional contractors will not be collected.	Excess debris will be charged. Prohibited Items-Dirt, Building materials, Construction debris, Loose leaves, Tree stumps, Tires, Propane tanks, Car parts. Television collection is offered by appointment only and is not considered a bulky item.	Bulky items, metal bulky items, and yard waste must be placed neatly in separate piles on the right-of-way for pick up. Three different trucks service these items; FY11/12 County reported-2,012 tons of bulky items

4.5 Brush and Leaf Curbside Collection

Fayetteville includes brush and leaf collection in its yard waste collection program. Greenville, Greensboro and High Point also include this service with yard waste. Table 4.4 highlights the differences of the cities that provide a brush and leaf curbside collection program.

Winston-Salem provides curbside collection of brush every 21 working days except during their leaf collection months that begin November 1 and occur until three rounds of leaf collection have been completed. During this period, they use 13 grapple trucks and 25-26 small dump trucks.

Greensboro's Field Operations Department conducts an annual Loose Leaf Collection Program from November to January with two scheduled pickups in each area of the city. Fayetteville's annual loose leaf collection is accomplished by Parks and Recreation's vacuum trucks from November through February. High Point's loose leaf collection is conducted once-a-year by the Streets Department. Winston-Salem is the only municipality that budgets for brush and leaf collection with a cost estimated to be $341.04/ton for brush and leaf collection, including the processing costs. This projects out to be a $65.98/year cost per Household in Winston-Salem.

Table 4.4 - Comparable Brush and Leaf Curbside Collection System

	Fayetteville	Winston-Salem	Greenville(1)	High Point	Greensboro	Durham	Wilmington
What services are included in the Brush and Leaf Collection category?	See Yard Waste Collection	Curbside of brush; loose leaf collection; bulky item collection	Loose leaf collection	grass clippings, leaves, bush trimmings, tree cuttings, limbs; boxed or clear bags <50 lbs.; loose leaves collected for 10 wks. each fall/winter	Field Operations Department conducts an annual Loose Leaf Collection Program from November to January with two scheduled pickups in each area of the city.	Bulky Brush	See Yard Waste Cart Collection
Public or private collection	See Yard Waste Collection	Public	Public	Public	Public	Paying yard waste customers are entitled to two free bulky brush pickups per year. Bulky brush must not exceed 4 cubic yards or one average size pickup truck. Excess debris will be charged.	N/A
Number of Collection Points	See Yard Waste Collection	77,533	20,000	35,544	80,640	N/A	N/A
Tons collected FY2014	See Yard Waste Collection	15,000	0	0	13,089	N/A	N/A
Frequency of collection (e.g. 1/week?)	See Yard Waste Collection	Curbside of brush every 21 working days except during leaf collection months; loose leaf beginning November 1 until three rounds of collection have been completed; bulky collection annually March through August.	Weekly pick up, bulky trash by appointment only.	once a year taken care of by streets department not solid waste	weekly, no Weds or weekends, 2 seasonal leaf sweepings	N/A	N/A
Number of routes	See Yard Waste Collection	16 per quadrant, 4 quadrants	Varies based on demand, only collected once per year	0	72	N/A	N/A
What are the number of FTE's Positions assigned to this work (e.g., Drivers, Helpers, etc.)	See Yard Waste Collection	65	0	0	44	N/A	N/A
Equipment dedicated to this work	See Yard Waste Collection	13 commercial log knuckle boom trucks, 25-26 small dump trucks	6 grapple trucks (same trucks used for yard waste)	3 truck mounted vacuum trucks, four pick-up trucks with self contained vacuums	9 packer trucks	N/A	N/A
How does this work overlap with other collection services?	See Yard Waste Collection	yard pick up	yard waste	Does not overlap	yard waste picked up at the same time	N/A	N/A
How are customers billed?	See Yard Waste Collection	No fee, tax based	Not Charged (pending) yard waste over 4 cubic yards $25/per collection	No fee, tax based	No fee, in tax base	N/A	N/A
FY 2015 budget Brush and Leaf Collection	See Yard Waste Collection	$5,115,670	See Yard Waste Collection	See Yard Waste Collection	See Yard Waste Collection	N/A	N/A
Yard Waste Processing Charge per ton		$0					
Yard Waste Processing Cost		$0					
Gross Processing Cost		$5,115,670					
Total Brush and Leaf Cost as $ per Ton		$341.04					
Brush and Leaf Total Cost per Household per Year		$65.98					
Other comments on this activity	See Yard Waste Collection	None	Budget is included in the yard waste collection; annual tonnage included in yard waste numbers	Budget is included in the yard waste collection; annual tonnage included in yard waste numbers	owner provided cans or clear bags	N/A	N/A

(1) Tonnage not tracked

4.6 Yard Waste Collection

The City ESD has a yard waste collection program responsible for the daily pickup of containerized curbside yard and leaf debris generated by city residents. The program includes logistical support to manage 10 or 12 crews, depending upon the season, and the daily equipment needed to service all of the residential units. The employees in this City program use rear-loading packer trucks for collection. The program is impacted heavily in the fall due to leaf volume. The crews must complete all of their routes each day, even in inclement weather. Workers rip open bags, empty them into the truck and put the bags in a sack on the side of the truck.

Fayetteville yard waste can be containerized as well. The City offers additional 96-gallon rollout carts for $53 each, plus $11.50 for delivery. Yard waste from the City is taken to the Cumberland County-owned Wilkes Road Treatment & Processing Facility and tipped free of charge. Tree and branch-like material is chipped and used as boiler fuel through a private contract that the County has initiated. Grass, leaves and some woody waste is composted at the same site. Table 4.5 provides a review of the various yard waste programs for the compared cities. The City is charged by the County for loads containing oversized logs, limbs over 3” in diameter or over 5 feet in length.

Winston-Salem residents not wanting to compost yard waste can have their yard debris collected year-round in a special 96-gallon cart purchased from the city for $65 along with a $60 annual sticker fee making them eligible for the collection service. There is a three (3) cart-per-residence limit with each cart containing no more than 150-lbs. High Point collects loose leaves for ten (10) weeks each fall/winter. Greensboro yard waste is collected weekly, using homeowner provided 32-gallon trash cans or clear plastic bags.

In Durham, yard waste collection is an optional fee-based program. For a $72 annual fee, residents are enrolled into the yard waste program from July 1 to June 30. This is an annual service that cannot be cancelled for a refund. Once enrolled in the yard waste program, the resident cannot cancel the service fees that are added to the water bill. Yard waste material, with any set-out of a maximum of ten (10) biodegradable brown paper bags or the yard waste placed into in 96-gallon carts, will be collected year-round. If a cart is at the residence, they are also charged a $18 annual cart leasing fee.

The City of Wilmington's yard waste is processed for $8.40 per ton through Diversified BioMass in Wilmington, a commercial facility and processed into a soil amendment and/or mulch. They are the only municipality paying a processing fee to an independent third-party for part of their yard waste management program.

For the benchmarked communities, the total cost per ton of yard waste, brush and leaf collection ranges from $73.23/ton to $467.28/ton and the total household cost per year ranging from $24.03/household to $80.80/household.

Table 4.5 - Comparable Yard Waste Collection System

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro	Durham	Wilmington
What services are included in the Yard Waste Collection category?	City is responsible for daily pickup of containerized curbside yard, leaf debris and small limbs generated by residents	Leaf collection begins in November; There are three rounds of leaf collection. Year-round leaf collection, of containerized yard waste to residents who purchase 96 gallon rollout carts	Collection of yard waste in bags	grass clippings, leaves, bush trimmings, tree cuttings, limbs; boxed or clear bags <50 lbs.; loose leaves collected for 10 wks. each fall/winter	1 time per week collection of containerized yard waste and Christmas trees	Yard waste collection is an optional fee-based program. For a $72 fee, residents are enrolled into the yard waste program from July 1 to June 30. Leaves, grass, shrub clippings, garden residue, twigs, branches and small limbs Only brown biodegradable paper bags will be collected. A maximum of 10 biodegradable bags per week, weighing no more than 25 pounds, can be set out on collection day. Bundles must be securely tied to be collected.	Loose yard waste such as grass clippings, leaves, pinecones, straw, and vines must be containerized
Public or private collection	Public	Public	Public	Public	Public	public	Public
Number of Collection Points	60,527	77,533	38,357	35,544	80,640	16,714	30,252
Annual Tons Collected FY 2014	19,861	22,800	18,000	2,359	14,851	14,520	11,228
Frequency of collection (e.g. 1/week?)	1 time per week	1 time per week	1 time per week	1 time per week	1 time per week	1 time per week	1 time per week
Number of routes	10-12 crews, seasonally dependent	4	6	12	72	10	32
What are the number of FTE's Positions assigned to this work (e.g., Drivers, Helpers, etc.)	27	8	12	13	44	15	22
Equipment dedicated to this work	11 rear loaders	6 automated trucks, one packer truck	6 knuckle booms	3 rear load packer trucks	9 packer trucks	1 side loader, 1 rear loader, 1 automated side loader	9 Rear Load Packer Trucks
How does this work overlap with other collection services?	Does not overlap	N/A	leaf and bulk	Trash, recycling, yard waste carts and bulky items picked up at the same time	Also conducts Leaf collection	Leaf collection	Does not over lap
How are customers billed?	Included in Solid Waste Fee with charges for large loads	Billed on an annual basis.	included in monthly fee	no fee, tax based	Tax base	$72 per year and 1.50 per month cart rental. Fees added to water bill.	Part of Monthly Fee
FY 2015 budget for Yard Waste Collection- Expense	$1,454,420	$1,415,430	$1,711,220	$1,102,319	$2,972,802	$1,350,512	$1,718,050
FY 2015 budget Brush and Leaf Collection- Expense from Table 4	$0	$5,115,670	$0	$0	$0	$0	$0
Revenues from Brush and Leak Collections	$0.00	($828,000.00)	$0.00	$0.00	$0.00	$0.00	$0.00
Yard Waste Facility Processing Fee per ton	$0.00	$0.00	$0.00			$0.00	$8.40
Yard Waste, Brush and Leaf Processing Cost	$0	$0	$0	$0	$0	$0	$94,315
Net Yard Waste, Brush and Leaf Collection and Processing Cost	$1,454,420	$5,703,100	$1,711,220	$1,102,319	$2,972,802	$1,350,512	$1,812,365
Total Yard Waste, Brush and Leaf Collection and Processing Cost as $ per Ton	$73.23	$250.14	$95.07	$467.28	$200.18	$93.01	$161.41
Yard Waste, Brush and Leaf Collection and Processing Cost per Household per Year	$24.03	$73.56	$44.61	$31.01	$36.87	$80.80	$59.91
Other comments on this activity	Workers rip open bags to collect yard waste and put bags in a sack on the side of the truck. YW can be containerized as well. The city offers additional 96 gallon rollout carts for $53 each plus $11.50 for delivery. Yard Waste is taken to the county-owned Yard Waste Compost Facility.	Yard Waste such as leaves, grass clippings, shrubbery trimmings, garden residue, etc., can no longer be placed in bags or boxes for collection by city crews; Residents not wanting to compost yard waste can have their yard debris collected in a special 96 gal. rollout cart purchased from the city for $65; $60 annual sticker fee; Only 3 carts per residence (150-lb. limit each), are eligible for service. The City takes yard waste to their City operated yard waste composting operation. They pay a fee to themselves to cover operation of $28/cu yard.	Yard waste should be separated (leaves, limbs, etc.) and at the curbside but not in the road. Limbs can be no longer than 5 feet in length and 4 inches in diameter. Yard waste is taken to a debris landfill at the per load rate of $25 for one axle trucks and 35 for two axle trucks.	Citizen can rent a "red trailer" From the city for disposal of large limb piles. Yard waste is taken to the City operated composting operation at a rate of $31 /ton.	Yard waste is collected weekly on the regular garbage collection day in homeowner 32-gallon trash can or clear plastic bags. Filled cans and bags should weigh no more than 50 pounds. Using black plastic bags, paper bags, and green recycling bags will result in non-collection. Tie yard waste in bundles not more than five feet long and no heavier than 50 pounds. Yard waste is taken to City's composting operation at rate $40/ton	The service fee does not include the cart rental fee. If a cart is at the residencethey are charged an $18 leasing fee. Note that this is an annual service that cannot be cancelled. Yard waste customers must notify Solid Waste Management in the event of address change.Leaves, grass, shrub clippings, garden residue, twigs, branches and small limbs Only brown biodegradable paper bags will be collected. A maximum of 10 biodegradable bags per week, weighing no more than 25 pounds, can be set out on collection day.	Yard waste is processed through Diversified BioMass in Wilmington a commercial facility and reused as soil and mulch. Processing cost= $8.40 per ton

4.7 Residential Recycling

The City of Fayetteville program consists of a curbside single stream residential collection program for recyclables placed in 35-gallon or 96-gallon carts. The carts are serviced through a collection contract with Waste Management. This contract has been in place since July 2008, when the curbside program began. The contract is for five years with two two-year extensions. It is in its first two-year extension. This program also provides for the collection of recyclables from all City-owned buildings, athletic facilities and the City's five (5) recycling drop-off sites operated by City crews. The City recycling program also manages the scheduling and logistics of cart repairs and delivery of carts for residents. Residents can upgrade to a 96-gallon cart by returning their 35-gallon cart and paying a one-time charge, currently $20. The collected recyclable material is delivered by Waste Management to Pratt Industries for processing at Pratt's Materials Recovery Facility (MRF). The City is currently rebated $11/ton by Waste Management for all city recyclable tons delivered to Pratt. Table 4.6 highlights the similarities and differences in the residential recycling programs.

All benchmarked cities provide single stream recycling. As indicated in Table 4.6, six (6) benchmarked cities provide single stream recycling 96-gallon carts with either weekly or every-other-week (EOW) collection. The exception is Fayetteville which provides 35-gallon carts as the norm, unless up-graded as noted in the previous paragraph. Fayetteville, Winston-Salem and Greenville have weekly recyclables collection and the other four municipalities have EOW recyclables collection. Two cities, Fayetteville and Winston-Salem, contract the collection of recyclables with Waste Management. Wilmington's municipal collection system competes with private subscription service.

The total cost per ton for the collection and processing of recyclables ranges from $81.18/ton to $241.90/ton. The annual cost per household ranges from $15.93 to $43.53.

Table 4.6 - Comparable Residential Recycling Systems

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro	Durham	Wilmington
What services are included in the Residential Recycling category?	Private curbside residential collection of recyclables through a private contract; ESD Collects from City-owned buildings, athletic facilities and the City's five (5) recycling drop-off sites.	Curbside and multi family recycling; Have contract for single stream roll out cart collection. Newspaper, magazines, junk mail, telephone books, chipboard, aluminum, steel, all plastics, cardboard, glass and aerosol cans. Also includes servicing 9 drop off centers.	Curbside and multi-family, city-issued container. Cardboard, chemical jugs (label removed, 3x rinsed), white goods/appliances, electronics, thermostats, cooking oil, yard waste, aluminum, glass, plastics, steel/tin cans, newspaper, paperboard, magazines	Curbside aluminum/metal cans, plastic bottles/milk jugs, glass jars/bottles, newspaper, magazines, phone books, office paper, junk mail, cardboard and chipboard	Curbside city-issued 96-gallon cart or green bags and 20 City drop off centers	Single Stream; Curbside city-issued 96-gallon cart; newspaper, mail, magazines, cardboard, phonebooks, juice/milk cartons, glass bottles, aluminum aerosol cans, plastic bottles/clean food containers, small toys	Voluntary curbside Single Stream collection program using 96-gallon carts for single family, small businesses and small apartment complexes
Public or private collection	Public for City Facilities & Private Curbside Contracted with Waste Management	Private (City contract)- Waste Management	Public	Public	Public	Public	Private subscription service (See above)
Single stream or Dual Stream Recycling	Single Stream	Single Stream	Single Stream	Single Stream	Single Stream	Single Stream	Single Stream
Cart Size	35- Gallon	96-Gallon	96-Gallon	95-Gallon	96-Gallon	96-Gallon	96-Gallon
Number of Collection Points	60,527	77,553	38,357	35,544	80,640	69,800	22,000
Annual Tons Collected -FY2014	9,280	12,671	5,538	8,827	18,123	13,700	7,104
Recyclable Material Pounds per Household per Week	5.90	6.28	5.55	9.55	8.64	7.55	12.42
Curbside Recyables as a % of all tons managed	12.1%	14.0%	11.7%	22.6%	13.8%	17.6%	16.3%
Frequency of collection (e.g. 1/week?)	Weekly	Weekly	Weekly	Every other week	Every other week	Every other week	Every other week; same day as trash collection
Number of daily routes	WM= 10-12; ESD= 1-2	N/A	6	4	72	11	12
What are the number of FTE's Positions assigned to this work (e.g., Drivers, Helpers, etc.)	2	0	15	7	15	15.8	5
Equipment dedicated to this work	1- Cart Delivery truck; 1 pick up truck to deliver trash carts as needed	N/A	3 automated side loaders and 3 manual rear loaders	City provided cart	15 automated trucks	2 side loader, 1 rear loader, 7 automated side loaders	4 rear loaders
How does this work overlap with other collection services?	Small truck route also collects trash from narrow streets, and other locations that is hard to get as big truck into.	Does not overlap	Does not overlap	11 drop off sites; Material Recovery Facility	Does not overlap	Does not overlap	Does not overlap
How are customers billed?	Included in Solid Waste Fee; Charge for changing cart size or resident damaged carts	No fee, Tax based	No fee, Tax based	$1.00 per month	No fee, Tax based	No fee, Tax based	Included in trash Fee
FY 2015 budget for Residential Recycling- Expense	$2,346,892	$2,688,188	$1,233,167	$2,456,136	$2,818,049	$1,615,264	$779,796
Recyclables Processing Cost (Income)	($102,080)	($416,990)	($6,242)	($909,046)	($357,031)	($503,064)	$142,080
Gross Recycling Cost for Collection & Processing all Tons	$2,244,812	$2,271,198	$1,226,925	$1,547,090	$2,461,018	$1,112,200	$921,876
Gross Recyclables Cost as $ per Ton	$241.90	$179.24	$221.55	$175.27	$135.80	$81.18	$129.77
Recycling Net Cost per Household per Year	$37.09	$29.29	$31.99	$43.53	$30.52	$15.93	$41.90
Other comments on this activity	This program also manages scheduling and logistics of cart repairs and delivery of 35 gallon recycling carts for residents; Revenues are total tons x $11/ton rebate from Pratt	Single-Family households are provided with one BLUE City owned 96-gallon rollout recycling cart; Multi-family households use blue for comingle, paper must be separated in paper bags. The City pays no tipping fee on recyclables. They have a profit sharing deal with Waste Management, Inc.	Curbside service uses a City-approved 96-gallon rollout container; You do not have to sort your recyclables, they can be co-minged; Containers used for recyclables must be placed three feet from the garbage containers on the service day; 3 city drop off centers and 150 other drop off centers one per multi-family location Recyclables are taken to Eastern Carolina Vocational Center for recycling. The city pays nothing for tipping and receives no rebate. The recycables fund positions for special needs and some in kind labor.	35 (includes MRF staff, 4 collections) The City is providing 95-gal recycling carts to residents. Residents may purchase an additional recycling cart for $57 and delivered. There is a maximum of 2 carts serviced at each residence. Recyclables are taken to the City's MRF for processing. The collections budget pays $30 / ton unloaded at MRF.	The City has 20 large public recycling containers located at fire stations and public facilities throughout the City. They may be used by both residents and businesses.; City began every other week collection in 2008.	Durham uses $36.72 per ton rebatefor budgeting purposes based on a rolling average of the Average Market Value of the Southeast USA region. Shredded paper must be placed in bags. Only paper or clear plastic bags are acceptable.	$20/ton processing fee to Waste Management, they have a transfer station in Wilmington and ship to Raleigh NC; annual tonnage estimate for FY14-15; Residents who are not city trash customers may use the recycling drop-off centers located throughout New Hanover County

4.8 Other City Provided Operations

The City ESD Administration manages the resources in the department which include responsibility for specifying and purchasing equipment, using route optimization software to route the primary collection trucks efficiently, hiring and training personnel, and developing and managing the annual departmental budget. Other program functions are managing the residential roll cart inventory and the City's fuel depot to make certain there is sufficient fuel daily by maintaining the citywide fuel storage and dispensing operation. Additionally, this program maintains the database for backdoor service customers and completes requisitions and payables for supplies, materials and equipment.

Administration is also responsible for weekly processing of applications, interviews, and on-boarding new employees, mitigating complaints, and processing notices of violations. Public relations, outreach programs, community watch meetings, resident conflict resolution, program mailings and promotional/marketing campaigns are other functions that are undertaken. Administration also manages daily budget documentation, development of the annual budget and the financial analysis of proposed program and process changes. Recent changes in the department include:

- Transitioning of the Call Center out of the ESD in February 2014 to where it is now managed by Corporate Communications in the PWC complex;
- Implemented CityWorks software in December 2014 to replace the work order program, MainTrac; and
- Currently adding of new on-board communications with FleetMind, for the garbage and yard waste trucks to provide real time information exchange and work order management.

The Gross Administration and Other Operating Cost for the City calculates to $21.72/ton for all of the tons managed, which is equivalent to $27.52/household. The compilation of the other city services that are provided by the benchmarked municipalities are highlighted in Table 4.7.

Winston-Salem has other operations that also provide code enforcement, while Greenville includes certain budgeted costs associated with the Director of Public Works salary, Recycling Coordinator and Pesticide Control Officer.

Greensboro's Field Operations is the most diverse department that provides many of the other critical services of that city in addition to the collection of trash, recyclables, yard waste, and loose leaf collection. Such activities include: street, storm water, park, and right-of-way maintenance, street cleaning, snow and ice removal, solid waste disposal, the White Street Landfill, solid waste transfer station and the household hazardous waste collection center.

Durham’s other operations include administration, code enforcement and waste reduction education costs.

Wilmington's budget includes a 50% share of their public services compliance officer and sustainability manager position. It also includes the safety and training specialist in public services administration.

Gross Administration and Other Operating Costs range from $10.89/ton to $32.71/ton managed. The household cost per year ranges from $9.29 to $45.71.

Table 4.7 - Comparable Other City Provided Operations

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro	Durham	Wilmington
Other Operations under Sanitation	Administration and Non-Program	Sanitation administration, Sanitation code enforcement.	Also provide mosquito and rodent control	Kersey Valley Landfill. Total budgeted staffing is significantly higher than actual as budget includes 20 MRF employees, 12 composting, and 13 other disposal employees	Field Operations is a diverse department that provides many of the City's critical services. Trash, recycling, yard waste, and loose leaf collection, street, storm water, park, and right-of-way maintenance, street cleaning, Snow and ice removal, Solid waste disposal, White Street Landfill, Solid Waste Transfer Station, Household Hazardous Waste Collection Center	Administration, Code Enforcement and Waste Reduction Education	Administration and Other Non-Operations
What are the number of FTE's Positions assigned to this work (e.g., Drivers, Helpers, etc.)	8	0.00	0.5	3	16	18	5
Equipment dedicated to this work	7 Pick up trucks and 1 Jeep				unknown	0	one SUV
Total Number of Households	60,527	77,533	38,357	35,544	80,640	69,800	31,253
Total Tons of All Waste Handled (Trask, Bulk, YW and Recycling)	76,725	90,808	47,309	39,040	131,278	77,838	43,673
FY 2015 budget for Environmental Services Administration- Expense	$924,933	$0	$0	$0	$0	$0	$416,014
FY 2015 budget for Non- Program Expenditures	$740,511	$988,540	$600,000	$700,000	$749,507	$1,213,004	$1,012,486
Gross Cost for Admin and Other City Provided Operations all tons	$1,665,444	$988,540	$600,000	$700,000	$749,507	$1,213,004	$1,428,500
Gross Administration and Other Operating Cost as $ per Ton	$21.71	$10.89	$12.68	$17.93	$5.71	$15.58	$32.71
Gross Administration and Other Operating Net Cost per Household per Year	$27.52	$12.75	$15.64	$19.69	$9.29	$17.38	$45.71
Other comments on this activity	Personnel include Department head, office staff and Supervisors	Code Enforcement: Enforces the City's sanitation ordinances, including the regulation of refuse storage, improperly containerized yard waste, and illegal distribution of handbills and advertisements. Sanitation Administration: Provides leadership, planning, employee safety training and enforcement, and fiscal stewardship for all sanitation programs.	Partial Director of Public Works, Superintendent, Recycling Coordinator, Pesticide Control Officer, Administrative Assistant. Adminstrative costs and indirect non program costs are under city hall budget. The figure included above is what City Hall requested from Sanitation to cover these expenses; 0.5 FTE for clerical personel.	Utilities department bills a $5 Landfill Fee to pay for developing additional space in the landfill, this falls under a separate landfill facilities fund. The City estimates Admin. expense at $700K annually. The cost is calculated by taking the number of finance, management and leadership up to the City Manager level FTEs and multiplying by a factor. The cost is imbedded in the overall department budget.	Special Services responsible for manual curbside solid waste collection in areas where automated collection is not possible with current equipment. Provides for the initial delivery and necessary maintenance of municipally-provided containers. Additional services are appliance pick-up, ABC collection, and Central Business District collection. Expenses are in the sanitation department and other department budgets. Figure above is for indirect cost for administrative and other non-program costs.	Commercial users may use the Waste Disposal and Recycling Center; however, the Hazardous Household Waste facility does not accept materials from commercial users.Collection costs of household solid waste, recycling, bulky items, yard waste, transfer station operations, code enfrocement and administrative costs are budgeted in the solid Waste Fund.	Budget includes Administration and nondepartmental budget; included in the nondept. Are indirect costs to the Gen. Fund for a 50% share of the Public Services Compliance Officer and Sustainability Manager position's salary benefits and operating expenses. It also includes an amount for the Safety and Training Specialist in Public Services Admin. It also includes Debt service for financing roll out carts for the recycling program.

4.9 Miscellaneous Other Information

The City does not operate any disposal or processing facilities. It hauls its waste to Cumberland County facilities. Garbage and bulk goes to the Ann Street Landfill which is owned by the County. Yard waste is hauled to the County Wilkes Road Treatment and Processing Facility for gringing into a boiler fuel and/or composting.

The City does own a transfer station site that is under a long-term contract for operations by Waste Industries. Waste Industries mainly receives commercial waste from within the City and environs, and hauls the waste it receives to it's landfill in Sampson County. The City receives lease fee and a per ton host fee as part of the contract. The City does not take any of it's waste materials to the transfer station.

Table 4.8 highlights the cities that operate their own waste facilities. In addition to Fayetteville, Greenville and Wilmington do not operate disposal or processing facilities. The other four cities own and operate some sort of disposal and/or processing facilities. These communities may or may not be charging a tipping fee or processing fee for their own waste. For example, Winston-Salem has a separate division (Solid Waste Disposal) and budget for the operations of its facilities.

Table 4.8 - Comparable Miscellaneous Other Information

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro	Durham	Wilmington
How does private collection operate in the City?	Open market for commercial businesses, Waste Industries has a Transfer Station	Open Market	Open Market	Private for commercial properties compete with City, but city is typically less expensive	Private serves townhouse and high rise building; site.	The City operates two drop-off facilities for City and Durham County residents to safely dispose of recyclables, electronics, appliances, household hazardous waste and trash. The City's yard waste processing facility opened on June 21, 2010. It is accessible from the same location as the transfer station. A private contractor operates the transfer station.	Open Market
If private collection is available, are businesses licenses required?	yes	Yes	No franchise fee required	No franchise license required	No franchise fee, just business license. July 15 this goes away.	N/A	Yes; $200.00 Per Annum
How many business licenses are assigned to the private sector collection.	Unknown	This number is not available per NC law these licensees will no longer exist.	None (6 companies serve area)	None	N/A	N/A	N/A
Non-Collection Related Personnel (Landfill, Transfer Station, MRF, Yard Waste Facility, Drop off centers, etc.)	0					5.8	None
FY 2015 budget for Miscellaneous Expenditures	$0	$0	$0	$0	$0	$6,686,095	$0
County Charge per Household per Year	$2,905,296						
Cumberland County Additional Charges	$88,103						
Other comments on this activity	FY 2015 Transfer Station Lease(Approx. $5,000/ month) and per ton Host Fees (Estimated using first 1/2 FY 2015 actuals)	The Division operates (2) permanent leaf drop-off sites, Reynolds Park Road which only accept leaves from City Sanitation crews during the leaf season, Overdale Yard-waste Facility and Forum 52 Yard-waste Facility which accepts leaves from	None	Kersey Valley Landfill. Total budgeted staffing is significantly higher than acutal as budget includes 20 MRF employees, 12 composting, and 13 other disposal employees.	None	Solid Waste Division maintains equipment assigned to the post-closure Land Clearing Inert Debris(LCID) site. Also includes Transfer Station Maintenance, Operating and maintaining a HHW site, and yard	None
Basis of disposal costs to the City	$40 per year per household unit through County Taxes	No fee, tax based	Combined monthly utilities billing - gas, water, sewer, electric and trash via paper or email.	No fee, tax based	No fee, tax based	No fee, tax based	As of July 1, 2014, the fee for the regular sized (maxi) cart is $26.29 per month and the mini cart fee is $21.36 per month. A minimum of 12 stickers at $1.25 each must be purchased at one time.
What disposal facility receives the waste from the City Residential collections?	Trash and bulk - Ann St. Landfill; Recycling- Pratt Industries; Yard Waste- Wilkes Rd Treatment & processing Facility	Solid Waste Division operates a sanitary landfill at Hanes Mill Road; the Division supervises closed out landfill operations on Ebert Street, Airport Road, Overdale and Link Road; there is sufficient land at the Landfill until at least 2021, and possibly until 2029, depending on the "waste stream" into the Landfill. A contract was negotiated with Stokes County in 1995 to provide for disposal of its sanitary waste at the Hanes Mill Road Landfill. The Division operates a active, C&D landfill on Old Salisbury Road, these materials may also be disposed at Hanes Mill Road Landfill.	Pitt County - 14 transfer stations, (Pitt Co SLF closed 1995), Bertie Co LF	Kersey Valley Landfill	The White Street Landfill accepts only construction debris and yard waste it no longer accepts MSW Residential. The White Street Landfill manages a compost operation and sells compost and mulch. Commercial and industrial trash should be disposed of at the Transfer Station, 6310 Burnt Poplar Rd. Transfer Station, (White Street MSW portion of LF - Closed, but operates as TS), Uwharrie Reg LF (Mt. Gilead, NC)In January 2013, the City entered into a new 5-year contract with ReCommunity for the processing and marketing of the city's recyclable materials.	City owned transfer station, yard waste facility, Waste hauled from TS to Sampson County Landfill	New Hanover County Landfill; Yard waste is processed through Diversified Bio Mas
Other comments on this activity	FY 2015 Transfer Station Lease(Approx. $5,000/ month) and per ton Host Fees (Estimated using first 1/2 FY 2015 actuals)	The Division operates (2) permanent leaf drop-off sites, Reynolds Park Road which only accept leaves from City Sanitation crews during the leaf season, Overdale Yard-waste Facility and Forum 52 Yard-waste Facility which accepts leaves from the general public as well as the City Sanitation crews throughout the year. Leaves that are taken to the Overdale Yard-waste Facility and Forum 52 Yard-waste Facility are mixed with grass clippings from the City's Yard Cart collection and is then distributed to the general public for compost at certain times of the year.	None	Kersey Valley Landfill. Total budgeted staffing is significantly higher than acutal as budget includes 20 MRF employees, 12 composting, and 13 other disposal employees. Operating expenses for MRF are managed as a separate business unit and budget.	None	Solid Waste Division maintains equipment assigned to the post-closure Land Clearing Inert Debris(LCID) site. Also includes Transfer Station Maintenance, Operating and maintaining a HHW site, and yard waste composting facility and Scrap tire disposal	None
Basis of disposal costs to the City	$40 per year per household unit through County Taxes		$33 (however, city pays zero, fee recovered by county by fee charged with taxes)				City pays $59 per ton at New Hanover county Landfill
What disposal facility receives the waste from the City Residential collections?	Trash and bulk - Ann St. Landfill; Recycling- Pratt Industries; Yard Waste- Wilkes Rd Treatment & processing Facility	Solid Waste Division operates a sanitary landfill at Hanes Mill Road; the Division supervises closed out landfill operations on Ebert Street, Airport Road, Overdale and Link Road; there is sufficient land at the Landfill until at least 2021, and possibly until 2029, depending on the "waste stream" into the Landfill. A contract was negotiated with Stokes County in 1995 to provide for disposal of its sanitary waste at the Hanes Mill Road Landfill. The Division operates a active, C&D landfill on Old Salisbury Road, these materials may also be disposed at Hanes Mill Road Landfill.	Pitt County - 14 transfer stations, (Pitt Co SLF closed 1995), Bertie Co LF	Kersey Valley Landfill	The White Street Landfill accepts only construction debris and yard waste it no longer accepts MSW Residential. The White Street Landfill manages a compost operation and sells compost and mulch. Commercial and industrial trash should be disposed of at the Transfer Station, 6310 Burnt Poplar Rd. Transfer Station, (White Street MSW portion of LF - Closed, but operates as TS), Uwharrie Reg LF (Mt. Gilead, NC)In January 2013, the City entered into a new 5-year contract with ReCommunity for the processing and marketing of the city's recyclable materials.	City owned transfer station, yard waste facility, Waste hauled from TS to Sampson County Landfill	New Hanover County Landfill; Yard waste is processed through Diversified Bio Mas

4.10 Personnel

The City ESD operates with 75 budgeted positions allocated across four collection programs and administration as indicated in the Figure 4.1 organization chart.

Figure 4.1 - City ESD Organization and Responsibility Chart

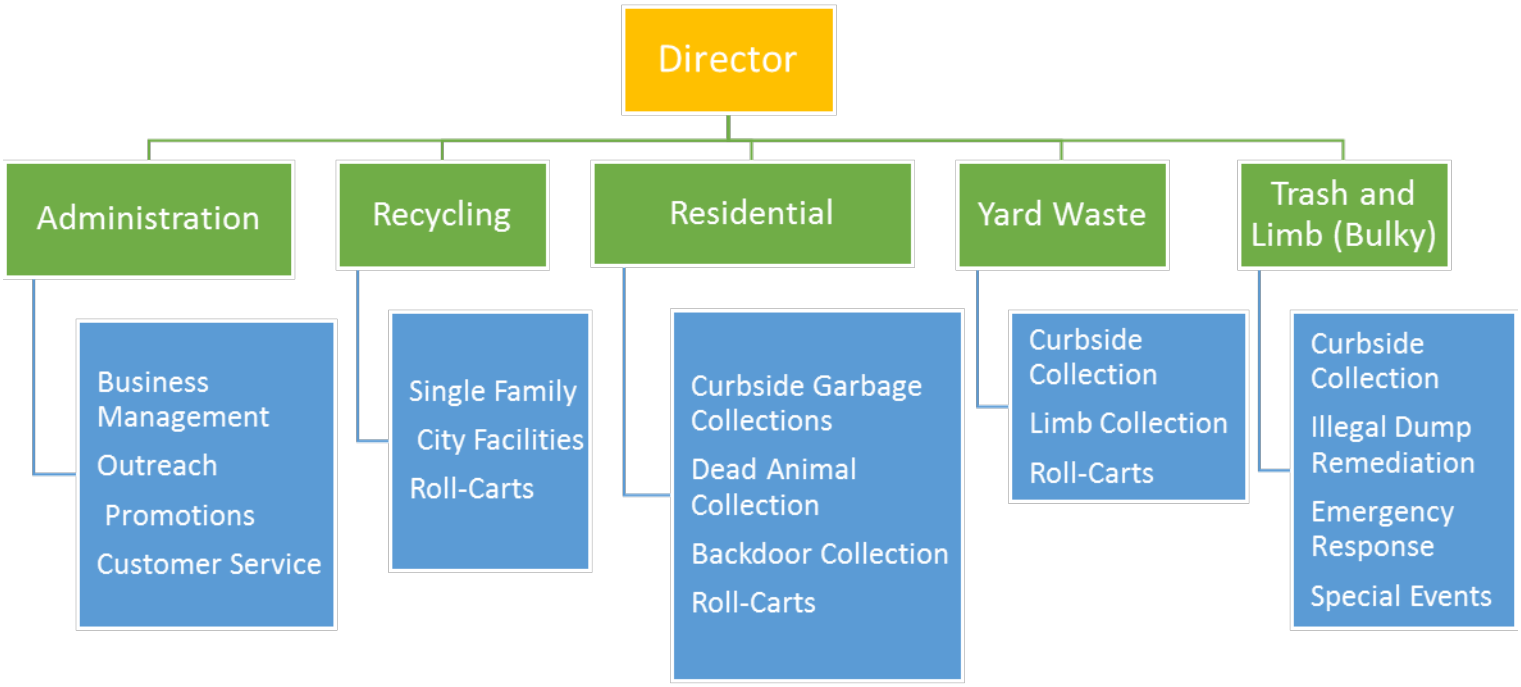


Table 4.9 presents the varying number of FTEs assigned to carry out the work needed to keep the cities clean. The number of FTEs, in part, reflect the size of the city, the number of services provided, types of trucks used (a rear load truck would require two workers possibly three, an automated side loader one person as example), and whether they manage disposal and processing services within their department. Also, one must take into account seasonality in the FTE numbers as is the case in Fayetteville. ESD collects leaves year round if in bags or containers while the Parks Division completes one round of loose leaf collections November through February using vacuum trucks. Therefore, most residents bag or containerize their leaves for ESD collection. The Yard Waste program is impacted heavily in the fall due to leaf volume. Other municipalities have limited bulk item collection which also will cause swings in the number of personnel needed.

Table 4.9 - Comparable Personnel of the North Carolina Municipalities Benchmarked

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro	Durham	Wilmington
Total Full Time Employees by Service(Budget)	**75**	**181**	**54.75**	**51**	**150**	**109**	**83**
Curbside Trash Collection	32	94	19	20	27	50	33
Central Business District	0	6	0	1	4	0	10
Bulk Item Collection	6	36	0	3	17	4.4	7
Brush and Leaf Curbside Collection	See Yard Waste Collection	65	0	0	44	0	0
Yard Waste Collection	27	8	12	13	44	15	22
Residential Recycling	2 (Private)	0 (Private)	15	7	15	15.8	5
Other City Provided Operations	8	0	0	3	16	18	5
Non-Collection Related Personnel (Landfill, Transfer Station, MRF, Yard Waste Facility, Drop off centers, etc.)	0	0	0	0	0	9	0
Total part time employees (FTE's)	7	11	3.75	0	0	0	

4.11 Comparative Solid Waste Budgets

Municipal solid waste collection services differ as much as budgets and to comparing collection service to another provides insight as to how each is managed. How each pays for their collection services is entirely up to the municipality.

Table 4.10 is the accumulation of each of the various program costs of the benchmarked cities summarizing their annual collection costs by program and as a gross cost through research and discussions with them. It does not provide the income or net cost as this would require further study outside the scope of this report. Gross cost is a good comparison as it does not have revenue or income applied and shows the actual cost of providing collection services.

Table 4.10 - Comparable Annual Gross Collection Costs and Summary Economics

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro	Durham	Wilmington
Total Trash Cost as $ per Ton	$88.58	$169.96	$243.36	$259.16	$138.99	$103.56	$230.38
Total CBD Trash Cost as $ per Ton	N/A	$577.65	N/A	N/A	$3,896.12	$0.00	$882.38
Gross Recyclables Cost as $ per Ton	$241.90	$179.24	$221.55	$175.27	$135.80	$81.18	$129.77
Total Yard Waste, Brush and Leaf Collection and Processing Cost as $ per Ton	$73.23	$250.14	$95.07	$467.28	$200.18	$93.01	$161.41
Total Bulky Item Cost as $ per Ton	$705.51	$184.83	$0.00	$0.00	$30.83	$370.99	$373.92
Gross Administration and Other Operating Cost as $ per Ton	$21.71	$10.89	$12.68	$17.93	$5.71	$15.58	$32.71
Trash Total Cost per Household per Year	$66.93	$114.07	$150.82	$203.09	$94.80	$70.47	$165.68
CBD Trash Total Cost per CBD Unit per Year	$0.00	$260.52	N/A	$450.00	$4,419.48	$4,101.00	$2,730.26
Recycling Net Cost per Household per Year	$37.09	$29.29	$31.99	$43.53	$30.52	$15.93	$41.90
Yard Waste, Brush and Leaf Collection and Processing Cost per Household per Year	$24.03	$73.56	$44.61	$31.01	$36.87	$80.80	$59.91
Bulky Item Total Cost per Household per Year	$21.59	$5.72	$0.00	$0.00	$16.44	$44.90	$24.07
Gross Administration and Other Operating Net Cost per Household per Year	$27.52	$12.75	$15.64	$19.69	$9.29	$17.38	$45.71
The Total Annual FY 2015 Budget for Solid Waste Services Including Collection, Admin and Other Services (Excluding Processing and Disposal Costs)	$10,833,101	$14,335,578	$8,544,814	$10,583,189	$17,251,615	$8,402,866	$9,423,352
The All-in Annual Cost for FY 2015 for Solid Waste Services Including Processing and Disposal Costs	**$13,826,500**	**$14,335,578**	**$8,544,814**	**$10,583,189**	**$17,251,615**	**$8,402,866**	**$9,423,352**
Total Number of Households	60,527	77,533	38,357	35,544	80,640	69,800	31,253
Total Tons of All Waste Handled (Trask, Bulk, YW and Recycling)	76,725	90,808	47,309	39,040	131,278	77,838	43,673
The Cost Per Ton of All Waste Managed	$180.21	$157.87	$180.62	$271.09	$131.41	$107.95	$215.77
Annual Cost Per Household for Solid Waste Collection & Processing	$228.44	$184.90	$222.77	$297.75	$213.93	$120.38	$301.52
Monthly Cost Per Household for Solid Waste Collection & Processing	$19.04	$15.41	$18.56	$24.81	$17.83	$10.03	$25.13
County Charge per Household per Year	$48	No fee	$72 per household	N/A	N/A		
Tipping fee at Landfill	$0	$36.00	$33 (however, city pays zero, fee recovered by county by fee charged with taxes on line above)	$33 per ton plus $2 tax	$44 @ TS / $40 @ LF for YW		$59

The annual average monthly cost of waste-related collection services for the seven (7) comparable cities is $18.68/home, Fayetteville's ESD provides solid waste collection services to 60,527 residential units at

a cost of $19.04 slightly above the average cost. Fayetteville's cost per home includes one-time capital expenses that increased the cost by $0.69/household/month. This will be illustrated further in Section 6.

Table 4.11 shows that when all of the programs are complied, Fayetteville ranks fourth at $180.21/ton on a cost for all tons managed basis, as they manage the largest amount of solid waste at 76,725 tons annually. Fayetteville ranks fifth in monthly household cost at $19.04/household. It is acknowledged that solid waste collection and processing is in a constant state of flux, where entities both public and private are continually looking for more efficient, cost effective and environmentally sound solutions to manage solid waste and stay within budgets. There are many challenging factors with the type of programs offered, equipment and other factors that one must take into consideration when comparing solid waste collection cost.

Table 4.11 - Gross Cost of Current Solid Waste Program

	Fayetteville	Winston-Salem	Greenville	High Point	Greensboro	Durham	Wilmington
The Cost Per Ton of All Waste Managed ($/Ton Basis)	$180.21	$157.87	$180.62	$271.09	$131.41	$107.95	$215.77
Rank	**4**	**3**	**5**	**7**	**2**	**1**	**6**
Monthly Cost Per Household for Total Solid Waste Collection, Processing & Disposal Activities	19.04	15.41	18.56	24.81	17.83	10.03	25.13
Rank	**5**	**2**	**4**	**6**	**3**	**1**	**7**

Table 4.12 summarizes Fayetteville's collection & processing costs. The Gross Monthly Cost for Solid Waste Collection & Processing is $19.04/household/month to the city for all services including contracted services and all tons managed. This cost includes a $48/ton County Solid Waste Fee for use of solid waste facilities and education. Also included in the gross cost is the additional disposal cost for non-compliant loads that are not covered by the $48 fee. As noted earlier in this Section, FY14/15 one-time capital expenses are also included in the $19.04/household/month.

Table 4.12 - Gross Cost of Collection, Disposal & Processing

Number of Households	60,527
Total Tons of All Waste Handled (Trash, Bulk, YW and Recyclables)(1)	76,725
FY 14/15 Budget for Solid Waste Services Including Collection, Admin and Other Services (Excluding Processing and Disposal Costs)(2)	$10,833,101
Cumberland County $48/ Household Fee Total	$2,905,296
Cumberland County 2014 Additional Disposal Charges(3)	$88,103
Gross Cost for FY 2015 for Solid Waste Services Including Processing and Disposal Costs	$13,826,500
Gross Cost Per Ton of All Waste Managed	$180.21
Annual Gross Cost Per Household Solid Waste Collection, Disposal & Processing	$228.44
Monthly Gross Cost Per Household for Solid Waste Collection Disposal & Processing	$19.04

(1) Cumberland County 2104 account 163/ 550 spreadsheet provided to GBB
(2) From City's FY 14/15 Adopted Budget
(3) As reported to City for calendar year 2014 (charges not covered by $48/HH Fee)

The City budgets $10,833,101 for collection services however what is not readily apparent is the additional costs of $48/household annually and additional disposal related to C&D loads and other similar loads not included in the Solid Waste Fee. This is important to understand as a resident is charged a $40/year Solid Waste Fee that does not cover the full cost of waste-related collection services. Table 4.13 provides insight as to certain non-city generated income that covers another portion of the gross cost of services. One of the more notable is the Transfer Station lease agreement with Waste Industries where Fayetteville receives a monthly payment of approximately $5,000/month also included is a $/ton host fee. The 15-year agreement between the City and Waste Industries was entered into August of 2009. In addition are payments received for recyclables and metals and followed by intergovernmental payments such as a County rebate for landfill diversion of recyclable material of $302,635 and the City's share of a $2/ton non-landfill solid waste credit. In total an estimated $666,482 that offsets collection, disposal and processing costs for the City. This amount of non-Fayetteville provided income and the $40/household solid waste fee still does not cover the gross cost of solid waste services.

Table 4.13 - Income to ESD from Outside Sources

Estimated Payment from Waste Industries for Lease of Transfer Station Site (est. FY15 City Budget)(1)	($135,000)
Estimated Payment of for Recyclables and Bulky Metals (est. FY15 City Budget) (2)	($111,847)
Estimated County Rebate to city of $5/year per household FY15	($302,635)
Estimated City share of $2/ton NC non-landfilled solid waste Credit in FY15.	($117,000)
Estimated Annual Income from Outside Sources to ESD	($666,482)

(1) Includes monthly lease payment and per ton host fee

(2) Waste Management payment of $11/ton for recyclables and OmniSource payment for metals

Table 4.14 applies the income from outside sources to the gross cost to show the annual net cost of service of $13,160,018 or an equivalent of $217.42/ household.

Table 4.14 - Net Cost of Services

Gross Cost for FY 2015 for Solid Waste Services Including Collection, Disposal & Processing(1)	$13,826,500
Estimated Income to ESD(2)	($666,482)
Cost for FY 2015 for Solid Waste Services Including Collection, Processing & Disposal Costs - Estimated Credits	$13,160,018
Annual Net Cost of Services/Household not covered by Residential Solid Waste Fees and Credits to the City	$217.42
Monthly Net Cost of Services/Household not covered by Residential Solid Waste Fees and Credits to the City	$18.12

(1) From Table 4.12

(2) From Table 4.13

The net result is $13,160,018 that is paid for from other city sources though City and County taxes, and Interfund transfers, that otherwise the resident would be paying and additional $18.12/month for a total of $58.12/month for solid waste collection services ($40 + $18.12 = $58.12).

4.12 Summary

All of the seven (7) cities that were benchmarked have four basic core collection programs including: residential refuse, residential recycling, bulk item and yard waste. Additionally, they all provide cart service for refuse and recyclable collection, and most have some sort of cart/containerized waste program for their yard waste collection program.

All seven (7) cities provide public refuse collection. Of the seven (7) municipalities, it is worth noting five (5) municipalities provide 4 day a week collection Fayetteville, Winston-Salem, High Point, Greensboro and Durham. Notable exceptions of the five, are High Point and Durham, which collect Monday through Thursday with no collection on Friday.

Greenville charges a monthly fee on their utility bill and has no automated trucks. Wilmington is the only city with a sticker program for excess trash, and only Fayetteville' refuse collection program overlaps with debris clean up, where City refuse crews assist with extra debris clean up on a regular collection day if needed.

Two communities, Winston-Salem and Greensboro, have a true Central Business District program that provides for all of the needs for this segment of customers. Winston-Salem and Greensboro appear to have the most robust CBD program with hand collection, carts and large containers for high volume users. Both programs operate seven (7) days a week. High Point provides cart service for their CBD and it is up to the large volume users to contract out to private haulers for large containers, much the same as done in Wilmington. In Winston-Salem, Greensboro and Wilmington, CBD collection crews of these respective cities also provide downtown and event cleanup operations to varying degrees.

Three (3) bulky item collection programs (Fayetteville, Greenville and Wilmington) have call-ahead service where the resident must call to have items collected. Durham runs a similar program in that residents leave out items on collection day so that crews can note locations for collection by the bulk item crew that collects a day later. Winston-Salem has a limited program where collection is over a partial year period. High Point provides a "Red Box" for exceptionally large piles of debris; this crosses over into the Brush Collection as well.

No program allows for contractor-generated debris pickup, and all accept the standard large items, such as furniture, mattresses, and white goods. The Fayetteville bulky item collection program provides much more than curbside collection. This bulky item collection also includes illegal dumpsite mitigation and handles cleanup of City-sponsored events, while other cities (Winston-Salem, Greensboro and Wilmington) have this function completed by their Central Business District crews.

Brush and leaf collection overlaps with yard waste collection in all seven (7) cities. This is a core program offered by all cities and is seasonally dependent. All of these organics collection programs have a containerized component and use a variety of vehicles from rear load trucks to automated trucks. Durham offers up to three yard waste carts for an $18/month leasing fee outside, and in addition to, the regular service fee. This "cart rental" fee is added to the water bill.

Most of the benchmarked cities have a seasonally limited loose leaf collection that starts in late fall and runs through some sort of predetermined period with the exception of Fayetteville who uses parks crews to collect loose leaves and High Point where the street department collects loose leafs in the fall and winter months. For these two cities, left overs are relegated to the solid waste departments to finish collecting once the parks and street departments declare the service completed. Wilmington is the only city to take their yard waste to a private contractor for processing and the only city to pay a discreet processing fee.

All cities provide single stream recycling in carts with the most significant difference being that Fayetteville is the only city to use 35-gallon carts for recyclable collection. Although this is a weekly collection program contracted out to Waste Management, a 35-gallon cart appears to be adequate for most homeowners. To move to an every-other-week (EOW) program would require larger carts at a minimum, generally 96-gallon in size. Fayetteville also includes recycling cart delivery and maintenance costs in the recycling program.

Both Fayetteville and Winston-Salem contract through a private hauler (Waste Management) for recyclables collection services. Of the seven municipalities, Fayetteville generates the sixth lowest recyclables weight per household at 5.90 pounds/household/week. Greenville is the lowest at 5.55 pounds/household/week. While contracting out for services, Fayetteville is the third lowest annual net cost per household for curbside recycling services at $37.09/household and it is above the average cost of $32.89/household. This is a function of the contract price, tons collected and rebate revenues. On a net cost per household-High Point (public) is the highest and operates its own MRF and charges itself a $30/ton fee; Wilmington (2nd highest) has private subscription service (22,000 residents) and is charged a tipping fee; Winston-Salem (contracted with Waste Management) is 2nd lowest at $29.29/ household.

Only three cities budget separate line items for the Administration of their solid waste programs shown in Table 4.7, again the costs are dependent on which services are provided in this area of the department. Fayetteville's costs are near the middle of those who track this expense as a separate item. It seems as though Fayetteville has one of the leanest Administrative support services, as far as personnel are concerned, with eight total employees. However, it should be cautioned other cities include post collection personnel and other positions that may not be directly related to collections.

Most cities lease their collection equipment from fleet services and do not track costs as closely as Fayetteville. There was not much reported financial information available from other cities, therefore GBB developed a "households per vehicle" comparison. This metric shows that Fayetteville is the third highest with 908 households per vehicle, which could also be looked at as the third most efficient use of vehicles in the benchmarking review.

5 City of Fayetteville's Solid Waste Resource Allocation and Costs

5.1 Introduction

This section deals with the allocation of City resources including equipment and labor applications across the curbside collection programs that the ESD provides for the single-family, duplex and triplex households in Fayetteville. These programs include curbside residential collection of trash, recyclables, bulky item pick up and yard waste. It also includes special services such as dead animal pick up, cart

maintenance and delivery. This section reviews the collection requirements and procedures for managing such materials.

5.1.1 Automated Collection with Carts

5.1.1.1 Carts

The City has opted over the past few years to transition to automated collection with the use of carts for both trash and recyclables collection. A cart can help the resident handle even the heaviest loads of residential garbage. The cart rests on its wheels, instead of on the ground, and can be rolled easily from a home to the curb, even with an unusually heavy load. As opposed to a smaller 15 – 20 gallon open bin, the 35-gallon recycling cart is provided with a lid that reduces the risk of rainstorms and windy days scattering the recyclables and can be rolled with one hand vs. using two hands to carry a bin to the curb.

Another benefit of a cart is the time and effort saved by residents in putting out garbage and recycling. Rather than struggling trying to lift or drag several heavy trash cans or plastic bags on collection days, they simply fill the cart and roll out one or two or even three (if they opt in for yard waste collection).

Stolen or vandalized carts are repaired at the City's expense. However, carts damaged from resident misuse or neglect will be repaired or replaced at the user's expense. Examples of misuse are burning or backing over the cart with your car. Additional carts are sold by the City. Residents desiring delivery of their cart must pay a delivery fee of $11.50. The carts are brown in color and hold 96 gallons. They can be used for both household garbage and yard waste as long as the materials are not mixed.

As an option to the 35-gallon cart, a Super Recycler 96-gallon blue cart can be purchased for $53. The cart will also be delivered by ESD for an additional charge of $11.50. The blue carts can only be used for recycling, not for garbage or yard waste.

Depending on local demographics, an estimated 1 to 6 percent of residents may have physical limitations that make it difficult for them to handle large carts.[1] The City offers special assistance to residents who demonstrate such a need.

5.1.1.2 Automated Collection Vehicles

The City has been moving to fully automated MSW collection over the past six (6) years. The current batch of new ASL trucks will give the ESD a fully automated fleet in FY15/16. An ESD study found that four automated trucks replace five rear-load trucks and six (6) positions which are typically reduced through attrition.

Automated collection methods have numerous advantages over traditional collection methods. With fully automated vehicles, the driver controls hydraulic arms or grippers from the vehicle cab. Unless there are problems, such as overflow materials, improperly prepared materials, obstructed set-outs, or the need for roll-out assistance, the driver can service an entire route without leaving the collection vehicle.

[1] United States EPA "Collection Efficiency Strategies for Success" (December 1999), op. cit., pp. 5/6

GBB research has also found that local governments and haulers that convert to automated MSW collection have found many of the following the benefits:[2]

- Reduced injury risk, such as puncture wounds and lacerations;
- Reduced vehicle needs: Fully automated collection increases (by up to 300 percent) the number of households served per worker, per hour. This increased productivity typically results in a smaller vehicle fleet,
- Decreased labor needs: Automated collection reduces crew size per truck. With fully automated systems, the driver typically works alone,
- Reduced environmental impacts: Automated collection means fewer trucks, lower overall fuel usage, fewer air emissions, and fewer traffic and safety impacts on community streets,
- Reduced weights: Carts with lids help keep water, ice, and snow from set-outs, which also helps control the weight of set-outs and decreases overall cart and/or truck weights,
- Improved neighborhood aesthetics: Uniform containers eliminate unsightly set-outs. Containers with lids are less likely to be tipped over or torn apart by animals, reducing litter potential, and
- Reduced public health risks: Containers with lids help mitigate odor and health concerns.

5.1.2 Residential Trash

The ESD currently uses 12 automated side-load packer trucks and three (3) rear-load packer trucks with cart tippers to collect trash placed in 96-gallon carts. As noted above, the service is provided four days-per-week, that is Monday, Tuesday, Thursday and Friday. The goal is to use fully automated trucks for trash collection in all neighborhoods by replacing the three rear-load trucks.

The proper containerization of trash and placement of carts is codified per Fayetteville City Ordinance 22-10. A simple overview of the ordinance is as follows:

- Carts must be 1-2 feet from the curb with cart handle facing the house,
- Cart lid should be within 6-8 inches of completely closing,
- Residents must allow 4 feet between cart and all other objects, including other carts,
- Carts must not be under low-hanging wires or tree branches close to the road,
- All trash bags much be inside City-approved carts,
- “Extra” trash bags left on the ground or in other non-approved containers will not be collected, and
- Carts must be to the curb by 7 a.m. as the city does not return once the truck has passed a house.

The ESD collection crews clock in about 6:30 a.m. to conduct pre-trip activities and then travel to their route to begin collecting trash around 7 a.m. Trash collection crews typically collect two (2) full loads per day, based on the weights reported by the Cumberland County Landfill, and dump the last load around 3:30 p.m., before returning to the route or traveling back to the staging yard for post-collection activities. Additionally, a small truck route collects 96-gallon carts in tight areas all over the city using a 13 cubic yard body on a Freightliner chassis with a two-man crew. In addition, the City has recently installed FleetMind on the residential trash collection equipment in order to be able to better manage

[2] *ibid*

the fleet and increase customer service. A more extensive discussion on FleetMind is provided in Section 10.

5.1.3 Residential Recycling

The City manages a contract with Waste Management, Inc. (WM) for the collection of single-stream recyclables placed into 35-gallon and 95-gallon blue carts on the same 4-day schedule as the City trash collection crews. By City ordinance, the cart must be curbside by 7 a.m. on the resident's weekly pickup day. Curbside recycling service is provided to city residents who live in single-family through triplex dwellings. There is an extensive list of acceptable recyclables and prohibited items that are presented in Section 13.6. Waste Management, Inc. delivers the collected recyclables to Pratt Industries, who processes and markets baled recyclables. Currently, Pratt rebates Waste Management $22/ton. Based on the City contract with WM, the City receives 50% or $11.00/ton of City recyclable materials delivered to Pratt. The City also has a separate Pratt Industries account for its small truck route collecting recycle from five (5) City facilities and receives an $11/ton rebate, less than the $22/ton received by WM.

5.1.4 Bulky Item

The ESD Bulky Item program collects all items placed curbside and generated by residents that will not fit into a cart or bag. Items collected include, but are not limited to, furniture, mattresses, limb piles, construction debris, and metal items, such as swing sets, grills and bicycles. The ten (10) ESD trucks used for this operation by nine (9) drivers, providing 20 to 40 cubic yards of capacity, have a grapple boom and open beds. One truck is reserved for back-up in case one is in for repairs.

Owner-generated construction debris, which now includes any amount of carpeting, will be collected by City staff for a $50 fee. Contractor-generated debris will not be collected. City ordinance allows the ESD to charge a fee of $357 for each full load of yard waste debris (20 cubic yards or more). There is no fee for loads less than 20 cubic yards. Both the owner-generated construction debris and full loads of yard waste are pre-paid services. Residents need to schedule a pickup through the City Call Center.

Four City bulky item collection crews follow the same schedule as the yard waste crews noted in Section 5.1.6 so that all woody and yard debris are collected on the same day. Due to truck-bed volume constraints, City bulky collection staff may make multiple trips to the disposal facility to empty the truck. Five ESD bulky staff collect special waste items that are too large to fit in your trash can are collected according to zip codes. Staff may also travel back to the staging yard to empty material into a metals container, or the tire container in the case of an illegal dump clean up. These five bulky crews also work on Wednesdays. If scheduled bulky waste service is light, and personnel otherwise available, they assist with loose trash pick-up and illegal dump site remediation.

5.1.5 Dead Animals

The ESD also collects dead animals from roadways and residences (if they are placed along the curb). This service is provided by a single crew member who collects the animals in a flat-bed truck when ESD is informed of their location by the City Call Center or direct call to the ENS office. After collecting the dead animal(s) and delivering them to the Landfill, the driver will run a route in small areas picking up trash.

5.1.6 Yard Waste

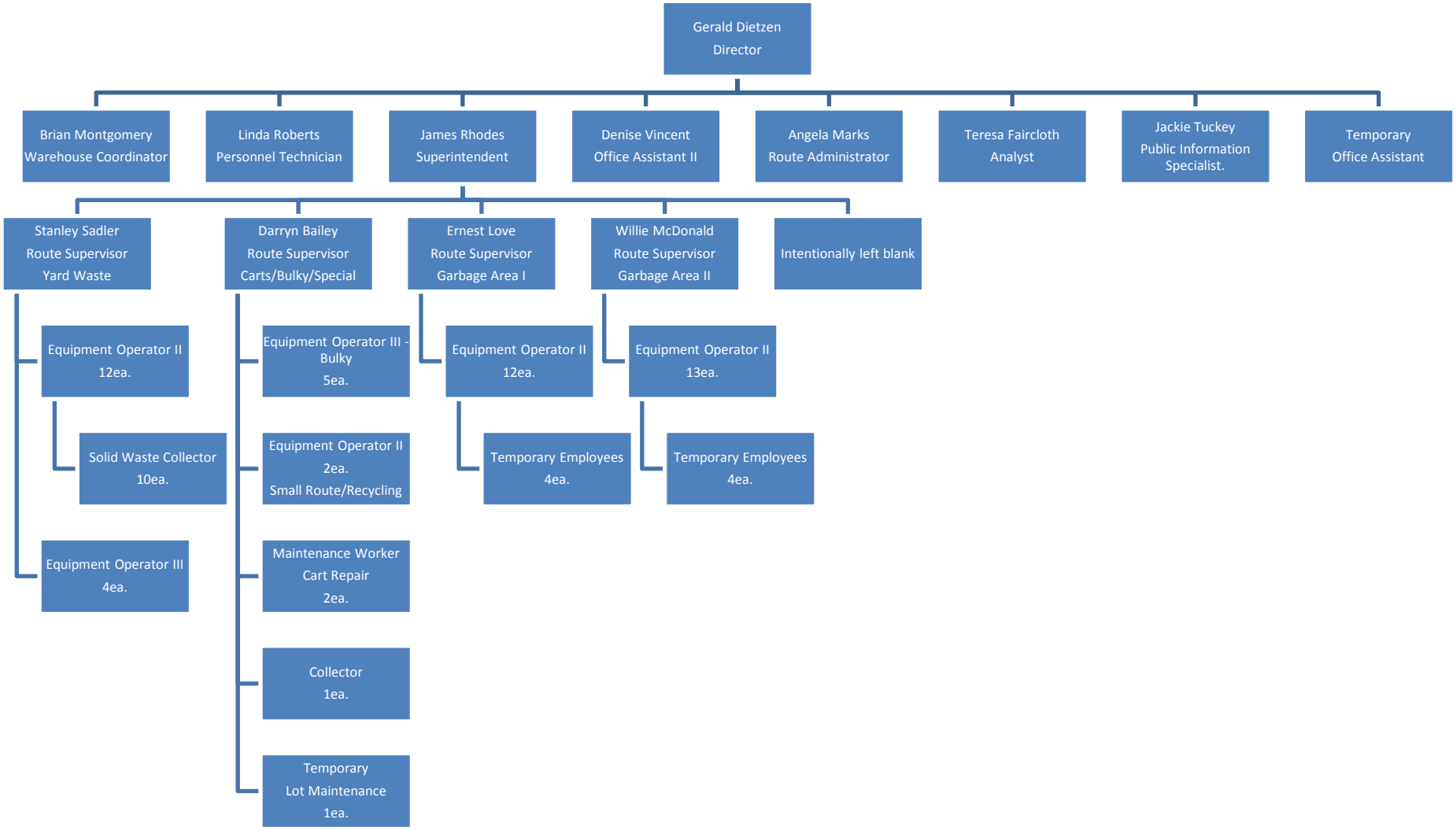
Yard waste consists of grass, weeds, leaves, tree trimmings, plants, shrubbery, pruning, limbs and materials which are generated by the homeowner in the maintenance of yards and gardens. Yard waste must be contained in an approved container not to exceed 32-gallons in size or bags. Limbs must be 3" in diameter, or less, and no longer than three feet in length and placed in an approved container or if the pile does not fit in the container, residents may place the limb pile at the curb for collection by the bulky item truck. It is no longer required to call for service for limb pile collection unless it is over the full load limit of 20 CY. For this service, the City also offers additional 96-gallon rollout carts for $53 each, plus $11.50 for delivery.

To collect yard waste, the ESD uses 10 to 12 rear-load trucks, operating Monday, Tuesday, Thursday and Friday. The number of yard waste trucks used is seasonally dependent. For bagged yard waste, ESD crews must rip open the bag, empty the contents and either (1) place the empty bag back into the resident's nearby cart, or (2) put the bag into a sack tied to the truck for later disposal. In addition, the City has recently installed FleetMind on the yard waste collection equipment to be able to increase productivity and better manage the fleet.

5.2 Environmental Services Department Organization Chart

The responsibility for the day-to-day operation of the ESD falls under the Director (Gerald Dietzen) who reports to the Deputy City Manager (Kristoff Bauer). The ESD staffing matrix is highlighted in Figure 5.1 and includes a Superintendent, four (4) Supervisors, eight (8) administrative staff, numerous equipment operators, a Cart Maintenance Technician, several Collectors and temporary employees. A total of eighty-two (82) full time equivalent staff and temporary employees are currently authorized in the Environmental Services Department.

Figure 5.1 - Environmental Services Organizational Chart



5.3 Collection Route Information

This section highlights the route information and details on ESD assets, organized by collection program. The information also provides the main service vehicles routed, versus the spare trucks maintained by ESD. This section also provides the number of routes, per week, by collection program.

5.3.1 Weekly Routes

Four types of services are provided by the City. The normal weekly service level, that is the number of routes and the days of the week on which collection service is provided, is as follows:

- Residential Refuse Collection - 60 total routes per week on Monday, Tuesday, Thursday and Friday;
- Bulky Item Collection- 40 to 48 total routes per week on Monday, Tuesday, Thursday and Friday, dependent on seasonality and call-ins for service;
- Yard Waste Collection – 40 to 48 total routes per week on Monday, Tuesday, Thursday and Friday, dependent on seasonality; and
- Small Truck routes - 8 total routes per week on Monday, Tuesday, Wednesday, Thursday and Friday, collecting from hard to get places and city facilities collecting both refuse and recyclables.

5.3.2 Asset Allocations

Table 5.1 shows the trash assets of the ESD, and indicates that 22 vehicles can be normally routed as/if needed, with ten (10) vehicles identified as spares. In addition, five pick-up trucks are provided for the Supervisors and Superintendent. A routed vehicle is the primary vehicle that is normally used for collection and a vehicle designated as a spare is the backup and/ or used to augment the primary vehicles in the instances where extra crews are needed. A vehicle designated as “other” is a support vehicle such as a supervisors pickup truck used to monitor collection crews or follow up on citizen complaints.

The spare factor for the frontline collection equipment, minus any supervisory trucks, is 45%. While this may seem high, it is effective under the current maintenance situation. ESD personnel report that their collection trucks are out-of-service for up to three weeks at a time. GBB recommends that the maintenance program for ESD equipment be further studied to determine the best method of maintaining trucks to reduce down time and costs, as well as this spare factor.

Table 5.2 lists the ten (10) boom/grapple trucks used for bulky item collection. These consist of five (5) different chassis manufacturers and the asset age spans a 7-year range for the primary routed vehicles.

The ESD runs 10 to 12 routes daily, with an 11% spare factor for this bulky waste collection program. The collection uses boom/grapple trucks. Over the last 5 years ESD has transitioned from 20 cubic yard to 30 cubic yard to 40 cubic yard to increase capacity and reduce turn-around time. This has allowed ESD to be able to service the City’s growth areas and not buy new equipment.

Table 5.1 - Trash Vehicle Asset List

No.	Year	Vehicle No.	Description	Primary use	Body Manufacturer	Type	Routed/ Spare/ Other
1	2011	4071	2011 FREIGHTLINER M2-106	Garbage	Loadmaster	STR	Routed
2	2007	4040	CRANE CARRIER	Garbage	Loadmaster	RL	Routed
3	2008	4056	CRANE CARRIER	Garbage	Loadmaster	RL	Routed
4	2008	4057	CRANE CARRIER	Garbage	Loadmaster	RL	Routed
5	2009	4063	CRANE CARRIER	Garbage	Loadmaster	RL	Routed
6	2011	4069	2011 MACK TRUCKS LEU600	Garbage	Loadmaster	RL	Routed
7	2011	4070	2011 MACK TRUCKS LEU600	Garbage	Loadmaster	RL	Routed
8	2011	4072	2011 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
9	2012	4073	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
10	2012	4075	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
11	2012	4076	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
12	2012	4077	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
13	2012	4079	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
14	2012	4080	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
15	2013	4081	2013 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
16	2013	4084	2013 MACK TRUCKS LEU600	Garbage	Heil	ASL	Routed
17	2013	4085	2013 FREIGHTLINER 108SD	Garbage	Heil	RL	Routed
18	2014	4089	2014 MACK TRUCKS LEU600	Garbage	Labrie	ASL	Routed
19	2014	4090	2014 MACK TRUCKS LEU600	Garbage	Labrie	ASL	Routed
20	2014	4091	2014 MACK TRUCKS LEU600	Garbage	Labrie	ASL	Routed
21	2014	4092	2014 MACK TRUCKS LEU600	Garbage	Labrie	ASL	Routed
22	2006	2099	2006 FORD F350 XL SD	Garbage		Utility	Routed
23	2005	4030	2005 FREIGHTLINER M2-106	Driver	Heil	STR	Spare
24	2008	4048	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
25	2008	4053	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
26	2008	4058	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
27	2008	4059	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
28	2009	4064	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
29	2012	4078	2012 MACK TRUCKS LEU600	Garbage	Heil	ASL	Spare
30	2013	4082	2013 MACK TRUCKS LEU600	Garbage	Heil	ASL	Spare
31	2013	4083	2013 MACK TRUCKS LEU600	Garbage	Heil	ASL	Spare
32	2007	4035	CRANE CARRIER	Garbage	Loadmaster	RL	Spare
33	2009	2123	2009 FORD F150	Garbage Spvr		Pick up	Other
34	2009	2124	2009 FORD F150	Garbage Spvr		Pick up	Other
35	2009	2124	2009 FORD F150	Garbage Spvr		Pick up	Other

ASL- Automated Side Loader

RL- Rear Load Packer

STR- Small Truck Route

Table 5.2 - Bulky Item Vehicle Asset List

No.	Year	Vehicle No.	Description	Primary use	Body Manufacturer	Type	Routed/ Spare/ Other
1	2007	5177	2007 CHEVROLET 7500 CHEVROLET	Bulky	Peterson Ind	Grapple	Routed
2	2007	5178	2007 CHEVROLET 7500 CHEVROLET	Bulky	Peterson Ind	Grapple	Routed
3	2007	5183	2007 STERLING Acterra	Bulky	Peterson Ind	Grapple	Routed
4	2005	5163	2005 STERLING 7500 STERLING	Bulky	Peterson Ind	Grapple	Routed
5	2009	4061	2009 INTERNATIONAL 7600	Bulky	Peterson Ind	Grapple	Routed
6	2009	4062	2009 INTERNATIONAL 7600	Bulky	Peterson Ind	Grapple	Routed
7	2014	4086	2014 INTERNATIONAL 7500 SFA	Bulky	Peterson Ind	Grapple	Routed
8	2014	4087	2014 INTERNATIONAL 7500 SFA	Bulky	Peterson Ind	Grapple	Routed
9	2014	4088	2014 FREIGHTLINER 114SD	Bulky	Peterson Ind	Grapple	Routed
10	2005	5137	2005 STERLING Acterra	Bulky	Peterson Ind	Grapple	Spare
11	2010	4068	2010 FORD RANGER	Bulky Spvr		Pick up	Other

Yard waste collection consists of older rear-load trucks and has a higher spare factor to accommodate for seasonality and breakdowns of the older equipment. Table 5.3 provides the details on the yard waste vehicle assets. Of the 18 frontline yard waste trucks, all consisting of 2007 and 2008 model year chassis', three (3) are designated spares which gives the yard waste collection program a 20% spare factor.

Table 5.3 - Yard Waste Vehicle Asset List

No.	Year	Vehicle No.	Description	Primary use	Body Manufacturer	Type	Routed/ Spare/ Other
1	2004	2083	2004 CHEVROLET SILVERADO	Y/W Supervisor		Pick up	Other
2	2008	4042	2008 CRANE CARRIER LET - 40-E	Yardwaste	Loadmaster	RL	Routed
3	2008	4043	2008 CRANE CARRIER LET - 40-E	Yardwaste	Loadmaster	RL	Routed
4	2008	4047	CRANE CARRIER	Yardwaste	Loadmaster	RL	Routed
5	2008	4049	CRANE CARRIER	Yardwaste	Loadmaster	RL	Routed
6	2007	4036	CRANE CARRIER	Yardwaste	Loadmaster	RL	Routed
7	2007	4037	CRANE CARRIER	Yardwaste	Loadmaster	RL	Routed
8	2008	4044	2008 CRANE CARRIER LET - 40-E	Yardwaste	Loadmaster	RL	Routed
9	2008	4045	CRANE CARRIER	Yardwaste	Loadmaster	RL	Routed
10	2008	4046	CRANE CARRIER	Yardwaste	Loadmaster	RL	Routed
11	2008	4051	CRANE CARRIER	Yardwaste	Loadmaster	RL	Routed
12	2008	4052	CRANE CARRIER	Yardwaste	Loadmaster	RL	Routed
13	2008	4042	2008 CRANE CARRIER LET - 40-E	Yardwaste	Loadmaster	RL	Routed
14	2008	4043	2008 CRANE CARRIER LET - 40-E	Yardwaste	Loadmaster	RL	Routed
15	2008	4047	CRANE CARRIER	Yardwaste	Loadmaster	RL	Routed
16	2008	4049	CRANE CARRIER	Yardwaste	Loadmaster	RL	Routed
17	2007	4031	CRANE CARRIER	Yardwaste	Loadmaster	RL	Spare
18	2007	4032	CRANE CARRIER	Yardwaste	Loadmaster	RL	Spare
19	2008	4050	CRANE CARRIER	Yardwaste	Loadmaster	RL	Spare

RL- Rear Load Packer

Table 5.4 shows the vehicles available for use by ESD administration and/or special service needs. Three of the eight (8) vehicles are used by the cart technicians to provide both the cart delivery and cart maintenance services needed to meet the City's needs. There are four spare pickup trucks in this cost center that may need determination as to their actual use.

Table 5.4 - Administration/Special Services/Other Vehicle Asset List

No.	Year	Vehicle No.	Description	Primary use	Body Manufacturer	Type	Routed/ Spare/ Other
1	2006	2098	2006 JEEP LIBERTY	Director		SUV	N/A
2	2009	4060	2009 FORD F150	Superintendent		Pick up	Other
3	2012	4074	2012 FORD F350	Cart Tech		Utility	Routed
4	2008	4054	2008 CHEVROLET W-4500	Cart Tech	PJ's Body Inc	Utility	Routed
5	2004	4018	2004 FORD F350 XL SD	Cart Tech	PJ's Body Inc	Utility	Spare
6	2010	4067	2010 FORD RANGER			Pick up	Spare
7	1997	2056	1997 FORD F150			Pick up	Spare
8	2010	4067	2010 FORD RANGER			Pick up	Spare

5.4 Tonnage Data

Tonnage information for calendar year 2014 has been applied to the ESD truck assets to determine the utilization of the routed and spare trucks. Table 5.5 shows all of the residential tons managed by the ESD staff for calendar year 2014. The ESD delivered 47,541 tons of trash material for disposal at Ann St. Landfill. In addition, ESD crew's delivered 19,861 tons of yard waste to the Wilkes Road Yard Waste Facility and separated 45 tons of metal for OmniSource to collect at the ESD department facility. Waste Management, Inc. delivered 8,613 tons of city-generated recyclable material to Pratt Industries. Not included in the Table 5.5 total tonnage are 967 tires collected by the ESD from illegal dumpsites and deemed incidental to loads otherwise delivered to the main facilities noted. The city total recyclables for FY 13/14 was estimated to be 9,280 tons.

Table 5.5 - All Residential Tons Managed, Calendar Year 2014

Disposal/ Processing Facility	Tons	Material
Ann St. Landfill	45,730	Residential Refuse Collection
Ann St. Landfill	1,807	Bulky Item Collection
Ann St. Landfill	2	Dead Animals Collection
Wilkes Rd. Yard Waste Facility	19,861	Yard Waste Collection
Pratt Industries & Others	9,235	Single Stream Recycling and Other
Omnisource	45	Metal from Bulky Item Collection
Total	**76,680**	

To review truck utilization to ensure efficient and full optimization, it is necessary to review such parameters as available hours of operation of the disposal sites, allowable collection crew start time, and the amount of labor needed to perform collection services, and the availability of the collection trucks. This report focuses on the primary collection trucks typically dedicated to one collection service with minimal overlap, as opposed to the small route trucks that collect various waste streams throughout the week.

The city has made a sizable investment in fully automated side-loader (ASL) packer trucks and carts to provide its residents with automated refuse collection. Table 5.6 shows the utilization of the ASL trucks during 2014.

The City's 16 ASL's (12 routed/4 spares) collected approximately one-third of the City's 76,725 tons collected in calendar year 2014. Using 2,886 loads delivered to Ann St. Landfill, the ASL's averaged 14 loads per day as a group, or 1.2 loads per truck per collection day. The average ASL load of approximately nine (9) tons is well within the capacity of the 24 cubic yard Heil packer truck body. The Heil automated truck bodies are utilized as designed considering limitations of the operating hours at the landfill and driver start times. GBB notes approximately 33% of the ASL's loads in 2014 averaged 11 tons with 50% of those loads between 9 and 11 tons and the other 50% between 11 and 13 tons. This indicates a heavy first load and a light second load.

Table 5.6 - Routed Automated Side-Loader Utilization for Trash

Disposal Location	Collection Truck Type	Loads	Tons	Avg. Tons per load	Avg. Number of Loads/ Day
Ann St. Landfill	Fully Automated Side Load Packer	2,886	25,640	8.9	14

The ESD waste collection program relies on 30 rear-load packer trucks to mainly collect yard waste and assist with bulky item collection. Table 5.7 breaks down the 21 routed rear-load packer collection trucks and the loads disposed during 2014.

Table 5.7 - Routed Rear-Load Packer Utilization

Disposal Location	Collection Truck Type	Loads	Tons	Avg. Tons per load
Ann St. Landfill	Rear load Packer	257	2,297	8.9
Wilkes Rd. Yard Waste Facility	Rear load Packer	1,836	9,511	5.2
Total	**Rear load Packer**	**2,093**	**11,808**	**5.6**

Routed rear-load packer trucks account for delivering approximately 5% of the City's waste to Ann St. Landfill and 48% of the City yard waste that is collected and then delivered to Wilkes Rd. Yard Waste Facility. As the rear-load trucks may perform double duty on a collection day, this report focuses on the average tons per load size based on the disposal location. The loads delivered to the Wilkes Rd. Yard Waste Facility are light, which is understandable as yard waste collection is labor intensive with workers ripping and emptying bags. As a group, the routed rear-load packer trucks averaged 10 loads a day (based on 208 work days per year).

The service loads completed in 2014 by the remaining nine (9) rear-load packer spare trucks are shown in Table 5.8. It is important to note the spare rear-load packer trucks delivered a significantly larger amount of trash to the Ann St. Landfill than the main route trucks. This can lead to higher maintenance cost by running spares vs. routed trucks. It also may indicate issues with the maintenance program itself, where the primary route trucks are not available as they should be.

The spare rear-load packer trucks averaged 13 loads per day as a group. The load sizes mirror routed rear-load packer loads to Wilke St. Yard Waste Facility and were slightly heavier with their trash loads to Ann St. Landfill.

Table 5.8 - Spare Rear-Load Packer Utilization

Disposal Location	Collection Truck Type	Loads	Tons	Avg. Tons per load
Ann St. Landfill	Rear load Packer	2,058	18,420	9.0
Wilkes Rd. Yard Waste Facility	Rear load Packer	619	3,212	5.2
Total	**Rear load Packer**	**2,677**	**21,632**	**8.1**

Nine (9) ESD grapple trucks are routed with one being utilized as a spare and they averaged slightly over one (1) load per day. It is difficult to determine the utilization as bulky waste material varies significantly based on density of the waste material.

Table 5.9 - Routed Grapple Truck Utilization

Disposal Location	Collection Truck Type	Loads	Tons	Average Number of Loads per Day	Avg. Tons per load
Ann St. Landfill(1)	Grapple	976	1,780	5	1.8
Wilkes Rd. Yard Waste Facility(2)	Grapple	1,694	4,122	8	2.4
Total	**Grapple**	**2,670**	**5,902**	**13**	**2.2**

(1) C&D, Carpet, Furniture and other similar material

(2) Brush, Lot Maintenance debris, etc.

Table 5.10 highlights the data gleaned from the small packer truck routes. These routes support the various other collection programs collecting trash, etc., on City streets not accessible by the larger collection vehicles. They also collect recyclables from City facilities. However, this later service is not specifically reviewed in this report due to the small quantities handled.

The small packer truck route averages one (1) load per day. It is not fully loaded since it covers various areas of the City as it is needed to complement the larger vehicles.

Table 5.10 - Small Route Truck Utilization

Disposal Location	Collection Truck Type	Loads(1)	Tons	Avg. Tons per load
Ann St. Landfill	Small Packer	225	184	0.8

(1) Does not include Recycling Route; Ann St. Landfill only, no loads taken to Wilkes Rd. Yard Waste Facility

5.5 Route Metrics

Due to the recent installation of FleetMind, reliable metrics or historic numbers at the daily and route level have not been available. This section reviews the route metrics for the three primary collection programs. With the residential refuse, bulky item and yard waste collection, the ESD crews tend to stay on the same collection service for the entire day and week. Table 5.11 illustrates the residential refuse collection program productivity statistics. The driver hours are the program total over four individual weeks in calendar year 2014. This provides a glimpse of the seasonal averages over the year and shows the effects of seasonality on the work ESD performs.

Weekly driver hours are the total hours spent by the collection crews for the week servicing the citywide 60,527 households. Table 5.11 illustrates the weekly average for the residential trash collection program. Driver hours include all time spent from clock-in to clock-out and includes any paid breaks, training or administrative time. It also includes hours spent in the operation of the truck on-route, and pre and post route activities. It does not include unpaid time during the course of a work day, nor does it include hours incurred by another employee working on the truck; if such occurs. For example, if a truck is assigned a driver and a helper for the day, they both may be clocked in for 10 hours for the day to run a collection route. However, only the driver's time is counted for 10 driver hours for the day.

Table 5.11 - Residential Trash Collection Statistics by Season

Week Ending	Weekly Driver Hours	Weekly Households	Average Households/ Hour/Route
2/02/14	627.5	60,527	96.5
5/11/14	776.0	60,527	78.0
7/20/14	657.5	60,527	92.1
10/12/14	656.5	60,527	92.2
Average	**679.4**	**60,527**	**89.1**
On Route Average	**543.5**	**60,527**	**111.4**
Household Service Time(1)			**32.5 Seconds**

(1) Using On Route Average of 111.4 households/hour and assuming 100% set out

Using mostly fully automated collection trucks, Table 5.11 indicates that the average annual number serviced is 89.1 households/hour. On a typical collection route approximately two (2) hours are spent in non-collecting actions such as pre-and post-route activities, disposal trips and traveling to and from route. Excluding these "non-collecting" times provides the actual on-route average annual collection of 111.4 households/hour. Assuming 100% set out rate. This equates to a service time per households of 32.5 seconds. Weekly driver hours remained relatively consistent over the four weeks with a low in February (a lighter tonnage month) of 627.5 weekly driver hours to a high in May (a heavier tonnage month) of 776.0 weekly driver hours.

Bulky item collection productivity is shown in Table 5.12 as combined bulky item and yard waste collection. Even though it is an on-call service, this table normalizes the data using the 60,527 households for production statistics. Due to the low amount of stops collected by bulky item crews, this table considers the household a drive-by, where the crew is driving past many more homes than they are collecting at individual stops on a daily basis. Their productivity is measured by drive-bys/hour/route. As it is for trash collection, on a typical bulky item collection route approximately two (2) hours are spent in non-collecting actions such as pre-and post-route activities, disposal trips and traveling to and from route. Excluding these "non-collecting" times provides the actual on-route average annual collection of 286.7 drive-bys/hour.

Table 5.12 - Bulky Item Collection Statistics by Season

Week Ending	Weekly Driver Hours	Weekly Households	Drive-Bys/ Hour/Route
2/02/14	182.5	60,527	331.7
5/11/14	330.5	60,527	183.1
7/20/14	350.5	60,527	172.7
10/12/14	192.0	60,527	315.2
Average	**263.9**	**60,527**	**229.4**
On Route Average	**211.1**	**60,527**	**286.7**

(1) Even though it is an on-call service, all households were used as a basis for calculations as the true number of pick ups per week will fluctuate week-to-week

The same trend comes to light with bulky item collection as with the trash collection. More hours are needed to collect bulk items and brush in the warmer months of May and July, when more of these items are set out by homeowners. However due to the 10-12 routes/day fluctuation, it would be best to look at this table as an overall average of 229.4 drive-bys/hour/route. As a word of caution in interpreting the information, the bulk item collection crews are not collecting 3 times as efficiently as the residential trash crews summarized in Table 5.11. Rather, it is a function of the on-call nature of this bulky waste program where they may collect 11 to 12 per truck per day not including paid pickups, code violations and illegal dump site remediation (for these add about 2 more per truck per day), and only using the 60,527 households as a reference point. Yard waste collection, summarized in Table 5.13 shows that October is a heavier month at only 138.2 drive-bys/hour/route due to the fall leaves and

brush that end up curbside. The same cautionary note regarding comparisons can be said for yard waste collection as for bulky item collection in determining their productivity using the term drive-bys/hour/route. And as for the previous two waste collection services, a typical yard waste collection route will have approximately two (2) hours are spent in non-collecting actions such as pre-and post-route activities, disposal trips and traveling to and from route. Excluding these "non-collecting" times provides the actual on-route average annual collection of 204.3 drive-bys/hour.

Table 5.13 - Yard Waste Collection Statistics by Season

Week Ending	Weekly Driver Hours	Weekly Households	Drive-Bys/ Hour/Route
2/02/14	301.3	60,527	200.9
5/11/14	376.0	60,527	161.0
7/20/14	366.0	60,527	165.4
10/12/14	438.0	60,527	138.2
Average	**370.3**	**60,527**	**163.4**
On Route Average	**296.3**	**60,527**	**204.3**

Thus, the average productivity, as measured solely by drive-by counts, for the yard waste collection program will be higher than refuse collection since not every household will put out yard waste on a weekly basis. As would be expected, there is considerable seasonality as seen in February with 200.9 drive-bys/hour/route versus the October data presented. The overall four-week average is 163.4 drive-bys per hour.

5.6 Operation, Maintenance and Capital Costs, by Program

5.6.1 Operation and Maintenance Cost

Table 5.14 through Table 5.18 provides CY 2014 operating and maintenance costs for the ESD vehicles, by cost center. This provides a visual of the cost-per-mile (CPM) including the supervisory vehicles assigned to each cost center. The ESD average cost was $2.40 per mile driven in 2014. Table 5.14 provides an overview, by service program.

Table 5.14 - ESD Vehicle Operating and Maintenance Costs

Department	Calendar Year 2014 ESD Vehicle O&M Cost per		Calendar Year 2014 ESD Vehicle O&M Cost	
	Meter Driven(1)	Total $ CPM	Total $(2)	Fuel $
Non-Program & Administration	30,408	$0.59	$17,994	$4,319
Trash	349,899	$2.83	$988,798	$197,075
Bulky Item	132,316	$1.68	$221,751	$71,732
Yard Waste	134,734	$2.42	$325,501	$107,453
ESD Total	**647,357**	-	**$1,554,044**	**$380,579**
ESD Average/ Vehicle (67 Vehicles)	**9,662**	**$2.40**	**$23,195**	**$5,680**

(1) Meter Driven = Miles

(2) Repair, Warranty, Accident, Capitalization and Fuel

Of the primary collection programs, trash collection services has the highest total cost at $2.83/mile with bulky Item collection vehicles the lowest at $1.68/mile. This would be expected as the equipment in the trash collection program drive on prescribed routes collecting trash on every residential street in the city, while bulky item trucks are dispatched based on appointments and will not run on every street. Also the hydraulic systems are more complex on the trash collection vehicles and operate continuously, as compared to grapple truck hydraulic system which runs periodically.

Table 5.15 provides an overview of the trash collection equipment. There are 42 vehicles assigned to Trash cost center 47182, which includes supervisory, routed, spare and other vehicles. Crane Carriers and Mack Truck LEU600 are the front line chassis used to collect trash from residential 96-gallon carts and considered the workhorse of the fleet. The Freightliner M2-106 and Ford F-350 are small route trucks collecting trash from 96-gallon carts in the areas of the City where the larger trucks cannot easily service, such as dead-end street and narrow drives.

The $2.83 cost per mile for the trash collection in CY 2014 is the highest of the four cost centers. Each automated truck is stopping and collecting from approximately 1,000-1,500 homes per day. This results in the arm and claw used to pick up the carts extending and retracting up to 3,000 times per day.

Table 5.15 - Vehicle Operating and Maintenance Costs, Trash Collection Services

Vehicle Information for Department 47182				Calendar Year 2014 ESD Vehicle O&M Cost per Mile		Calendar Year 2014 ESD Vehicle O&M Cost	
No.	Year	Vehicle No.	Description	Meter Driven(1)	Total CPM	Total $(2)	Fuel $
1	2004	4018	2004 FORD F350 XL SD	5,730	$1.04	$5,947.76	$1,362.98
2	2008	4054	2008 CHEVROLET W-4500	11,510	$0.77	$8,868.52	$3,928.86
3	2011	4071	2011 FREIGHTLINER M2-106	11,587	$0.82	$9,460.00	$5,105.90
4	2007	4040	CRANE CARRIER	5,631	$3.07	$17,280.58	$6,843.96
5	2008	4042	2008 CRANE CARRIER LET - 40-E	6,873	$4.59	$31,568.01	$8,987.27
6	2008	4043	2008 CRANE CARRIER LET - 40-E	11,285	$2.25	$25,339.20	$11,464.16
7	2008	4047	CRANE CARRIER	6,681	$5.64	$37,681.39	$8,116.82
8	2008	4048	CRANE CARRIER	7,348	$3.44	$25,249.39	$9,420.09
9	2008	4049	CRANE CARRIER	9,068	$3.45	$31,285.50	$10,557.59
10	2008	4053	CRANE CARRIER	8,000	$3.15	$25,165.48	$8,863.10
11	2008	4056	CRANE CARRIER	7,190	$5.01	$35,992.04	$8,613.53
12	2008	4057	CRANE CARRIER	10,607	$3.83	$40,628.38	$15,092.75
13	2008	4058	CRANE CARRIER	7,065	$4.26	$30,130.04	$11,240.22
14	2008	4059	CRANE CARRIER	5,790	$7.43	$42,999.75	$8,243.50
15	2009	4063	CRANE CARRIER	5,880	$5.09	$29,933.50	$8,884.72
16	2009	4064	CRANE CARRIER	2,962	$5.02	$14,863.88	$0.00
17	2011	4069	2011 MACK TRUCKS LEU600	3,879	$7.19	$27,891.12	$6,234.67
18	2011	4070	2011 MACK TRUCKS LEU600	2,769	$7.87	$21,792.27	$4,679.87
19	2011	4072	2011 MACK TRUCKS LEU600	10,011	$5.98	$59,910.51	$18,212.06
20	2012	4073	2012 MACK TRUCKS LEU600	9,521	$6.95	$66,154.61	$14,912.72
21	2012	4075	2012 MACK TRUCKS LEU600	8,505	$4.85	$41,211.98	$0.00
22	2012	4076	2012 MACK TRUCKS LEU600	10,774	$3.75	$40,388.69	$0.00
23	2012	4077	2012 MACK TRUCKS LEU600	9,295	$4.10	$38,068.85	$0.00
24	2012	4078	2012 MACK TRUCKS LEU600	11,751	$2.73	$32,040.95	$0.00
25	2012	4079	2012 MACK TRUCKS LEU600	14,569	$1.50	$21,923.28	$0.00
26	2012	4080	2012 MACK TRUCKS LEU600	10,729	$3.96	$42,480.57	$0.00
27	2013	4081	2013 MACK TRUCKS LEU600	9,073	$3.40	$30,881.47	$0.00
28	2013	4082	2013 MACK TRUCKS LEU600	11,488	$2.74	$31,520.15	$0.00
29	2013	4083	2013 MACK TRUCKS LEU600	8,427	$3.76	$31,667.74	$0.00
30	2013	4084	2013 MACK TRUCKS LEU600	9,750	$3.22	$31,430.11	$0.00
31	2013	4085	2013 FREIGHTLINER 108SD	16,718	$1.07	$17,830.23	$10,865.21
32	2014	4089	2014 MACK TRUCKS LEU600	3,314	$1.41	$4,660.57	$0.00
33	2014	4090	2014 MACK TRUCKS LEU600	3,761	$1.58	$5,927.42	$0.00
34	2014	4091	2014 MACK TRUCKS LEU600	3,375	$1.71	$5,769.13	$0.00
35	2014	4092	2014 MACK TRUCKS LEU600	1,682	$1.40	$2,354.70	$0.00
36	2006	2099	2006 FORD F350 XL SD	16,330	$0.46	$7,538.23	$5,436.74
37	2010	4067	2010 FORD RANGER	5,552	$0.30	$1,673.56	$859.70
38	2010	4068	2010 FORD RANGER	6,551	$0.24	$1,584.19	$1,114.15
39	1997	2056	1997 FORD F150	6,479	$0.25	$1,635.20	$1,080.30
40	2009	2123	2009 FORD F150	11,612	$0.35	$4,044.05	$2,549.89
41	2009	2124	2009 FORD F150	16,532	$0.29	$4,773.23	$3,527.59
42	2009	4060	2009 FORD F150	4,245	$0.29	$1,251.60	$876.77
			Total	**349,899**		**$988,798**	**$197,075.13**
			Average	**8,331**	**$2.83**	**$23,543**	**$4,692.26**

(1) Meter Driver = Miles

(2) Repair, Warranty, Accident, Capitalization and Fuel

Table 5.16 provides an overview of bulky item cost center 47183 which has 10 grapple truck collection vehicles assigned. The average cost for bulky item collection is a $1.68/mile. The bulky item trucks are dispatched on a call-in basis to collect bulky items left curbside at residential units. Grapple truck booms are hydraulically operated, however the boom is run at a customer location and averages far less than 1,000 stops per day that a trash truck would normally service.

Table 5.16 - Bulky Item Vehicle Operating and Maintenance Costs

Vehicle Information for Department 47183				Calendar Year 2014 ESD Vehicle O&M Cost per Mile		Calendar Year 2014 ESD Vehicle O&M Cost	
No.	Year	Vehicle No.	Description	Meter Driven(1)	Total CPM	Total $(2)	Fuel $
1	2005	5137	2005 STERLING Acterra	14,186	$1.56	$22,111.87	$10,720.25
2	2007	5177	2007 CHEVROLET 7500 CHEVROLET	13,707	$1.47	$20,121.76	$9,212.47
3	2007	5178	2007 CHEVROLET 7500 CHEVROLET	15,420	$1.50	$23,089.36	$9,595.02
4	2007	5183	2007 STERLING Acterra	11,924	$2.28	$27,238.37	$9,848.68
5	2005	5163	2005 STERLING 7500 STERLING	10,547	$3.20	$33,789.13	$8,072.02
6	2009	4061	2009 INTERNATIONAL 7600	18,162	$1.31	$23,765.99	$12,573.59
7	2009	4062	2009 INTERNATIONAL 7600	10,896	$3.83	$41,743.31	$11,709.52
8	2014	4086	2014 INTERNATIONAL 7500 SFA	14,706	$0.97	$14,331.18	$0.00
9	2014	4087	2014 INTERNATIONAL 7500 SFA	17,684	$0.68	$11,987.57	$0.00
10	2014	4088	2014 FREIGHTLINER 114SD	5,084	$0.70	$3,572.64	$0.00
			Total	**132,316**		**$221,751**	**$71,731.56**
			Average	**13,232**	**$1.68**	**$22,175**	**$7,173.16**

(1) Meter Driver = Miles

(2) Repair, Warranty, Accident, Capitalization and Fuel

Table 5.17 provides an overview of yard waste cost center 47184 which has 11 rear-load collection trucks and one supervisor truck. This cost center consists of older trucks; five built in 2007 and six 2008 rear-load packer trucks. The use of older rear-loaders is common of yard waste collection operations. Containerized yard waste collection programs using homeowner cans and bags require two man crews at a minimum. As trucks are transitioned out of the more demanding trash collection program they will be used by yard waste crews until the trucks are retired.

Table 5.17 - Yard Waste Vehicle Operating and Maintenance Costs

Vehicle Information for Department 47184				Calendar Year 2014 ESD Vehicle O&M Cost per Mile		Calendar Year 2014 ESD Vehicle O&M Cost	
No.	Year	Vehicle No.	Description	Meter Driven(1)	Total CPM	Total $(2)	Fuel $
1	2007	4031	CRANE CARRIER	8,530	$3.10	$26,445.92	$8,186.39
2	2007	4032	CRANE CARRIER	8,576	$2.95	$25,285.19	$9,526.46
3	2007	4035	CRANE CARRIER	9,195	$3.55	$32,660.20	$10,882.25
4	2007	4036	CRANE CARRIER	5,696	$7.84	$44,632.55	$8,518.12
5	2007	4037	CRANE CARRIER	9,841	$2.63	$25,927.99	$11,173.04
6	2008	4044	2008 CRANE CARRIER LET - 40-E	9,152	$2.70	$24,711.12	$9,555.58
7	2008	4045	CRANE CARRIER	36,808	$0.81	$29,986.84	$10,440.31
8	2008	4046	CRANE CARRIER	7,265	$4.67	$33,899.12	$8,040.40
9	2008	4050	CRANE CARRIER	9,291	$2.29	$21,303.96	$9,103.23
10	2008	4051	CRANE CARRIER	9,222	$2.72	$25,064.67	$8,636.75
11	2008	4052	CRANE CARRIER	9,659	$3.34	$32,305.43	$11,209.11
12	2004	2083	2004 CHEVROLET SILVERADO	11,499	$0.29	$3,277.84	$2,181.65
			Total	**134,734**		**$325,501**	**$107,453.27**
			Average	**11,228**	**$2.42**	**$27,125**	**$8,954.44**

(1) Meter Driver = Miles

(2) Repair, Warranty, Accident, Capitalization and Fuel

Rear-load packer trucks used for yard waste collection equipment will not collect as many stops as a trash truck and the hydraulic system will not cycle as often. This is also illustrated in the earlier Table 5.13 showing twice as many yard waste drive-bys/hour as a trash truck collects, which equates to the yard waste trucks collecting from approximately ½ the number of trash stops per day on average. The average cost in CY 2014 for yard waste collection was $2.42/mile.

Finally, cost centers 47180/47181 consist of a Jeep Liberty for the director and two special service trucks primarily used for cart delivery. Table 5.18 provides an overview of the usage and cost of this centers vehicles.

Table 5.18 - Administration and Special Services Vehicle Operating and Maintenance Costs

Vehicle Information				Calendar Year 2014 ESD Vehicle O&M Cost per Mile		Calendar Year 2014 ESD Vehicle O&M Cost	
No.	Year	Vehicle No.	Description	Meter Driven(1)	Total CPM	Total $(2)	Fuel $
1	2005	4030	2005 FREIGHTLINER M2-106	7,105	$2.13	$15,152.67	$4,133.81
2	2012	4074	2012 FORD F350	21,811	$0.11	$2,449.39	$0.00
3	2006	2098	2006 JEEP LIBERTY	1,492	$0.26	$391.78	$185.50
			Total	**30,408**		**$17,994**	**$4,319.31**
			Average	**10,136**	**$0.59**	**$5,998**	**$1,439.77**

(1) Meter Driver = Miles

(2) Repair, Warranty, Accident, Capitalization and Fuel

While these vehicles will see the least amount of use they are part of the overall operating cost ESD and therefore must be included in the overall equipment cost review. The average cost for these three vehicles was $0.59/mile in CY 2014.

The ESD works closely with PWC to ensure there is enough operating equipment to provide collection services for the city. The working relationship includes establishing and implementing replacement parameters based upon an 8-year replacement schedule. This is ensures the city has the operating equipment needed to provide the required and satisfactory collection services. The factors involved are age of the truck, maintenance costs and budget constraints. It is important to track maintenance costs as the oldest trucks may not be a replacement candidate as it has low maintenance costs. Conversely, a high maintenance cost truck may not be a replacement candidate as it may have just had a major component replaced extending its useable life.

The replacement procedures ESD and PWC have established include that at the seven year mark, the equipment list is reviewed and submitted with the annual budget. Once City Council approves replacement equipment in FYQ1, a truck order is placed in September of current FY. It typically takes 18 months for equipment to be received due to the backlog at equipment manufacturers. Once received and in operation, ESD retires a truck and PWC sells the used equipment for the City through GovDeals.com and charges a 10% handling fee.

5.6.2 Capital Cost

The following five tables, (Tables 5.19 through 5.23), provide a high level look at the maintenance costs, by program, and includes the ESD 5–year vehicle replacement plans. This review culminates in a summary on Table 5.24 of the ESD as a whole. The Table 5.19 five-year individual vehicle replacement plan covers a cart delivery truck and the ESD Director's vehicle.

Table 5.19 - Special Services/Administration

Vehicle Number	Dept	Year	Make	Model	Replacement Year	Purchase Price	LTD Maint	Usage Code	Estimated Replacement Cost	Age
2012/4074	47180	2012	FORD	F350	2021	$37,157.80	$5,975.93	FLATBED, TRUCK, CART	N/A	N/A
2006/2098	47181	2006	JEEP	LIBERTY	N/A	$16,833.74	$3,866.95	4X4, SUV	N/A	N/A
Total						**$53,991.54**	**$9,842.88**		N/A	N/A

The ESD does not plan on replacing a vehicle until 2021 at the earliest. Based on the LTD maintenance costs this seems to be a good plan. Table 5.18 contained three (3) trucks in this cost center. Asset number 4030, a 2005 Freightliner M2-106, is not slated to be replaced due to its age.

Table 5.20 reviews the City's trash collection fleet. This cost center includes supervisor vehicles, a flatbed truck, 2 utility trailers, 2 small route trucks, 12 rear-load packers and 16 automated trucks for a total of 40 pieces of equipment. Similar to cost center 47180/47181, asset numbers 4018 and 2056 are not scheduled for replacement due to age.

Table 5.20 - Trash Collection Assets - Replacement

Vehicle Number	Dept	Year	Make	Model	Replacement Year	Purchase Price	LTD Maint	Usage Code	Estimated Replacement Cost	Age
2008/4042	47182	2008	CRANE CARRIER	LET - 40-E	2016	$147,802.51	$118,289.48	S/WASTE TRUCK	$275,000	8
2008/4047	47182	2008	CRANE CARRIER	LET 2-40 CRANE CARRIER	2016	$147,925.30	$125,345.47	S/WASTE TRUCK	$275,000	8
Total					**2016**	**$295,727.81**	**$243,634.95**		**$550,000**	
2007/4040	47182	2007	CRANE CARRIER	LET 2-40 CRANE CARRIER	2017	$146,159.69	$105,192.66	S/WASTE TRUCK	$175,000	10
2008/4054	47182	2008	CHEVROLET	W-4500	2017	$46,093.33	$24,068.53	TRUCK, BODY, CART	$36,500	9
2008/4057	47182	2008	CRANE CARRIER	LET 2-40 CRANE CARRIER	2017	$161,628.58	$105,092.04	S/WASTE TRUCK	$175,000	9
Total					**2017**	**$353,881.60**	**$234,353.23**		**$386,500**	
2008/4043	47182	2008	CRANE CARRIER	LET - 40-E	2018	$148,200.63	$102,172.89	S/WASTE TRUCK	$175,000	10
2008/4048	47182	2008	CRANE CARRIER	LET 2-40 CRANE CARRIER	2018	$148,329.14	$88,389.99	S/WASTE TRUCK	$175,000	10
2008/4058	47182	2008	CRANE CARRIER	LET 2-40 CRANE CARRIER	2018	$161,999.13	$101,561.24	S/WASTE TRUCK	$175,000	10
2008/4059	47182	2008	CRANE CARRIER	LET 2-40 CRANE CARRIER	2018	$162,310.75	$103,151.98	S/WASTE TRUCK	$175,000	10
2009/2124	47182	2009	FORD	F150	2018	$18,663.21	$9,113.25	PICKUP	$21,000	9
2009/4063	47182	2009	CRANE CARRIER	LET 2-40 CRANE CARRIER	2018	$180,634.46	$108,830.89	S/WASTE TRUCK	$175,000	9
Total					**2018**	**$820,137.32**	**$513,220.24**		**$896,000**	
2008/4056	47182	2008	CRANE CARRIER	LET 2-40 CRANE CARRIER	2019	$161,919.31	$89,185.14	S/WASTE TRUCK	$175,000	11
2009/2123	47182	2009	FORD	F150	2019	$17,304.12	$7,273.90	PICKUP	$21,000	10
2009/4064	47182	2009	CRANE CARRIER	LET 2-40 CRANE CARRIER	2019	$180,033.50	$63,359.58	S/WASTE TRUCK	$175,000	10
2011/4069	47182	2011	MACK TRUCKS	LEU600	2019	$178,751.96	$81,869.81	S/WASTE TRUCK	$175,000	8
2011/4070	47182	2011	MACK TRUCKS	LEU600	2019	$178,072.18	$74,755.68	S/WASTE TRUCK	$175,000	8
2011/4072	47182	2011	MACK TRUCKS	LEU600	2019	$231,079.25	$93,897.83	AUTOMATED S/WASTE TRUCK	$275,000	8
2012/4076	47182	2012	MACK TRUCKS	LEU600	2019	$234,945.16	$74,432.80	AUTOMATED S/WASTE TRUCK	$275,000	7
Total					**2019**	**$1,182,105.48**	**$484,774.74**		**$1,271,000**	
2012/4073	47182	2012	MACK TRUCKS	LEU600	2020	$230,540.73	$63,033.37	AUTOMATED S/WASTE TRUCK	$275,000	8
2012/4075	47182	2012	MACK TRUCKS	LEU600	2020	$235,267.12	$59,424.07	AUTOMATED S/WASTE TRUCK	$275,000	8
2012/4077	47182	2012	MACK TRUCKS	LEU600	2020	$235,048.39	$52,215.54	AUTOMATED S/WASTE TRUCK	$275,000	8
2012/4078	47182	2012	MACK TRUCKS	LEU600	2020	$234,708.41	$72,507.67	AUTOMATED S/WASTE TRUCK	$275,000	8
2012/4080	47182	2012	MACK TRUCKS	LEU600	2020	$235,060.91	$64,101.35	AUTOMATED S/WASTE TRUCK	$275,000	8
Total					**2020**	**$1,170,625.56**	**$311,282.00**		**$1,375,000**	
2010/4067	47182	2010	FORD	RANGER	2021	$16,961.24	$1,890.45	PICKUP, EXTENDED CAB	Not Forecasted	11
2010/4068	47182	2010	FORD	RANGER	2021	$16,526.05	$1,816.10	PICKUP, EXTENDED CAB	Not Forecasted	11
2011/4071	47182	2011	FREIGHTLINER	M2-106	2021	$133,361.81	$16,203.66	S/WASTE TRUCK	Not Forecasted	10
2012/4079	47182	2012	MACK TRUCKS	LEU600	2021	$234,540.70	$44,843.60	AUTOMATED S/WASTE TRUCK	Not Forecasted	9
2013/4081	47182	2013	MACK TRUCKS	LEU600	2021	$233,509.38	$47,614.05	AUTOMATED S/WASTE TRUCK	Not Forecasted	8
2013/4082	47182	2013	MACK TRUCKS	LEU600	2021	$233,536.75	$34,086.67	AUTOMATED S/WASTE TRUCK	Not Forecasted	8
2013/4083	47182	2013	MACK TRUCKS	LEU600	2021	$234,016.68	$38,823.53	AUTOMATED S/WASTE TRUCK	Not Forecasted	8
2013/4084	47182	2013	MACK TRUCKS	LEU600	2021	$233,342.95	$33,489.24	AUTOMATED S/WASTE TRUCK	Not Forecasted	8
Total					**2021**	**$1,335,795.56**	**$218,767.30**		**Not Forecasted**	
2014/4089	47182	2014	MACK TRUCKS	LEU600	2022	$236,016.45	$193.63	AUTOMATED S/WASTE TRUCK	Not Forecasted	8
2014/4090	47182	2014	MACK TRUCKS	LEU600	2022	$235,529.79	$735.48	AUTOMATED S/WASTE TRUCK	Not Forecasted	8
2014/4091	47182	2014	MACK TRUCKS	LEU600	2022	$235,382.72	$329.11	AUTOMATED S/WASTE TRUCK	Not Forecasted	8
2014/4092	47182	2014	MACK TRUCKS	LEU600	2022	$235,060.37	$194.00	AUTOMATED S/WASTE TRUCK	Not Forecasted	8
2013/4085	47182	2013	FREIGHTLINER	108SD	2023	$130,175.29	$7,663.34	S/WASTE TRUCK	Not Forecasted	10
Total					**2023**	**$1,072,164.62**	**$9,115.56**		**Not Forecasted**	
2009/4060	47182	2009	FORD	F150	2024	$19,224.42	$3,991.21	PICKUP	Not Forecasted	15
Total					**2024**	**$19,224.42**	**$3,991.21**		**Not Forecasted**	
2006/2099	47182	2006	FORD	F350 XL SD	N/A	$30,260.99	$68,187.17	FLATBED, TRUCK, DUMP	Not Forecasted	
2010/4065	47182	2010	CARRY ON TRAILER	6X10 GWHS	N/A	$1,671.90	$1,088.92	UTILITY TRAILER	Not Forecasted	
2010/4066	47182	2010	CARRY ON TRAILER	6X10 GWHS	N/A	$1,923.34	$791.95	UTILITY TRAILER	Not Forecasted	
Total					**N/A**	**$33,856.23**	**$70,068.04**		**Not Forecasted**	
47182 Total						**$3,822,477.77**	**$2,089,207.27**		**$4,478,500**	
47182 Avg. by Year						**$256,470.15**	**$232,134.14**		**$895,700**	**9.0**

The average replacement age for these 40 pieces of equipment, which includes trucks and trailers in the trash collection cost center, will be 9.0 years at retirement. Most of the automated trucks have planned replacement at 8 years old, which is not out of the ordinary as the highly mechanical automated trucks have more moving parts than the traditional rear-load trucks, thus incurring more maintenance costs due to increased wear and tear. Maintenance on an automated truck could cost 33% of its original price annually. Rear-load packer trucks are slated for replacement at 10 years old. There seems to be a large number of vehicles in this cost center considering that the ESD runs an average of 15 curbside routes and 2 small truck routes per day. Solid waste industry best practices for the major private waste collection firms is an average of 10-15%, by equipment type, for curbside collection vehicles. The ESD spare factor is 20%, and having forty (40) trucks in this cost center is high and adds to cost. A total of twenty (20) collection trucks would be more in line of what is required, depending on the availability of trucks that are out of service due to maintenance issues.

Table 5.21 reviews the City's bulky item collection fleet. This cost center includes seven (7) grapple/limb trucks.

This equipment will be 9.3 years old at retirement. ESD is purchasing 40 cubic yard body trucks to replace the smaller 20 and 30 cubic yards trucks. Over time, this will allow the crews to stay out up to twice as long collecting bulk items, thus reducing the disposal trips by half. In addition, this reduces mileage, maintenance and labor cost.

Table 5.21 - Bulky Item Collection Assets - Replacement

Vehicle Number	Dept	Year	Make	Model	Replacement Year	Purchase Price	LTD Maint	Usage Code	Estimated Replacement Cost	Age
2007/5177	47183	2007	CHEVROLET	7500 CHEVROLET	2016	$50,246.33	$66,052.21	LIMB TRUCK	$185,000	9
2007/5178	47183	2007	CHEVROLET	7500 CHEVROLET	2016	$51,343.13	$72,306.75	LIMB TRUCK	$185,000	9
Total					**2016**	**$101,589.46**	**$138,358.96**		**$370,000**	
2009/4062	47183	2009	INTERNATIONAL	7600	2018	$173,403.22	$103,029.78	LIMB TRUCK, TANDEM AXLE	$185,000	9
Total					**2018**	**$173,403.22**	**$103,029.78**		**$185,000**	
2009/4061	47183	2009	INTERNATIONAL	7600	2019	$172,093.01	$62,837.86	LIMB TRUCK, TANDEM AXLE	$185,000	10
Total					**2019**	**$172,093.01**	**$62,837.86**		**$185,000**	
2014/4086	47183	2014	INTERNATIONAL	7500 SFA	2023	$165,460.56	$14,224.66	LIMB TRUCK, TANDEM AXLE	Not Forecasted	9
2014/4087	47183	2014	INTERNATIONAL	7500 SFA	2023	$165,429.85	$8,448.77	LIMB TRUCK, TANDEM AXLE	Not Forecasted	9
Total					**2023**	**$330,890.41**	**$22,673.43**		**Not Forecasted**	
2014/4088	47183	2014	FREIGHTLINER	114SD	2024	$172,702.76	$1,174.73	LIMB TRUCK, TANDEM AXLE	Not Forecasted	10
Total					**2024**	**$172,702.76**	**$1,174.73**		**Not Forecasted**	
47183 Total						**$447,085.69**	**$328,074.76**		**$740,000**	
47183 Avg. by Year						**$158,446.48**	**$65,614.95**		**$246,667**	**9.3**

Table 5.22 reviews the City's yard waste collection fleet. This cost center includes 10 rear-load packers and a supervisor truck to collect the city's containerized yard waste year-round.

The yard waste program has the oldest replacement age for its trucks in the fleet at 10.1 years. This is common practice as weights are lower and all trucks are not used daily due to the seasonality of the program. The average LTD maintenance costs are slightly higher than the trash collection fleet, but the trucks are also the oldest in the fleet by two to three years.

Table 5.22 - Yard Waste Collection Assets - Replacement

Vehicle Number	Dept	Year	Make	Model	Replacement Year	Purchase Price	LTD Maint	Usage Code	Estimated Replacement Cost	Age
2007/4031	47184	2007	CRANE CARRIER	LET 2-40 CRANE CARRIER	2016	$144,263.83	$116,984.91	S/WASTE TRUCK	$175,000	9
2008/4045	47184	2008	CRANE CARRIER	LET 2-40 CRANE CARRIER	2016	$148,040.34	$116,846.68	S/WASTE TRUCK	$175,000	8
2008/4051	47184	2008	CRANE CARRIER	LET 2-40 CRANE CARRIER	2016	$148,787.58	$121,406.20	S/WASTE TRUCK	$175,000	8
Total					**2016**	**$441,091.75**	**$355,237.79**		**$525,000**	
2004/2083	47184	2004	CHEVROLET	SILVERADO	2017	$12,285.91	$11,080.20	PICKUP	$21,000	13
2007/4032	47184	2007	CRANE CARRIER	LET 2-40 CRANE CARRIER	2017	$144,784.54	$102,881.14	S/WASTE TRUCK	$175,000	10
2007/4035	47184	2007	CRANE CARRIER	LET 2-40 CRANE CARRIER	2017	$143,883.76	$107,656.48	S/WASTE TRUCK	$175,000	10
2007/4036	47184	2007	CRANE CARRIER	LET 2-40 CRANE CARRIER	2017	$144,252.23	$105,953.93	S/WASTE TRUCK	$175,000	10
Total					2017	**$445,206.44**	**$327,571.75**		**$546,000**	
2007/4037	47184	2007	CRANE CARRIER	LET 2-40 CRANE CARRIER	2018	$144,226.41	$77,154.42	S/WASTE TRUCK	$175,000	11
2008/4044	47184	2008	CRANE CARRIER	LET - 40-E	2018	$148,161.67	$95,993.83	S/WASTE TRUCK	$175,000	10
Total					2018	**$292,388.08**	**$173,148.25**		**$350,000**	
2008/4050	47184	2008	CRANE CARRIER	LET 2-40 CRANE CARRIER	2019	$147,878.63	$65,983.16	S/WASTE TRUCK	$175,000	11
2008/4052	47184	2008	CRANE CARRIER	LET 2-40 CRANE CARRIER	2019	$148,053.90	$78,539.69	S/WASTE TRUCK	$175,000	11
Total					2019	**$295,932.53**	**$144,522.85**		**$350,000**	
47184 Total						**$1,474,618.80**	**$1,000,480.64**		**$1,771,000**	
47184 Average by Year						**$196,615.84**	**$250,120.16**		**$442,750**	**10.1**

Table 5.23 summarizes the ESD vehicle replacement plan, by total costs and average costs, for both the replacement schedule and LTD Maintenance. The average age has dropped to 9.5 years old from 12-13

years old through a solid equipment replacement program started seven (7) years ago by the current ESD Director.

Table 5.23 - Five-Year Replacement Plan Summary, FY 2016 Forward

Original Purchase Price of Vehicles	**$8,748,552**
47180/47181 Estimated Vehicle Replacement Costs	N/A
47182 Estimated Vehicle Replacement Costs	$4,478,500
47183 Estimated Vehicle Replacement Costs	$740,000
47184 Estimated Vehicle Replacement Costs	$1,771,000
Department Total of Estimated Vehicle Replacement Costs through 2020	**$6,989,500**
47180/47181 Expected Average Total Replacement Cost by Year	N/A
47182 Expected Average Total Replacement Cost by Year (23 Vehicles)	$895,700
47183 Expected Average Total Replacement Cost by Year (4 Vehicles)	$246,667
47184 Expected Average Total Replacement Cost by Year (11 Vehicles)	$442,750
Department Total of Expected Average Vehicle Replacement Costs per Year	**$344,708**
47180/47181 Average Cost of Vehicle Replacement	N/A
47182 Average Cost of Vehicle Replacement	$194,717
47183 Average Cost of Vehicle Replacement	$185,000
47184 Average Cost of Vehicle Replacement	$161,000
Department Average Cost of Vehicle Replacement (38 Vehicles)	**$183,934**
47180/47181 Average Age of Vehicle Replaced	N/A
47182 Average Age of Vehicle Replaced	9.0
47183 Average Age of Vehicle Replaced	9.3
47184 Average Age of Vehicle Replaced	10.1
Department Average Age of Vehicle Replaced	**9.5**
47180/47181 Total LTD Maintenance	$9,843
47182 Total LTD Maintenance	$2,089,207
47183 Total LTD Maintenance	$328,075
47184 Total LTD Maintenance	$1,000,481
Total Vehicle LTD Maintenance Costs Through FY 2014	**$3,427,606**
47180/47181 Average LTD Maintenance	$4,921
47182 Average LTD Maintenance	$232,134
47183 Average LTD Maintenance	$65,615
47184 Average LTD Maintenance	$250,120
Department Average LTD Maintenance Costs Through FY 2014	**$138,198**

Going back to purchases in CY 2006, the purchase price of the entire ESD fleet was $8.8 million. The estimated cost to replace certain ESD vehicles through 2020 is $7.0 million, with the largest amount in trash cost center 47182. The city expects to spend an average of $344,708 annually by cost center to buy new ESD vehicles through 2020 or $138,934/vehicle. The average vehicle replacement age must balance costs and useable life to minimize total annual costs. ESD provides a robust environmentally

sound and customer focused collection program that is in line with similarly sized programs around the country, and competitive with the comparable cities in North Carolina as pointed out earlier in Section 4.

5.7 Software and Ancillary Equipment Used

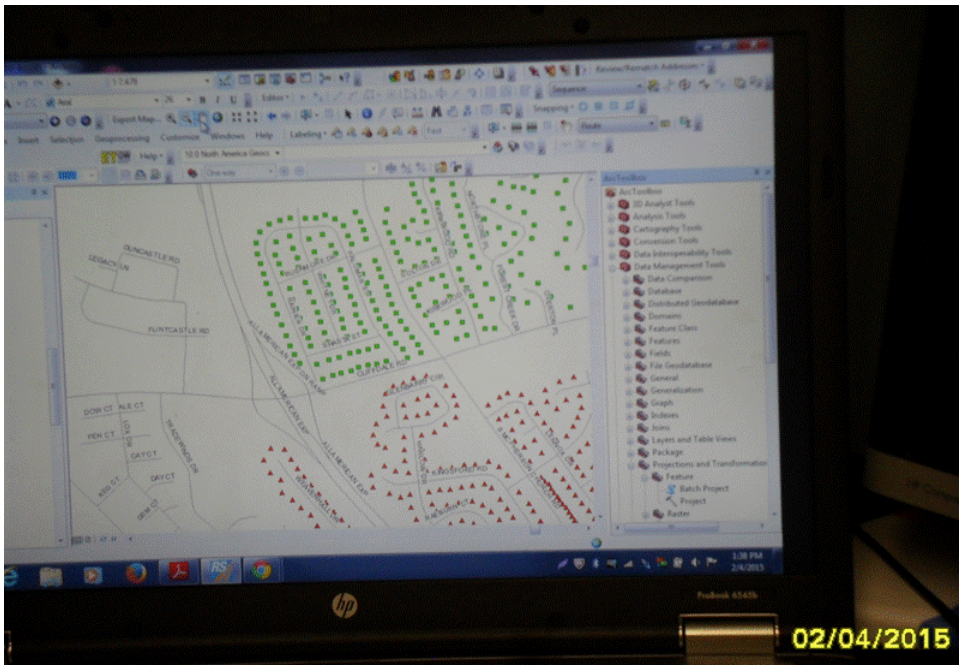
The ESD relies on three primary software vendors to maximize efficiency for the workforce. RouteSmart, FleetMind, and Cityworks. As Cityworks is used City-wide this report will focus on RouteSmart and FleetMind and include the On-Board Tablet used by drivers in the Refuse and yard waste collection programs. Both of these software programs will be covered in more detail in Section 10 therefore this Section 5 is a cursory introduction and how the resources are allocated.

RouteSmart

This software provides a sustainable route optimization solution that handles the details of solving complex routing challenges with a high degree of precision. RouteSmart Technologies takes the place of labor intensive manual routing to drive cost and inefficiencies out of the routing operations of the ESD. The ESD conducted a route optimization in 2007 using RouteSmart as collection days scattered all over the city. They continue to use it today to be able to adjust routes as needed due to equipment breakdowns, helper trucks, newly added service and similar reasons that a quick and efficient temporary or permanent reroute is needed. Exhibit 5.1 shows two colored coded optimized routes in green and red. RouteSmart is used by ESD for residential vehicle routing with the exception of residential recycling. The route optimization software helps the City achieve goals and meet priorities by:

- Decreasing miles,
- Maximizing stops and lifts per hour,
- Balancing workloads across the week,
- Reducing overtime,
- Improving safety,
- Speeding your route planning time, and
- Modeling new service areas.

Exhibit 5.1 - RouteSmart Mapping



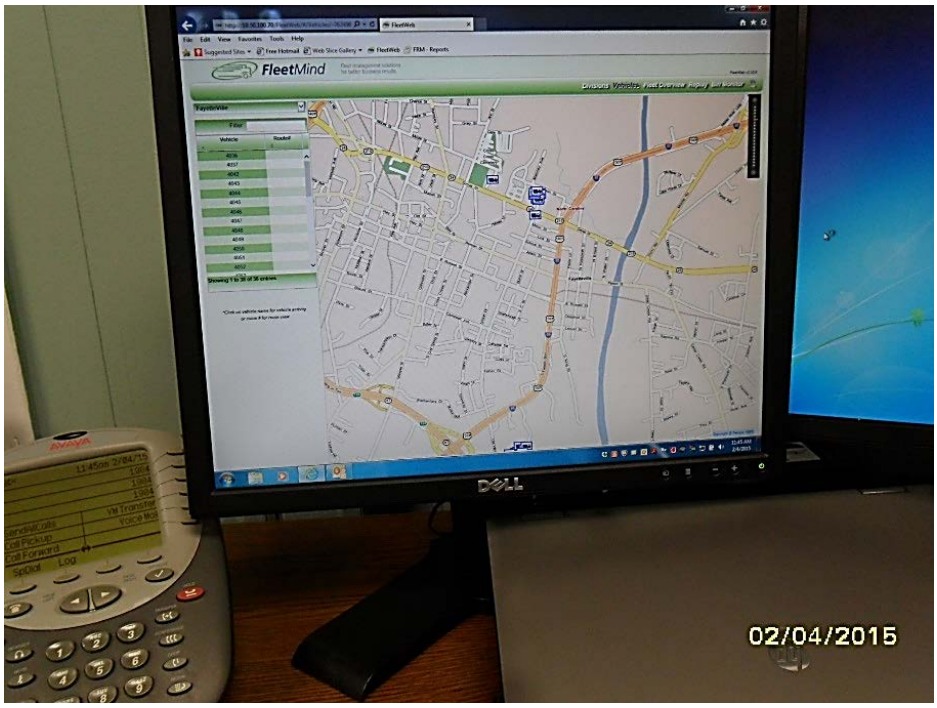
FleetMind

To improve operations, provide complete fleet visibility and help ensure a problem-free customer experience the City purchased and began installing FleetMind fleet management solutions in its trash and yard waste fleet in Q2 FY14/15. Training for ESD personnel is on-going as of the date of this Report. The full functionality and benefits of the system will be utilized as staff is trained.

FleetMind is used by the solid waste industry as a fleet management solution to improve operations, reduce costs, provide fleet visibility and help ensure problem-free customer service. This software helps improve service efficiencies, billing accuracy, safety and customer service experiences. It provides the ESD with complete visibility into fleet operations allowing them to run a 'greener' fleet and reduce resource requirements. FleetMind takes the management of drivers, routes and landfills to new level of productivity that the RouteSmart route optimization software, when used alone cannot provide. They track Key Performance Measurements (KPMs) to measurably increase efficiencies and let the ESD proactively monitor the fleet in real-time.

GPS routing is available to the Call Center, with the eventual thought, the Call Center will be able to provide real time information for their use with customers.

Exhibit 5.2 - Screen Shot of Asset Tracking



All Refuse and Yard Waste collection trucks have either the FleetLink Virtual OBC On-Board GD4010 Flat Fleet-link Driver Display Terminal (refer to Exhibit 5.3) or the FleetLink Lite Virtual OBC On-Board Tablet (refer to Exhibit 5.4) installed based on the truck need. These provide the driver with an interactive command center that provides a single point of interface for the driver, truck, back office and all communications.

Exhibit 5.3 - FleetLink Virtual OBC On-Board GD4010 Flat Fleet-link Driver Display Terminal

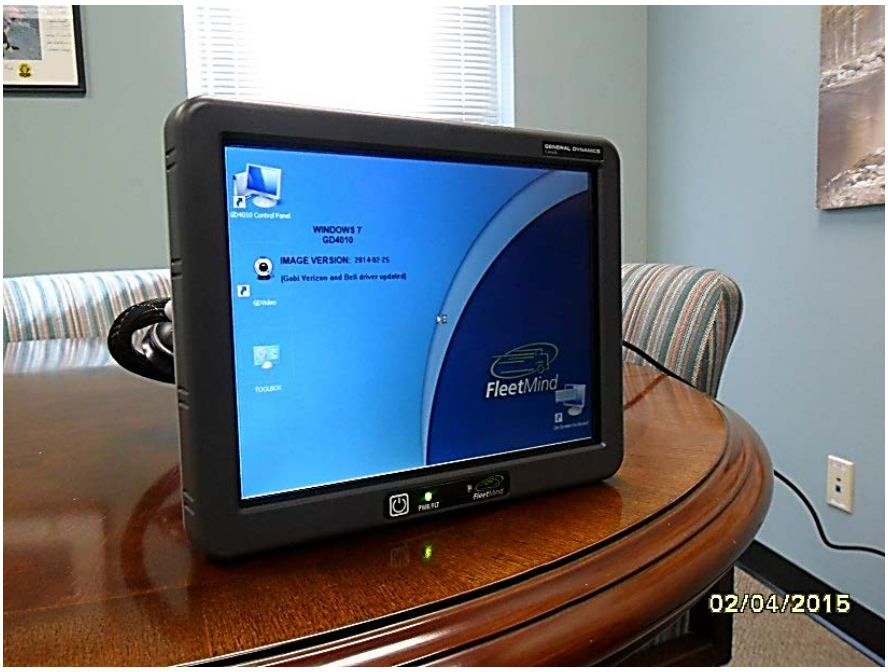


Exhibit 5.4 - FleetLink Lite Virtual OBC On-Board Tablet

The FleetMind software tracks the locations of lifts, automatically associates lifts with customers, and observes it all with system-managed time stamps. City crews can easily log the precise activities that account for the full day, in real time. FleetMind archives 10 days of “breadcrumb” trails (refer to Exhibit 5.5), and an unlimited number of days for reporting. As employees get proficient in the use of FleetMind, they will use the Bin Monitor Function of FleetMind to pinpoint the geocode of a cart versus the centroid of the property as it is now. This change will allow for more accurate service verification.

Exhibit 5.5 - Breadcrumb Trail

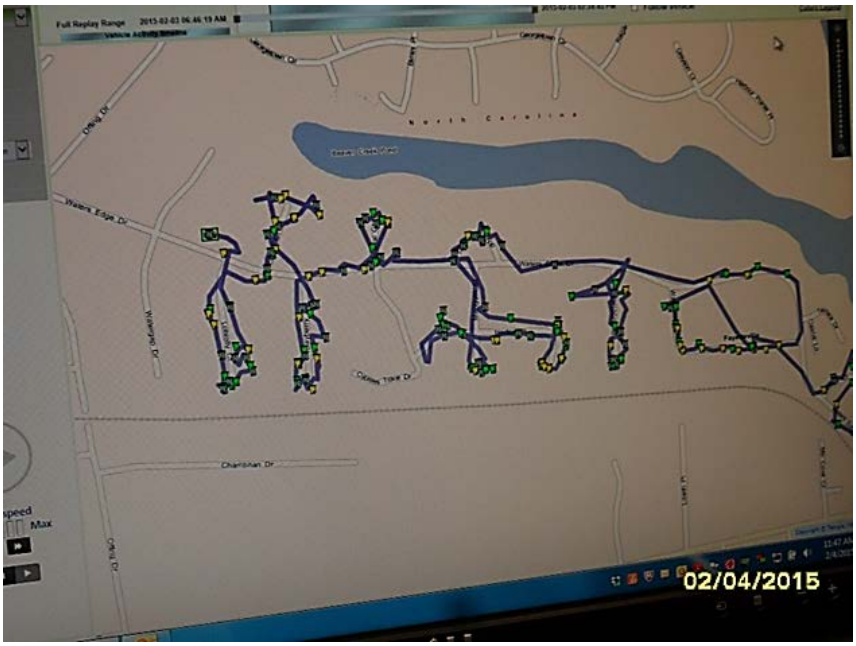


Exhibit 5.6 shows a color coded map depicting the status of the carts. The color codes in Exhibit 5.6 provide a visual of the information found in Figure 5.2 an example of a report that is generated from the information a driver enters into the OBC terminal using the Bin Monitor Function that shows the status of the cart collection for the day.

Exhibit 5.6 - Bin Monitor Back Office Screen Shot

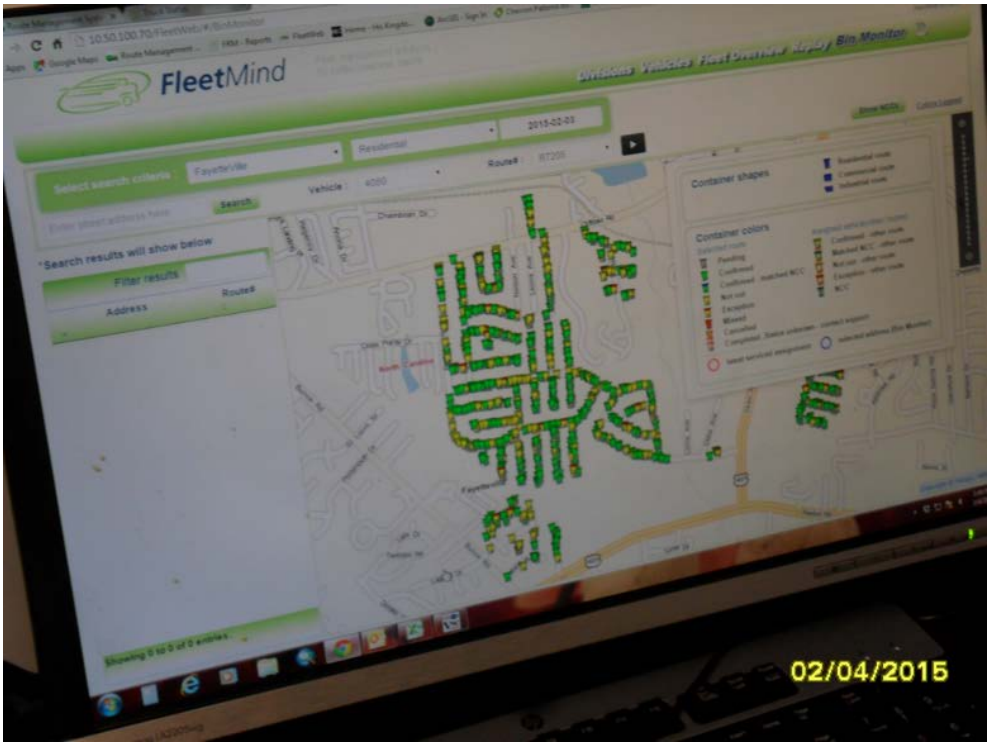
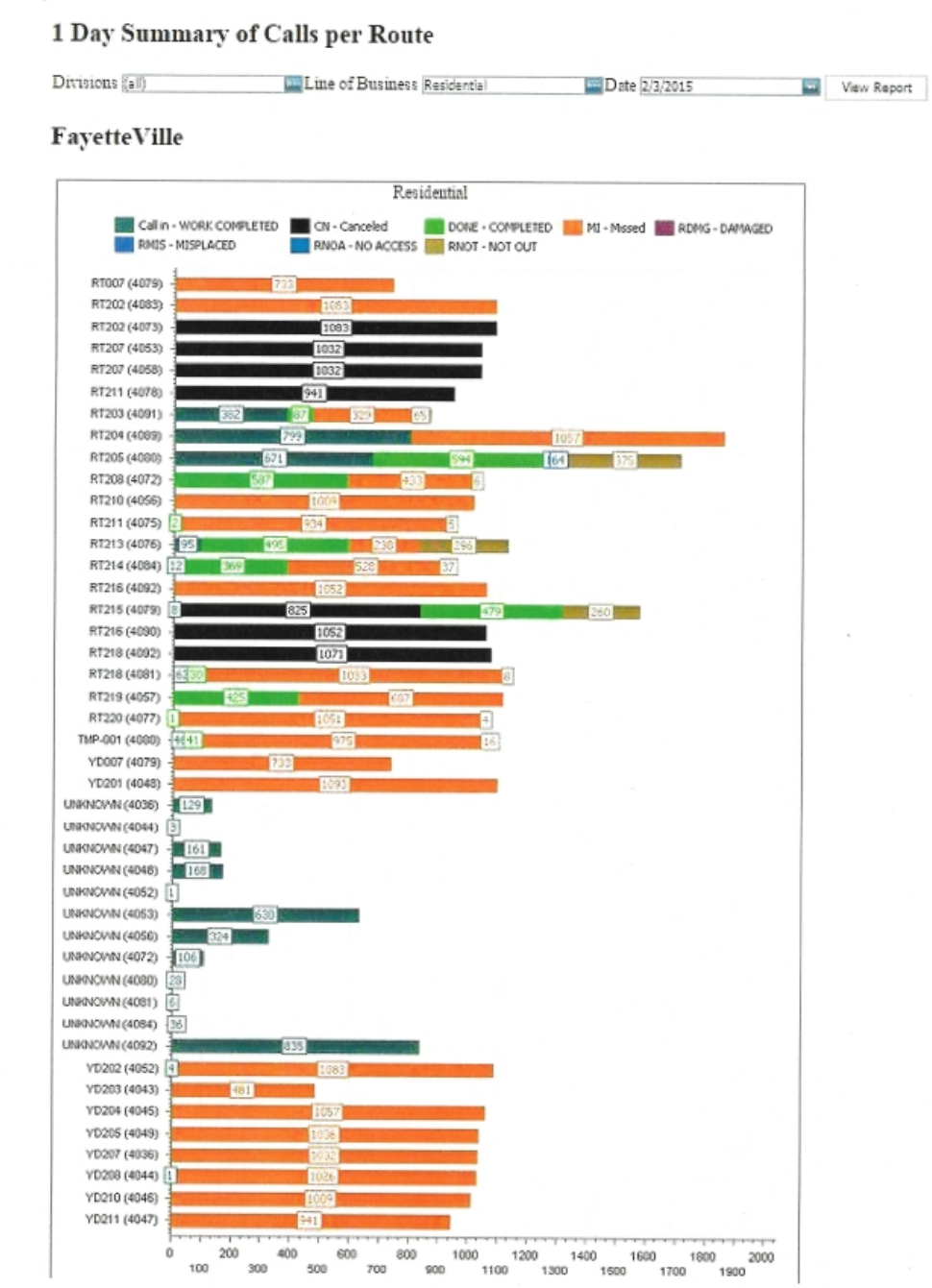


Figure 5.2 - Summary of Calls per Route (from FleetMind)



The Summary of Calls report illustrated in Figure 5.2 provides the details on the status of the cart service for each route on each day, including information whether the cart was tipped, not out or missed, replaced, being repaired and other information.

Additionally, FleetMind integrates with Cityworks to generate work orders. (Cityworks is a new city-wide work order program that has been in use since December 2014.) Two types of work orders related to

collection services are generated by the Call Center, either a Missed Pick-Up (MPU) or a call-for-information. The Call Center will be able to view truck location and travel path to generate either ticket depending on the circumstance. As an example, if the collection truck has not yet been there, the work order would be a call-for-information.

In addition the ESD uses VNC® Viewer which is a remote access and control technology for desktop and mobile platforms. Supervisory personnel will use this remote access viewer application to view the actual screen of a trucks OBC terminal. There is no limit to the number of computers you can access, nor how long you can connect in for. It is free to use whether connecting locally or over the Internet.

The ESD now has a powerful platform to keep cost in line and improve customer service by managing resources using state of the art technology available to the solid waste industry.

5.8 Labor Costs by Program

The ESD has 75 FTE budgeted positions exclusive of temporary positions. These positions are allocated across five (5) cost centers and include vacant positions as well as those in training. The front line employees average total recommended compensation package in FY15/16 is approximately $22/hour. The 2016 Recommended Total Compensation is the sum total of Base pay, FICA, Retirement, Life, Dental, Medical, Workers Compensation and Longevity Pay (if applicable) per position in the ESD even if vacant at the time of this report.

Table 5.24 is a summary allocation of the Special Services and Administration portion of the Personnel budget.

Table 5.24 - Department Labor Costs

Program	Number of Positions	Yrs of Service at 7/1/15	Average Tenure	2016 Recommended Total Compensation	2016 Avg. Annual Compensation Package
Special Services/ Administration (47180/47181)	10	139.4	13.9	$651,671.90	$65,167.19
Refuse (47182)	32	333.4	10.4	$1,480,298.42	$46,259.33
Bulky Item (47183)	6	77.3	12.9	$298,486.76	$47,992.64
Yard Waste (47184)	27	199.4	7.4	$1,168,991.27	$43,295.97
Total for the Environmental Services Dept.	75	749.5		$3,599,448.34	
Average per Program	19	187.4	11.2	$899,862.09	$50,678.78

It should be noted that the ESD has long tenured employees in a traditionally high turn-over rate industry. Based on job duties and responsibilities ESD has a competitive wage structure with comparable private solid waste industry positions which helps to retain employees. Overall there is good tenure in key positions in the Administration that help guide an effective organization again key to retaining a workforce. Understandably both the refuse and bulky item programs have the least average tenured employees as they are usually the entry level positions and the more physically demanding and traditionally have a higher turnover rate. Turnover adds to increased costs through lower productivity. However there is good news on the horizon as the ESD will have fully automated refuse collection in 2016 which will help reduce turnover as the refuse collector position will be physically less demanding.

Due to turnover in the ESD they are training the equivalent of one employee year-round as it takes approximately 6 weeks from the interview to hire and then an additional 6 weeks to train for solo work. This costs the ESD approximately $46,000 per year in total compensation not including the loss of productivity. In addition ESD spends an estimated 8.38 hours in FY14/15 providing additional operations and safety training to all of its employees at a cost of approximately $200/employee/year.

5.9 Summary

The ESD has been very busy running operations and planning for the future. Over the course of the previous 7 years the ESD has transformed from a traditional city solid waste collection service to a well-managed cost-effective department. While there seems to be maintenance improvement opportunities to reduce the number of assets needed to service residents.

ESD has reduced trucks through FY14/15 and will now have to start adding trucks due to expansions in FY 15/16 related to due to new developments being built in West Fayetteville.

While the ESD has implemented many cost reduction strategies over the past 7 years the Department may be getting close to its maximum financial savings and the level of cost reductions going forward through equipment use and efficiency gains through technology use. The department will have to look for internal opportunities to continue finding savings at the same level as in previous years. As examples; the last 5 years Bulky Item collection has transitioned from 20 cubic yard to 40 cubic yard grapple trucks to increase capacity and reduce turn time and to be able to service new neighborhoods without adding personnel and new equipment. Converting to automated curbside collection over the previous 7 years has reduced labor cost and risk of injuries.

6 Private Hauling and Collection Services Benchmark Study

6.1 Introduction

While equipment intensive and labor intensive, the collection of garbage and/or recyclables from single family residences is not a complex activity. Many local governments still provide municipal garbage and recycling collection as a service to their constituents. However, a multitude of private waste collection service providers also perform this service for American communities. A 1996 report noted that more than half of U.S. cities use private haulers for some waste-related collection services[3]. Interestingly, both types of service are actually provided in Fayetteville and elsewhere around the state. Many communities have continued with all, or a part of, their public solid waste collection practices.

Section 6 seeks to provide background on the competitive nature of the private sector solid waste industry and its ability to provide some, or all, of the services currently provided by City forces. GBB understands that numerous pressures fall onto the municipal staff to make sure the City is receiving the best of services at the most competitive of costs. Other sections of this report point out that Fayetteville is competitive in delivering services by consistently seeking cost effective solutions through automation

[3] Solid Waste Management: A Guide to Competitive Contracting for Collection", Lynn Scarlett, J.M. Sloan, Reason Foundation, August 1996.

and the use of state-of-the-art technologies that the private companies are also using as well. This section summarizes the costs of six communities with certain private MSW collection and hauling services.

6.2 Service Contracts

Six (6) communities of varying sizes were evaluated wherein the services were provided by a private contractor and, in some cases, in combination with the municipality itself. Those reviewed included: Brunswick County- Waste Industries; Cornelius- Republic Services, Inc.; Fayetteville- Waste Management, Inc.; Huntersville- Advanced Disposal; Siler City- Waste Management, Inc. and Winston-Salem- Waste Management, Inc.

Table 6.1 provides an overview of the communities reviewed and services provided by either the private or public sector. Each service will be discussed in greater detail in this section.

Table 6.1 - Public Private Services

	Fayetteville	Winston-Salem	Brunswick County	Siler City	Cornelius	Huntersville
Refuse	Public	Public	Private	Private	Private	Private
Recycling	Private	Private	Private	Private	Private	Private
Yard Waste	Public	Public	None	Public	Private	Private
Bulk Item	Public	Public	None	Public	None	Public

6.3 Collection Contract Cost

GBB reviewed the City of Fayetteville's Environmental Services Department FY 14/15 Budget to determine how it benchmarks against other comparable North Carolina communities. The results show the City ranks fifth in cost per household providing curbside Refuse, Bulky Item, Yard Waste collection services in an efficient manner and contracting with Waste Management, Inc. for Recycling Services. How does the City stack up against cost in communities that privatize most if not all of their services? Section 6.4 will look at representative municipalities identified earlier and compares service delivery costs with them on an annual and monthly basis.

Table 6.2 offers an overview of these costs based on FY 14/15 contract prices and the services provided in the associated municipality.

Table 6.2 - Representative North Carolina Municipalities with FY14/15 Private Hauler Contract Cost

	Fayetteville	Winston-Salem	Brunswick County(2)	Siler City(2)	Cornelius(3)	Huntersville(3)
Contracted Hauler	Waste Management	Waste Management	Waste Industries, Inc.	Waste Management	Republic Services	Advanced Disposal
Private Services Provided(1)	RC1	RC1	T, RC2	T, RC2	T, RC2, YW	T, RC2, YW
Number of Collection Points	60,527	77,533	81,516	2,890	9,600	18,660
Annual Residential Refuse Tonnage	45,732	52,054	75,443	3,072	7,400	12,120
Annual Recyclables Tonnage	9,280	12,671	4,454	245	2,086	3,833
Recycling Rate Garbage and Recyclables only	16.9%	19.6%	5.6%	7.4%	22.0%	24.0%
FY14/15 Monthly Contract Refuse Price/ per Household	$0.00	$0.00	$12.27	$14.41	$16.18	$13.34
FY14/15 Monthly Contract Recycling Price/ per Household	$2.91	$2.89	$0.00	$0.00	$0.00	$0.00
FY14/15 Total Annual Price/Household	$34.92	$34.68	$147.24	$172.92	$194.16	$160.08
FY14/15 Total Annual Contract Price/Household	$2,113,603	$2,688,844	$12,002,416	$499,739	$1,863,936	$2,987,093

(1) T= Weekly Trash, RC1= Weekly Recycling, RC2= Every Other Week Recycling, Weekly YW= Yard Waste

(2) Recycling price included in Refuse price

(3) Recycling and Yard Waste included in Refuse price

Both Fayetteville and Winston-Salem have contracted to the private sector for recycling services only. Fayetteville's contract cost is on par with Winston-Salem's contract cost even with Winston-Salem having 22% more homes and a slightly higher recycling at 19.6% than Fayetteville at 16.9%.

6.4 Types of Services Contracted

Table 6.3 is similar in scope to the comparable tables in Section 4, in that it compares the four basic services that comprise Fayetteville's program and highlights the contracted versus the municipality provided services that the representative municipalities deliver. The city-provided additional services must be considered if the decision to privatize moves forward.

Table 6.3 - Services Provided by Private Haulers in Representative North Carolina Municipalities

Types of Collection Services Contracted	Fayetteville(1)	Winston-Salem(1)	Brunswick County(4)	Siler City (2)	Cornelius (3)	Huntersville(3)
Private/ Public Curbside Refuse Collection	Public	Public	Private	Private	Private	Private
Type of Service Vehicle	Automated and manual	Manual and automated	Manual and automated	Automated	Manual	Automated
Cart Size	96-gallon, city-owned	96-gallon provided by Waste Management, Inc.	96-gallon	96-gallon, provided by Waste Mangement, Inc.	96-gallon	96-gallon
Collection Frequency (e.g. weekly)	Weekly	Weekly	Weekly	Weekly	Weekly	Weekly
Refuse Tonnage	45,732	52,054	75,443	3072	7,400	12,120
Other comments on this activity	Single family - triplexes	Collection of trash in 96 gallon carts from Single family; multi-family and small businesses that generate the same amount of trash as a residential unit.	County-wide program, many beach communities contract with Waste Industries fro a second collection during the summer months.	None	Three extra bags are allowed, but not on a weekly basis.	Service provided to single family homes and a few small businesses located in the downtown area under the current collection contract. Overall, the town does not offer this service to the non-residential sector.
Private/ Public Curbside Recycling	Private	Yes	Yes	Private	Yes	Yes
Collection Frequency (e.g. weekly)	Weekly	Weekly	Every Other Week	Every Other Week	Every Other Week	Every Other Week
Type of Service Vehicle	Automated	Automated	Manual or Automated	Automated	Automated	Automated
Single Stream or Dual Stream	Single Stream	Single Stream	Single Stream	Single Stream	Single Stream	Single Stream
Cart Size	35-gallon cart, city-owned	96-gallon	96-gallon	64-gallon cart	64-gallon	96-gallon
Recyclables Tonnage	9,280	12,671	4,454	245	2,086	3,833
Other comments on this activity	This program also manages scheduling and logistics of cart repairs and delivery of 35 gallon recycling carts for residents.	Curbside and multi family recycling; Have contract for single stream roll out cart collection. Newspaper, magazines, junk mail, telephone books, chipboard, aluminum, steel, all plastics, cardboard, glass and aerosol cans. Also includes servicing 9 drop off centers.	A mix of un-incorporated and incorporated areas of the county.	None	Townhomes receive the same collection services as single family. Other multifamily complexes do not receive these services.	No recycling services provided to multifamily with the exception of townhomes.
Private/ Public Yard Waste Collection	Public	No	No	Public	Private	Private
Collection Frequency (e.g. weekly)	Weekly	1 time per week	N/A	Weekly in bags except when loose leaf collection begins in late October and continues until late January	Weekly	Weekly
Collection Method	Rear load packer trucks	Automated and manual	N/A	Grapple Trucks and two Walk Behind Mulchers	Manual	Automated
Yard Waste Tonnage	19,861	22,800	N/A	235	1,845	5,696
Other comments on this activity	ESD is responsible for daily pickup of containerized curbside yard, leaf debris and small limbs generated by residentsCity is responsible for daily pickup of containerized curbside yard, leaf debris and small limbs generated by residents	Residents can purchase 96-gallon carts, Curbside of brush every 21 working days except during leaf collection months; loose leaf beginning November 1 until three rounds of collection have been completed; brushcollection annually March through August.	Incorporated municipalities within the County may contract separately or conduct the service itself.	Street Department operates a walk-behind mulcher for curbside collection of residential yard waste; 95% of the mulch created by this program is donated to individuals and 5% goes to professional and industrial users. City offers its residents a loaner dump truck to load with wood waste, or large amounts of vegetative waste. Town staff brings the truckload of waste to the County's main facility at no charge to the resident.	Consists of excess leaves, grass, tree and shrubbery trimmings and other organic material removed in general maintenance of property by the homeowner. Clear plastic bags can be tied and any other style bag that is not clear must be left open. Bags over 50 pounds will be left on the curbside. Maximum of 20 bags per week.	Advanced Disposal provides a 96-gallon cart for curbside; grass clippings will not be collected in bags (must be in carts); plastic bags are not allowed in the yard trimmings cart.
Private/ Public Bulky Item Collection	Public	No	No	Collected by Street Department	No	Public
Collection Frequency (e.g. weekly)	By Appointment	Once during March - September collection period	N/A	Weekly	N/A	By Appointment
Collection Method	Grapple trucks	Grapple trucks, dump trucks	N/A	Grapple trucks and other vehicles	N/A	Manual Rearload packer truck
Bulky Item Tonnage	1,852	2,400	N/A	Not Available	N/A	Not Reported
Other comments on this activity	The Bulky Item program collects all items placed curbside and generated by residents that will not fit in a cart or bag. Items include, but are not limited to, furniture, mattresses, limb piles, construction debris, and metal items, such as swing sets, grills and bicycles. Owner-generated construction debris is be picked up for a $50 fee per.	Bulky items will be picked up by the city crews only during annual neighborhood area cleanup; they do not mix bulky items with yard waste, recyclables or brush; items the city can collect include: mattresses, appliances, furniture, carpet and toys.	Incorporated municipalities within the County may contract separately or conduct the service itself.	Discarded appliances such as ovens, refrigerators, washer, dryers, furniture or other similar items may be placed at the curb side were the Street Department will collect them. Street Department also collect litters and improperly dumped items.	The Town of Cornelius does not provide Bulk Item Pickup, it is up to the resident to contact a hauler or residents can drop off bulk recyclables at the North Mecklenburg Recycling Center.	Separate fees based on the category; Brush Pickup and Category 1- Appliances, metal, lawn and garden equipment; Category 2- smaller furniture, mattresses; Category 3- sectional sofa, hot tub, piano, wooden swing set/large playground equipment; Category 4- items not included in other categories. Construction debris will not be collected.
FY14/15 Solid Waste Budget						
Additional Collection Activities Not Privatized	Curbside Refuse, Bulky Item and Yard Waste Collection, Cart Maintenance, Dead animal colelction, colelction at City-owned facilities, debris clean up, event clean up.	The city provides dead animal collection Monday through Saturdays; Animals are collected from the streets only; animals must be in a bag and curbside. Collections are also made at Animal Hospitals and Fish Markets for a fee.	None	Curbside collection of Bulky & White Goods, Yard Waste and Tires (2 weeks each Spring) conducted by Siler City	None	None
Other Comments	None	Garbage and Recycling for businesses and residences in the CBD; special events cleanup; uses crew who also clean sidewalks, empty trash receptacles and maintain other common areas	Waste Industries Contract includes staffing 4 convenience centers and 1 transfer station. Contract expires June 30, 2019	Siler City would consider cost-sharing with County for an Environmental Educator position if budgets allow; solid waste collection and disposal contract expires June 30, 2017.	The current contracts for collection of household sanitation, small business sanitation, recycling and yard debris are in effect until July 1 , 2015	None

(1)FY13/14 Budget Estimated tonnages
(2) FY 10/11 Chatam County 2012-2022 Solid Waste Plan tonnage
(3) FY 11/12 Mecklenberg County 2012 Solid Waste Plan tonnage
(4) FY11/12 Brunswick County 2012 Solid Waste Management Plan tonnage
(5) FY13/14 Budget reported data from DAA

The refuse collection service is very similar in nature in that they have weekly collection at single family homes in 96-gallon carts that are collected with either automated or rear-load packers (manual) vehicles.

Bulky items are collected at a variety of frequencies and with various types of equipment. Fayetteville collects with grapple trucks, and Huntersville collects with rear-load packers and charges a separate fee, both municipalities by appointment only. Siler City's Street Department collects bulky items with grapple trucks and other vehicles on a weekly frequency. Winston-Salem collects bulky items over an annual seven month period one time only with grapple and dump trucks. Both Brunswick County and Cornelius do not collect bulky items and have residents either call a hauler and pay for it separately or the resident hauls it to a county owned facility for disposal either at cost or not charge depending on the item.

Five of six municipalities provide weekly containerized yard waste, Brunswick County leaves it up to the incorporated municipalities within the County to contract separately or conduct the service itself. It should be noted that Huntersville contracted hauler, Advanced Disposal provides automated 96-gallon cart for containerized yard waste collection.

All municipalities in this review provide single stream curbside recycling in carts. There are notable differences in the size of carts and frequency of collection. Four communities have every other week automated recyclables collection by private haulers; Brunswick County, 96-gallon cart; Cornelius, 64-gallon cart; Huntersville-96-gallon cart and Siler City- 64-gallon cart. Both Winston-Salem and Fayetteville have weekly automated collection by private haulers. Winston-Salem uses 96-gallon carts and Fayetteville uses 35-gallon and 96-gallon carts.

6.5 Summary

The following Table 6.4 summarizes by comparing Fayetteville's all tons managed cost per service from Section 4 to representative municipalities. Included in Table 6.4 are all tons managed collection and disposal costs based on the current Fayetteville data such as tonnage, households and disposal facilities available. Item 7a shows a deduction in FY14/15 for one-time capital expenses and a gross cost subtotal of $18.35/household/month. However as one-time capital expenses occur in organizations as a part of doing business, this report will include Item 7a for comparative purposes as shown in Item 8 gross cost of $19.04/household/month.

Table 6.4 - Summary of Fayetteville's FY14/15 Cost of Services

Item	Service Provided	Annual Cost (or credit) per Household	Monthly Cost (or credit) per Household
1	Trash Collection (1)	$66.93	$5.58
2	Recyclables Collection (2)	$38.77	$3.23
3	Yard Waste, Brush and Leaf Collection (3)	$24.03	$2.00
4	Bulky Item Collection (4)	$21.73	$1.81
5	Net Administration and Non-Program Costs (5)	$27.52	$2.29
6	County Disposal Charges (for Landfill and Compost site-related services) (6)	$48.00	$4.00
7	County Additional Disposal Charges	$1.46	$0.12
7a	Deduction for one-time costs for FleetMind purchase and Parking lot paving(7)	($8.26)	($0.69)
7b	**Gross Cost of City Solid Waste Services Subtotal**	**$220.17**	**$18.35**
7c	One-time costs for FleetMind purchase and Parking lot paving added back to obtain total	$8.26	$0.69
8	**Gross Cost of Solid Waste Services**	**$228.43**	**$19.04**
9	Transfer Station Lease Revenue (8)	($2.23)	($0.19)
10	Recycling Revenues from Waste Management and OmniSource (9)	($1.85)	($0.15)
11	County Rebate for City Recyclables Diversion (10)	($5.00)	($0.42)
12	City Share of NC Solid Waste Disposal Tax (11)	($1.93)	($0.16)
13	**Estimated income to City for ESD Provided Services**	($11.01)	($0.92)
14	**Net Annual Cost of City Solid Waste Services**	**$217.42**	**$18.12**

(1) Includes ESD Costs Only; refer to Table 4.1
(2) Includes ESD costs associated with the Waste Management contract for curbside collection of
(3) Includes ESD costs only; the County charge to the city for operation of the compost site are in Item 5; refer to Table 4.5
(4) Includes ESD costs only; refer to Table 4.2
(5) Includes ESD costs only; refer to Table 4.7
(6) Based on $48/Household Annual Fee To City and 60,527 households
(7) One-time Purchase of FleetMind (approx. $400,000 and parking lot repaving (approx. $100,000)
(8) Payment from Waste Industries for Transfer Station Lease (Est. $135,000/Year value FY15 City budget)
(9) Based on Payment of $11 per ton of recyclables delivered to Pratt plus the OmniSource bulky metals revenues (est. $111,847/Year)
(10) Based on County rebate to city of $5/year per household
(11) Based on City share of non-landfilled solid waste at $117,000 credit in FY15

The City provides solid waste services at an annual net cost of $217.42/household. This includes the county disposal cost (see Item 6) plus outside source revenues as indicated in Table 6.4. The City's cost includes the additional city-provided services of bulk collection, special services such as dead animals,

services not provided by other solid waste departments as shown in Table 6.3. Further analysis of outsourcing collection services is found in Section 11.

7 Estimated Value of Value-Added Services

7.1 Introduction

Value-added services have an unlimited range, and typically are determined by the municipality according to their needs, long-standing operating procedures, and local tradition or politics regarding charitable giving, special event services, etc. Some value-added services, such as waste collection from government buildings, may be driven by ordinances, costs, and negative public perception if out-sourced. Whether directly noted or embedded in the pricing in all cases where it is either asked or required of the private sector, there will be a cost for providing these types of services.

Section 7 provides an overview of the estimated value of value-added services currently provided by the ESD. Such services may include those that are not normally included in a typical service agreement with a private contractor such as emergency response activities, special event support, pick-up of recyclables from City-owned facilities, rapid-response resolutions, local Call Center vs. US regional Call Center, intra-departmental equipment loans, annual United Way/Heart Association employee contributions and promotions of recycling programs.

7.2 Emergency Response Activities

The management of disaster debris and demolition waste, resulting from hurricane or tornado damage and flooding, can be complex, costly, and logistically challenging. This includes developing procedures, logistics, systems, and contracting the services necessary to effectively plan, implement, track, monitor, and report the management of disaster debris and control the overall costs. Factors to consider when setting up storm debris collection with a private hauler include resources allocated, cost per hour, description of service, and previous emergency debris volumes. Depending on the size of a natural disaster, such as hurricanes, tornadoes, storm debris, or man-made disasters such as terrorism, etc. after event clean up may be may become the city's responsibility as County, State and Federal agencies may not declare Fayetteville a disaster area. With privatized services performed under contractual provisions, disasters may or may not be considered a force majeure event. If considered force majeure, service delays and increased costs most likely will occur.

Examples of east coast storm debris costs; Pender County, North Carolina incurred $16,000 in charges by contractors for handling approximately 200 cubic yards of vegetative debris generated by Hurricane Isabel (2003) equating to $80.00/cy. Both Hurricanes Bonnie and Charley (August 2004) generated vegetative debris totaling 1,137 cubic yards. Clean-up costs were approximately $20,000 or $17.59/cy.[4]

[4] http://www.pendercountync.gov/Government/Departments/SolidWaste/StormDebris.aspx

Exhibit 7.1 - Illustration of Storm Debris Cleanup

A more recent example occurred in Colts Neck Township, New Jersey where township employees and six contractors handled the massive debris left behind by super storm Sandy, that including 109,400 cubic yards of vegetative materials. Town employees and equipment were used to load, haul and dispose of 803 cubic yards by working 1,164 regular time hours and 446 overtime hours. The bulk of the debris removal work was done by Bergeron Emergency Services which loaded and hauled 64,441 cubic yards at a cost of $753,964.39, or $11.70 a cubic yard.[5]

After the tornado struck Fayetteville in 2011, the City's ESD crews assisted with the initial debris push on all roads where the devastation occurred. Within 28 hours of the tornadoes event, streets were made passable for first responders. This service would need to have been conducted by a private hauler should ESD services be contracted out, leaving the City without its own equipment to provide such post-event clean-up activities. Debris removal outside of declared disaster areas would require the City to manage the hauler and will result in charges ranging from $125/hour/truck and higher, as they charge by-the-hour, rather than charge by the cubic yard.

As an example, Waste Management, Inc. is contracted by the City of Lake Dallas, Texas for collection truck rates with storm debris service charges[6] as follows:

a) Rear-end loader - $125/per hour
b) Grapple truck - $150/per hour

For illustration purposes, assume WM grapple truck has a 40 cubic yard box for debris and they collect three (3) loads per day, the total for the week would be 720 cubic yards (40cy x 3 loads= 120cy x 6 = 720cy/week). WM, due to DOT regulations, cannot work a driver over 60 hours in a 7-day period. Therefore the trucks would operate 10 hours a day/6 days a week at $150/hr. for a total cost of $9,000/week (10 hrs. x 6 days x $150/hr. = 60 hrs.). The collection cost per cubic yard equals $9,000 ÷720cy= $12.50/cy.

[5] http://chrissmith.house.gov/news/documentsingle.aspx?DocumentID=347550.
[6] Lake Dallas-WM Solid Waste Contract-Exhibit B Disaster 12-01-14FINAL.

GBB has determined that the average base hourly wage for an ESD Equipment Operator is $16.03/hr. and operating and maintenance (O&M) costs for a City grapple truck averages $29.62/hr. based on the 2014 LTD annual average costs. Table 7.1 compares the city's estimated costs with a representative private hauler.

Table 7.1 - Comparison of Storm Debris Collection, City versus Private Hauler

	Est. Cost/ Hr	Weekly Cost (Basis 60 hours)	Cost, $/cy (2)
ESD Labor (1)	$16.03	$1,122.10	$1.56
ESD O&M	$29.62	$1,777.20	$2.47
Total ESD (2)	$45.65	$2,899.30	$4.03
Private hauler (2)	$150.00	$9,000.00	$12.50
Cost Difference	$104.35	$6,100.70	$8.47

(1) Weekly Cost based on 40 hours regular pay plus 20 hours time-and-a-half
(2) Based on 720 cy/week

The cost for a private hauler to assist with storm cleanup is not out of line with acceptable industry practices. However, it is much higher than the equivalent service that can be provided by ESD using their fleet of existing vehicles.

7.3 Special Event Support

Special event support service may or may not be provided by private haulers. Whether provided by the City or by a contracted hauler, there is a cost as nothing is truly "free". If included as part of contracted services, the events are typically listed in the contract and become part of the marginal costs a hauler charges. Table 7.2 provides the annual cost by event for ESD to support clean-up at 66 special events.

Table 7.2 - Estimated Value of Annual Special Events Services

Event No.	Event	Annual Fequency	No. ESD Employees Needed	Total Labor Hours Required	Labor Value	Vehicle Fuel Costs	Event Cost
1	Fayetteville Dogwood Festival	1	11	418	$11,411	$250	$11,661
2	International Folk Festival	1	11	264	$7,207	$125	$7,332
3	Events held at Festival Park-not incl. Dogwood/Folk Festival	30	1	60	$1,222	$600	$1,822
4	Events held at various parks & Medical Arts Bldg	22	1	44	$896	$440	$1,336
5	Fayetteville Beautiful City-wide clean up	1	7	39	$1,065	$150	$1,215
6	All American Marathon	1	4	24.5	$499	$45	$544
7	Police Dept Community Awareness Day	2	1	7	$143	$20	$163
8	Homeless Standown (Chance St)	1	1	3.5	$71	$40	$111
9	Greek Festival	1	1	2.5	$51	$20	$71
10	National Airborne Day	1	1	2	$41	$20	$61
11	Homeless Outreach	1	1	2	$41	$20	$61
12	FFD Safety Day	1	1	2	$41	$20	$61
13	Veterans Day Car Show-Transportation Museum	1	1	2	$41	$20	$61
14	Second Harvest Food Bank	2	0	0	$0	$20	$20
	Total			**870.5**	**$22,729**	**$1,790**	**$24,519**

Depending on the amount of "free services" support the city asks or requires a hauler to provide in a Request for Proposal (RFP) or a Request for Bids (RFB) such as containers for community clean-ups, or street and litter bin service after a parade, or trash and recycling carts for a festival, the city should expect it to cost approximately $96,000 ($1.59 per household annually) for 870.5 equivalent hours of special events support.

The example below shows how the special services cost was determined. The approximate current contract price of $2.1 million for curbside recycling services divided by the number of annual Waste Management operating hours multiplied by the number of hours of ESD special services support from Table 7.1. Assuming Waste Management routes averages 100 hours per collection day, they operate approximately 20,800 driver hours/year.

$2,113,603 ÷ 20,800 hours= $102/hr. (rounded up)

870.5 hours x $102 =$89,000

$89,000 ÷ 60,527= $1.47/household/year ($0.12/month)

7.4 Pick-up of Recyclables from City-Owned Facilities

City-owned facilities may be out-sourced under a larger contract as a per-location charge or under a separate City facilities services contract. Sometimes this is included as a "free service" with the trash collection contract, or as a proffer in government contracts. In any contract providing this service as value-added or "free," it should be stipulated to include the resources allocated, a list of facilities

included, the type of service to be provided, the cost per hour or location, and the ultimate destination of the materials. This is key in the event new city facilities open or existing facilities are closed.

Typical contract language may state that the contractor is to provide trash & recycling containers for a list of city facilities at no cost. The trash and recycling collection schedule would be noted in procurement documents, with the hauler providing the service for the collection and disposal of trash and recyclables from all city-owned or leased facilities. Such requests may also include servicing City parks at no cost to the City. Pratt Industries is paying $11/ton for the recyclables material the City delivers to them. This is the same price Waste Management pays the City for the recyclables material based on a 50/50 split for the recyclable material delivered to Pratt Industries on behalf of the City. GBB recommends that the City investigate their marginal costs to determine if it is cost neutral or it might be advantageous for the City to have WM collect recyclables from city-owned facilities. This is the only city-provided recycling currently done by the ESD on the small truck routes. Even if WM collected the recyclables from city-owned facilities, the City would still realize the $11/ton rebate minus the cost to provide the service itself.

7.5 Rapid-Response Resolutions

The ESD tracks its return trip costs to collect garbage. For the first six months of FY15, it estimated that cost, referred to as a "Go-Back", to be $75.53/trip. This will be discussed further in Section 12. Any time a truck is taken off-route to rapidly respond to a customer issue it costs the city approximately $75.53/resolution. The goal of ESD is to proactively reduce issues that generate the need for resolution, thereby reducing costs.

Private haulers do not estimate rapid response cost in their Proformas, but view them as a cost that impacts the bottom line. Therefore, they proactively work to reduce issues requiring a response. Any City costs associated with resolving complaints and "Go-Back" issues would go away with contracted services. Currently, this is a significant cost to the City, as presented in Section 12.

ESD should continue to work to improve its need to resolve issues whether valid or not, and implement a set of service standards to reduce this cost. It would be advantageous for City staff and elected officials to support the department in this endeavor and not give away "free" service or ask for costly favors. Immediate fixes are to aim for shortest time for complaint resolution, by empowering employees to solve some problems on the spot.

7.6 Local Call Centers vs. Regional or National Call Centers

There was a time when the Call Center that dealt with customer service issues was considered a backroom operation. Recently, the Call Center has become the focus of many enterprise initiatives. The Call Center's cost, the volume of contacts, the importance of customer relationships, the customer experience, and the changing marketplace, have all played a role in altering the enterprise view of the Call Center. Management must be prepared to respond to these changes and build value-based relationships with others across the enterprise.

Centralizing Call Centers is an effective method to minimize costs and increase efficiency of the customer service team. Today's focus has shifted to a Call Center on providing the ultimate customer service experience, in order to stand above competition. Multi-location companies are choosing to

consolidate their Call Centers to one location, in order to increase efficiency and provide a consistent customer service experience.

Municipalities tend to use local staff and consolidate City services under one roof. To do so, cities are now using software and applications such as SeeClickFix/FayFixIT to keep citizens informed and give them the ability to register issues on-line without making phone calls. Exhibit 7.1 shows the new tote board in the City's Call Center to show calls waiting, Call Center agents available, customer service not ready and the longest time waiting to provide a visual to better assist customers. Private haulers have large, more networked Call Centers, which also have the capability to dispatch services.

Exhibit 7.2 - Call Center Tote Board

Large private haulers like Waste Management, Inc. and Republic Services have been transitioning their Call Centers into more centralized locations where they handle large geographic areas often covering numerous states. While this has reduced costs, it has also caused concern that local people are not taking care of local issues and municipalities lose valuable information as to how the hauler is performing. Oftentimes, RFPs for collection stipulate that there must be a local Call Center; however, the trend towards regional Call Centers is continuing. As technologies improve, and the increased use of computer applications, it is expected that the approach will be adapted even for smaller local haulers.

The Call Center transitioned out of ESD in February 2014 and it is now managed by Corporate Communications located on the PWC campus. The local Call Center will remain in place for the foreseeable future. It would be beneficial to integrate FleetMind software into the city Call Center to further assist them to handle solid waste collection issues, whether public or private. It may be beneficial to also transition the POS at the ESD to the Call Center to make it a one-stop-shop, and reduce the risk of mishandled payments, theft and the like. With Cityworks/FayWorx software, the Call Center should also be able to manage the cart maintenance and other service related issues when residents call 433-1FAY for assistance through integration with FleetMind by immediately entering work orders reducing inter-department phone conversations which can cause service delays.

7.7 Intra-Departmental Equipment Loans

The private sector does not lend equipment nor does it borrow equipment. Therefore, as a value added service the ESD's ability to loan equipment to other departments is reduced or eliminated depending on the services outsourced. An example may be the parks department requiring the use of a grapple truck for a cleanup effort. The reverse is also true where the ESD would not require the need for a leaf vacuum collection truck as an example to assist with loose leaf collection.

The average cost of a bulk item grapple truck is estimated to be $185,000 in FY 2016. If such equipment did not exist at ESD, the capital cost would have to be assumed by another department, or the service outsourced to a private company as illustrated earlier in section 7.2 at $150/hour. The intrinsic value of intra-department equipment loans does not have a price tag; rather, it is a core management practice of the City that will be lost with a private hauler handling the services.

7.8 Annual Untied Way/Heart Association Employee Contributions

There are intangible benefits to Annual United Way/Heart Association Employee Contributions that whether in the public or private sector help increase employee morale. These programs can continue with privatized services, although the contributions by ESD as a whole would be reduced due to staff reduction. In FY14/15 SD contributed $2,357.16 through payroll deductions, fund raisers and direct gifts.

One of the benefits received from the employee contributions was the United Way's information referral center to assist residents with the 2011 storm debris clean-up. Impacted City residents were able to report any damages to property or unmet needs. This service was outside the normal services the City provides and was free-of-charge and offered through the United Way.

7.9 Promotions of Recycling Programs

The city currently does provide promotional programs to help its recycling program. Approximately 50% of the $50,000 budgeted for advertising, printing, postage, is used to promote recycling. North Carolina's communities have more reasons than ever to increase the effectiveness of their recycling efforts. The three R's have a corollary in the three "E's" – efficiency, the economy and the environment. The city has its recycling program in place and poised to capture these benefits by increasing public participation. However asking existing city recyclers to increase their amounts recycled will require replacing the 35-gallon cart with a larger cart. The resident is currently charged to increase the cart size and only the most dedicated recyclers will spend their money will purchase the larger size cart. Until cart size, and the weekly frequency of collection more publicized, the City must encourage those who are not recycling to participate through incentive programs and public outreach.

North Carolina's communities have more reasons than ever to increase the effectiveness of their recycling efforts. The three R's have a corollary in the three "E's" – efficiency, the economy and the environment.[7] The city has its recycling program in place and poised to capture these benefits by increasing public participation. However asking existing city recyclers to increase their amounts recycled will require replacing the 35-gallon cart with a larger cart. The resident is currently charged to increase

[7] http://re3.org/React/2.pdf, p. 11.

the cart size and only the most dedicated recyclers will spend their money will purchase the larger size cart. Until cart size, and the weekly frequency of collection more publicized, the City must encourage those who are not recycling to participate through incentive programs and public outreach.

When conducting recycling outreach, it is important to think of the public in two different groups – those who recycle, and those who don't. When communicating with current recyclers, focus is on telling them where, when and what to recycle. It is less promotion and more instructional. Appealing to non-recyclers takes a little more creativity. With either group, your best bet is to avoid heavy handed environmental messages and guilt-based approaches. Instead, focus should be on appealing to their positive gain.[8]

The goal of all program coordinators should be to seek the lowest cost per ton possible. For the city, this can be achieved by increasing participation, implementing award/incentive systems, increasing user friendliness (e.g., switching from 35-gallon cart to a 96-gallon cart at no cost) or any combination of these.

One such rewards based incentive program is Recyclebank®, who partners with local businesses and the community to generate economic, environmental, and social benefits for both municipalities, citizens and haulers. RecycleBank® is an incentive based rewards program which rewards people who participate with local discounts and deals with local and national businesses. In 2011 Waste Management, Inc. made a strategic investment in Recycle Rewards, Inc., whose subsidiary is Recyclebank. With the investment, Waste Management joins existing Recyclebank investors RRE Ventures, Sigma Partners, Kleiner Perkins Caulfield and Byers, The Westly Group, Generation Investment Management, Top Tier Capital Partners, Physic Ventures and Craton Equity Partners.

The program is intended to motivate residents to increase household recycling and thereby help municipalities realize sustainability goals, cost reductions, increased community engagement, and increased support for local businesses. The following are two examples of the benefit of a recycling incentive rewards program.

In the spring of 2013 Spring Hill, TN implemented a curbside single stream recycling program and RecycleBank by adding the service to the curbside trash collection already contracted to Waste Management. The curbside recycling cost in FY2015 is $3.72/household/month and curbside trash collection is $9.87/household/ month for trash service. Spring Hill reported that the early stages of the recycling program in 2013 saw a 75% participation rate. After one year of the new recycling program Spring Hill saw its participation rate go from 75% to 86%. They believe the recycling participation rate increased in part because of Recyclebank.[9]

[8] *Ibid*., re3.org., p. 13.

[9] http://www.tennessean.com/story/news/local/williamson/spring-hill/2014/07/02/spring-hill-sees-high-recycling-participation-rate/12026089/

Bridgeport, CT a city with a population of 147,216 converted from dual stream to single stream recycling program and simultaneously implemented RecycleBank in 2013. The city saw a 67% increase in participation rate and the rewards program contributed an estimated $89,000 to the local economy.[10]

RecycleBank program monthly prices range from $.30/household - $4.00/household depending on the package size with an approximate 4% increase in recyclables.[11] A rewards style incentive program could cost the City from $217,897 to $2,905,296 annually based on 60,527 households and depending on the rewards package for an estimated 4% increase in recyclables from 9,280 tons to 9,651 tons. The additional 371 tons of recyclables would bring in $4,081 in rebates from Waste Management. The city would not see a reduction in landfill disposal fees as that cost is embedded in the annual $48/household County Solid Waste Fee.

Without knowing the current participation rate it would be difficult to estimate an increase in participation if a rewards program were to be implemented. However, using the assumption that Fayetteville would see a similar $89,000 contribution to the local economy what is the estimated bottom line impact of a rewards style program such as RecycleBank. $217,897 – ($4,081 + $89,000) = $124,816 annually which equates to $336/ ton of the additional 371 tons of recyclables or $2.06/ household annually.

7.10 Illegal Dump Remediation

This program mitigates an average of 10 illegal dumpsites per week, helping keep Fayetteville clean and beautiful. This service would have to be absorbed by another department or outsourced. Approximate cost to city based on $4.03/per cubic yard estimate in Section 7.2 and estimate each illegal dumpsite averages 10 cubic yards: 10 sites x 10cy x 52 weeks x $4.03 = $21,000 annually. Outsourced this same service could cost upwards of $65,000 at $12.50/cubic yard.

7.11 Summary

In summary there are value added services that actually may be more of a cost than if conducted by a private hauler. One such service is recycling collection from City facilities. Conducting a cost accounting of this service will determine the true cost, preliminarily to be negotiated with Waste Management to determine their charge to the city of the service to compare with city cost. Table 7.2 summarizes the cost/value of the services in this section.

[10] http://www.forbes.com/sites/heatherclancy/2013/10/07/how-recyclebank-incents-communities-to-care-about-recycling/

[11] L. Skumatz, D. Freeman, et.al. Recycling Incentives: Part 1. Resource Recycling, February 2011

Table 7.3 - Estimate of the ESD Value-Added Services

ESD Value-Added Services	Description of the Activity	Private Hauler Estimated Cost	City Estimated Value
Emergency Response Activities	Estimated private hauler cost per cubic yard impact on the City with private hauler bulky Item collection, leaving the City without bulk item collection equipment. For natural disaster debris collection formally handled by the ESD.	$12.50/cy	$4.03/cy
Special Event Support	Private hauler special event support for festivals, parades, cleanups, etc.	$95,000(1)	$24,519 annually
Pick-up of recyclables from City owned facilities	Estimated private hauler cost per location for the collection of recyclables from all City-owned buildings,athletic facilities and the City's 5 recycling drop-off sites by City staff. Waste Management would still provide the $11/ ton rebate.	$2.91 per location(2)	$23,000 annually
Rapid Response Resolutions	This program includes first responders to quickly resolve collection related complaints in the field.	Part of contractual cost	$75.53 per resolution
Local vs. Regional Call Center	Call Center transitioned out of Environmental Services in February 2014 and is now managed by Corporate Communications	N/A	N/A
Intra-Dept Equipment Loans	Examples are ESD borrowing leaf collection trucks for loose leaf collection; loaning grapple trucks for debris clean up	N/A	$185,000/ truck
Annual United Way/ Heart Association employee Contributions	Intangible value private haulers have similar programs; privatizing will reduce City's overall contributions	Unknown	$2,357
Promotions of Recycling Programs	There currently are no programs such as Recycle Bank or recycling Perks in Fayetteville. Implemnting a program can increase local community and ESD revenue.	$151, 000	$151,000
Illegal Dump Remediation	This program mitigates an average of 10 illegal dumpsites per week, helping keep Fayetteville clean and beautiful.	$65,000	$21,000

(1) Based on current contract cost
(2) Assumes hauler will add on each facility using current contract price

While city provided services are often seen as a cost, they can prove to have value when the service is outsourced or goes away. For instance the use of grapple trucks for rapid response to storm cleanup has been shown to be invaluable to the City and could become a costly and inefficient endeavor in the future should this service be outsourced. A value-added benefit for Fayetteville could come from an incentive rewards program to increase recycling that will help drive awareness and provide economic benefits for both the ESD and Fayetteville businesses.

8 City Employee Benefits and Limitations versus Private Hauling Companies

8.1 Introduction

Benefits for employees can be very different between public and private sector employees. Job seekers have different expectations when making decisions to join either a public or private sector organization,

with many of them related to the benefits available. This section reviews the City of Fayetteville's wage and benefits package, and then summarizes the different benefits offered City workers vs. a private refuse firm.

Public sector employees enjoy excellent benefits, including health insurance, dental insurance, generous leave and other income security benefits such as retirement. These benefits can make a job more appealing in the public sector, even if the base compensation is lower than the private-sector base wages. Job security is typically better in the public sector, once an employee completes a probationary period. Terminating public-sector employees is often times difficult, unless it is for gross misconduct. There is long-term job stability in the public sector unless serious economic factors affect the City to the level that employee cuts must be made. Private sector employees are more subject to market and business-related fluctuations. A loss of a municipal contract can result in the private sector laying-off employees, as an example.

8.2 Review of Fayetteville's Wage and Benefits Package

The City of Fayetteville provides an extensive wage and benefits package that is available to ESD employees. The list of items include, but not limited to, health and dental benefits, paid time off, retirement, discipline policies, promotion, quality of life programs, etc. that are beneficial to city employees that are not available with private sector solid waste companies.

8.3 Synopsis of Private Haulers Wage and Benefits Package

This section compares the City-provided benefits to two public sector companies who are identified as Private Sector A and Private Sector B. One of the most discussed topics in a job interview is health benefits. Table 8.1 summarizes and compares Fayetteville’s health benefits with two top private sector solid waste companies.

Table 8.1 - Medical Benefits Comparison

Entity Compared	Pay Cycle	Health	Dental	Vison	Supplemental Insurance Benefits	Cobra
City of Fayetteville	Bi-Weekly	Yes, after 30 days of full time employement, eligible 30 hours per week, employee, eligible dependents	Yes, after 30 days of full time employement, eligible 30 hours per week, employee, eligible dependents	Yes, employee and eligible dependents	At the employee's expense through payroll deduction: Term life insurance (For employees and their eligible dependents) Cancer/dread disease insurance, Vision insurance (For employees and their eligible dependents), Universal life insurance, Disability income insurance.	yes
Private Sector Company A	Weekly	Yes, after probation period, employee, eligible dependents	Yes, after probation period, employee, eligible dependents	Yes, employee and eligible dependents	Employee and eligible dependents; Term Life, Legal services, Employee discount programs, Free online training programs; basic policies paid by company increase in coverage at employees expense	yes
Private Sector Company B	Weekly	Yes, after probation period, employee, eligible dependents	Yes, after probation period, employee, eligible dependents	Yes, employee and eligible dependents	Employee and eligible dependents; Term Life, Legal services, Employee discount programs, Free online training programs, basic policies paid by company increase in coverage at employees expense	yes

The basic health benefits offered are similar. The pay cycle noted on this table shows the city pays biweekly.

Another heavily discussed topic revolves around the accrual of vacation time. Table 8.2 points out the many differences in vacation between the City and the public sector. City employees may earn 2 fewer days over the length of their employment, however, they also have the ability to accrue their vacation time and carry it over one year to the next with a maximum of 35 days kept on the books. The private sector typically has a "use it or lose it" vacation policy.

Table 8.2 - Number of Days of Vacation Comparison

	0-3 years	3-5 years	5-10 yrs	10-15 years	15-20 years	20+ years
City of Fayetteville(1)	10	12	14	16	18	20
City of Fayetteville Accruable Leave	25	25	25	30	30	35

	1 year	2 -8 years	8-15 years	N/A	15+ years	N/A
Private Sector A as of 2012(1)	5	10	15		20	
Private Sector B as of 2012(1)	5	10	15		20	
Private Sector accruable	0	0	0	0	0	0

(1) Full-time, regular employees working 40 -hour work weeks are eligible for vacation leave

The private sector tends to periodically change eligibility years for vacations. The number of days eligible are as of 2012, and these may have changed since.

There are a couple of notable differences in the remaining leave types offered by the City as compared to the private sector. Table 8.3 compares the remaining leave time offered by the City. The City offers school leave to allow employees to attend school meetings with their children. In addition, the City offers voluntary shared leave and sick leave both of these are not offered in the private sector. The private sector typically provides for six (6) paid holidays per year, whereas ESD 4-day/10 hour collection staff get 8 holidays per year and accrue 8 additional holiday hours to equal that of regular employees who get eleven 8-hour holidays per year. The City also provides sick leave, something not typically found in the private waste sector. The private sector does offer personal days, which an employee uses for sick days. Private sector personal days are reimbursed at years end if not used. The city offers additional funeral days when an employee must travel further than 200 miles, but these must be used from the other accrued leave, such as sick leave, comp time, annual leave, or a combination thereof. The private sector typically requires the employee to use personal or vacation days when extra days are needed.

Table 8.3 - Leave Comparisons

	U.S. Savings Bonds	National college savings plan contributions Credit Union	United Way	YMCA membership/ Fireman's Relief Fund	Employee Stock Purchase Plan	Employee Assistance Program	Disciplinary Policys	Uniforms	Promotions
City of Fayetteville	Yes	Yes	Yes	Yes, YMCA and Healthplex memberships are discounted for City Employees.	No	Yes	Progressive	Yes	Yes- Internal Candidates given preferential treatment
Private Sector Company A	No	No	Yes	No	Employee stock purchase plan,stock at discounted rates can be purchased twice per year	Yes	Progressive	Yes	Yes- Internal Candidates given preferential treatment
Private Sector Company B	No	No	Yes	No	Employee stock purchase plan,stock at discounted rates can be purchased twice per year	Yes	Progressive	Yes	Yes- Internal Candidates given preferential treatment

Time off of work after the first 2 weeks is tracked as FMLA with the city. Extended medical leave can be approved after FMLA runs out by approval of the Department Director and the City Manager. During extended time out, all forms of accumulated leave will be used until leave is exhausted, then employee is in no-pay status.

Table 8.4 provides a review of the death benefits, life insurance and disability benefits of the City versus the typical private sector waste firms.

All three pay some sort of death benefit to named beneficiaries. The Death/Life insurance benefits are similar for those employees who fall below a $50,000 annual salary. For those employees whose annual salaries are above $50,000 the private sector offers more. The private sector does offer additional coverage to an employee for a monthly premium. It is also noted that a variety of additional insurance packages are offered by the city using pre-taxed pay.

Table 8.4 - Death Benefit, Life Insurance and Disability Benefits

	U.S. Savings Bonds	National college savings plan contributions Credit Union	United Way	YMCA membership Fireman's Relief Fund	Employee Stock Purchase Plan	Employee Assistance Program	Disciplinary Policys	Uniforms	Promotions
City of Fayetteville	Yes	Yes	Yes	Yes	No	Yes	Progressive	Yes	Yes- Internal Candidates given preferential treatment
Private Sector Company A	No	No	Yes	No	Employee stock purchase plan,stock at discounted rates can be purchased twice per year	Yes	Progressive	Yes	Yes- Internal Candidates given preferential treatment
Private Sector Company B	No	No	Yes	No	Employee stock purchase plan,stock at discounted rates can be purchased twice per year	Yes	Progressive	Yes	Yes- Internal Candidates given preferential treatment

Another topic that is covered extensively in a job interview, and one of the most important, concerns retirement and 401(k)'s. Table 8.5 summarizes this topic. The City offers a retirement benefit that the private sector does not. The City offers retirement benefits through the State of North Carolina retirement program and offers optional 401K and ICMA programs without a match. It should also be noted that private sector Company A has recently began offering a retirement medical benefit. However details were not available at the time of this report.

Table 8.5 - Retirement and Post-Employment Benefits

	Retirement	Retiree Health Insurance	401(k)	Longevity Pay
City of Fayetteville	Retirement benefits are based on years of creditable service, and the average of the highest four consecutive years salary and your age at retirement. After five years of creditable service, EE is entitled to a benefit at a later date. After five years of creditable service through the retirement system, EE's who are permanently disabled, as approved by the Medical Review Board, are eligible for disability benefits. Employees are required to contribute 6% of base salary, city contributes approximately 7% of base salary.	To be eligible for this benefit, an employee must meet all of the following criteria: If an employee's date of hire is before February 1, 2008: Must have retired as an employee of the City of Fayetteville with 10 or more years of creditable service. If an employee's date of hire is after February 1, 2008: Must have retired as an employee of the City of Fayetteville with 20 or more years of creditable service. Both must have completed five or more years of continuous service as a full-time employee of the City of Fayetteville.	Yes, Non- matching	Yes
Private Sector Company A	No	Retiree medical coverage	Yes- Voluntary matching up to 6%; first 3% dollar for dollar match, second 3%= $ .50 per dollar	No
Private Sector Company B	No	No	Yes- Voluntary matching up to 6%; first 3% dollar for dollar match, second 3%= $ .50 per dollar	No

Table 8.6 reviews the remaining additional benefits offered by the City and summarizes whether they are also offered in the private sector. The private sector does not offer much in the way of payroll deductions for extra benefits. They leave this up to the employee to set up automatic deductions outside of payroll, through banking institutions and credit unions where their paycheck is deposited. As the two public sector companies are publically traded, they offer discounted employee stock purchases twice a year, obviously not available from the City. Finally, it is noted that longevity pay is no longer available for City new hires as of July 2009.

Table 8.6 - Additional Benefits

	U.S. Savings Bonds	National college savings plan contributions Credit Union	United Way	YMCA membership Fireman's Relief Fund	Employee Stock Purchase Plan	Employee Assistance Program	Disciplinary Policys	Uniforms	Promotions
City of Fayetteville	Yes	Yes	Yes	Yes	No	Yes	Progressive	Yes	Yes- Internal Candidates given preferential treatment
Private Sector Company A	No	No	Yes	No	Employee stock purchase plan,stock at discounted rates can be purchased twice per year	Yes	Progressive	Yes	Yes- Internal Candidates given preferential treatment
Private Sector Company B	No	No	Yes	No	Employee stock purchase plan,stock at discounted rates can be purchased twice per year	Yes	Progressive	Yes	Yes- Internal Candidates given preferential treatment

With respect to job openings at the City, the department head has the authority to post an in-house vacancy or an external vacancy opening. All employees must compete for each promotional opportunity with all others who apply, in-house or out. In-house indicates open to all city employees.

8.4 Summary

Based on the review of benefits, the City does offer a robust benefits package that is very rewarding and comparable to the private sector. It should not be considered a limitation to hiring and keeping quality employees in the ESD.

9 Equipment and Vehicle Maintenance Cost Comparison

9.1 Introduction

Section 9 focuses on solid waste maintenance activities only and compares municipal vehicle and equipment maintenance cost data with that of the City operations. Due to the competitive nature of the private industry, actual cost data is not available. However, private hauler best practices and benchmarking ideas are noted based on GBB's industry knowledge. Hopefully, such information will give the City ideas on how to improve maintenance procedures and reduce expense. Cost reductions can be achieved through quality maintenance practices by both ESD and Fleet Services. GBB's efforts were not to review PWC Fleet Services. However, as they maintain the ESD Fleet, best practices affect them more so than the ESD. To reduce ESD's maintenance costs, they will have to work closely with Fleet Services to implement improvements as they see fit. Generally speaking, ESD maintenance is a function of (1) the age of equipment, (2) usage of the equipment measured by miles and (3) required routine inspections. The procedures for maintenance, such as utilization of staff mechanics versus outsourcing and warranty work, is also discussed.

9.2 Equipment and Maintenance Costs

ESD has 67 vehicles that are maintained by the PWC Fleet Services Division. Fleet Services also maintains and repairs police, airport, parks and rec, administration and fire department equipment. The

supervisors at Fleet Services decide how the work load is performed. Two maintenance shifts, working 5:30a.m. – 3p.m. and 2:30p.m. - 11:30p.m. Monday through Friday to maintain the entire City's fleet of vehicles. The first shift has a heavier workload and more maintenance technicians. When a truck breaks down the repair is made one full shift cycle later as the repairs are made during the day. PWC also sells used ESD equipment through GovDeals. Com and charges ESD a 10% handling fee.

When a breakdown occurs, ESD calls PWC customer relations, who generate a work order for the repair. If a repair is required on new equipment (that is, warranty work) the PWC Analyst gets involved to ensure the warranty is handled correctly. PWC uses the FASTER asset management and database system. The PWC Analyst also generates a monthly invoice summary report which is sent to the City finance department, who then allocates out the expenses to the appropriate City department. The ESD analyst then reviews the finance department report to ensure it matches the general ledger. Repairs are charged on actual time spent. Fleet Supervisors let the ESD Director know the repair status via a weekly list which notes vehicle number and its status as of report creation. A Preventative maintenance (PM) schedule is provided monthly.

PM work is typically done on Wednesday, so as not to interrupt the ESD collections. Tire repairs are actually completed at the ESD facility by a contracted local tire repair company then charged a 20% surcharge by Fleet Services. If repairs need to be outsourced, Fleet Services uses local truck repair services such as Trans Source, the Mack Dealer. Other in-town repair services include International, Freightliner, H and H and Fairmont Cylinders who repairs hydraulic cylinders. If a Crane Carrier chassis truck repair is beyond Fleet Services ability, it is taken to Charlotte. Hydraulic hoses and brakes are typically done by Fleet Services.

Asset Number Cost History Reports for ESD vehicles do not show that warranty dollars are actually tracked and accounted for. To illustrate, Table 9.1 shows the month-to-month cost history for Asset 2014/4086 for calendar year 2014. The asset experienced $14,000+ in repair cost with no applicable warranty work. As presented to GBB for review, this asset did not have fuel or oil costs indicated for the calendar year.

Table 9.1 - Asset Number Cost History for 2014/4086

PUBLIC WORKS COMMISSION — **ASSET NUMBER COST HISTORY** — p.60
W150 - Asset History — **01/01/2014 TO 12/30/2014**
1/16/2015 1:49:05 PM

Asset Number: 2014/4086 Description: 2014 INTERNATIONAL 7500 SFA Class: 500D8 Department: 47183

Month/Year	Total $	Operating $	M, R, & W $	Maintenance $	Repair $	Warranty $	Accident $	Capitalization $	Fuel $	Fuel Qty	Oil Qty	Other Qty
1/2014	789.684	789.684	789.684	0.000	789.684	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2/2014	14.991	14.991	14.991	0.000	14.991	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/2014	79.282	79.282	79.282	0.000	79.282	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/2014	966.374	966.374	966.374	0.000	966.374	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/2014	1838.640	1838.640	1838.640	0.000	1838.640	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/2014	2214.897	2214.897	2214.897	0.000	2214.897	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/2014	4634.983	4634.983	4634.983	0.000	4634.983	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/2014	2.224	2.224	2.224	0.000	2.224	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/2014	36.627	36.627	36.627	0.000	36.627	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/2014	774.115	774.115	774.115	0.000	774.115	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12/2014	2979.361	2979.361	2979.361	0.000	2979.361	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Totals:	14331.180	14331.180	14331.180	0.000	14331.180	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Meter Driven	Total CPM	Operating CPM	M, R, & W CPM	Maint CPM	Repair CPM	Warr CPM	Accident CPM	Capital CPM	Fuel CPM	MTR/UNIT	MTR/UNIT	MTR/UNIT
14706	0.975	0.975	0.975	0.000	0.975	0.000	0.000	0.000	0.000	0.000	0.000	0.000

The total cost per mile for the various costs for ESD vehicles in calendar year 2014 is shown in Table 9.2. There is no warranty shown for any of the departments 67 vehicles.

Table 9.2 - Total ESD Department Cost History Calendar Year 2014

PUBLIC WORKS COMMISSION
W150 - Asset History
1/16/2015 1:49:05 PM

ASSET NUMBER COST HISTORY
01/01/2014 TO 12/30/2014

p.68

REPORT TOTALS:

Total $	Operating $	M, R, & W $	Maintenance $	Repair $	Warranty $	Accident $	Capitalization $	Fuel $	Fuel Qty	Oil Qty	Other Qty
1554043.633	1516512.359	1135933.093	0.000	1130762.715	0.102	37531.274	5170.277	380579.266	122632.300	0.000	0.000

Meter Driven	Total CPM	Operating CPM	M, R, & W CPM	Maint CPM	Repair CPM	Warr CPM	Accident CPM	Capital CPM	Fuel CPM	MTR/UNIT	MTR/UNIT	MTR/UNIT
647357	2.401	2.343	1.755	0.000	1.747	0.000	0.058	0.008	0.588	0.189	0.000	0.000

ASSET NUMBER COUNT: 67

According to data from Fleet Services, ESD vehicles drove a total of 647,357 miles in CY 2014. The metrics include averaging about 12,449 miles per week, driving about 2/10 of a mile per week per household. The total 2014 vehicle operating spend was $1,554,043. The major spend areas that made up the total were; repair 73%, fuel 25% and accident-related charges of 2%.

9.3 Comparable Equipment and Vehicle Costs

Table 9.3 shows the marked differences in labor rates, mark-ups and budgets for the comparable municipalities that their internal fleet services charges. Labor rates range from $50/hour in Winston Salem to a high of $68/hour in Wilmington. The mark-up rates on parts and materials tend to be lower or non-existent in the municipalities where the labor rates are higher; and higher mark-up percentages with lower labor rates. For example, High Point has a $60/hour labor rate with no mark-ups on parts, material or outsourced labor, whereas Fayetteville Fleet Services has a 20% mark up with a $61.13/hour labor rate. It is interesting to note that Wilmington Fleet Services also has a mark-up on fuel.

Table 9.3 - Comparable Fleet Services Information

	Fayetteville(1)	Winston-Salem(2)	Greenville(2)	High Point(2)	Greensboro(2)(3)	Durham(2)(4)	Wilmington
FY14/15 Maintenance Budget for Sanitation Department Vehicles	$1,500,000	$350,000	$1,708,220	$1,718,555	$5,409,810	$475,200	$1,121,597
Hourly Labor Rate for Solid Waste Vehicles	$61	$50	$60	$60	$52	$59	$68
Parts and Material Mark-up %	20%	26%	15%	0%	25%	5%	10%
Sub-Let/ outside shop Mark-up %	20%	13%	15%	0%	5%	0%	0%
Mark -up on Fuel(1)	No	15 cents/gallon	15 cents/gallon	No	9 cents/gallon	No	Yes

(1) Mark up on fuel from City fuel depot is $.10 per gallon; fuel from PWC fuel depot is not charged the $.10 per gallon.

(2) are from the FY12/13 UNC SOG Performance Measures for Fleet Maintenance Report

(3) Budget includes lease expenses which are tied to maintenance fees for leased vehicles from Fleet Services and also cover capital cost of future vehicles

(4) Budget is for parts only; Fleet Services only bills the departments for parts, no labor. The labor budget comes from the program.

Table 9.4 summarizes the information available for comparable municipalities in North Carolina. None of the solid waste departments in this study repair their own vehicles and outside of Fayetteville, most lease their vehicles from the respective Fleet Services department, with the lease cost including capital, repair and maintenance expenses.

Table 9.4 - Comparable Public Maintenance Costs

Item	Equipment & Vehicles, By City	Fayetteville(1)	Winston-Salem	Greenville	High Point	Greensboro	Durham(2)	Wilmington(3)
1	Collection Points	60,527	77,553	38,357	35,544	80,640	69,800	31,253
2	Are Vehicles Leased	No	Yes	No	No	Yes	Yes	Yes
3	Vehicle Inventory	67	79	51	39	63	72	33
4	Households per Vehicle	903	981	752	911	1,280	969	947
5	Average Age of Fleet (Years)	9.5	8.7	7.4	9.6	7	5.5	9.1
6	Hourly Labor Rate for Solid Waste Vehicles(1)	$61	$50	$60	$60	$52	$59	$68
7	Parts and Material Mark-up %	20%	26%	25%	0%	25%	5%	10%
8	Sub-Let/ outside shop Mark-up %	20%	13%	15%	0%	5%	5%	0%
9	Mark -up on Fuel(4)	No	No	No	No	No	No	Yes
10	Annual Maintenance Budget for Vehicles	$1,500,000	$350,000	$1,708,220	$1,718,555	$5,409,810	$475,200	$1,121,597
11	Average Annual Maintenance Cost per Vehicle	$22,388	$4,430	$33,495	$44,066	$85,870	$6,600	$33,988
12	Average Annual Cost per Collection Point	$24.78	$4.51	$44.53	$48.35	$67.09	$6.81	$35.89
13	Other comments on this activity	Public Works Commission Fleet Services maintains vehicles.	Fleet Services maintains equipment.	Fleet Maintenance Division maintains equipment.	Fleet Services maintains Vehicles	The Equipment Services Division maintains the City fleets departments(Excl. Fire Dept.). Vehicle budget includes lease expenses.	The Fleet Management Department is responsible for all services related to the City of Durham's vehicles. Budget is for parts only.	Fleet Services Department centralizes the expenditures for maintenance.

(1) FY14/15 Maintenance Budget
(2) Items 10-12 are parts cost only; Budget is for parts only; Fleet Services only bills the departments for parts, no labor
(3) FY15/16 Maintenance Budget
(4) No Fayetteville mark-up from Fleet Services; but a 10% mark-up if from City fuel depot.

Vehicle costs will range as widely as there are fleets. Fleets are not maintained the same, do not have the same number of spares, the skill level of fleet services personnel varies, types of vehicles to be maintained differs, accounting practices are different, availability of third party truck shops is problematic and a litany of other variables makes it difficult to compare. However, Table 9.4 summarizes the various ways fleets are looked at around the state.

The average annual cost per vehicle ranges from $4,430 to $85,870 per year with Fayetteville near the lower cost at $22,388 annually. The budgeted expenses vary widely as shops charge different labor rates and mark-ups, and age of a fleet will also come into play. Fayetteville has one of the highest average age of fleet (9.5 years). This can be attributed to the high number of spares illustrated in Section 5.

As an example, the spare factor for refuse trucks used by the City as reviewed in Section 5 was 45% (19 routed and 9 spares). By reducing the spares from 9 to 4 leaves a 20% spare factor which is still within an acceptable range to provide refuse collection services. Table 9.5 shows the bottom line cost savings by eliminating five (5) spares with Fleet Services commitment.

Table 9.5 - 2014 Repair Expense for Spare Trash Trucks

No.	Year	Asset No.	Description	Repair $(1)
1	2008	4048	CRANE CARRIER	$15,829
2	2008	4053	CRANE CARRIER	$16,302
3	2008	4058	CRANE CARRIER	$18,890
4	2008	4059	CRANE CARRIER	$33,668
5	2009	4064	CRANE CARRIER	$14,864
2014 Total of 5 Oldest Refuse Spares				**$99,553**

(1) Excludes the cost of fuel which is assumed to be utilized by another spare vehicle as these are retired.

The city could then take a portion of this $99,553 and use this money to better maintain the remaining trucks. Again this practice is used by the top private waste hauling firms to control costs and, when managed properly, provide enough trucks to cost effectively service customers.

Simply put, the more trucks repaired the higher the cost to maintain those trucks, and therefore the higher the cost of service. By reducing the spares through Fleet Services, and ESD coordinating a quality fleet management program, the maintenance and repair money can be spent on the routed trucks to keep them in tip-top shape longer with Fleet Services commitment.

9.4 Summary

It is recommended that warranty items be carefully tracked to ensure the full benefit is realized. All warranty is not on a new vehicle, as there may be warranty opportunity missed due to replacement parts on older vehicles as well as outsourced repairs. Large national haulers track warranty with a goal of capturing at least 10% of repair costs as warranty work. In 2014, ESD spent $1,130,762 on repairs that could potentially equate to $113,000 in warranty rebates. It is recommended that the ESD implement more detailed maintenance and cost tracking based on these observations.

Fleet Services operates two shifts and ESD has a large amount of spare trucks to ensure enough vehicles to service residents. Therefore, Fleet Services repairs the majority of vehicles during the day when the sanitation vehicles should be running. Solid waste collection is one of the few services that is not provided around the clock and yet is vital to the City's well-being. The private sector repairs vehicles on the second shift after the day is completed and keeps a skeleton crew on during the day to handle road calls and major repair projects. A review and study of the PWC- ESD repair relationship may yield further benefits by shifting a portion of the workload and technicians to the second shift. This would allow sanitation vehicles to be repaired at night vs. waiting a full shift cycle, reducing down time, spare truck quantity and cost. This will require cooperation between the two departments with both mutually benefitting.

Additionally adding a certified mechanic with a service truck to the ESD to handle pre route repairs and road calls can be a benefit to both ESD and Fleet Services. This is a typical practice by private sector companies. The mechanic would handle minor delay causing repairs and quickly get the truck back in

service by making the repair on the spot vs. someone driving or towing the truck to Fleet Services. By adding this position it will reduce the amount of trucks waiting for repair and reducing the need for spares. As an example the City of Raleigh, North Carolina Solid Waste Service Department has over 100 trucks and is staffed with one department Mechanic and a helper. They average 2-3 trucks out of service daily as compared to ESD where 5 or more out of 67 are out of service daily. The mechanic position would reduce the need for spare trucks, improving customer service and increasing overall efficiency.

While ESD has been consistently implementing cost saving measures over the past several years, it will become increasingly difficult to find the large dollar savings. The next logical area to review and reduce operating cost is in the maintenance and repair of vehicles. This will begin with the pre-trip inspection and require ESD working closely with Fleet Services to find new savings going forward.

With the addition of FleetMind, it will need to be determined how maintenance and repair on the ESD equipment is handled. It is recommended that a third party software vendor facilitate maintenance on the equipment.

Solid waste trucks built after 2010 have a complex emission system that requires a periodic regeneration (Regen) of the Diesel Particulate Filter that traps exhaust soot. High temperature exhaust is applied to the filter and burns off the soot. However, as with any filter, it eventually becomes clogged and must be cleaned.

The Regen system is better suited for over the road applications, and not the stop and go of curbside trash collection. Higher speeds mean higher exhaust temperatures and more efficient burn-off of the particulates on the filter. Stop and go solid waste collection keeps the exhaust temperature lower due to increased idle time while servicing customers and a lower average speed. Because of this, higher than normal down time is experienced by solid waste departments due to the lack of understanding by drivers on how to operate the truck in stop and go driving. Currently, Fleet Services handles Regen issues. Based on GBB's experience, it is recommended that all ESD employees work with the equipment vendor and Fleet Service on how to operate the truck, and when to Regen in the field, as this will have a dramatic effect on reducing down time. Simply put, many Regen issues are operator error. Another piece to the Regen puzzle is the particulate filter that has to be periodically cleaned using a special process. The new process has not yet made it to all end user shops, thus requiring the filters to be shipped to a vendor for cleaning. It is recommended to keep an extra filter or two in house, so that the filter can be swapped out between vehicles while the dirty filter is cleaned. This keeps the trucks in service, rather than parked, waiting on the filter to be cleaned and returned.

10 Use of Collection Software and Technology

10.1 Introduction

Over the past ten years, many new high-tech devices and computer-based systems with complicated algorithms have been introduced into the waste industry to improve performance standards and track data. The programs and information collected have been used to help benchmark general performance of labor/equipment in providing waste and recyclables-related services. The purpose of these tools are to provide operating efficiencies for both drivers and ESD office personnel. This section reviews the state of this software as it has been integrated into ESD, and also provides information on the potential for integration of new software and communications tools onto the city vehicles.

GBB analyzed and evaluated how FleetMind Solutions, Inc. and Cityworks® Asset Management System integrates, and the projected efficiency gains, of using these two systems with the existing RouteSmart routing optimization software system. As RFID technology is currently not being considered for use by the City, this Report also briefly mentions how RFID is used within the waste industry, and how RFID could be potentially integrated. To project efficiencies, this section answers the following questions:

- What will be the efficiency impact of work order software on driver productivity, fleet maintenance and office personnel?
- How will the work order software provide data gathering and tracking, and a flexible report center for the City to make informed decisions?
- What costs are associated with purchase, training, implementation, software licensing and support?

The Report describes best practices that incorporate the integration of existing RouteSmart, FleetMind and Cityworks® Asset Management System to solid waste collection in the City. GBB evaluated the benefits and costs of the current system, and made projections as to efficiency and cost gains when adding the work order software, and potentially RFID technology. By themselves, RouteSmart and FleetMind technologies and products both provide value. However, they are complimentary, not competing, products, such that together they provide increased value.

10.2 RouteSmart Technologies-Route Optimization

Curbside high density residential routing requires the collection vehicle to make a stop at most addresses on a street. Some of the challenges are to reduce backtracking of the vehicle, minimize left-hand turns, and avoid vehicle route overlap and keeping routes logically contained inside of neighborhoods on certain days of the week. Route optimization software, and the complex algorithms that are written into the code, allows the user to create the most efficient collection routes possible. Optimized routes minimize unproductive time, optimize trips to-and-from facilities, balance the route times and can control unwanted turns which may introduce safety issues. All of these benefits reduce time and therefore cost. Another benefit of using route optimization software is that the travel paths can be virtually-driven for testing purposes and/or driver training, and then modified as needed. The advent of computer aided route design has significantly improved routing, as opposed to the use of crayons, highlighters, and marking up maps. Depending upon the baseline prior to implementation, the savings from optimized routes using computer assisted programs is substantial, typically 15%-25% of the overall all-in costs.

In the past, and prior to the computer-assisted routing, when a city wanted to develop new residential routes, or provide drivers with information to help on routes not collected due to truck breakdowns for example, either one's memory or paper maps were used. This oftentimes resulted in missed collections, increased cost, safety hazards where a driver may end up driving down a dead-end street, and imbalanced workloads resulting in employee complaints. Using maps, it was a matter of looking at an area and determining what looked like an appropriate route, adding all the households up for a given day, and then determining if that was the appropriate amount of work for a truck, or a route. Then the dispatcher or supervisor would manually build the route network.

When you're drawing maps, you typically can't take into account certain things like school zones needing to be serviced at certain times of day due to traffic. So drivers would go out on the route and adjust the sequence themselves, as best they could to avoid those areas during time of traffic

congestion. There would be a lot of extra driving time, because some drivers would double-back, rather than just completing the route to service streets in order.

Prior to 2007, Fayetteville collection routes were scattered across the city as annexation took place and new subdivisions were built. The ESD decided to utilize a route optimization software in 2007 and selected RouteSmart. Collection days are no longer scattered all over the city, and balanced workloads typically exist across the four-day collection week. Effectively developing new routes during the transition to automated trash collection routes were critical, while providing consistent service. ESD continues to use RouteSmart today, and adjusts routes, as-needed, to address equipment breakdowns, provide helper trucks, service new areas, and uses it where a quick and efficient temporary or permanent reroute is needed. The route optimization software helps the city achieve its cost savings and service goals by:

- Maximizing stops and lifts per hour,
- Giving office staff and drivers the ability to focus on taking care of customers, and
- Modeling new service areas and routing when the new fully automated trucks are brought on line.

In the city, rear-load packer trucks collecting both sides of a street have been transitioned to automated one-man crews collecting a single side. As this transition continues, the ability to efficiently adjust the collection system and efficiently reroute the collection fleet is key to both a successful transition and having minimal constituent-related service issues. The ESD is well positioned for these future needs.

10.3 FleetMind™

To improve operations, provide complete fleet visibility, and to improve the customer experience, ESD has recently purchased FleetLink Virtual OBC On-Board Waste Package-GD4010 Flat Screen Kits and Virtual OBC On-Board Waste Package – Entry Level Tablet Kits. The city began installing the FleetMind fleet management solution in curbside trash and yard waste trucks in Q4 CY14. FleetMind will allow ESD to improve service efficiencies and customer service experiences to reduce resource requirements through real-time fleet tracking and dispatching and provide the drivers the ability to complete service tickets thus ensuring more accurate work order completion. It will also provide real-time photos, by interacting with the on-board camera system, where the ESD drivers can take photos of improper set outs, as an example.

FleetMind is a web-based route management system that also integrates with both RouteSmart and Cityworks® (see discussion in Section 10.4). Thus, all daily operations are managed cleanly from the back-office system within ESD and reduces the need for verbal communication and waiting until the end-of-the-day to close out service tickets, verify services provided, and report customer issues such as carts-not-out and extra trash. In addition, the ESD office staff will now have the ability to track key performance measurements to monitor accountability and measure efficiency levels.

Each trash and yard waste truck will have FleetMind' s on-board display (Fleetlink Mobile System), and the office staff will have FleetMind's FleetLink Route System, which is a web-based route management solution that provides driver support and insight to dispatch operations for the residential waste collection services. It will also be used to assist with the tracking of residential cart delivery and cart maintenance. The automated vehicle location (AVL), working with the GPS portion of the system, will take the guesswork out of managing routes to ensure that drivers are actually implementing designated

routes to (1) minimize the travel distance, (2) track the amount of fuel used, and (3) confirm the amount of time required to complete assignments. GPS routing will be available to the Call Center. Eventually, the Call Center will be able to provide real-time information for their own use to generate one of two types of work orders related to collection services, either a MPU or a call-for-information. Staff in the Call Center will be able to view the truck location and current travel path to generate either ticket, depending on the circumstance. As an example, if the truck has not been there, the work order would be a call-for-information.

As ESD employees get more proficient, they will be able to use the BIN Monitor function of FleetMind to pinpoint the geocode location of a cart vs. the centroid of the property as it is now. This will allow for more accurate service verification.

FleetLink Route System will give the ESD the ability to conduct the following best practice activities with improved accuracy and efficiency:

- Manage cart and stop status for missed pickups, not-outs, unable to service,
- Monitor trucks and drivers,
- Create and maintain routes,
- Create add-ons, extras, and on-demand tasks,
- Assign optimized routes to trucks and drivers,
- Initiate the wireless delivery of electronic route sheets to the FleetLink Mobile system,
- Support normal dispatch operations such as re-assigning service stops to different trucks in the event of a breakdown or other anomalies, and
- Reduce paperwork.

ESD estimates about 1,000-1,150 homes per day are serviced per trash collection truck. FleetMind has the ability to provide a Summary-of-Calls per Route report to determine actual residential set-out rates. However, this is dependent on the driver manually geocoding carts using Bin Monitor. Alternatively, RFID (see discussion in Section 10.5) could provide the information without human interaction in the field. RFID technology is currently not being considered by ESD due to its cost versus ROI.

There was also a cost for FleetMind Technology. Over the past two budget cycles, the ESD has outfitted the fleet with a capital outlay of $450,000, which is being amortized over 7 years, costing approximately $5,400/month. FleetMind Technologies states its ROI ranges from a low of 2.6% to a high of 5.2% with an average expected savings of 3.4% for driver and overhead cost, vehicle operation/burden (repair) cost and fuel cost. Table 10.1 applies these potential savings to the City fleet maintenance costs reported in Section 5 versus these expenses. Based solely on the fuel and maintenance cost reported in FY14/15, the projected annual savings could range from $29,000 to $58,000 for the three primary city-provided waste services.

Table 10.1 - Combined Trash, Yard Waste and Bulky Item Collection Fleet Average Annual Savings

	FY 14/15 Expense (1)				FleetMind Estimated Savings		
	Trash	Yard Waste	Bulky Item	Combined	2.6% Low Est.	3.4% Average Est.	5.2 % High Est.
Miles	253,226	134,734	94,842	482,802	12,553	16,415	25,106
Gallons	56,180	34,833	23,087	114,100	2,967	3,879	5,933
Fuel $$	$176,388	$107,453	$71,732	$355,573	$9,245	$12,089	$18,490
Repair $$	$725,907	$217,264	$142,428	$1,085,599	$28,226	$36,910	$56,451
Fuel and Repair $$	$902,295	$324,717	$214,159	$1,116,454	$29,028	$37,959	$58,056

(1) 19 Garbage, 11 Yard Waste and 7 Bulky Item front line collection trucks from Section 5 that have both fuel and repair cost listed.

In addition to fuel and maintenance savings, Table 10.2 applies the same savings estimates to the forecasted ESD labor for FY 15/16. This projects another $70,000 to $140,000 annual savings.

Table 10.2 - ESD Total Employee Labor Average Annual Savings

	FY16 ESD Est. Labor	FleetMind Estimated Savings		
	Estimated Labor Cost	2.6% Low Est.	3.4% Average Est.	5.2 % High Est.
Labor Expense(1)	$2,661,499	$69,199	$90,491	$138,398

(1) includes all 73.25 FTEs

Table 10.3 combines the ESD projected savings in fuel, repair and labor expenses over the 7-year amortization schedule of the FleetMind Technology to help determine the projected break-even point, which is the payback period, for the investment made. Based on an annual average projected savings of 3.4%, and using a 3% annual CPI for associated ESD expenses, the expected break-even point for the $450,000 city investment is in 3-4 years; sometime in Q1 FY 18/19. This assumes that full utilization and proficiency occurs prior to FY 15/16.

Table 10.3 - Projected ESD Savings at 3.4% Average Annual Savings

	Year 1	Year 2(1)	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Fuel and Repair $$ (2)	$39,098	$40,428	$43,056	$45,856	$48,837	$52,013	$55,394	$324,682
Labor Expense	$90,491	$96,375	$102,641	$109,315	$116,422	$123,992	$132,054	$771,290
Total	$129,589	$136,802	$145,697	$155,170	$165,260	$176,005	$187,449	$1,095,972

(1) Both costs assume a 3% Annual CPI starting year 2
(2) Year 1 includes a 3% CPI as a catch up to FY16

As with any fleet management software, there is an expectation that efficiency will always increase. In discussions with FleetMind representatives, they were unable to share any statistics from former or

current customers due to the customer's request to keep it savings proprietary. However, they were able to share "case studies" on reported operational improvements and cost related savings. Casella Waste, in a pilot study with FleetMind, installed the equipment on 150 collection vehicles and reduced fuel consumption by an estimated 5% by using alarms to monitor idle time, optimizing routes, and identifying inefficient driving patterns. Western Oregon Waste was looking to find additional revenue, improve inefficient service verification and be able to integrate with billing and the back-office. Western Oregon Waste reported misses were immediately dealt with, and extra pick-ups went from nothing to dozens weekly with an increase in revenue. They reported a 50% reduction in data entry time due to a direct interface with their internal reporting system. U-Pak, a recycling service provider in Toronto, CA, saw a 60% reduction in data entry positions, through an 80% reduction in data entry times. U-Pak also was able to use FleetMind to gather accurate service times for operations and pricing. FleetMind data has assisted in several vehicle accident investigations as well.[12]

Following are a few examples regarding how Technology such as FleetMind can provide ROI.

- **Helper Routes:** It is typical that on any given day some routes will fall behind schedule. Some number of pickups from that route will need to be given to another driver. Without technology in the vehicles, this is a time-consuming event. A supervisor must drive out to the field or two drivers must meet up somewhere. With FleetMind's product, this process becomes simpler. ESD's Routing Analyst now has the ability to move stops from one vehicle to another. Increasing time savings.
- **Communication:** The FleetMind product makes office to driver communication much easier. For example, there may be a traffic delay in a part of town, or the landfill may be backed up, or you may need to communicate an additional pickup to a driver. With FleetMind technology, the Routing Analyst can send messages to the drivers instead of needing to call a two-way radio or cell phone. This provides time savings and safety improvements.
- **Customer Service**: The technology can provide both improved customer service and savings in customer service time. Consider this scenario. How many times in a day does a citizen call into Customer Service and ask questions about their service that day (e.g. when will I be picked up? Or, I was missed today.). Prior to the deployment of FleetMind, the CSR must call the driver asking questions. The driver may or may not be able to take the call at that moment. If they take the call while driving, they become a distracted driver. With the deployment of the FleetMind system, the CSR does not need to call the driver. All the GPS data and event data is uploaded from the truck's FleetLink Mobile System to the office's FleetLink route system in real time. The CSR is enabled to answer the citizen's questions in real time. With mobile computer technology, there is simultaneous customer service improvements and cost savings.
- **Extras:** Without mobile technology, a driver must write extra information on paper route sheets, and office staff must manually enter that data. With mobile technology the driver is able to easily enter the extra into the mobile computer and take a picture for proof. Almost always with the introduction of mobile computer technology, the number of recorded extras increases, and with pictures the number of disputed extras decreases.
- **Paper Savings:** With electronic route sheets the need to print paper route sheets diminishes. It is easy to track the savings in paper and toner costs. Additionally, an office staff member does not need to print route sheets each afternoon, staple them, and place them into driver slots.

[12] http://www.fleetmind.com/fleet-management-products/downloads

- **Driver Morning Time:** There is a certain amount of time each morning between driver check-in to pulling out of the yard in their truck. Drivers will no longer need to pick-up paper route sheets socializing while doing so, and supervision can see in the route data the exact time the driver is starting their route. This has the potential to save minutes of driver time per day per route.

The above examples describe measurable ROI examples. The usage of FleetMind will also provide benefits that are not easily measurable. Two such examples are listed here.

- How often does a citizen call to complain about a truck speeding in their neighborhood? How is that situation handled? With the GPS data provided by FleetMind, you can determine whether you had a vehicle in that neighborhood at all, and if so, ESD can see what speed the driver was driving.
- Obviously, mobile computers will provide data that allows ESD the ability to track driver behavior. However, it is typical that drivers become strong proponents of the system. Without the proof in the data provided, the driver always loses the argument. What the citizen says will be taken as truth – it has to be without data. Drivers come to realize that this system aids them, because more often than not, the data backs the driver, improving job satisfaction.

GBB is not specifically recommending FleetMind. However, it is important to note these experiences as Fayetteville has recently made a significant investment in FleetMind technology. The company has been in business for over ten years and have large solid waste customers such as Republic Services, Advanced Disposal, Casella Waste Systems and Progressive Waste Systems.

Efficiency gains, which translate into cost savings, will come about by reducing mileage and using the tools and reports provided by FleetMind. Table 5.11 estimated CY 2014 trash collection at 89.1 households/hour/route. Increasing this by 3.4% will add about 3 households/hour/route. Assuming an 8-hour workday this equates to 16 minutes/day/route, creating a total of 4 driver-hours/day for the 15 trash routes. Using the same projection methodology, total yard waste collections should increase by 5.6/households/hour, or 22 minutes a day, over the current estimated 163.4 households/hour/route for a total of approximately 4-driver hours/day for the 11 yard waste routes. Similarly, bulky item collection should increase by 7.8 households/hour/route, about 2 minutes/hour/route. This is approximately 2.5 driver-hours per day for the 10 bulky item collection routes. While always subject to local conditions, Table 10.4 applies the same savings percentages to illustrate potential efficiency gains which could be used toward absorbing some growth without adding personnel and equipment.

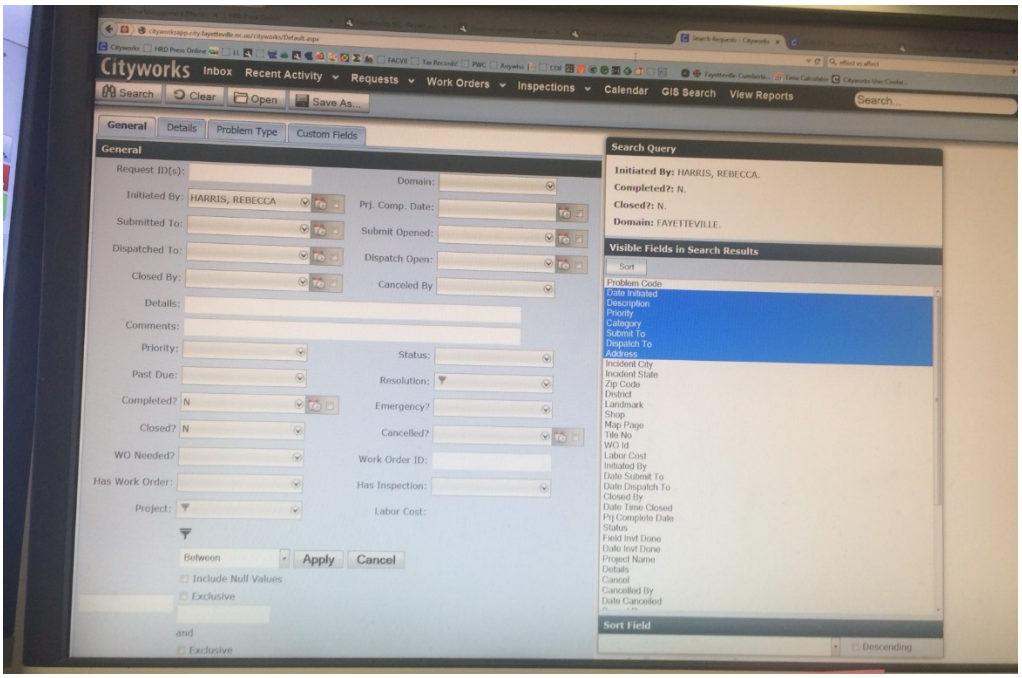
Table 10.4 - Expected Efficiency Gains

Calendar Year 2014		FleetMind Est. Efficiency Gains		
Service	Households/Hour	2.6% Low Est.	3.4% Average Est.	5.2 % High Est.
Refuse	89.1	91.4	92.1	93.7
Yard Waste	163.4	167.7	169.0	171.9
Bulky Item	229.4	235.3	237.2	241.3

10.4 Cityworks ®Asset Management System

A city-wide project to implement Azteca Cityworks® began in the fall of 2014. The system began operation in December 2014, and is still in the testing phase as of the release of this Report. The city selected the Timmons Group to help with the implementation. Exhibit 10.1 is a screen shot of an actual work order entry screen to provide real time dispatching of issues. Once entered, this work order will go directly to the truck's on-board computer tablet to provide the requested service.

Exhibit 10.1 - Screen Shot of Work Order Entry Screen



Cityworks will provide the ESD with a fully-integrated Enterprise Asset Management System. This will allow ESD to be flexible and responsive to residents needs by coordinating services through the 433-1FAY Call Center. The Call Center will now have the ability to use and integrate FleetMind system and an electronic work order system to better manage and improve customer services. As the system is still in the early stages of implementation, it is difficult to project savings. However, there is the opportunity to reduce missed collection go-back time and increase same-day services, when combining this technology with the service standards described in Section 12.

10.5 RFID Technology

Radio-frequency identification (RFID), as applied to the solid waste industry, is the wireless use of electromagnetic fields to transfer data from tags attached to carts, or other objects, to vehicles used for solid waste collection. This automatically identifies and tracks the attached tags. The tags contain electronically stored information such as a serial number or unique identifier(s).

To reduce or eliminate human interaction when providing services, a reader and the passive RFID tag, work together as each cart is serviced or maintained. A reader is embedded onto the truck near the cart tipper, or a handheld can be used, both of which capture the tag's ID. This is electronically recorded and data such as the location and the time of service can be obtained.

RFID is used for many purposes in the solid waste industry and the cost to implement has been reduced over the past ten years. Some cart manufacturers have embedded the tag into the cart manufacturing process, anticipating the tag will be used in the future. Embedding tags upfront may be justified as the cost of retro fitting is expensive. RFID can be used to help track set out rates for any collection service the technology is applied. When coupled with GPS technology and routing software, the RFID system can be used for customer service, collection of program data, measurement of collection system efficiency and tracking cart inventories. Some industry related justification for RFID use include:

- Using RFID-derived data to target public outreach and education to increase recycling rates reducing the need to provide blanket mailings covering the entire city reducing mailing cost,
- Cart inventory management tool to track each individual asset location and life cycle,
- Monitoring the recycling contract performance to ensure compliance and verify service,
- Should the city decide to implement an incentive-based recycling, the RFID system could be used to create collection systems that encourage and reward recycling program participation by focusing on areas that have low participation, and
- Assisting the Call Center through the asset management system by electronically verifying services, maintaining cart inventories for delivery and maintenance purposes. As an example, a 96-gallon cart in inventory could be electronically slated to be delivered to residents to replace their 35-gallon carts. Both carts would be tracked through completion and completed in real time reducing paperwork and the time necessary to complete the order.

10.6 Summary

There have been dollar savings available and already captured by the ESD through the aggressive implementation of the software and technology. The savings most apparent is available through reduced mileage and increased efficiency. The key is to champion the system from the beginning to ensure it will be used as intended. There can be a temptation in future years to eliminate a software system as the annual savings, on a year-over-year basis, can be minimal, even when used correctly. The challenge is to continually set realistic improvement goals and utilize the systems, or system upgrades when offered, to get there. Fayetteville should consider the use of RouteSmart in combination with FleetMind to efficiently route the bulky work orders on a daily basis. This will reduce time/miles, and give the bulky item crews the ability to complete more stops on a daily basis, improving customer service.

Customer service will also be improved as both the ESD and Call Center work together to provide timely and quality service, again improving the customer experience, and reducing service time to further reduce and control costs.

11 Service Delivery Privatization

11.1 Introduction

Many local government budgets are facing challenges such as shrinking revenues and rising expenses that can lead to budget shortfalls. One of the most logical responses is to reduce the cost and size of government, by concentrating on providing critical municipal services such as police and fire protection. Cities are increasingly privatizing of other services, in some cases to provide service at a lower cost or to

go to a “user-fee” type of service. Waste collection, recycling and disposal are among the most often privatized.

What’s right for Fayetteville? The city asked itself the question in 2011, “Does outsourcing the City’s garbage collection make sense to ensure continued high quality municipal services. The goal at the time was to ensure that the City delivers municipal services in a cost-effective manner with a high level of customer satisfaction. The decision was made to conduct an outsourcing pilot project that could have resulted in privatizing a portion of the curbside collection of trash.

As described earlier in this Report, the ESD provides a variety of solid waste collection services including automated weekly collection of household trash, weekly yard waste, and a private contractor providing weekly collection of recyclables. Also included through ESD staff are specialized services; scheduled bulk collection, dead animal collection, seasonal leaf collection, C&D collection, and cart maintenance and delivery.

Around the country and locally in North Carolina many of these services are contracted with private firms for a variety of reasons. Private companies oftentimes have the economy-of-scale to spread their costs out. While the savings may not be as great in today’s dollars as they were a couple of decades ago, there may still be savings as more communities are conducting full cost analysis of current services, whether privately or publicly conducted, to determine their overall costs and what is best for them in the long run. While it may look like there is savings early on, depending on the contract terms and price escalators, the financial situation can be very different over the contract term.

Section 6 provided background on privatizing solid waste collection and the ability of a private company to provide some, or all, of the services currently provided by City staff, and at what overall cost to the city. The good news is that the current ESD staff realizes there are numerous pressures that befall them to make sure the city is receiving the best of services at the most competitive of costs.

Other sections of this report point out that the ESD is competitive in delivering services by consistently seeking cost effective solutions through automation, the use of state-of-the-art technologies, and by measuring and acting on key performance measurements which are very similar to what is done in the private sector.

This section of the Report summarizes the costs of six communities with private MSW collection and hauling services. This section develops a data base of current services that may identify more cost effective methods of service delivery, and identify potential opportunities for improved efficiency and effectiveness for the City. The intent of the review is to summarize constructive and actionable findings and recommendations.

11.2 Local Private Solid Waste Collection Programs

Table 11.1 summarizes the local private haulers from Section 6. It is organized by the type of hauler service(s) provided to municipalities.

Table 11.1 - Private Waste Services for Public Entities

	Fayetteville	Winston-Salem	Brunswick County	Siler City	Cornelius	Huntersville
Curbside Trash Collection	-	-	Private	Private	Private	Private
Trash Collection Frequency(1)	-	-	Mon- Fri	Mon- Thurs	Mon- Fri	Mon- Fri
FY14/15 Monthly Contract Trash Price Household	**-**	**-**	**$12.27**	**$14.41**	**$16.18**	**$13.34**
Curbside Recycling Collection	Private	Private	Private	Private	Private	Private
Curbside Recycling Frequency	Weekly; M,T, Th, F	Weekly; M,T, Th, F	Every Other Week (EOW)	Every Other Week (EOW)	Every Other Week (EOW)	Every Other Week (EOW)
FY14/15 Monthly Contract Recycling Price/Household	**$2.91**	**$2.89**	In Trash Price Above	In Trash Price Above	In Trash Price Above	In Trash Price Above
Curbside Yard Waste	-	-	-	-	Private	Private
Weekly Yard Waste Frequency(1)	-	-	-	-	Weekly; Mon- Fri	Weekly; Mon- Fri
Curbside Bulk Item	-	-	-	-	-	-
FY14/15 Total Annual Price/Household	**$34.92**	**$34.68**	**$147.24**	**$172.92**	**$194.16**	**$160.08**

Table 11.1 shows that all of the cities receive curbside recycling from private haulers. Four (4) of six (6) cities receive both private curbside refuse and recyclables collection and two (2) of six (6) provide private services for all three: curbside refuse, recycling and yard waste. None of the private companies in this study provide bulk item collection. Three of the six municipalities have five days per week trash collection while the other three have four days per week collection. The communities reviewed do not privatize bulk item collection as noted in Section 6. One community does not provide bulk item collection at all, and left it up to the resident to handle it themselves or it was collected by the street department.

It is important to note the average costs of the various service levels. For example, for private contracting of the curbside collection of refuse and recyclables provided to Brunswick County and Siler City average $13.34/household/month. For the curbside collection of refuse, recyclables and yard waste collection services, Cornelius and Huntersville are charged an average of $14.76/household/month.

Fayetteville and Winston-Salem only privatize their weekly recyclables collection. The current private sector collection charge is $2.91/household/month for Fayetteville and $2.89/household/month in Winston-Salem.

11.3 The Cost of Outsourcing Current City Services

Table 11.2 reviews the costs for the four waste-related services and administration costs for all of the tons managed and currently provided by ESD for 60,527 households. The gross cost, as reviewed in Section 4.6, is $228.43/household/year, or $19.04/household/month (Item 8). With an annual net cost of $217.42/household and $18.12/household/month.

Table 11.2 - Fayetteville ESD Cost of Services Provided

Item	Service Provided	Annual Cost (or credit) per Household	Monthly Cost (or credit) per Household
1	Trash Collection (1)	$66.93	$5.58
2	Recyclables Collection (2)	$38.77	$3.23
3	Yard Waste, Brush and Leaf Collection (3)	$24.03	$2.00
4	Bulky Item Collection (4)	$21.73	$1.81
5	Net Administration and Non-Program Costs (5)	$27.52	$2.29
6	County Disposal Charges (for Landfill and Compost site-related services) (6)	$48.00	$4.00
7	County Additional Disposal Charges	$1.46	$0.12
8	**Gross Cost of Solid Waste Services**	**$228.43**	**$19.04**
9	Transfer Station Lease Revenue (7)	($2.23)	($0.19)
10	Recycling Revenues from Waste Management and OmniSource (8)	($1.85)	($0.15)
11	County Rebate for City Recyclables Diversion (9)	($5.00)	($0.42)
12	City Share of NC Solid Waste Disposal Tax (10)	($1.93)	($0.16)
13	**Estimated income to City for ESD Provided Services**	($11.01)	($0.92)
14	**Net Annual Cost of City Solid Waste Services**	**$217.42**	**$18.12**

(1) Includes ESD Costs Only; refer to Table 4.1

(2) Includes ESD costs associated with the Waste Management contract for curbside collection of recyclables billed to the City on a $/household/month basis and ESD recycling service cost; refer to Table 6.4

(3) Includes ESD costs only; the County charge to the city for operation of the compost site are in Item 5; refer to Table 4.5

(4) Includes ESD costs only; refer to Table 4.2

(5) Includes ESD costs only; refer to Table 4.7

(6) Based on $48/Household Annual Fee To City and 60,527 households

(7) Payment from Waste Industries for Lease of Transfer Station Site (Est. $ 135,000/Year value FY15 city budget)

(8) Based on Payment of $11 per ton of recyclables delivered to Pratt plus the OmniSource bulky metals revenues (est. $111,847/Year)

(9) Based on County rebate to city of $5/year per household

(10) Based on City share of non-landfilled solid waste at $117,000 credit in FY15

Table 11.3 displays the potential net cost of collection by privatizing certain services should the city decide to outsource by comparing current net cost with the cost of outsourcing trash and recyclable collection and trash, recyclables and yard waste collection. As noted previously, Bulky Waste is not a privatized service for the municipalities in this Report. The Report shows the costs as monthly for ease of explanation. However, the basis for private hauler contract pricing is typically a monthly per household charge.

Table 11.3 - Estimate of Fayetteville Cost of Services if Outsourced

Item	Service and Cost	City's Current Monthly Cost with Recyclables Collection Outsourced (1)	Monthly Cost per Household with Trash and Recyclables Collection Outsourced(2)	Monthly Cost per Household with Trash, Recyclables and Yard Waste Collection Outsourced(3)
1	Trash Collection/Household/Month	$5.58	$13.34	$14.76
2	Recyclables Collection/Household/Month	$3.23	$0.00	$0.00
3	Yard Waste, Brush and Leaf Collection/Household/Month	$2.00	$2.00	$0.00
4	Bulky Item Collection/Household/Month	$1.81	$1.81	$1.81
5	Net Administration and Non-Program Costs/Household/Month	$2.29	$2.29	$2.29
6	County Disposal Charges/Household/Month (for Landfill and Compost site-related services)(4)	$4.00	$4.00	$4.00
7	County Additional Disposal Charges/Household/Month(5)	$0.12	$0.12	$0.12
8	**Estimated Gross Cost of Solid Waste Services/Household/Month**	**$19.04**	**$23.44**	**$22.86**
9	Estimated income/Household/Month to City for ESD Provided Services, if applicable(6)	($0.92)	($0.92)	($0.92)
10	Estimated Monthly Net Cost/Household	**$18.12**	**$22.52**	**$21.94**
11	**Estimated Annual Net Cost to City with Outsourced Services(7)**	**$13,159,996**	**$16,359,852**	**$15,936,812**

(1) From Table 11.2. (gross costs items 1-8 and net cost item 10) City's cost/ household to provide waste collection services
(2) From Table 11.1 using the average contract price of $13.34 for Brunswick County and Siler City for combined trash and recycling services
(3) From Table 11.1 using the average contract price of $14.76 for Cornelius and Huntersville for trash, recycling and yard waste collection
(4) Assumes County Disposal Charges (for Landfill and Compost site-related services) stays in place with private collection
(5) Assumes there would still be landfill charges associated with bulky item disposal not covered by $48 County Fee
(6) Assumes all outside income from Table 11.2 (Items 9-12) are still available with private collection
(7) Estimated Annual Net Cost to City based on (item 10) Estimated Monthly Net Cost/Household x 60,527 households x 12 months

As presented in Table 11.3, the first column reviews the monthly cost for current collection from Table 11.2 for a monthly estimated net cost of $18.12/household (refer to Item 10). The second column provides an estimate of the monthly cost of privatizing trash and recycling services (with the City still providing yard waste and bulky item services) indicating a potential monthly net cost of $22.52/household. The third column shows the monthly net cost of service as $21.94/household for three of the four potential services (trash, recycling and yard waste), if presumed contracted with a private hauler and the City still providing bulky item pickup. In summary, Table 11.3 shows that based on the current private sector cost-of-service information provided for this Report using the costs of other benchmarked municipalities, the City is providing solid waste collection services at a lower cost than other communities that have outsourced a significant portion or most of their collection services.

Cart maintenance, frequency of service (every other week vs. weekly recycling), number of households and other variables that exist from one contract to another will affect the net cost, however Table 11.3 does provide a glance at potential comparative costs. The service variables are numerous when it comes to the level of service that the private contractors provide and therefore their costs. Regardless, it does point out that the city's cost-of-service is within the range of costs that could be expected for private collection services.

Should the City decide to outsource, it is recommended to contract out collection services only, and direct waste loads to County facilities and have the city continue to pay the County's $48/household/year assessment as a Solid Waste Fee. This fee helps finance the operation of the county

solid waste facilities. Should the fee no longer exist it would dramatically increase the net overall cost per ton to operate the county facilities and have a reverse effect on any potential savings if city-wide collection services were to be privatized and the waste allowed to flow to a private landfill, for example. Also, it appears that a full cost accounting study would be helpful to provide data on how the county-city financial relationship would financially need to evolve if these city services were privatized.

11.4 Waste Management Contract Review

The City entered into a recyclables collection agreement with WM on April 9, 2008 for an initial fee of $2.62/residential unit. Over the past seven (7) years, the rate has increased 9% to $2.91/residential unit. For purposes of that agreement, a residential unit is a single family and includes complexes with 7 or fewer units. The initial term ran from July 1, 2008 through June 30, 2013 with two additional 2- year terms of which WM is currently in the first extension set to run through early June, 2015.

The scope of work includes once per week single stream collection of recyclables from residential units within the City limits. WM currently takes the recyclables to Pratt Industries on Owen Drive. As part of the agreement for all recyclables delivered by WM, Pratt Industries rebates WM $22/ton, which in turn pass along 50% ($11/ton) to the City.

Two items that would be beneficial to the city that do not seem to be taking place at this time are as follows:

1) Section 2. A.6 Public Awareness Program, where WM is to participate in a Public Awareness Program with assistance of the City. WM is to work with the city to establish a mutually agreeable cost effective program. Part of this program is a semi-annual meeting with the ESD and the Public Information Office; and
2) Section 13.04 Documentation related to weights, set-out rates and complaint calls that are to be submitted as part of the semi-annual meeting.

The contract does not allow for a change in service frequency. However, it is recommended that the city explore an every-other-week recyclables collection program as it has found that the cost of such service decreases by a significant amount. This would require the city to go to 64-gallon, or most likely 96-gallon, carts to provide capacity for the increased volume. Theoretically a 64-gallon cart would allow for 3-1/2 eighteen (18) gallon bins there-by allowing for the every-other-week (EOW) collection and then some. GBB research has shown recyclable cart weights increase significantly, and the cost of service drops, providing a win-win.

Alternatively, the city could consider both cart and service frequency when the current contract is up for renewal in the near future.

In addition to the above review of the WM contract, GBB also conducted a preliminary analysis of the City actually pulling in-house the current recyclables collection program. Based on the number of city households requiring weekly service and ASL hourly collection capability, it was determined that twelve (12) collection trucks would most likely be required for this once-per-week collection. As an alternative, GBB also reviewed the economics of eleven (11) ASL's performing this recyclables collection, with two spare trucks assumed in either case. GBB assessed the fleet costs with a new ASL vehicle capital cost of $275,000 with an amortization over 8 years, and then added the requisite driver, fuel and other O&M costs, including one supervisor dedicated to this potentially new service. Using the city costs developed

for the current fleet of newer ASL vehicles that are collecting trash, it was determined that the service with 12 new ALS's would cost 20% more for the City to provide than the current WM contracted costs. If a weekly city recyclables collection service could be done with only 11 ASL's, the annual cost is estimated to be 10% greater than the current WM contracted cost. These estimates also assumed that the city would receive the full $22/ton rebate that Pratt is currently crediting to WM for each ton delivered to their single-stream MRF.

Therefore, based on GBB's review of the alternative city costs to conduct the current recyclables collection activities by ESD owned/operated vehicles, versus the WM contracted cost, the projected costs per household do not currently generate any savings to justify a capital investment by the city of over $3 million in additional ASL trucks and the hiring of a dozen additional city employees as drivers, plus a supervisor, to provide such services.

11.5 Summary

Certain services provided by Fayetteville are not typically included in a private contract that would be considered in a privatization process. Cart maintenance for example, will depend on how procurement is handled. When the hauler provides the carts in a procurement, they can lock in extensions and have an advantage for future procurements as capital is already in-place and may have been fully depreciated. This allows them to submit prices to increase their margins and stay competitive and/or offer lower pricing compared to other proposers. The hauler would incur any costs associated with maintaining the carts. The cost of carts can be built into the front end of a contract where the hauler purchases the carts and the cost is embedded in the early years of the contract. Over time, the city could own them and even maintain the carts. There are ways to incorporate the capital costs into a future procurement should the city decide to convert to every-other-week collection, as a larger cart will be needed to provide capacity for the increase in recyclables.

Dead animal collection may or may not be acceptable to private haulers due to health issues and disposal site regulations. Collection at city-owned facilities may be built into a contract as a "no-cost" item or at a fee per collection. Either way, the city will end up paying for the additional service.

Storm debris clean-up will typically fall under a force majeure event and may not be collected by the private hauler. This would require the City to bid out the service, if they are not providing it already. This can result in negative public perception while waiting to find out if the area is declared a federal disaster area, or conducting a new procurement process for this service. This can cause an unplanned financial burden on the City while it waits for payment from FEMA, if at all.

How to handle special event clean ups must also be determined how to handle in a potential privatization of services. Which events will be covered, and by whom? Will it be an additional cost or built into the base contract? As stated earlier in this Report, there are no "free" services when privatizing.

There are other considerations in addition to cost when considering privatizing services These include potentially changing residents' service days, how services would be delivered, disrupting service resulting in additional costs to the City, and an increase the demand on the city's Call Center. The city must also fully understand the impact on staff and other costs associated such as divesting current assets, how to realign the department structure, developing timelines for future procurement, managing the contract, and developing procurement documents to align with solid waste plans and city

sustainability goals. In addition, should a potential contractor propose an alternate disposal location, this could affect the financial relationship between the County and the city and this would need to be further understood. Therefore some of the costs will not go away and will need to be added to the contract to obtain the full cost accounting of the services provided.

Should the city decide to look at outsourcing services once again, one way to possibly lower costs are through managed competition. Using this process, the procurement provides an even playing field for all haulers, including the municipality itself, if so inclined to participate. In this process, local solid waste departments compete with private contractors to provide solid waste services. While privatization does not occur if the public sector wins the contract, the intended result is that residents may benefit from lower charges and increased services provided by a competitive procurement.

Regardless of the above discussion and opportunities presented in Section 11, the findings for this Report show the ESD is operating cost effectively and GBB concurs with the 2011 City-led Outsourcing Project which concluded it is still not cost effective to privatize additional collection services at this time.

12 Call-Back Comparison to Industry Standards

12.1 Introduction

Both customer experience and operational efficiencies are negatively impacted by service call-backs. Not only is there a negative customer perception, there is a cost associated with a failed service standard necessitating call-back. By addressing service standards in a measured approach to improve on already high standards set by the ESD. The ESD will be able to exceed their strategic initiative "To provide regular scheduled collection of municipal solid waste and to ensure adequate resources to complete the work."

Many private and public solid waste collection firms have developed some basis of measurement for service standards as a minimum guideline to measure service performance. All such service providers participate in taking calls about residential refuse collection, and nearly all maintain records of one kind or another about such calls. Municipalities and private firms follow very different procedures in processing and recording these calls and in determining which ones are valid complaints. Whatever the reason a missed pick-up is recorded, whether valid or not, it should be tracked as a miss and investigated to determine why there was a miss reported. This often times leads to other reasons than a true missed collection occurred. Maybe the resident had set out extra material, or possibly there was some internal reason where a service request was entered incorrectly.

Investigating and tracking each error helps improve the system overall. Solid waste departments should ensure they have a solid reporting system in place to help eliminate false reporting from homeowners who are out of compliance to collection program standards, or those residents that do not have waste material out when collection occurs. Fayetteville has just such a system, and is providing real time reporting as discussed in Section 9 using FleetMind and Cityworks® software.

12.2 Methodology

GBB conducted an analysis of Fayetteville's service errors per 10,000 collection points (households), analyzing available data gathered from the City, by service type, for the City's approximately 60,527

homes. Simultaneously, GBB conducted an analysis of industry service standards by reviewing available data from both the benchmarked public sector and private sector solid waste industry leaders to provide a benchmark to other North Carolina municipalities, as well as Waste Management Inc. the largest private hauler in the industry.

Measuring missed collections is arguably one of the most important indicators of the city's ability to satisfy the resident's service delivery expectations. This section analyzes the yearly average versus a more detailed seasonality analysis. It would be expected that the warmer months with a growing season would experience a higher number of misses due to the increase set out of yard waste and bulky items and lower in the winter months when this material would not be set out. These findings assume that a service error is the same as a missed pick-up/missed collection point.

Across the country, the public sector measures service errors in different ways. For example, some municipalities such as Edmond, Oklahoma, Atlanta, Georgia, and Fayetteville, North Carolina measure against 10,000 collection points.[13] Other municipalities use service errors associated with 1,000 collection points, as presented in the University of North Carolina's School of Government Benchmarking Study. Charlotte, North Carolina measures missed collections on a per crew basis, with no more than five (5) missed collections per month[14]. For these reasons, the review is able to present limited comparative data about complaints, or valid complaints for residential refuse collection or other solid waste services. Nonetheless, the project recommends that the City devise a set of standards for providing service to include call backs and to identify complaints and procedures for processing them. Table 12.1 provides data points for selected cities in North Carolina.[15]

[13] D. Ammons, "Municipal Benchmarking: Assessing Local Performance and Establishing Community Standards," (M.E. Sharpe, New York, 2012), *op. cit*., p. 408-410.
[14] Ibid., p. 410
[15] UNC Benchmarking Project "Final Report on City Services for FY 2012-2013 Performance and Cost Data," (School of Government, 2014)

Table 12.1 - Service Errors per 10,000 Collection Points[16]

Residential Waste

	Service Errors per 10,000 Collection Points					Est. Misses/ Week	
	FY 10/11	FY11/12	FY12/13	FY13/14 Est.	FY 14/15 Recomm.	FY13/14	FY14/15
Fayetteville	N/A	N/A	3.23	3.60	2.40	21.79	14.53
Winston-Salem	59.30	58.80	30.00	N/A	N/A	N/A	N/A
Greenville	N/A	N/A	236	N/A	N/A	N/A	N/A
High Point	2.40	1.80	1.50	N/A	N/A	N/A	N/A
Greensboro	45.00	82.00	59.00	60.00	N/A	N/A	N/A
Durham	0.00	0.00	5.00	N/A	N/A	N/A	N/A
Wilmington	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Bulk Item Collection(2)

	Service Errors per 10,000 Collection Points					Est. Misses/ Week	
	FY 10/11	FY11/12	FY12/13	FY13/14 Est.	FY 14/15 Recomm.	FY13/14	FY14/15
Fayetteville	N/A	N/A	N/A	5.50	5.00	33.29	30.26
Winston-Salem	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Greenville	N/A	N/A	N/A	N/A	N/A	N/A	N/A
High Point	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Greensboro	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Durham	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wilmington	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Yard Waste Collection

	Service Errors per 10,000 Collection Points					Est. Misses/ Week	
	FY 10/11	FY11/12	FY12/13	FY13/14 Est.	FY 14/15 Recomm.	FY13/14	FY14/15
Fayetteville	N/A	N/A	N/A	5.50	5.00	33.29	30.26
Winston-Salem	10.00	9.00	9.00	9.00	N/A	N/A	N/A
Greenville	N/A	N/A	N/A	N/A	N/A	N/A	N/A
High Point	10.00	10.00	9.00	9	N/A	N/A	N/A
Greensboro	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Durham	908	100	100	197.00	N/A	N/A	N/A
Wilmington	51.00	55.00	42.00	171.00	N/A	N/A	N/A

Residential Recycling(3)

	Service Errors per 10,000 Collection Points					Est. Misses/ Week	
	FY 10/11	FY11/12	FY12/13	FY13/14 Est.	FY 14/15 Recomm.	FY13/14	FY14/15
Fayetteville (Contracted)	N/A	N/A	4.85	4.50	4.00	27.24	24.21
Winston-Salem (Contracted)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Greenville	N/A	N/A	N/A	N/A	N/A	N/A	N/A
High Point	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Greensboro	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Durham	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wilmington	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) Data from UNC SOG Performance Measurement Project FY12/13; Residential Waste, Bulk Item and Recycling are normalized using 10,000 collection points, yard waste is measured on 10,000 collection points

(2) Fayetteville is the only city tracking Bulk Item Collection Service Errors

(3) Fayetteville is the only city tracking Residential Recycling Collection Service Errors

N/A = Not Available

[16] City of Fayetteville Annual Budgets FY 10/11 – FY 14/15, *op. cit*., Environmental Service Fund

12.3 Fayetteville Call Back Percentage

During FY13/14 the City estimated the number of residential waste collection service errors to be 3.60 per 10,000 collection points as indicated in Table 12.1. This is equivalent to one miss for every 16,813 households (approximately 22 misses/week). This equates to less than 1% of the households experiencing a missed collection. The ESD tracks its return trips to collect garbage costs. For the first six (6) months of FY 14/15, the City estimated that the cost, referred to as a "Go-Back", was $75.53/trip. The Go-Back cost analysis is illustrated in the following example. Note: This section uses $75.53 for the ease of explanation. Actual "go-back cost" will vary for each type of service uses different equipment and number of personnel.

Example of Garbage Go-Back Cost, FY14/15

$$60{,}527\ collection\ points \div 10{,}000 = 6.05\ service\ errors\ per\ week/collection\ points$$

$$6.05 \times 3.60 = 21.79\ misses\ per\ week$$

$$21.79 \times \$75.53\ per\ miss = \$1{,}646\ per\ week\ for\ all\ misses$$

$$\$1{,}646 \times 52\ weeks = \$85{,}592\ \textit{Annual cost for residential refuse collection service misses}$$

The above illustrative example is for City residential waste collection only and shows 22 weekly misses. Applying similar math to bulk item collection (33 weekly misses) and yard waste collection (33 weekly misses) using the estimated FY 13/14 error rates, and assuming the same City Go-Back cost of $75.53, shows the City spent approximately $233,584 in FY13/14 on service errors for all three of the public collection programs it performs. This is illustrated in the following example. Note that recycling collection is not included in these cost calculations as it is contracted to Waste Management, Inc.

Example of FY 14/15 ESD Go-Back Cost

Residential waste - 21.79 Est. weekly misses x $75.53 = $1,133 per week

Bulky item collection - 33.29 Est. weekly misses x $75.53 = $2,514 per week

Yard waste collection - 33.29 Est. weekly misses x $75.53 = $2,514 per week

($1,113 + $2,514 + $2,514) x 52 weeks = $319,332 annual Go Back costs

Solid Waste Private Industry Service Standards

As a reference for comparison purposes with the private sector, WM, Inc. sets its acceptable standard of performance for missed pickups (MPU) at 1 MPU or less per 1,000 customers for all services on a weekly

basis.[17] This is equivalent to an allowable 60.5 MPU's per week for all three services (refuse, bulky item, and yard waste) in the City of Fayetteville as illustrated in the following example.

60,527 weekly collection points ÷ 1,000 = 60.5 acceptable MPUs/week

From Table 12.1 Fayetteville's FY14/15 estimated total service errors is 88 per week for the City's 60,527 weekly collection points. This is based on residential waste at 21.79 + bulky item collection at 33.29 + yard waste collection at 33.29 = 88.37 (rounded to 88 estimated misses/week).

To compare against this private hauler, the City has a miss every 688 households weekly which is significantly above Waste Management's acceptable MPU standard.

60,527 weekly collection points ÷ 88 estimated misses per week = 688 households

Should the ESD hit the recommended service error goals of 2.4, 5.0 and 5.0 in FY14/15, for residential waste, bulky item and yard waste collection respectively, it will reduce the City service error Go-Back costs by $35,200, or approximately a 17% reduction.

2.4 + 5.0 + 5.0 = 12.4 misses/10,000 collection points

12.4 x 6.05 service errors per week/collection points = 75 misses per week

88 FY13/14 misses per week - 75 FY 14/15 misses per week = 13 less misses per week

13 x $75.53 x 52 weeks = $51,058 annual reduction in Go-Back cost

Furthermore, 75 misses per week in FY14/15 for the 60,527 weekly collection points equals a miss every 807 households, a 17% improvement in customer service.

12.4 Summary and Recommendations

The following is a list of best practices that will quickly improve service when properly applied and managed that can be used as a guideline for the ESD to develop their own set of standards.

1. Never allow a service error because a driver could not find an address.
2. Never put cans or carts back in the road, blocking driveways or mailboxes, this isn't a missed collection, but is a courteous industry practice.
3. Always close lids on all carts and cans, this keeps water out of them when it rains and keeps lids from blowing down the street inconveniencing residents.
4. Always pick up loose trash spilled around the can or cart, which sets the standard for professionalism.
5. Always immediately call in "not-outs", extra trash or unserviceable stops, this eliminates the misses due to late set outs. The Resident can be informed prior to them calling in as to why their items were not collected.

[17] P. Pengeroth,"Driving Operational Excellence Through Benchmarking," (Waste Management, Inc.), presentation to the Municipal Waste Management Association on September 30, 2010, *op cit.*, Slide 24.

6. Always report damaged cans or carts, this provides a proactive approach and reduces the chance of a miss later due to the resident not being able to get the cart to the street.
7. Always call in a stop if unsure about extra trash at a resident, see item 5.
8. Never tell a resident we can't, always say "we can and here's how"-find a solution to help them. (Example- "if you bundle your sticks we will come by tomorrow to collect it", this sounds better than saying no we cannot collect your sticks because they are not bundled.
9. Always tell your supervisor about a problem at a residence- they are there to help.
10. Always recover a MPU within standards (Current standard is "you will be serviced as soon as possible, usually within 48 hours"). GBB recommends setting standards to "if called in by 2pm will be collected the same day, after 2pm you will be serviced the next collection day before noon".
11. Never miss a resident's first scheduled pick up.
12. Always go the extra mile to service a resident (see items 1-11).
13. Always conduct a thorough driver check-in to gather any information related to a resident that may not have been relayed earlier.

By setting and managing goals, and incorporating a set of best practices the City will reach world- class Industry Service Standards. With the use of FleetMind and Cityworks® it is recommended that MPU's be investigated to determine the root cause to address the real reason behind a service failure. Using these softwares, which are already used by the City, will achieve the quickest results in providing improved solid waste services.

13 Regional MSW Analysis and Recommendations

13.1 Introduction

In the past 25 years, many landfills have changed from being the local waste disposal site to more regional sites that bring in waste from a broader geography, not just the nearby communities. With permitting and operational constraints, as well as economy-of-scale impediments, it stands to reason that a regional approach to all waste management practices could also make sense, especially if the economics of new processes or equipment require additional tonnages to make them cost-effective.

The City of Fayetteville lies completely within Cumberland County, and Cumberland County is adjacent to six other counties (and close to two others) and contains a portion of Fort Bragg. There are four major material streams within the solid waste of these eight counties; residential MSW, commercial MSW, recyclables, and construction and demolition (C&D). C&D is not considered within this Report, although it should be noted that the processing of C&D to recover aggregate and metals is beneficial. It can also produce an excellent fuel with recovered wood and fibrous materials.

The eight regional counties have a total population of just over one million people and nearly 380,000 households (US Census 2013 est.). Cumberland County is the most populous at 325,781 people and 121,226 households, with Fayetteville representing 63% of that total population with 204,408 people (US Census 2013 est.). Table 13.1 shows the distribution of population in the eight regional counties.

Table 13.1 - Population, by County

County	Population (2013 US Census estimate)	Households (Census 2009-2013 estimate)
Cumberland	325,871	121,226
City of Fayetteville	204,408	76,766
(Fayetteville Percent)	63%	63%
Bladen	34,843	14,256
Johnston	177,967	60,759
Harnett	124,987	40,677
Hoke	51,322	16,161
Lee	60,266	21,204
Moore	91,587	36,997
Sampson	64,150	23,336
Robeson	134,841	45,154
Total Region	1,065,834	379,770
(Fayetteville Percent)	19%	20%

Source: US Census

13.2 Regional Disposal Sites

The MSW generated follows a similar pattern to the population. Reviewing the contiguous counties to Cumberland County, Figure 13.1 shows the regional waste facilities for transfer or disposal of MSW. Table 13.2 lists the actual quantity of MSW for each county as reported to the State and published by North Carolina Division of Waste Management. These quantities include residential and commercial MSW, but exclude C&D materials.

Figure 13.1 - Fayetteville Region Disposal Locations

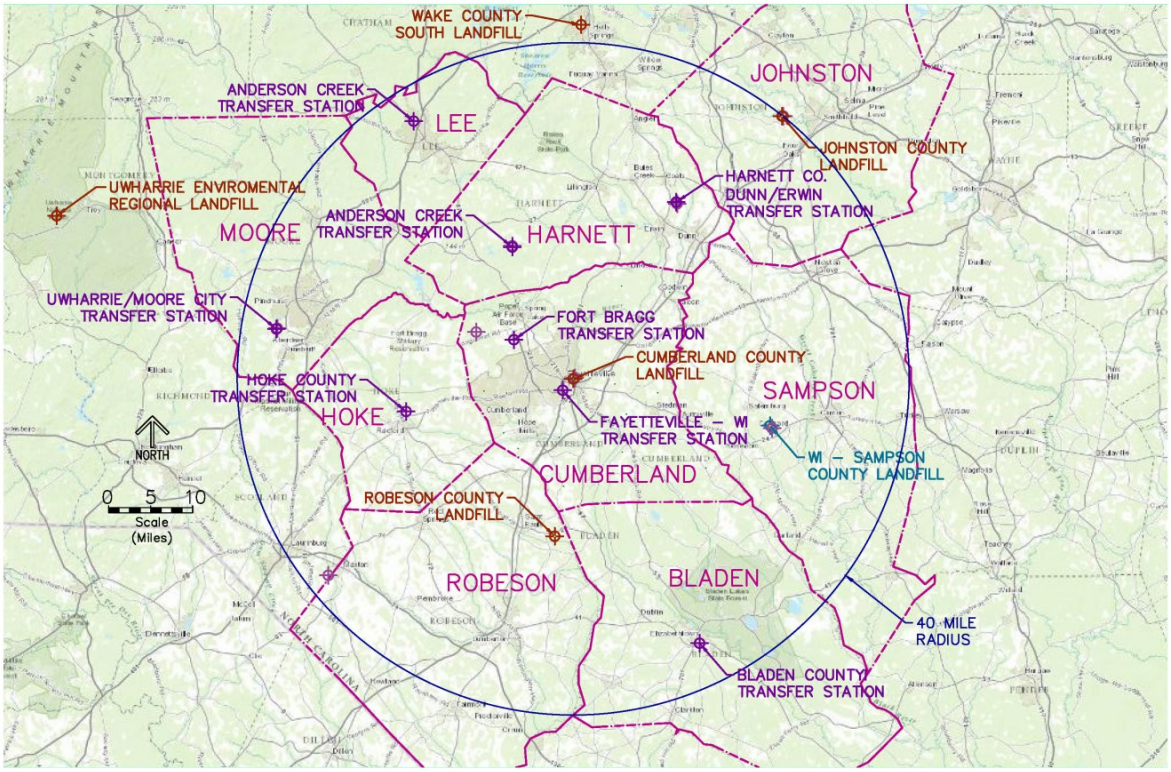


Table 13.2 - Regional MSW Quantities, by County

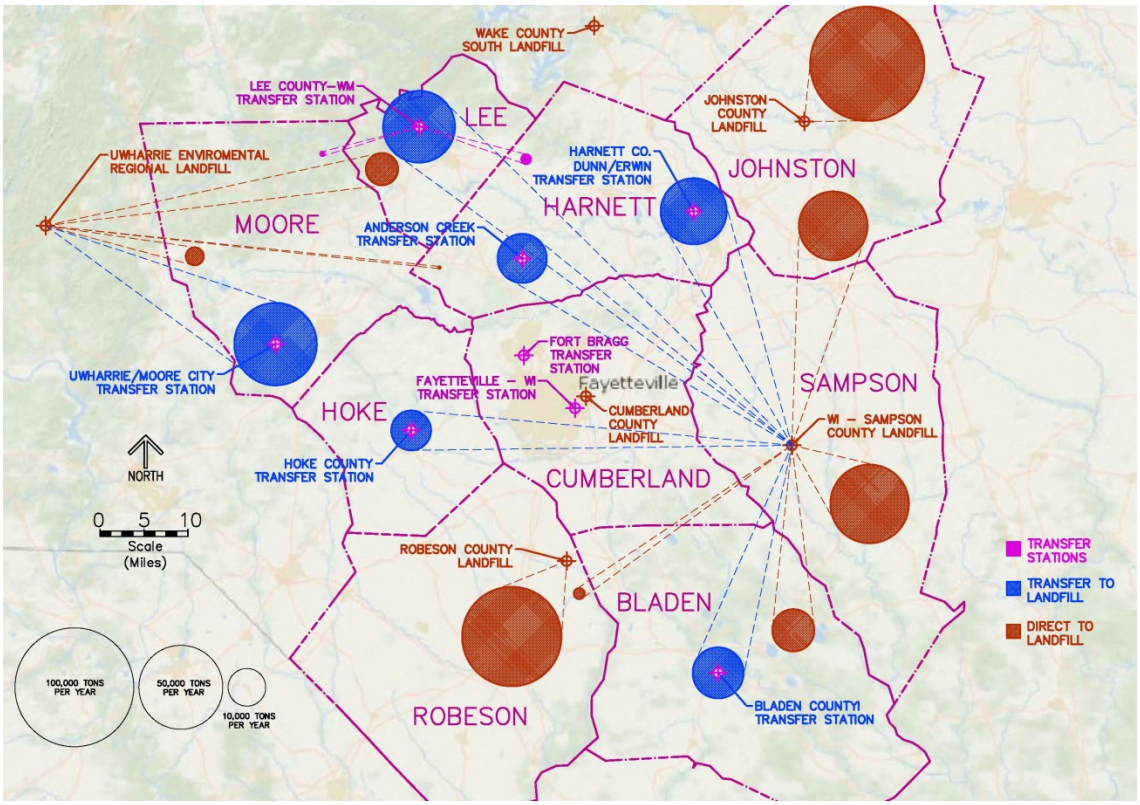
County	Total MSW Produced (Tons)
Cumberland	294,026
Bladen	35,836
Hoke	23,894
Harnett	52,743
Johnston	125,629
Lee	48,409
Moore	52,581
Robeson	71,062
Sampson	43,574

Source: NC Data (NCDENR FY12-13)

As depicted in Figure 13.1, there are five major regional landfills in the Fayetteville area, with three county-owned landfills and two private landfills. Robeson, Johnston and Cumberland Counties own their landfills and most of the residential waste from those counties go to these respective landfills. The two major private landfills are the Waste Industries-Sampson County Landfill (WI-Sampson County) to the east of Cumberland County, and the Uwharrie Environmental Landfill to the west of Moore County. Nearly all of the remaining commercial and residential waste in the region goes to these two large

private landfills, with the majority going to the WI-Sampson County landfill. Figure 13.2 illustrates the flow of MSW waste in the surrounding counties to Cumberland, and to which landfill the waste ends up, either directly or via transfer station.

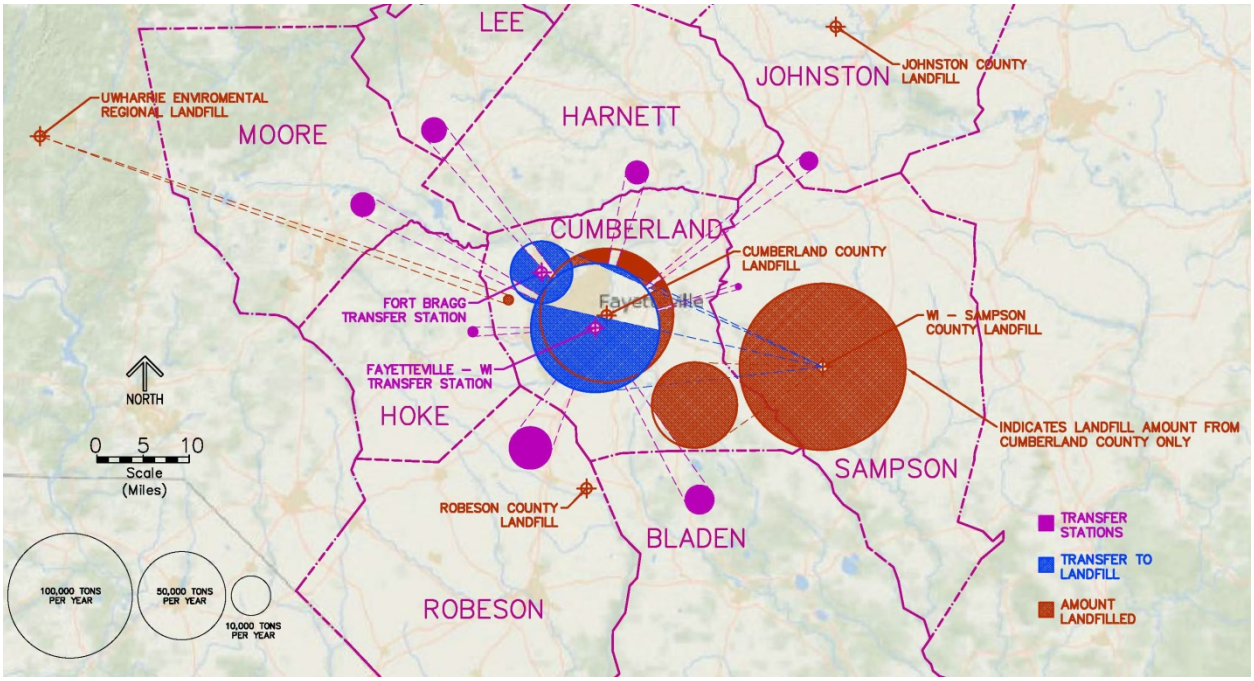
Figure 13.2 - Regional MSW Generated and Where it Goes



A high percentage of the regional commercial waste is disposed at the WI-Sampson landfill, although this represents only a portion of the total waste disposed at this large 3,000 TPD permitted landfill. To include the graphic depiction of the amount of annual tonnage delivered to this landfill in Figure 13.2, the circle would not have fit!

Within Cumberland County itself, excluding Ft Bragg, there are two places that MSW are taken, either the Cumberland County owned Anne St Landfill or the Waste Industries operated transfer station. All of the City collected residential trash goes to the Anne Street Landfill and the transfer station materials, with the majority being commercial waste, hauled to WI – Sampson County landfill. There is also a percentage of direct-haul waste to the WI-Sampson landfill as well as material from the Fort Bragg waste Transfer Station. Figure 13.3 illustrates the flow of waste within Cumberland County.

Figure 13.3 – Cumberland County MSW Generated and Where it Goes



Upon the initiation of this study, GBB reached out to representatives from Fort Bragg to discuss the scope of work and the potential interest of Fort Bragg in a regional project opportunity. Fort Bragg has a Net Zero Waste goal by 2025 and a Net Zero Energy goal as well. The solid waste currently generated on the base is about 30,000 ton per year.

At this time, two waste haulers have contracts that became effective as of September 2014. One of the contracts is for collection service inside the base and the other is for collection outside the base (typically base housing). The Fort Bragg waste that is not recycled at the materials recycling facility owned/operated by Pratt, goes to the Cumberland County Landfill for disposal. Previously, some of the waste was delivered to the Waste Industries transfer station for hauling to their landfill located in Sampson County.

13.3 Implications of Fort Bragg

Documents presented to GBB for the past two years by support staff at Fort Bragg indicated in their FY 2013 report (10/1/12 – 9/30/13) that 26,782 tons of MSW were generated and 9,559 tons were reported to have been disposed at the Waste Industry Sampson County Landfill. This data also reflected that 7,223 tons (a 27% diversion rate) occurred at Fort Bragg for this waste stream.

The most recent comprehensive report provided by Fort Bragg for FY 2014 (10/1/13 – 9/30/14) reported that the waste generation increased to 31,257 tons, but that their diversion rate also increased to 12,704 tons or 41 percent. Thus, their diversion increased by over 5,500 tons in FY14 versus FY13.

The discussions with base contacts indicated that the military has a Zero Waste program being aggressively managed and that the net waste stream that might be potentially available for any "regional waste program" should be at or near "zero" after the next few years.

Additionally, GBB staff discussed their potential interest in being an energy market for a waste-to energy project. It is noted that no off-base waste would be allowed to be hauled onto Fort Bragg. Additionally, it was indicated that the military is conducting on-going negotiations with a third party to provide a substantial portion of the base energy needs and that they are not interested in being considered as an alternative energy market candidate.

Therefore, as it pertains to Fort Bragg, for purposes of this GBB regional evaluation, and based on the strict Zero Waste and Zero Net Energy military programs that they need to abide with, Fort Bragg should (1) not be considered as a waste supplier to any long-term regional project opportunity, and (2) should not be considered as either a potential steam or power market from any possible regional waste-to-energy project.

13.4 Markets

Without the energy demands for a large and sustainable consumer like Fort Bragg, the potential energy markets for power and heat (steam) for a regional project are not realistically viable. Due to much higher disposal costs and a much different economic baseline, Europe has seen success with using smaller refuse derived fuel (RDF) boilers for use at industries that require 24 hour heat sources and electricity as an efficient and stable source. The efficiency of any boiler, whether fired by fossil fuels or RDF, is much higher when producing both heat and electricity. Most of these smaller boilers use prepared RDF instead of straight MSW as RDF is smaller in size and has a higher heating value (and generally burns cleaner). The benefits of such a system, besides the economics of stable and efficient heat, is that the Greenhouse Gas (GHG) emissions counted in such modelling estimates as the EPA's WARM model are less for combustion of RDF than that of fossil fuels for the same output of heat and electricity. However, the regional waste alternative around Fayetteville and the baseline economics and regulations are not anywhere near the European model with respect to the RDF opportunities.

However, with additional processing, certain fractions from MSW can be used to produce ethanol or other fuels and even saleable chemicals. While the technology used is similar to current processes, the use of RDF or non-recycled plastics (NRP) to create fuels or chemicals is still new, with few commercial scale facilities. While there appears to be a potential for utilizing portions of processed MSW to create these high value commodities, the technology is still evolving and it would also seem to be prudent to hold off on considering any commercial scale facility until the technology, and the proponent vendor, is more experienced and proven. However, this could be something for consideration in the future if the economics and technology become more viable.

While the current energy values and options associated with conventional fuels will not create any immediately waste-related energy opportunities, it is important to understand the status of such technologies and Section 13.5 provides current information in that regard.

In addition to energy-derived system opportunities, the complex waste stream does offer the potential to look within. As demonstrated in the Section 3 accounting of the waste and recyclables materials, commodity values exist if a mining process can be developed to extract the "urban ore". This subject, and more materials markets opportunity, is detailed in Section 13.6. Thus, even with residential curbside recycling, recoverable commodities are still found in the trash stream. Some of these commodities have value if they can be extracted in a marketable form.

13.5 Alternative Conversion/Recovery Technology

13.5.1 Waste-to-Energy

State of the Technology

Since the beginnings of its implementation in the 1890s, the combustion of MSW with energy recovery (now known as Waste-to-Energy or WTE) has matured into a safe, effective and environmentally acceptable technology, though it often continues to face economic challenges and local political opposition.

Direct combustion of MSW at WTE plants is a mature technology, and the most commonly used MSW conversion technology in the U.S. The waste is combusted with minimal or no front-end processing, and heat generated from combustion creates steam. This steam is used in district heating networks, industrial applications, or to power turbine generators for electricity production. Water condensed out of the steam is cycled back and reused, and gases created by combustion are filtered through advanced air pollution control technologies. The combustion process and cleaning of the gases produce ash, which is treated and processed to remove metals for recycling. The ash can be used as alternative daily cover (ADC) at landfills or as construction aggregate, but is most often landfilled.

Number of Existing or Planned WTE Facilities

No new greenfield mass-burn WTE facilities have been built in the United States for more than twenty years, although there have been expansions of existing facilities to add additional units. Recently there have been several new procurements. As a result, the majority of firms associated with mass-burn WTE are either operators or owners/operators of existing facilities. As shown in Table 13.3, Covanta Energy Corporation and Wheelabrator Technologies, Inc. own and operate the majority of privately-owned mass burn WTE facilities.

Table 13.3 - U.S. Operating Mass-Burn/Waterwall Facilities and Vendors

Entity	Owned	% Owned	Operated	% Operated
Covanta	16	31%	28	55%
Wheelabrator	12	24%	15	29%
Public	23	45%	6	12%
Other	0	0%	2	4%
Total	**51**	**100%**	**51**	**100%**

Source: Energy Recovery Council (ERC), 2014 Directory

Some of these WTE facilities were designed by American firms with their proprietary technology, such as Detroit Stoker, Combustion Engineering (now Alstom) and Babcock & Wilcox, but the majority of these existing systems utilize European grate design. The two leading suppliers of WTE grate systems in the United States and overseas are The Martin Company of Germany and Von Roll of Switzerland, represented in the U.S. by Covanta and Wheelabrator, respectively.

While there were no “greenfield” WTE facility procurements in the United States throughout the 1990’s and early 2000’s, there have been recent expansions and procurements for new facilities in the past ten (10) years. This indicates a slight re-emergence of this technology and the positive environmental

impacts they have in comparison to a landfill. Table 13.4 summarizes the recent expansions and procurements of new facilities in the North America. While the US market may have been stagnate, throughout this same time period, the demand for these facilities has increased in Europe and in Eastern Asia. European, Chinese and Japanese technology suppliers are actively marketing their systems, and they have been consistently improving both their energy production and environmental performance. The WTE waterwall technology is mature, and is used more than any other for large WTE facilities in the United States and overseas.

Table 13.4 - Recent WTE Facility Expansions and Procurements in North America

Facility		Location	TPD	Status
Expansion[1]				
	Hillsborough County Resource Recovery Facility	Florida	600	Operating
	Lee County Resource Recovery Facility	Florida	630	Operating
	Honolulu Resources Recovery Venture	Hawaii	900	Operating
	Olmsted County Waste-to-Energy Facility	Minnesota	200	Operating
New Procurements				
	Frederick County energy Recovery Facility	Maryland	1,500	Design & Permitting
	Palm Beach County Renewable Energy Facility No. 2	Florida	3,000	Under Construction
	Durham York Energy Center	Ontario, CN	470	Under Construction

Note: Tons Per Day (TPD) represent only the expansion capability, not the overall facility processing capabilities

Facility sizing

A typical WTE facility must operate continuously since it receives MSW on a daily basis. A WTE facility is also the most efficient when running in a continuous fashion. Generally, and for redundancy and facility availability, two units would be provided, each for half the daily design capacity. Therefore, when one unit is down for scheduled (or unplanned) maintenance, the other unit will be able to operate. Waterwall systems generally have unit sizes of 200 Tons Per Day (TPD) up to 750 TPD, and multiple units are used when higher waste disposal capacity is required. Therefore a small redundant system would be, at minimum, 400 TPD in capacity.

Although MSW is a heterogeneous mix of society's waste, there is a degree of uniformity in its properties. Approximately half of its weight is composed of paper waste, with the remainder containing plastics, glass, ferrous and non-ferrous metals, food waste and yard waste and has a moisture content of 25% or more, and based on typical United States waste profiles, MSW can generate over 500 to 600 kWh/ton of electric power, when properly combusted.

Conclusions on Waste-To-Energy:

The availability of low cost regional landfills and low power prices does not currently present an economic opportunity for this technology for Cumberland County or the eight-county region.

13.5.2 Advanced Conversion Technologies

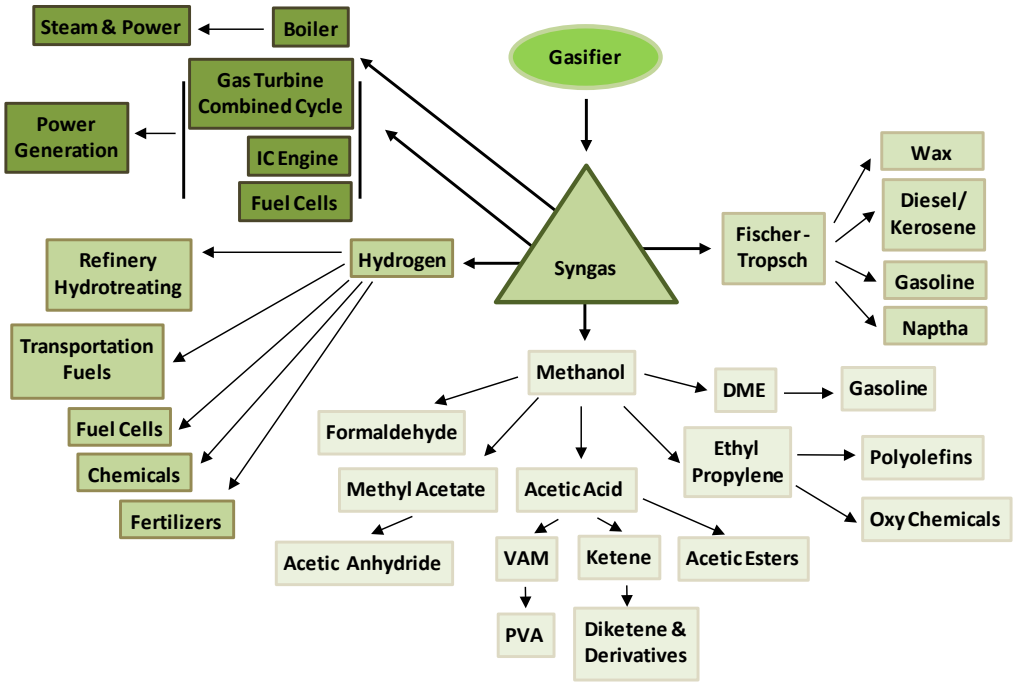
Introduction to methodology

Based on previous experience and knowledge of the industry of advanced thermal conversion technologies that use MSW as a primary feedstock, three types of general technologies (gasification, plasma gasification and pyrolysis) for the purpose of this report were reviewed. In this section of the report, a general description of these three technologies has been provided.

Gasification

Gasification is a thermal process of partial combustion under controlled limited amounts of air or oxygen in the combustion chamber. Gasification rapidly heats organic waste, such as MSW, to produce a synthesis gas, Syngas, which consists primarily of hydrogen, carbon monoxide, carbon dioxide and some trace compounds. It varies in its heating value from 200 to 500 Btu per cubic foot. It can be used as a directly combusted fuel or as feedstock for synthesis of other chemical products such as methanol, ethanol, and dimethyl ether shown in Figure 13.3.

Figure 13.4 - Gasification Output Pathways[18]



Gasification technology has been applied to biomass materials or homogeneous industrial waste products, it is now developing in the field of municipal waste processing and therefore it is considered an emerging technology. The feedstocks vary by many characteristics, such as energy content, size, shape, chemical composition, bulk density, ash composition, and moisture content. Typical feedstocks

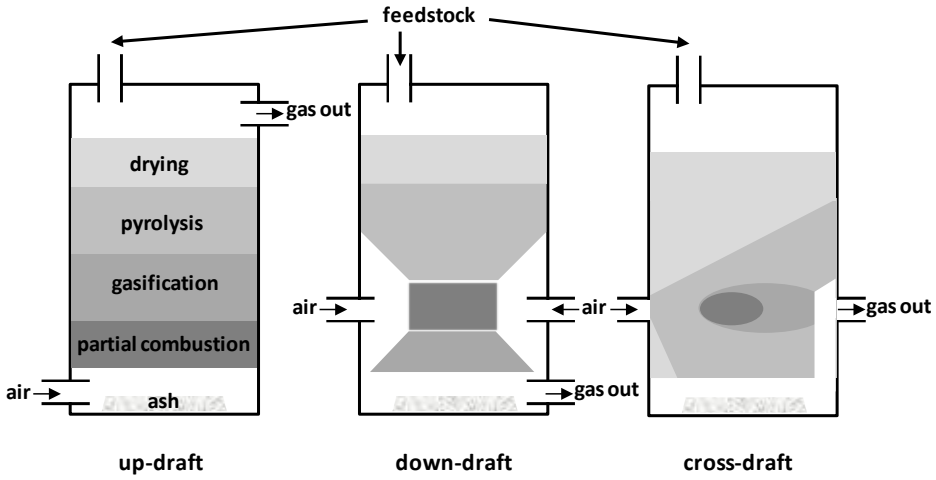
[18] GBB Diagram, 2012.

used in gasification technologies include: waste wood, wood pellets and chips, aluminum waste, plastics, industrial waste, municipal solid waste (MSW), refuse-derived fuel (RDF), auto-shredder residue (ASR), coal, petroleum coke, agricultural residue, grass, corn stover, mill waste, sewage sludge, black liquor.

First, the feedstock is homogenized into smaller particles then inserted into the gasifier followed by a controlled amount of air or oxygen (and steam for some gasifiers). The process begins when waste is fed into a gasification chamber to begin the heating process, first having been compressed to remove entrapped air from the feedstock. Some oxygen, sufficient only to maintain the heat necessary for the process to proceed, is injected into the reactor. Feedstock passes through several temperature zones where a sequence of reactions breaks down the material before the syngas is produced and removed from the chamber. The temperatures in a gasifier typically range from 1,100 to 1,800 degrees Fahrenheit. At this high temperature, organic materials in the MSW will dissociate into hydrogen, methane, carbon dioxide, water vapor, etc., and non-organics will melt and form a glass-like slag. After the gas is cleaned, and water is removed, it can be used for power generation, heating or for other purposes. The glass-like slag can be processed to remove metals that can be used as construction fill, concrete aggregate, or other building material for roads, etc.

Traditional gasification systems come in several primary variations, each with advantages for particular feedstock or product applications. The basic design of each system type is built around the reaction chamber with insertion of feedstock, but each has a different heating mechanism, air entry and syngas removal location, as illustrated in Figure 13.4. The selection of an optimal gasifier type for a particular application depends on variables such as the size, moisture content, and calorific value of the feedstock and the desired product type and quality.

Figure 13.5 - Gasification System Types[19]



Updraft Gasifier

An updraft gasifier has stacked zones clearly defined to dry, pyrolyze, gasify, and partially combust the feedstock.

[19] GBB Diagram, 2012.

In this type of system, the air is introduced from the bottom of the chamber and rises counter-current to the downward movement of the waste through the conversion zones. The synthesis gases produced move upwards and exit from the top of the chamber. This upward movement of the air and gas improves the process efficiency as the rising hot gases help to control temperatures, aid in drying of the feedstock, and improve the mixing of the gases in the chamber. Possible disadvantages of updraft systems is increased tar present in the raw gas and inefficient loading for some large or heterogeneous feedstocks.

Fluidized bed gasifiers are one type of updraft gasifier. In these gasifiers, feedstock is suspended in oxygen-rich gas (effectively creating fluid-like movement of the gas and feedstock within the chamber). The suspension improves the heat transfer rate between the gas and the feedstock and allows ash to fall out of the suspension instead of being carried up with syngas. Fluidized bed systems can gasify feedstocks with potential to form corrosive ash without damaging the chamber. In addition, they support a higher feedstock throughput than other gasifier types. This type of reactor may also be referred to as a circulating fluidized bed or transport reactor.

Downdraft Gasifier

In downdraft gasifiers, the air is introduced at a mid or top part of the chamber and the synthesis gas is removed from the bottom part of the chamber. Heat is applied from the top of the chamber, and the gas temperature increases as it moves downward. The gas leaves the chamber at very high temperatures. This heat can be harnessed for use in heating the upper portion of the chamber. A benefit of downdraft gasifiers is that when gas exits the chamber, it must pass through the ash (in the form of char) which acts as a filter, reducing the amount of tars in the syngas.

Entrained flow gasifiers are a type of downdraft gasifier. In these gasifiers, the feedstocks and the air (or oxygen) are introduced high in the chamber so the oxidant and the feedstock blend as they move downward. Gasifiers of this variety operate at high temperatures and are efficient for conversion of coal or other easily pulverized materials into low-tar syngas, because the reactions occur along the entire length of the chamber.

Cross-draft Gasifier

In the cross-draft gasifiers, the air inlet and the gas outlet are on the opposite sides in the middle of the-chamber. This type of gasifiers are less common as they produce high temperature syngas at a high velocity that does not have as efficient CO2 reduction as other gasifier types. This system design limits the types of feedstocks to low ash fuels such as wood, petroleum coke, and charcoal.

Cross-draft gasifiers have a few advantages such as the type of synthesis gas produced and the system startup time. This design produces synthesis gas with high carbon monoxide, low hydrogen, and low methane content when used on dry fuels, and a fast startup time that is desirable for some applications.

Level of Commercialization

Gasification has been used worldwide for almost 200 years to convert carbon-based materials such as coal and other fossil fuels, biomass, and waste materials into energy, heat, fuels, and chemicals. Gasification of wood waste, wood chips and agricultural biomass is commonly performed throughout North America and Europe for electricity and heat production. The gasification of MSW has achieved different levels of commercialization in different areas of the world.

In Asia, commercial scale gasification of MSW and industrial wastes has been performed over the past 20 years, particularly in Japan and South Korea.[20] In Europe, MSW gasification has been a mixed experience. Several facilities constructed in Germany, Japan and Italy were shut down because of economic and operational difficulties.

In North America, currently there is one full-scale gasification facilities operating commercially on MSW. However, a number of companies have pilot and demonstration facilities, and several additional commercial facilities are in advanced levels of development.

Plasma Gasification

Plasma gasification does not rely on a different gasifier structure or arrangement of air inlets and syngas outlets but rather on type of heat source used. Plasma gasification is used in industries that require disposal of hazardous wastes at high temperature. The high temperature (up to 10,000 degrees Fahrenheit) is created by the plasma torch in the gasifier.

Two different plasma gasification configurations are available based on the part of the gasification process the plasma torch is applied. First type is the plasma assisted gasification and second is the plasma coupled with traditional thermal gasification.

The first type has the plasma torch (s) in the gasification chamber where the heat generated breaks apart the chemical bonds in the feedstock and forms gas. Inorganic rejected materials are collected at the bottom of the gasification chamber, as a glass-like inert material potentially suitable for construction or other aggregate applications. Most plasma torch gasifiers are arranged similar to an updraft system, where feedstock is inserted near the top of the chamber, air or oxygen inserted in the middle or bottom of the chamber, and syngas is removed from the top of the chamber. The feedstock moves downward and into the intense heating zones created by the plasma torches. This type of system helps to prevent tar formation, as the syngas remains at a very high temperature (upwards of 1000°C) as it exits the chamber.

Plasma arc refers to the means of introducing heat into the process. Essentially a plasma arc system is a pyrolysis or starved air process generating heat by firing the waste with a plasma torch using electric current to produce a syngas, which is then combusted to produce steam and/or electricity, and is typically classified as an incinerator. If the system generates an off-gas that contains burnable gases (e.g., hydrogen and carbon monoxide) that can be used off-site, it can be classified as a gasifier.

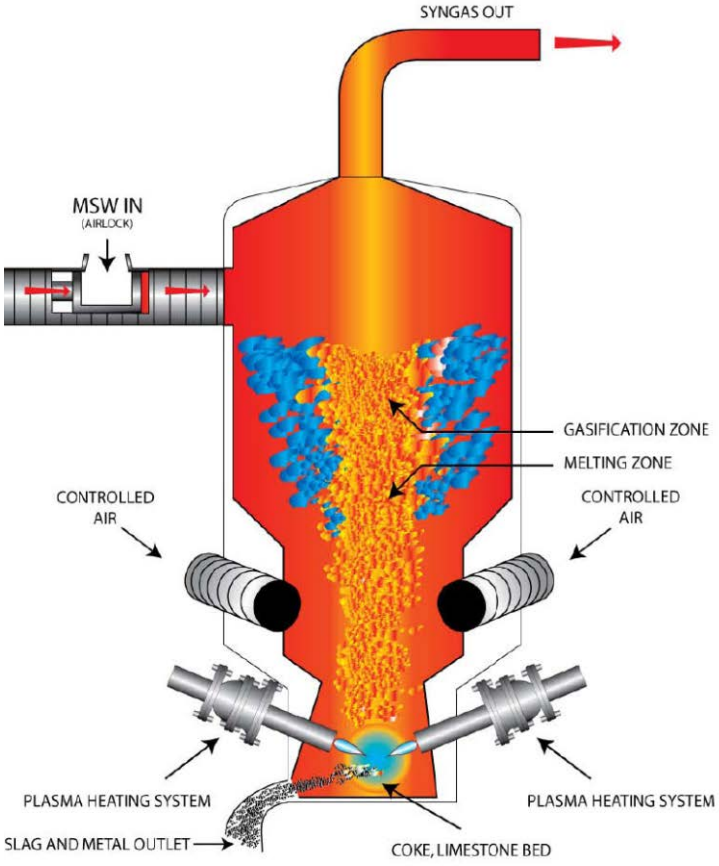
Plasma is a collection of free-moving electrons and ions across a gas volume at reduced pressure. The gas molecules, losing one or more electrons, become positively charged ions capable of transporting electric current and generating heat when the electrons go into a stable state and release energy similar to lightning in the atmosphere. Plasma can reach temperatures exceeding 7,000° F. Molten slag generated by the process is about 3000° F. The by-products of plasma gasification – slag or glassy aggregate and metals – are similar to those produced in other high-temperature gasification technologies. As with other gasification technologies, plasma gasification requires the pre-processing of the MSW feed to reduce the particle size before its introduction into the plasma reactor. (Note: while

[20] http://www.netl.doe.gov/

Figure 13.5 indicates MSW enters in the upper left side of the gasifier, the actual feedstock is similar to RDF.)

One of the primary drawbacks of plasma arc technology is the huge parasitic load of the plasma torches. Therefore, the net electric output of the conversion process, if generating electricity for sale from the system, would be substantially reduced. There are no commercial-scale plasma arc facilities processing MSW in the U.S., although several companies are marketing some form of this technology and proposing facilities. There are three small plasma arc facilities processing MSW and/or auto-shredder residue in Japan reportedly using the Westinghouse plasma reactor. Few, if any of the plasma arc pilot facilities have been able to generate a fuel gas, and air emissions have been found to be no better than conventional incineration systems.

Figure 13.6 - Cross-section of a Plasma Arc Furnace



Source: Westinghouse Plasma Corporation

Pyrolysis

Pyrolysis is a non-combustion thermal decomposition (cracking) of the material in complete absence of air or oxygen. End products of the pyrolysis are liquid fuels, combustible gases and solid (inert) residue. The gas is burned out in a gaseous phase, requiring much less oxygen than incineration. Metals, glass and other inorganic residues will usually melt at the temperatures within the pyrolysis chamber and will be discharged as a black gravel-like substance, termed frit. Advantages of this process are in the lack of

air entering the chamber and the resulting smaller size of system components. Pyrolysis has been applied to homogeneous industrial waste products and plastic wastes, and used for chemical synthesis, and is now developing in the field of municipal waste processing. There have been many attempts to develop this technology outside a laboratory or a pilot plant.

It is a well establish technology in the chemical industry but has some previous failures on commercial scale projects with MSW as feedstock. Currently pyrolysis is being applied to mixed non-recyclable plastic waste materials for production of synthetic fuel. It is considered an emerging technology due to the short history of operating plants in the US.

Although pyrolysis has been used throughout the world to process a variety of feedstocks, including plastic wastes and biomass, and treatment methods have been developed for byproducts, limited performance data is available for pyrolysis systems that process hazardous wastes that may contain dioxins and PCBs and the treated byproducts from hazardous waste pyrolysis may still require special handling and disposal.[21]

Conclusions on Alternative Conversion:

While a myriad of different technologies are advancing and have shown commercial size technologic viability, the lack of longevity, operational experience, high expense and potential issues with by-product stability and revenue values, continues to be a deterrent to current implementations in the United States and not a regional opportunity at this time.

13.6 Mixed Waste Processing Facility (MWPF)

13.6.1 Introduction

From the early days of MSW processing development, the need for energy recovery outlets for the energy-rich fraction of the MSW was apparent. In fact, in the early days of the technology when recyclables had less value, the main market was for Refuse Derived Fuel (RDF) and the primary driver. Now the objective is generally to recover recyclable materials, while also producing a cleaner, higher heating value fuel product.

The first processing facilities were frequently referred to as “dirty” MRFs, while the more modern facilities are typically referred to as Mixed Waste Processing Facilities (MWPFs). The terms “dirty MRF” and MWPF are still, at times, being used interchangeably. Historically, the phrase “dirty MRF” had been used to emphasize the contamination inherent in MSW feedstock. However, the processing or pulling of materials from trash has also created the image of a “dirty” work environment. The phrase is now used as a pejorative. The phrase “Mixed Waste Processing Facility” is a better description of the evolution of these facilities. A MWPF can be designed to accept and process both co-mingled recyclables, if a single-stream collection system exists, as well as processing the remaining trash stream itself. Many national manufacturers of separation equipment are recognizing the potential opportunities of MWPF systems and tout their MSW processing experience on their websites and in their brochures.

[21] Source: Center for Public Environmental Oversight, 2008.

13.6.2 Materials Recovery at Today's MWPF

The modern MWPF will incorporate different equipment and technology to sort and separate the materials, although most have similar objectives in handling the MSW stream. Nearly all modern designs have a pre-sort to eliminate bulky or prohibitive materials, contain a method to open plastic bags, and include screens to remove the small "fines" material. Nearly all incorporate Eddy Current Separators (ECS) and magnets to recover metals. More automated facilities also have a density separator to remove heavy objects, and a 2D/3D separator to split flat items such as paper (a two-dimensional object or 2D) from those with shape such as containers (a three-dimensional object or 3D). The most sophisticated plants also incorporate near infrared (NIR) optical units to recover recyclables from these split streams. The mechanical equipment integrated into a MWPF is typically called a mixed waste processing line (or MWP line, for short).

Greenwaste Recycling in San Jose, California combines the container streams from both a MWP line and a single-stream recycling line into one container stream that uses an optical unit for PET, manual sort for HDPE, and another optical unit for mixed plastics. The Greenwaste facility touts a recovery rate of 98 percent from the single-stream feedstock. With a 75 percent recovery achieved on the MWP line, a total facility diversion is noted as 88 percent, which includes recovery of organics, such as yard waste and food waste.[22]

The large Newby Island facility in Milpitas, California (refer to Figure 13.6) combines the container streams off of 2D/3D sorters from single-stream materials and commercial waste into one highly automated optical sorting line. Many of the new facilities, both single-stream and MWPFs, will have guarantees, with certain exclusions, for both recovery rates and purity rates of the recyclables.

Figure 13.7 - Newby Island Resource Recovery Park in Milpitas, California

[22] Website at Greenwaste.com – About Us; as of August 25 2014

Concern for the ability of MWPFs to procure clean, useful commodities for users of these materials is one of the biggest issues facing these newer facilities. There is some publicly available testimonial regarding the success of some modern MWPF, but in-depth data is not yet available. The facilities at Newby Island, Greenwaste, and the Infinitus privately owned-operated MWPF in Montgomery, Alabama have been selling their recovered recyclables, including fiber, and it was indicated by Infinitus that the price was "hi-side," especially for containers and metal.[23]

The SWANA Applied Research Foundation (ARF) did a preliminary study of recyclable and organics recovery from multifamily housing in Seattle. Recyclables, trash, and organics at their multi-facility housing units have separate bins for collection. This data was compared to information from San Jose, California, where a MWPF processes the MSW recovered from multifamily housing. While the quality of the recyclables from the source separated bins in Seattle was labeled as "high", the quality of recyclables from San Jose was labeled as "acceptable." This is one of the few published sources verifying that the recovered materials from a MWPF are of adequate standard for the commodities market.[24]

Given the amounts of recyclables still in the trash stream, as documented during the recent city waste sort described in Section 3, and the extensive advancements being implemented at MWPF's, a more detailed analysis is warranted. It is also worth noting that other outputs from a MWPF can also have additional energy potential. For example, product streams such as the organics can be used as a feedstock for Anaerobic Digestion (AD) systems to produce bio-gas (similar to the gas recovery at a landfill).

13.6.3 MWPF Recovery Analysis

The percentages of commodities that can be recovered at a MWPF are variable, depending on the incoming material, the type of equipment installed, and the level of automation. However, recent publicly available information has indicated promising numbers for the recovery of recyclables at highly automated MWPFs. These potential rates of recovery are shown in Table 13.5. It should be noted that these numbers are from an equipment manufacturer with recent experience with these modern MWP facilities, and that these numbers also may exclude certain items such as liquid filled containers that end up as residue. Other manufacturers are also indicating similar recovery numbers although, as of this Report, an extensive account of hard data is not available to confirm.

[23] REW Conference, San Jose, CA – talk by Kyle Mowitz, Infinitus Energy, November 2014

[24] MSW Management Magazine - Jeremy K. O'Brien - *Source-Separation and Mixed Waste Recycling Systems for Multifamily Buildings: A Comparative Analysis* – March-April 2014

Table 13.5 - Projected MWPF Recovery Rates, Consolidated by Commodity[25]

Material	Highly Mechanical Sorting System, %
Fiber	
Mixed Fiber	50-70
Cardboard (OCC)	65-75
Plastics	
PET	85-90
HDPE	85-90
Plastics #3-#7	75-80
Film	25-40
Metals	
Ferrous	90-95
Aluminum	90-95
Organics Foodwaste, Yardwaste	80-90

Data collected by GBB for the city during the March, 2015 week-long waste sort, included materials in the recycling and trash streams, including sizing. The resulting data indicates that there are significant recoverable recyclables in the trash stream. Three scenarios were studied with the available data from the waste sort to approximate the level of recyclable recovery along with the potential recovery with different processing systems.

The first scenario looks at the current city system of recycling which provides for a separate single-stream collection vehicle and the recovery based on assumptions on the typical efficiency of a single-stream MRF. The second scenario evaluates the recovery potential if there was no single-stream collection (and hence no MRF), and all the city trash/recyclables material were collected in one cart with one collection service and was all processed at a MWPF. The third scenario looks at the potential recovery of additional recyclables if a MWPF was also built, for the delivery and processing of the city trash collection, and both systems operated in tandem, with the residue from the MRF also being processed at the MWPF for potential additional recovery. Both of the MWPF scenarios assume the city yard waste collection program continues.

As detailed in Table 13.6, the data indicates that during the sort study period in late March, the city had 78 percent, by weight of the total material generated, set out in the trash cart and 22 percent placed in the recycle cart. The city has a third collection bin for yard waste that was not considered in this Report section. However, some yard waste still ended up in the trash container and was included in the organics commodity amounts.

[25] SWANA webinar, July 23, 2014.Title: Mixed Waste Processing: What Does It Offer? Presenters: Karl Hufnagel, PE, Civil Engr. – Brown and Caldwell: Eric Winkler, Sales – Bulk Handling Systems

Table 13.6 - City of Fayetteville, North Carolina Material Composition Study Summary Results

	Trash Cart			Recyclables Cart		
Commodity	**Garbage Weight (lbs)**	**As a % of Garbage**	**As a % of Overall**	**Recyclables Weight (lbs)**	**As a % of Recyclables**	**As a % of Overall**
Organics [(1)]	1,382	14.1%	11.0%	12	0.4%	0.1%
OCC	206	2.1%	1.6%	398	14.6%	3.2%
Other Fibers	1,767	18.0%	14.1%	1,114	40.8%	8.9%
Glass	362	3.7%	2.9%	398	14.6%	3.2%
PET	274	2.8%	2.2%	213	7.8%	1.7%
HDPE-(Natural)	24	0.2%	0.2%	59	2.2%	0.5%
HDPE-(Colored)	24	0.2%	0.2%	59	2.2%	0.5%
Mixed Plastic	464	4.7%	3.7%	75	2.8%	0.6%
Bags and Film	881	9.0%	7.0%	38	1.4%	0.3%
Aluminum	144	1.5%	1.2%	69	2.5%	0.6%
Ferrous	218	2.2%	1.7%	120	4.4%	1.0%
Other Residue [(2)]	4,055	41.4%	32.4%	172	6.3%	1.4%
Totals	**9,802**	**100.0%**	**78%**	**2,728**	**100.0%**	**22%**

(1) Contains Food Waste, Soiled Paper, and Yard Trimmings

(2) Includes C&D, Diapers, Textiles, Electronics and Other Residue

Based on the composition data presented in Table 13.6, the recycling cart included almost 22.2 percent non-recyclable materials, while the trash cart contained a number of recyclables. In fact, except for Cardboard (OCC), glass, and HDPE, greater than half of the total recyclables cataloged were in the trash stream.

Table 13.7 shows the percentage of the individual commodities that were in each container, and the percentage of that commodity in the total materials, as set out curbside and collected. This indicates that recyclable fiber, glass, and HDPE natural were well represented, with over two thirds of each commodity in the in the recycling bin. However, other containers, fibers, and metals are more evenly split between the two streams.

Table 13.7 - Material Composition Study, Comparison of Recycling and Garbage Set-outs

	Summary Information - All Materials As Setout by Residents			
Commodity	**Total Weight of Commodity (Both Carts)(lbs)**	**% of Commodity located in Garbage Bin**	**% of Commodity located in Recycling Bin**	**Commodity as % of Overall Collection Stream**
Organics	1,395	99%	1%	11%
OCC	604	34%	66%	5%
Other Fibers	2,882	61%	39%	23%
Glass	760	48%	52%	6%
PET	487	56%	44%	4%
HDPE-(Natural)	83	29%	71%	1%
HDPE-(Colored)	83	29%	71%	1%
Mixed Plastic	539	86%	14%	4%
Bags and Film	920	96%	4%	7%
Aluminum	214	68%	32%	2%
Ferrous	338	65%	35%	3%
Other Residue	4,227	96%	4%	34%
Totals	**12,530**	**78%**	**22%**	**100%**

(1) Excludes Yard Waste Set-outs

Scenario 1: Estimate of MRF Recovery

All MRFs and MWPFs have an inherent efficiency of recovery, thus not all the recyclable material is actually recovered. Additionally, the age of the MRF and equipment available and utilized at that time will also impact recovery rates and thus residue rates. The modern automated systems generally have a very high efficiency, and many equipment vendors are guaranteeing these recovery percentages, although they are commonly not published due to competitive advantage.

In general, a highly automated single-stream MRF will have a higher recovery efficiency than a modern MWPF, mostly due to the feedstock being a concentration of recyclable commodities that was set-out curbside. For illustrative purposes, the higher recovery efficiencies stated earlier in Table 13.5 are used to estimate the recovery from a MRF. In actuality, modern MRFs may achieve slightly higher efficiencies, especially for fiber, so for this Report the fiber efficiencies were increased by 5% to represent a more realistic recovery amount.

Table 13.8 shows the estimated recovery rates from the recycling bin only as if it were to be processed at a modern MRF with these assumed recovery efficiencies. (This is not indicative of the actual recovery at the private Pratt MRF facility, which was not part of the waste sort). The last column in Table 13.8 shows the potential individual recovery of each commodity, meaning the total commodity recovered at the MRF with respect to the total of that commodity in both collection streams. The total recyclables diversion rate, which is the percentage of the total recovered recyclables at a typical MRF, is a percentage of all the generated materials collected in both the trash and recyclables bins, is 16 percent of the total waste stream.

Table 13.8 - Estimate of Recyclable Recovery at Fayetteville, North Carolina MRF

	Est. of MRF Processing & Recovery			
Commodity	**Recyclables Weight (lbs)**	**Est. of % Recyclables Recovered at a MRF**	**Est. Weight Recovered at MRF (lbs)**	**Individual Total Recovery Rate, Recyclable Materials**
Organics	12	0%	0	0%
OCC	398	80%	318	53%
Other Fibers	1,114	75%	836	29%
Glass	398	85%	339	45%
PET	213	90%	192	39%
HDPE-(Natural)	59	90%	53	64%
HDPE-(Colored)	59	90%	53	64%
Mixed Plastic	75	80%	60	11%
Bags and Film	38	30%	11	1%
Aluminum	69	95%	66	31%
Ferrous	120	95%	114	34%
Other Residue	172	0%	0	0%
Totals	**2,728**	**75%**	**2,042**	
			Total Diversion Rate	**16%**

Source: Gershman, Brickner & Bratton, Inc.

Table 13.8 indicates that that approximately half of the total OCC and HDPE plastics (in both containers) would be recovered for recycling. This also shows that there are still more materials that can be recovered, especially metals, PET and mixed plastics, in the waste container.

Scenario 2: One-bin collection and MWPF Processing Only

While many communities may have good residential recycling programs with significant participation and high diversion rates, others do not. Table 13.9 uses the same data, in a combined mode, to illustrate a scenario where there is no significant residential participation in a local curbside program, and the community wants to consider only a MWPF for all of their residential waste materials. In this case, and assuming the same recovery efficiencies for the MWPF as assumed in Table 13.9, the total recovery rate for an MWPF alone is calculated to be 35 percent. This recovery is lower than the previous two-facility example due mainly to the lower efficiencies of commodity recovery assumed for the fiber fraction processed at the MWPF. If organics are not recovered by the MWPF, the overall diversion rate would drop to 27 percent.

Table 13.9 - Estimate of One Bin Only MWPF Recovery

	MWPF Only For All MSW - One Bin				
Commodity	**Total weight of Commodity (lbs)**	**% Recovered at MWPF**	**Weight Recovered (lbs)**	**Net Weight to Landfill for Disposal**	**Individual Total Recovery Rate MWPF only**
Organics (1)	1,395	70%	976	418	70%
OCC	604	55%	332	272	55%
Other Fibers	2,882	40%	1,153	1,729	40%
Glass (1)	760	65%	494	266	65%
PET	487	75%	365	122	75%
HDPE-(Natural)	83	75%	62	21	75%
HDPE-(Colored)	83	75%	62	21	75%
Mixed Plastic	539	65%	350	189	65%
Bags and Film	920	15%	138	782	15%
Aluminum	214	80%	171	43	80%
Ferrous	338	80%	270	68	80%
Other Residue	4,227	0%	0	4,227	0%
Totals	**12,530**		**4,374**	**8,156**	
			Total Diversion Rate W/ Organics		**35%**
			Total Diversion Rate W/O Organics		**27%**

(1) Organics and Glass recovery will require additional processing and facilities

Source: Gershman, Brickner & Bratton, Inc.

Based on the composition of the waste from the detailed field sort, and equipment/system efficiencies of recovery at a community using both a MRF and MWPF versus a MRF alone, the projected impact on total quantities recovered are:

- 88% more OCC, Mixed Paper and ONP;
- 174% more PET, HDPE, and Mixed Plastics; and
- 182% more metals.

Note that this is a hypothetical exercise and the MWPF extraction rate is based on the new generation of MWPF which is still being commercialized. True recovery numbers are still unknown.

Scenario 3: Tandem MWPF and MRF Recovery

If all of this waste was assumed to be processed through a separate MWPF, in order to increase the overall recycling rates, Table 13.10 provides the estimates for such a co-located materials recovery system.

Table 13.10 - Estimate of Processing Waste through a MWPF in Addition to MRF Recovery of Recyclables

Commodity	Recovery Rate for MRF and MWPF				
	Trash Total into MWPF (lbs)	% Recovered at MWPF	Recyclables Weight Recovered (lbs)	Net Weight to Landfill for Disposal (lbs)	Individual Total Recovery Rate including MRF + MWPF
Organics [1]	1,382	80%	1,106	289	79%
OCC	206	65%	134	152	75%
Other Fibers	1,767	50%	884	1,162	60%
Glass [1]	362	75%	271	150	80%
PET	274	85%	233	62	87%
HDPE-(Natural)	24	85%	20	9	89%
HDPE-(Colored)	24	85%	20	9	89%
Mixed Plastic	464	75%	348	131	76%
Bags and Film	881	25%	220	688	25%
Aluminum	144	90%	130	18	92%
Ferrous	218	90%	196	28	92%
Other Residue	4,055	0%	0	4,227	0%
Totals	**9,802**		**3,563**	**6,925**	
			Total Diversion Rate W/ Organics[2]		**45%**
			Total Diversion Rate W/O Organics		**36%**

(1) Organics and Glass recovery will require additional processing and facilities

(2) Processing the MRF Residue at the MWPF may recover an additional 2% of recoverables

Source: Gershman, Brickner & Bratton, Inc.

Using the lower baseline recovery rates noted earlier in Table 13.5, each commodity is shown with a projected recovery rate within the MWPF. Therefore, in conjunction with a MRF, a MWPF could recover an additional 36 percent of material from the overall residential waste stream, as commodities and an organic fraction. In this analysis, and based on the assumptions noted, the overall recovery rate would increase from 16 percent with a MRF only, to 45 percent with a MRF and MWPF tandem. The far right column in Table 13.10 indicates the combined recovery rates for the individual materials, with the overall recovery rate of some commodities reaching 90 percent.

In addition, the organics, which are prevalent in the mixed waste container, are assumed to be separated at the MWPF. This organics-rich stream could enter into an anaerobic digestion process or go to a composting facility. This, and the recovery of glass, would require additional processing and facilities to recover as a recyclable commodity. If the organics are not included in the recovery, the overall diversion drops to 36 percent. Alternatively, if organics were recovered and the remaining residue was utilized as an engineered fuel, the total diversion rate would be approximately 86 percent.

In evaluating a MRF versus MWPF, the reduced efficiencies of the MWPF fiber sort recovery were considered since fiber quality suffers in the MWPF process and calculated quantity of total fiber recovered was similar. The other non-recovered fiber could possibly be integrated into an anaerobic digestion system. However, this alternative process to further increase diversion is not considered in the above analysis. Additionally, the revenue value of increased plastics and metals recovery using a modern

MWPF could potentially overcome any market price penalty per ton of product marketed for any potential contamination contained therein.

Commodity Revenue:

Based on the waste sort constituent data and the MSW tonnages reported to be going into the County Landfill, the potential recovered commodities from a MWPF illustrated earlier in Scenario 2 are shown in Table 13.11. This assumes that all waste coming to the Ann St. Landfill is processed by a modern, automated MWPF. This does not include recyclables that are source separated in the weekly recyclables bin and recovered by the Pratt MRF.

Table 13.11 - Potential Recovered Materials from County Landfilled Waste

Material Types	Percentage in Material Stream	Annual Tonnage	Estimated Recovery, %	Estimated Recovery Tonnage
Organics	14.1%	16,076	70%	11,253
OCC	2.1%	2,391	55%	1,315
Other Fibers	18.0%	20,553	40%	8,221
Glass	3.7%	4,207	65%	2,735
PET	2.8%	3,187	75%	2,390
HDPE-(Natural)	0.2%	279	75%	210
HDPE-(Colored)	0.2%	279	75%	210
Mixed Plastic	4.7%	5,398	65%	3,508
Bags and Film	9.0%	10,250	15%	1,538
Aluminum	1.5%	1,680	80%	1,344
Ferrous	2.2%	2,539	80%	2,031
Other Residue	41.4%	47,161	0%	0
Estimated Totals	**100.0%**	**114,000**		**23,524**

Source: Gershman, Brickner & Bratton, Inc.

Table 13.12 estimates the value of each recoverable commodity in both a 5-year average for pricing as well as current pricing as of April 2015. This indicates a significant drop in the recent market value of recovered materials. Fibrous materials, such as Old Corrugated Cardboard and Mixed Paper, are down $25/ton to $30/ton in market value versus the 5-year average. Except for HDPE colored, all of the plastic resins are also much lower. Even Ferrous Metals are down 45 percent from the 5-year average.

Table 13.12 - Estimated Value of MWPF Recovered Materials (not including those recovered at the existing MRF)

	5-Year Average Commodity Value		Current Commodity Value		
Material Types	**Historic Sale Price (Cent/Lb)**	**Historic Sale Price(1)(2) ($ per ton)**	**Current Sale Price (Cent/Lb)**	**Current Sale Price ($/Ton)**	**% Price NOW versus 5-year Historic Average**
Organics	(see $/Ton)	$0	(see $/Ton)	$0	Not Applicable
OCC	(see $/Ton)	$118	(see $/Ton)	$80	-32%
Other Fibers	(see $/Ton)	$67	(see $/Ton)	$50	-25%
Glass	(see $/Ton)	$0	(see $/Ton)	$0	0%
PET	$0.215	$429	$0.125	$250	-42%
HDPE-(Natural)	$0.350	$700	$0.305	$610	-13%
HDPE-(Colored)	$0.241	$481	$0.295	$590	23%
Mixed Plastic(2)	$0.006	$12	$0.002	$4	-67%
Bags and Film(4)	$0.151	$302	$0.110	$220	-27%
Aluminum	$0.771	$1,543	$0.720	$1,440	-7%
Ferrous	(see $/Ton)	$114	(see $/Ton)	$63	-45%
Other Residue	(see $/Ton)	$0	(see $/Ton)	$0	Not Applicable

(1) Price based on RecyclingMarkets.net SE 5 yr Historic Data (2010-2014)

(2) Price of #3-#7 based on RecyclingMarkets.net SE 2 yr Historic Data (2013-2014)

(3) Price based on current RecyclingMarkets.net SE Pricing(April 2015)

(4) Pricing for LLDPE only, mixed film may be less

Source: Gershman, Brickner & Bratton, Inc.

The specific business structure and financial position of private MRF's is typically not published and not available for evaluation. Also, recognizing the competitive nature of the recycling industry, and the private waste business in general, private companies must keep certain information "close-to-the-vest". However, with that said, it is also important for the city to understand the financial implications of the marketplace in which they have elected to provide services, as the city indeed is a regular market participant.

Table 13.13 is provided to extend the commodity-specific market pricing information developed in Table 13.12 to a more city-friendly example. Using (1) the nominal city-setout of 10,000 TPY of curbside recyclables, (2) the recyclables cart sort data presented in Table 13.8, and (3) the current low values in the commodity market, a modern automated single-stream MRF that performs as-assumed could potentially create an income stream of over $1 million from all of the city single-stream materials. If the higher 5-year average for prices were considered, the value of the same recovered materials would be closer to $1.3 million

Table 13.13 - Illustrative Value of City Curbside Collected Single Stream Recyclables from a MRF

Material Types	Estimate of Recovered Tonnage Available For Sale	Historic Sale Price(1)(2) ($ per ton)	Estimated Historic Commodity Value	Current Sale Price(3) ($ per ton)	Estimated Current Commodity Value, $
Organics	0	$0	$0	$0	$0
OCC	1,167	$118	$137,734	$80	$93,379
Other Fibers	3,064	$67	$205,270	$50	$153,187
Glass	1,241	$0	$0	$0	$0
PET	703	$429	$301,626	$250	$175,691
HDPE-(Natural)	194	$700	$136,072	$610	$118,543
HDPE-(Colored)	194	$481	$93,474	$590	$114,656
Mixed Plastic(2)	220	$12	$2,685	$4	$880
Bags and Film(4)	42	$302	$12,713	$220	$9,255
Aluminum	242	$1,543	$373,110	$1,440	$348,294
Ferrous	417	$114	$47,593	$63	$26,076
Other Residue	0	$0	$0	$0	$0
Estimated Totals (5)	**7,485**		**$1,310,277**		**$1,039,961**
		Average Value, $/Ton Recovered	**$175.06**		**$138.95**
				Net Value Decrease	**20.6%**

(1) Price based on RecyclingMarkets.net SE 5 year Historic Data (2010-2014)
(2) Price of #3-#7 based on RecyclingMarkets.net SE 2 year Historic Data (2013-2014)
(3) Price based on current RecyclingMarkets.net SE Pricing(April 2015)
(4) Pricing for LLDPE only, mixed film may be less
(5) Total Values Based on Processing 10,000 tons of City materials as indicated by the recent waste sort

As a public MRF reference point for this current commodity value slump, GBB has just begun an evaluation for Kent Count MI (Grand Rapids area). With the MRF owned and operated by the County, their County DPW 2014 Budget assumed an average recovered commodity sales value of about $110 per ton in the Upper Midwest region. The Kent County DPW 2015 Budget only assumes $84 per ton for the average income on materials sold into the marketplace. This is a 24 percent drop in the average market value for all of the commodities sold from this Upper Midwest MRF and illustrates the general marketplace in which we are currently functioning.

It is important to keep the value of MRF materials in perspective based on the current business arrangement that the city has with WM, as the full-service recyclables collector and materials marketing arm. WM currently receives $22/Ton delivered to the Pratt MRF located in Fayetteville as a rebate from recovered materials sales. This is shared, through contractual terms, 50/50 between the city and WM. Therefore, the city currently receives $11/Ton as the materials revenue rebate. With that said, GBB also needs to acknowledge that Pratt had to invest in their MRF facility and processing equipment, and has full operational responsibility and risk for the performance and costs thereof. GBB is not privy to any of the financial data in this regard.

With the introduction of the commodity values in Table 13.12, and the extended implications of the actual materials present in the waste stream and the potential recovery thereof, Table 13.13 has introduced a significant aspect of the financial underpinnings that will now be reviewed as it is applied to more extensive regional processing and recovery opportunities.

13.7 Potential for Regional Opportunity

13.7.1 Regional Program Structures

The availability of relatively inexpensive landfills in the region, coupled with low-cost energy and the lack of any substantial 24/7 energy markets of size, allows GBB to make a clear and reasonable recommendation that neither a regional waste-to-energy project nor an alternative fuels project, such as a plant making ethanol or other liquid, would be cost-competitive at this time, or into the near future.

However, with that said, the potential to consider a MWPF is not so easily dismissed and some very interesting considerations are in play in the Fayetteville region that require this system opportunity and technology to be worth detailed evaluation. More specifically, the background that helps advance the reason for more initial evaluation of this approach is as follows:

1. The city of Fayetteville has the ESD that collects the residential waste;
2. ESD controls the current short-term contract with Waste Management for residential recyclables collection;
3. A local MRF exists in the city that is privately-owned and operated by Pratt with long-term no city-contract;
4. A private transfer station, operated by Waste Industries, exists in the city and serves as the drop-off site for significant quantities of regionally generated MSW (non-city) and/or commercial waste, ultimately destined for transfer trailer long-haul for the WI-Sampson County landfill; and
5. Cumberland County owns and operates the in-city MSW landfill that receives the city residential waste and bulky-waste materials.

The above listing and stated business relationships becomes important in that it helps provide a pretty clear understanding of the movement of waste materials around the city, and more importantly, a good estimate of the costs from the source of MSW generation to the ultimate discharge location.

Due to the nature of the regional disposal options presented in clear graphical exhibits earlier in this Report, such as in Figure 13.1 through Figure 13.3, and due to the low cost and competitive nature of the industry supported by their private landfill capacity, GBB is of the opinion that a “regional project” should only be initially evaluated as a Cumberland County wide opportunity and not presumed, at this time, to include waste materials from any other contiguous County sources.

With that premise, GBB received in-County waste flow information from DENR summarizing their FY12/FY13 annual facility reports. Table 13.14 presents the waste quantities and the destination locations for in-County generated waste sources. This table indicates that almost 250,000 tons were generated and managed by the six methods described. Of that total, the County landfill received approximately 114,000 tons, which was 39% of the total indicated on the state reports. Materials moving through the WI Transfer Station were a close second at 106,000 tons and 36% of the total. About 16% of the waste reported appears to have been hauled directly to the WI Sampson County landfill without going through the WI transfer station. In the report, Fort Bragg was noted as having generated 25,000 tons during that year.

Table 13.14 - Cumberland County, North Carolina Waste Destinations for FY12/FY13

Location-Disposition		Tons per Year	% of the Total
1	Cumberland County Landfill	114,619	39.0%
2	Fort Bragg Tranfer Station	24,504	8.3%
3	City of Fayetteville-WI Transfer Station	106,111	36.1%
4	Uwharrie Env Landfill	541	0.2%
5	Other Hauls to WI-Sampson County Landfill	46,868	15.9%
6	Other Hauls to Outside the County	1,385	0.5%
Total MSW Generation		**294,026**	**100.0%**

While the precise annual tonnages will ebb-and-flow differently based both the economy and negotiated tipping fee rates at the noted disposal facilities, realistically, only a few options exists for the majority of the Cumberland County-generated waste disposal. For example, the city will continue to use the county landfill and Waste industries will continue to support their transfer station and haul to their private landfill. The float involves where the other private haulers, including WM and the independents, will haul their collected waste for disposal.

Before presenting more analysis of the details and options associated with a MWPF for consideration by the city, GBB wishes to point out information compiled in Attachment A to this Report. Attachment A is a recent presentation pertaining to a nominal 150,000 TPY MWPF built in the City of Montgomery Alabama by a private developer. This facility has been in operation for about one year and generally serves as the flagship of the current modern MWPF's.

13.7.2 MWPF Sizing Options Considered

Based on the current waste generation profile and market activity that exists in the city and county, it was deemed appropriate to review four different options for the throughput of the MWPF. These four options are more fully introduced in Table 13.15. While this review does cut across existing business interests, some long-term and others short-term, it is important to understand the technical and economic implications of these opportunities, setting aside the many other interests that such waste-related programs create once they enter the public arena of discussion and consideration.

Table 13.15 - Opportunities Evaluated for MWPF

Option	Type of Facility & Materials Considered for Processing	Assumed Tons/Year Processed
Base	MRF - City Only Single-Stream Recyclables (Baseline)	10,000
1	MWPF - County Landfilled Trash Only (Single-Stream to MRF)	115,000
2	MWPF - One Cart, All Countywide Mixed Waste (including City and County Recyclables)	130,000
3	MWPF - County Landfill Trash plus Single-Stream MRF Residue (Single-Stream to MRF)	117,515
4	MWPF -City & Countywide, All in One Cart + 50,000 TPY of Private Trash Material	180,000

In order to quantify the design and potential operational implications of these options, this Report uses the main recycling facility owned/operated by Pratt as the baseline. GBB does not know the overall quantity of materials processed and recovered by Pratt, but the baseline presumed for measuring a more broadly impacting facility like a MWPF is the nominal 10,000 TPY of current city curbside recyclables delivered to Pratt.

The four options noted in Table 13.15 are a combination of sizes that either consider the other tonnages going to the existing County landfill, integrates the current city-recyclables into a "one-cart-for-all collection system delivering materials into a MWPF, or both with additional tonnages obtained locally that are now delivered directly, or indirectly, to other potentially competitive waste disposal facilities.

An overview of each option is as follows:

1. Option 1 assumes that the current Pratt MRF continues to receive the city-generated curbside recyclables. However, for simplicity in this evaluation, all of the trash currently going directly to the County landfill would be processed through a MWPF. Any resultant residue from the MWPF would go to the county landfill;
2. Option 2 assumes that all of the city-generated trash and recyclables, as well as the other trash going into the county landfill would be processed in a MWPF. The city-system would became a one-cart-for-all collection;
3. Option 3 is similar to Option 1 in that the Pratt MRF continues to receive the city curbside recyclables, however, the MWPF would also receive and reprocess the MRF residue to have a second chance at removing additional recyclables; and
4. Option 4 is similar to Option 2 with all of the countywide trash going into the MWPF with a city-wide one-cart-for-all program instituted, plus, the MWPF competitively is assumed to attract another 50,000 TPY of waste generated in the County that currently being landfilled either by direct haul out of the County or use of the WI transfer station.

The main reason to build a MWPF is to improve the amount of recyclables separated and marketed in the region, hopefully at a competitive cost, and reduce the amount of waste going to a landfill. There are many technical approaches to the internal design of a MWPF and many recoverable products marketed therefrom as noted in Attachment A and Attachment B.

In this regard, Table 13.16 has been compiled to illustrate the projected increased tonnages that are forecast to be delivered, recovered for recycling and not landfilled from each of the four options evaluated. It is important to note that all of the additionally recovered materials indicted in Table 13.16 are being landfilled at this time.

The percent of materials recovered for the four MWPF options does not include the realistic potential of adding onto the system an anaerobic digestor (AD) for the organics and fines materials. This is a future phase add-on for the City of Montgomery Alabama project and AD system are used in concert with many of the mixed waste processing plants in Europe where they are called Mechanical & Biological Treatment Facilities, or MBT projects, for short.

Table 13.16 - MWPF Options Evaluated, Estimated Recovery Rates and Landfilled Quantities

Option	Type of Facility & Materials Considered for Processing	Assumed Tons/Year Processed	% of Material Recovered	Tons Recovered	Process Residue For LF	Additional Tons Recycled vs. Baseline (1)
Base	**MRF - City Only Single-Stream Recyclables (Baseline)**	10,000	74.8%	7,485	2,515	-
1	**MWPF - County Landfilled Trash Only (Single-Stream to MRF)**	115,000	30.5%	35,059	79,941	27,575
2	**MWPF - One Cart, All Countywide Mixed Waste (including City and County Recyclables)**	130,000	34.9%	45,385	84,615	37,900
3	**MWPF - County Landfill Trash plus Single-Stream MRF Residue (Single-Stream to MRF)**	117,515	29.9%	35,184	82,332	27,699
4	**MWPF -City & Countywide, All in One Cart + 50,000 TPY of Private Trash Material**	180,000	34.9%	62,841	117,159	55,356

(1) The total quantity of Recyclables Processed through the Pratt MRF from non-City of Fayetteville curbside collection program is not known by GBB

13.7.3 Management and Operations Organization

Providing the city with insight or direction of the potential management and/or operations of a modern MWPF needs a clear-the-air discussion of the past in the City of Fayetteville. Recently, at the Northeast Recycling Coalition (NERC) Conference, held April 7-8, 2015, GBB attended and was inadvertently reminded that about two decades ago, the county was involved in the development and implementation of the mixed waste processing plant that generated refuse derived fuel (RDF) as the main product to supply an off-site private boiler system. While the main processing building used for that short-lived project still exists next to the county landfill, and thus provides constant memories of this ill-fated implementation. However, the current experiences with solid waste project development,

and mainly the technologies employed, along with the sharing of risks and responsibilities associated therewith, are very different.

It is also clearly acknowledged that there are those interests not wanting to abandon any curbside recycling collection program in lieu of a potential one-cart-for-all system. However, the intent of this section of the Report is merely to make the city aware of alternatives, and the general implications of those options evaluated.

With respect to the management and operations of MWPF's, and indeed even the ownership and marketing responsibility thereof, there exists private sector interests that will provide for the design, permitting, financing and long-term operations of MWPF's. Therefore, neither the city nor the county needs to take on any project-related risks that they are not comfortable with accepting. However, it would be expected that the waste flows that either public entity controls would be committed to such a project under a well-defined contractual mechanism.

13.7.4 Optimum Facility Location

Due to the close proximity of the city to the county landfill, and the ongoing active waste collection routes that already exist, and the strategic siting of the landfill, it is suggested that the MWPF for any of the four options noted be considered for location at or near the county landfill. While this is put forth as the optimum facility location, GBB has not specifically talked to the county or evaluated the current use and sizing opportunity of the large BCH building presented in Exhibit 13.1 for its potential to be retrofitted to accommodate such a facility.

Exhibit 13.1 - Photograph of the Current BCH Buildings at the County Landfill Site

13.7.5 Preliminary Estimate of Capital and Operation Costs

The costs to operate a MWPF can be highly variable depending on the location, the size, and the opportunity to use existing buildings. As an example of the potential costs of different MWPF sizes, Table 13.17 notes data from a recent presentation that provided preliminary estimates of the approximate costs for a modern, highly automated MWPF. Based on the options noted in Table 13.15, the sizing would be slightly larger than the 35 TPH system referenced in Table 13.17.

Table 13.17 - Approximate Costs for MWP Facility[26]

MWPF Capacity (Tons Per Hour)	Minimum Bldg. Size (Square Feet)	Minimum Site Size, Acres	Estimate of Equipment Cost, $ Millions	Sitework and Building Costs, $ Millions (1)
35	50,000	8-10	$10-12	$6-9
70	80,000	10-12	$16-18	$9-12
100+	100,000+	12-15	$28-30	$11-16

(1) Excludes the cost of the land

The rolling stock needed to operate the facility and the labor, administration and management that is also needed to run the operation also needs to be taken into account. Table 13.18, which came from the same presentation, provides an estimate of the labor needed to run these facilities, which may take more or less staff depending on the administration and other support that may be able to cover some cross-duties at the facility.

Table 13.18 - Typical Staffing Levels for Highly Automated MWPF[27]

MWPF Capacity (Tons Per Hour)	Equipment Operators	Sorting Functions	Supervision & Maintenance	Total Labor Contingent
35	3-5	20-24	3-4	26-33
70	5-6	42-46	4-6	51-58
100+	6-85	48-52	7-10	61-70

The total costs of these plants, on a per-ton basis, still vary depending on the tonnages available. The closer to capacity the machinery can run (and for longer periods of time at capacity, say 2 shifts per day) the greater the total tons processed will be and the less cost per ton value will be. As a simplistic example, and not corresponding to any of the options herein, if the yearly cost to own/operate a MWPF is $6,000,000 at one shift, and the facility processes 100,000 tons annually, the cost would be $60 per ton. However, if that same facility can be owned/operated to run two shifts at $8,000,000 (the initial

[26] Kufnagel and Winkler, op.cit.
[27] Kufnagel and Winkler, op.cit.

capital costs won't be increased, just labor, mobile equipment costs and maintenance) and it can process 200,000 tons per year, then the price would become $40 per ton.

While Table 13.17 and Table 13.18 provide a general review illustrating the impacts of MWPF capacity, measured on a TPH basis, have on certain cost and staffing indicators, GBB has created cost and performance estimates based on the four options selected for evaluation in this Report. These estimates were created assuming a 40 TPH system, which can be operated for up to two shifts per day on a six day-per-week basis. The annual throughput capacity operating 15 hours per day and 310 days per year would be 186,000 tons of MSW. Based on the Table 13.12 annual capacity expectations, the assumed operation regime for the four options would be as detailed in Table 13.19.

Table 13.19 - General Design and Operation Parameters for MWPF Options Evaluated

			Operational Parameters w/40 TPH MWPF			
Option	**Description of Design Premise**	**Est. of Annual Capacity, TPY**	**Days/Week**	**Days/Year**	**Tons/Day**	**Hours/Day**
1	**MWPF - County Landfilled Trash Only (Single-Stream to MRF)**	115,000	5	260	442	11
2	**MWPF - One Cart, All Countywide Mixed Waste (including City and County Recyclables)**	130,000	5	260	500	13
3	**MWPF - County Landfill Trash plus Single-Stream MRF Residue (Single-Stream to MRF)**	117,515	5	260	452	11
4	**MWPF -City & Countywide, All in One Cart + 50,000 TPY of Private Trash Material**	180,000	6	310	581	15

The preliminary cost estimates for each of the four options are presented in Table 13.20. This table initially establishes a capital cost estimate based on an assumed single-line of processing equipment, consideration of a new greenfield building, and purchasing the initial mobile equipment to support the operations as part of the initial upfront capital. The equipment replacement reserve would be considered to be included as part of the annual O&M costs.

Table 13.20 - Estimated Capital & O&M Costs for the MWPF Being Evaluated

Cost Element Description	Option 1	Option 2	Option 3	Option 4
Initial MWPF Annual Processing Capacity (2015)	**115,000**	**130,000**	**117,515**	**180,000**
Capital Costs:				
40 TPH MWPF Processing Equipment	$12,000,000	$12,000,000	$12,000,000	$12,000,000
Design, Engineering, Sitework & Building	$18,000,000	$18,000,000	$18,000,000	$20,000,000
Mobile Equipment Capital	$1,000,000	$1,000,000	$1,000,000	$1,300,000
TOTAL INITIAL CAPITAL COST ESTIMATE	**$31,000,000**	**$31,000,000**	**$31,000,000**	**$33,300,000**
Operating/Maintenance Cost, $/Ton				
Average $/Ton Estimate, w/o Residue Disposal	**$35**	**$34**	**$35**	**$33**
PRELIMINARY ANNUAL O&M COST ESTIMATE	**$4,025,000**	**$4,420,000**	**$4,113,038**	**$5,940,000**

Source: Gershman, Brickner & Bratton, Inc.

13.7.6 Preliminary First Five (5) Year Operating Financial Analysis

In developing the financial analysis for comparison with the current system, a series of estimates on the annual throughput, as well as the projected revenue for any recovered materials and any other cost reduction, is crucial to the analysis. To initiate the review, it is necessary to define the overall annual Mass Balance based on all of the key input and performance assumptions noted. Table 13.21 presents an example of the methodology used for developing the preliminary mass balance for each MWPF evaluated. For this Report, GBB has elected to show the specific assumptions for Option 2 to illustrate the presentation used in this regard.

Table 13.21 - Overview of Mass Balance Assumptions for Option 2

		(1st Full Year)					
		2018	2019	2020	2021	2022	
2015	Years from the Base $ Estimate	3	4	5	6	7	
Base							
Year	WASTE HANDLED/MATERIALS GENERATED	1	2	3	4	5	TOTAL
130,000	MWPF Feedstock Available @ 2%/Year Growth	137,957	140,716	143,531	146,401	149,329	717,934
186,000	Maximum Assumed Design 40 TPH (15 hrs/6 dpw)	186,000	186,000	186,000	186,000	186,000	
	Required to Bypass MWPF to LF w/o Operational time change	0	0	0	0	0	
	Tonnage Actually processed through MWPF Per Year	137,957	140,716	143,531	146,401	149,329	717,934
	Production Time as Hours Per Day for 40 TPH Processing Plant, 5 DPW	13.3	13.5	13.8	14.1	14.4	
	Est. of Existing Situation with Single Stream MRF & City Recyclables						
7,485	Recovered Materials Created by Single Stream MRF@ 2%/Year Growth	7,943	8,102	8,264	8,429	8,598	41,336
	Modified Situation with All Materials to MWPF in Future						
34.9%	Recovered Materials Created from MWPF, incl. previous S-S materials	48,163	49,126	50,109	51,111	52,133	250,641
65.1%	After MWPF Option, the Reduced Waste Materials going to Landfill	40,220	41,024	41,844	42,681	43,535	209,304
Option 2	Increased Percentage in Recyclables Captures vs. Option 1 (Only S-S MRF)	506%	506%	506%	506%	506%	506%
	Total Landfill Tonnage Avoided after 5-years		209,304	Tons NOT Landfilled			
	Total Cubic Yards of Landfill Space NOT Consumed after 5-years (1500 #/cy)		279,073	Cubic Yards at LF NOT Consumed			
	% Overall Material Going to landfill with MWPF versus only Single Stream		69%	(or 31% Less Landfill Space Used)			

Based on the evaluation approach presented in Table 13.21, a summary of all of the key throughput and performance parameters for the four MWPF options are summarized in Table 13.22

Table 13.22 - Summary of Preliminary Mass Balances for all Options

Option	Preliminary 2015 Input, TPY	Tons Processed, 5-Years	Tons Recovered, 5-Years	% Additional Materials Recovered Versus Only S-S Curbside Collection, 5-Year	Tons Not Landfilled w/MWPF Option, 5-Year (vs. S-S)	CY of Landfill Capacity Not Used w/MWPF Option	% Less Landfill Space Used During 5-Years with MWPF
Option 1	115,000	635,095	193,617	368%	193,617	258,155	25.6%
Option 2	130,000	717,934	250,641	506%	209,304	279,073	30.9%
Option 3	117,515	648,902	194,278	370%	152,942	203,922	25.2%
Option 4	180,000	930,000	324,676	685%	283,340	377,786	29.7%

With the MWPF waste flows noted in Table 13.22, one of the additional key elements of the five-year analysis is the projected income stream associated with the MWPF options. For this analysis, the preliminary market income from the sale of the recovered recyclables in presented for each option. Table 13.23 presents a review of the gross income for the specific recyclables sold and then, using the percentage of the overall materials processed as a baseline, presents the net value of those materials on a $ per ton of actually handled and processed waste at the MWPF. For example, for Option 2, based on the materials found in the March 2015 waste sort and current market values, the value for just the recyclables is estimated at almost $125 per ton. With a projection of almost 35 percent being recovered

materials and sold into the recycling stream, this projected Option 2 revenue stream equates to $43.51 per ton processed as noted in Table 13.23.

Table 13.23 - Projected Gross Revenues for MWPF Options Evaluated

Option	Recyclables Value, $/Ton Recovered	% Recovered, as materials	Recyclables Value, $/Ton Processed
Option 1	$108.76	30.5%	$33.16
Option 2	$124.63	34.9%	$43.51
Option 3	$110.05	29.6%	$32.55
Option 4	$124.63	34.9%	$43.51

Based on the waste availability for each of the four options, a Preliminary Financial Analysis has been developed for a minimum of the first five (5) years of operation. The consolidated assumptions are those reviewed in previous tables, and the analysis for Option 2 is presented in Table 13.24. For an example of the main reference table used in this Table 13.24, the assumptions of the capital cost and the O&M costs are those previously shown in Table 13.20.

Table 13.24 - MWPF Financial Evaluation for Option 2

			2018	2019	2020	2021	2022
		Years from the Base $ Estimate	3 (1st Full Year)	4	5	6	7
			1	2	3	4	5
2015		MWPF Feedstock Available @ 2%/Year Growth	137,957	140,716	143,531	146,401	149,329
		Tonnage Actually processed through MWPF Per Year	137,957	140,716	143,531	146,401	149,329
		Recovered Materials Created from MWPF	48,163	49,126	50,109	51,111	52,133
		Estimated % of Input Tonnage Recovered for Product Sales	34.9%	34.9%	34.9%	34.9%	34.9%
		Estimated landfilled Tonnage	89,794	91,590	93,422	95,290	97,196
$/Ton Est. Costs	Incr./Yr.						
$34	2.0%	Operation and Maintenance Cost for the MWPF	4,977,638	5,178,734	5,387,955	5,605,629	5,832,096
10%		3rd Party w/Guarantees, Operator Overhead and Profit	497,764	517,873	538,796	560,563	583,210
		MWPF Total All O&M Costs w/3rd party Operator	5,475,402	5,696,608	5,926,751	6,166,192	6,415,306
		MWPF Total O&M on a $/Ton Processed Basis	39.69	40.48	41.29	42.12	42.96
Capital Costs	Incr./Yr.	**Projected Revenue Streams and/or Authority Cost Reduction Items**					
$124.63	0%	Recycle Materials Revenues at 100% of the Current Market Prices	6,002,736	6,122,791	6,245,247	6,370,152	6,497,555
		Value of Products per All Tons Processed at MWPF	43.51	43.51	43.51	43.51	43.51
		Net Cash Flow between Estimated O&M Costs and Material Revenues, $/Year	(527,334)	(426,183)	(318,496)	(203,960)	(82,249)
		Net Cost per All Tons Processed w/o Capital Debt Cost or LF Disposal of Residue	(3.82)	(3.03)	(2.22)	(1.39)	(0.55)
$ 31,000,000	1,908,049	**Assumed Capital Costs -- financed over 25 years at 4% Interest Rate**	1,908,049	1,908,049	1,908,049	1,908,049	1,908,049
		Net Cost per All Tons Processed for Capital Debt Cost	13.83	13.56	13.29	13.03	12.78
		Net Annual Cost for the MWPF, $	1,380,714	1,481,866	1,589,553	1,704,089	1,825,800
		Net Annual Cost for the MWPF, $/Ton Handled	10.01	10.53	11.07	11.64	12.23
		Other Cost Implications for Consideration:					
		Credit for City Collection Savings with One-Cart System for MSW & Recyclables	TBD	TBD	TBD	TBD	TBD
		Residue Disposal Costs at County Landfill	TBD	TBD	TBD	TBD	TBD
		Est. of Savings by Postponement of New Cell Development Costs	TBD	TBD	TBD	TBD	TBD
		Est. of Savings by Postponement of LF Closure-Post Closure Exp.	TBD	TBD	TBD	TBD	TBD

In addition to the costs estimated in Table 13.24, there are also certain other cost benefits that are expected to accrue based on either the "one-cart-for-all" collection system or reduced usage of the County landfill. These subject areas are identified at the bottom of Table 13.24. Since this Report has provided GBB with an extensive background of city-related collection cost data and equipment performance statistics, the preliminary estimate of a less expensive collection program has been reviewed and our evaluation approach, initial conclusions and estimated cost impacts are discussed in the following section.

13.7.7 One-Cart-For-All and the Potential for Significant Savings on City Collection Costs

As demonstrated by data provided earlier in this Report, the waste collection costs are almost 70 percent of the overall waste management costs for a community. Therefore, the efficacy of this system, and the purposes to which it is design and equipment expensed becomes critical to the overall budget for the services rendered. Over the years, many different types of collection vehicles and materials to be collected have been decided to be in the best interest of the community and the number and costs of collection systems, and trucks on the road within neighborhoods, has increased.

In reviewing historical weight data for the city, Table 13.25 provides a snapshot of the potential weights for a one cart collection system to review a potential MWPF opportunity. Specifically, Table 13.25 uses CY 2014 Ann St. Landfill trash tons delivered by ESD using both the city rear load packer trucks and automated side loader (ASL) trucks. In addition to the trash, the table also includes the total recyclable tons delivered by WM to the Pratt Industries MRF during the March 23-27, 2015 sort week since that recent data became available during the Report. The table shows that a household could potentially set out an average of 34.6 pounds of MSW (trash and recyclables) per week. Based on the current 60 weekly routes, the average route could expect to collect approximately 17.4 MSW tons, but only if assuming 100% cart set out using the weights from Table 13.25.

Table 13.25 - MWPF One Cart Weight Analytics

CY 2014 Ann St. MSW Tons(1)	Weekly Collection Points	Trash Lbs./Home/ Week	Recyclables Lbs./Home/ Week(2)	Total MSW Lbs./Home/ Week	Avg. Tons/Route/Day (3)
45,730	60,527	29.1	5.5	34.6	17.4

(1) Delivered by all MSW collection vehicles

(2) Using 167.2 tons as reported by Pratt Industries during sort week÷ 60,527 Collection points

(3) Based on 60 weekly trash routes

Table 13.26 analyzes the city's new ASL fleet load size. Using the CY 2014 average load-size by truck, nine (9) trucks would average two or more loads per day while seven (7) would deliver less than two full loads. Operating fifteen routes per day, using the CY 2014 average load size, shows that the trucks have the potential to handle the additional recyclables (with route optimization to balance the routes) to achieve an average two or less loads/day. As with most solid waste collection routes that average two loads a day, there is a "full" first load and a partial second load with a heavier being the first load. Regardless of the actual load size, the city trucks averaging two disposal trips per collection day.

Table 13.26 - ASL Load Capacity for One Cart MWPF Review

Number of Vehicles	Year	ASL Vehicle Number(1)	CY 2014 Number of Loads Delivered to Landfill (2)	CY 2014 Total Amount of MSW Delivered by ASLs in Tons	CY 2014 Average Load Size Deliveredby ASLs in tons	Loads/Day using CY 2014 Average Load Size(3)	Loads/Day using 11-Ton Average Load Size(4)
1	2011	4072	259	2,438	9.4	1.8	1.6
2	2012	4073	207	1,788	8.6	2.0	1.6
3	2012	4075	182	1,638	9.0	1.9	1.6
4	2012	4076	252	2,166	8.6	2.0	1.6
5	2012	4077	199	1,758	8.8	2.0	1.6
6	2012	4078	179	1,637	9.1	1.9	1.6
7	2012	4079	245	2,303	9.4	1.9	1.6
8	2012	4080	264	2,214	8.4	2.1	1.6
9	2013	4081	185	1,727	9.3	1.9	1.6
10	2013	4082	234	2,047	8.7	2.0	1.6
11	2013	4083	199	1,651	8.3	2.1	1.6
12	2013	4084	215	2,021	9.4	1.9	1.6
13	2014	4089	122	971	8.0	2.2	1.6
14	2014	4090	52	503	9.7	1.8	1.6
15	2014	4091	56	475	8.5	2.1	1.6
16	2014	4092	29	254	8.8	2.0	1.6
Totals/ Average			**2,879**	**25,592**	**8.9**		

(1) ASL- automated side loader; numbers 4090, 4091 and 4092 are partial year totals and based upon when they arrived in 2014

(2) 2014 Year ASL load numbers dependent on actual in-service timing of truck

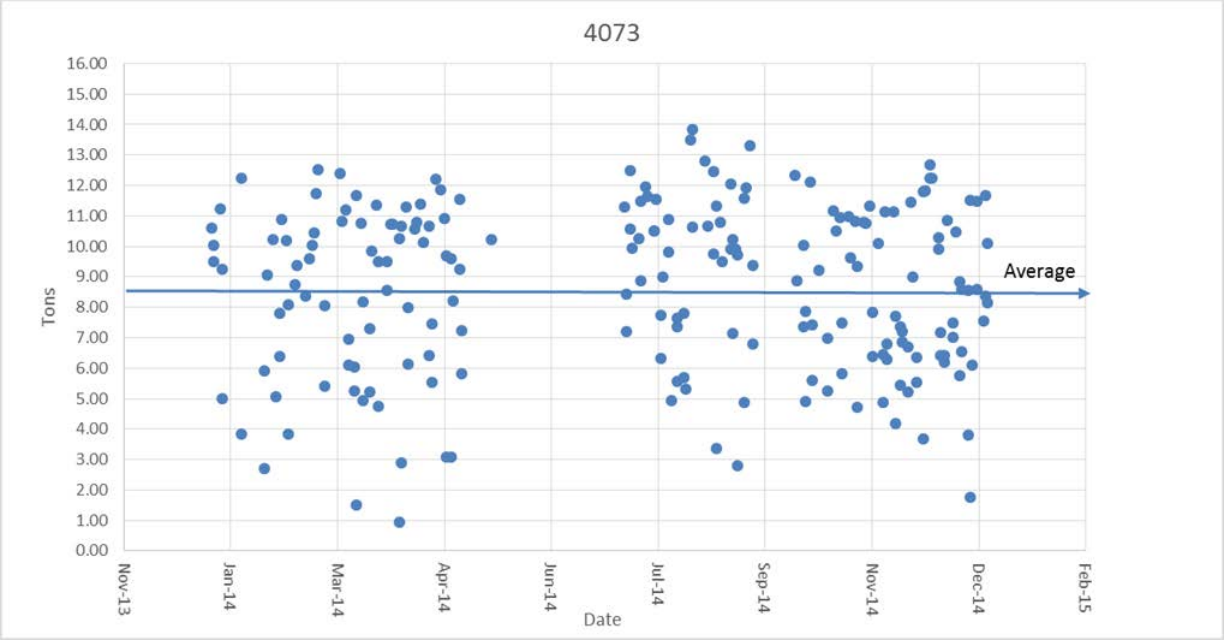
(3) Using 17.44 tons per route from Table 13.25 and 15 ASL Trucks/day for 60 weekly routes.

(4) 11 ton average high side load size based on GBB's review of CY 2014 ASL loads delivered to Ann St. Landfill

During GBB's analysis of trash load sizes, we found that the all of the ASL's average 11 ton loads approximately 50% of the time. Of this truck loads above the average, 50 percent of the loads are 11-13 tons and the other half are between 9 and 11 tons. Truck 4073 in Figure 13.8 is a good example of this load data. Additionally, Attachment E contains the Load Analyses for all 16 ASL's.

This analysis shows that the ASL trucks have the weight capacity with their two loads to handle a single MSW waste stream. Also, the MWPF's in operation have not had issues with processing of compacted loads affecting their ability to separate materials. Therefore, the compaction ratio for the trucks would not be expected to hinder load size and customer performance. Using the compacted MSW of 750 pounds/cubic yard in an ASL compactor truck, a route will average 46.4 cubic yards of waste. Therefore, a 24 cubic yard compaction truck will average 1.9 loads/route. With two loads per day, any MWPF would need to be able to accept the waste until the end of the work day. Since the current estimates indicate actual operation would be over more than one shift, the processing of waste received from routes later in the work-day and processed soon thereafter that same day should not be an issue.

Figure 13.8 - ASL Truck 4073 Load Analysis



While the total collection weight does not seem to be an issue, a detailed study at the household level will be needed to determine if cart size, number of routes or other adjustments would need to be made at the curb. Currently the city collects trash weekly from 96-gallon carts and Waste Management collects recyclables weekly from 35-gallon or 96-gallon carts. Let's consider that the majority of the recycling carts are 35-gallon, providing in total, 130-gallons of MSW volume per household if both carts were actually full at collection time. This actual set-out situation would demand additional review and significant generators may need two carts for the MSW; which is actually the number they have now.

Looking at weight versus volume, Table 13.23 shows that there is potentially an average of 34.6 pounds/household/week at the curb. A decade ago there would have been a better argument that there is not sufficient volume in a 95-gallon cart to hold a single combined waste stream. However, the push has been to have manufacturers reduce their packaging material and this, in part, has shown contributing to the downward trend of recyclable volumes along with increasing use of electronics reducing paper volumes. If needed, large cardboard accumulations would need to be broken down to be set inside the cart as the city's new ASL truck styles do not allows for material to be hand loaded. Further study is recommended to understand the curbside implications of the one cart system set-out in this regard as well.

In summary, the route times spent collecting may not increase as the ASL trucks would still service one cart per household like they typically do for trash now. However, collection costs may slightly increase if the location of a potential MWPF, as disposal distance, could increase from that mileage to the county landfill. By adding both the MSW and recyclables streams together, which is a key consideration with Option 2 and Option 4, the City could eliminate the need for the citywide recyclables collection service which is quite expensive. Table 13.17 indicates the current curbside recycling program costs are averaging almost $270 per ton.

If the one-cart-for all concept could eliminate this additional collection, it would save $2.3 million by dropping the weekly recycling contract and associated County costs, but it would also involve the loss of

$102,080 in material revenue rebates from the current MRF. However, based on the above productivity assumptions and current costs of service, as presented in Tables 13.25 and 13.27 respectively, a single cart collection service with a MWPF discharge point has the potential to reduce the city net collection costs by over $2.2 million. If the actual volume of the ASL truck becomes a constraint using the current routes with a one-cart system, one additional collection truck may be needed and moderate route adjustments made using the RouteSmart technology to accommodate this need. This would potentially reduce the savings noted in Table 13.27 by approximately 10 percent of that shown.

Table 13.27 - Estimate of MWPF Impact on Reducing City Collection Costs (Options 2 & 4 Only)

Description	(Cost)/ Credit	Units	Tons	Total
Cost/ Home	($3.23)	60,527		($2,346,027)
WM CY 2014 Rebate to City	$11.00		9,280	$102,080
Net Cost Reduction by Elimination of Curbside Collection of Recyclables				**($2,243,947)**
Estimate of the Actual Tons of Recyclables Setout by City Residents				**9,280**
Actual Cost Per Ton for Current Curbside Collection/Recycling Rrogram				**($241.80)**
Cost/ Home	($3.23)	60,527	FY 13/14	($2,346,027)
WM CY 2014 Rebate to City			8,613	$0
Net Cost Reduction by Elimination of Curbside Collection of Recyclables				**($272.38)**

13.7.8 Potential Use of Existing Building for MWPF to Reduce Capital Cost & Save Money

Another potential opportunity for the actual siting of a MWPF might be at the county landfill and within the old BCH facility noted in Exhibit 13.1. While GBB has not reviewed the design and structure for such a retrofit potential, the previous use of the building was akin to the needs of this MWPF. If it were a possibility as part of a city-county relationship, GBB has assumed that possibly only 30% of the estimated design, building and site development costs would be required. Table 13.28 provides a review of the potential cost reduction for the building facility if that were achieved.

Table 13.28 - Potential Capital Cost Reduction if Using Existing Facility

Option	Greenfield New Facility		Refurbishment of Existing Facility		Savings, $/Year	Savings, $/Ton
	Assumed Capital Cost, Greenfield Facility	Annual Debt Payment As Calculated (4%-25 yrs.)	Capital Cost Using Existing Building, Modifications Assumed Needed @ 20% of Greenfield	Annual Debt Payment As Calculated (4%-25 yrs.)	Reduced Annual Payment (Savings from Base Estimate w/Used Building)	$/Ton Change (Reduced) MWPF Costs, if Retrofit Possible
Option 1	$31,000,000	$1,908,049	$18,400,000	$1,132,519	($775,530)	($6.74)
Option 2	$31,000,000	$1,908,049	$18,400,000	$1,132,519	($775,530)	($5.97)
Option 3	$31,000,000	$1,908,049	$18,400,000	$1,132,519	($775,530)	($6.60)
Option 4	$33,300,000	$2,049,614	$19,300,000	$1,187,914	($861,699)	($4.79)

13.7.9 Feasibility of a Regional Program and Basis of a Partnership

This Report attempts to put in perspective the economic implications of potentially changing the current solid waste management system. As part of the evaluation, it is important to make sure that there is a clear understanding of the actual costs of the current program. The "regional program" that ultimately has been evaluated by GBB in Section 13 of this Report remains a cooperative city-county partnership, with each governmental entity still conducting their respective waste enterprises as they do now. However, there is the potential for a new processing/recycling facility, herein called a MWPF, which would augment the current waste programs.

So with that in mind, GBB has compiled the actual costs for both the city and county to conduct their current waste-related programs. For the city, this activity starts with curbside services. With the County it starts at citizen drop-off and/or disposal areas. A review of the recent budgets for each governmental entity is present in Table 13.30. As can be seen, the cost for the city is over $140 per ton as an all-in cost for all of the waste materials managed. For the county, which does not have an extensive collection system like the city, the net cost is about $85 per ton handled. These numbers are solely the costs, and are not depicting the revenues or other taxes charged to support these waste programs. When the city and county costs are accumulated and distributed across the overall materials managed, the average cost per ton for the current services is approximately $100/ton.

Table 13.29 - Current Summary of Costs of the City & County for Waste Management Programs

City and County Expenditures	FY14/15 Budget	Tons	$/Ton	Net $/Ton of Total Waste Managed
A. City ESD Costs				
City of Fayetteville ESD Fund(1)(2)	**$10,833,161**	**76,725**		**$141.19**
B. County Solid Waste Fund - Expenditures(3)				
Administration	$1,382,437			
Ann Street(4)(5)	$12,120,478	155,210	$78.09	
Wilkes Road(6)	$1,394,615	31,023	$44.95	
Container Sites	$1,293,206			
Transportation (County collection?)	$770,066			
White Goods(7)	$359,636	634	$567.25	
Construction &Demolition(4)(7)	$252,130	31,790	$7.93	
Recycling(7)	$1,304,515	2,804	$465.23	
County Sub Total	**$18,877,083**	**221,461**		**$85.24**
Total(8)	**$29,710,244**	**298,186**		**$99.64**

(1) FY15 Adopted Environmental Services Department Budget
(2) Includes all tons for trash, recyclables, bulky and yard waste tons from Table 5.5
(3) FY15 Adopted County Budget does not include HHW or maintenance costs
(4) Based on 83% MSW and 17% C&D from Section 5.02 of County SWMP
(5) Tons from County Solid Waste website
(6) Includes wood not from yard waste
(7) Includes, aluminum cans, cardboard, carpet/padding, commingled textiles, glass, metal, newspaper,
(8) The total includes City yard waste (19,861 tons) collection cost of $1,454,420 + Wilkes Rd. O&M Costs of $1,394,615= $2,849,035

13.7.10 Summary

A detailed cost review has been completed of each of the four MWPF options described in the Report. Table 13.30 provided a comparative review of the key summary data, including the potential cost impacts associated with (1) elimination of the separate recyclables collection program and instituting a one-cart-for-all collection system using the city ASL, (2) presenting the financial benefit if the existing BCH building, for example, could be made available as the MWPF site, and adding the cost of a $45 per ton landfill cost for the specific residue that is generated from each of the four options that were evaluated.

Table 13.30 - Cost Summary Estimate of the MWPF Options Evaluated

		Comparison - CY 2018 Assumed 1st year of Facility Operation			
Item	Option	1 (continues use the MRF)	2 (uses a new MWPF)	3 (continues use the MRF)	4 (uses a new MWPF)
1	MWPF Feedstock Available @ 2%/Year Growth	122,039	137,957	124,692	191,017
2	Recovered Materials Created from MWPF	37,205	48,163	37,332	64,935
3	Estimated % of Input Tonnage Recovered for Product Sales	30.5%	34.9%	29.9%	34.9%
4	MWPF Total O&M on a $/Ton Processed Basis	$40.86	$39.69	$40.86	$38.52
5	Value of Products per All Tons Processed at MWPF	$38.00	$43.51	$37.31	$43.51
6	Net Cost per All Tons Processed w/o Capital Debt Cost or LF Disposal of Residue	$2.86	($3.03)	$3.54	($4.99)
7	Net Cost per All Tons Processed for Capital Debt Cost	$15.63	$13.83	$15.30	$10.26
8	Net Annual Cost for the MWPF, $/Ton Handled	$18.49	$10.01	$18.84	$5.13
9	Collection Adjustment Savings (credit to projected MWPF tonnages)	$0.00	($16.11)	$0.00	($11.63)
10	Net MWPF Costs with Collection Savings assumed as One-Cart-For-All Credit	$18.49	($6.10)	$18.84	($6.50)
11	Assumed Landfill Cost at $45 per Ton for Residue (Cost based on all MSW to MWPF)	31.28	29.29	31.53	29.70
12	Net Costs Including Residue Disposal at Existing County Landfill	$49.78	$23.19	$50.37	$23.20
13	Potential Building Construction Retrofit Credit, if Cost Reduction Occurred	($6.74)	($5.97)	($6.60)	($4.79)
14	Net Costs Assuming Reuse of Existing Large Processing Building	$43.03	$17.22	$43.77	$18.41

Line item 9 in Table 13.30 is worthy of discussion due to the way the city collection savings associated with the elimination of the curbside program is considered. This single-stream curbside collection program is eliminated with Option 2 and Option 4 due to the implementation of a “regional one-cart-for-all-system” that will financially benefit the collection program and recovered materials from all of the participants. Therefore, this collection cost reduction of approximately $2 million was assumed for purposes of this evaluation to be credited to all of the Option 2 and Option 4 tons put into the MWPF and not just the city tons. Therefore, the Item 9 credit per ton was $0.00 for Option1 and Option 3, but it decreased significantly on a per ton basis for Option 4 versus Option 2 with the same $2 million gross dollar savings spread over a much larger throughput in Option 4. This in essence becomes counter-productive to most of the other costs in Table 13.30 associated with Option 4 which do achieve an economy-of-scale benefit over Option 2. This is most obvious in Item 7 which is the capital cost financing allocation.

Based on all of the assumptions noted herein, and the non-recovered and marketed recyclable materials presumed to go into the county landfill at an assumed $45 per ton rate in 2018, the net costs associated with each of the four MWPF options are presented in line item 12. If the old BCH building at the county

landfill could also be used to substantially reduce the new MWPF capital investment in a new building and site needs, line 14 notes the "all-in" preliminary projections of the 2018 costs.

It is clear from Table 13.30 that regardless of MWPF throughput, the ability to eliminate the extra city collection system is the key differentiating factor between Options 1 and 3 versus Options 2 and 4. The line 14 net costs are very clear in this regard. The current city and county waste programs have several unique circumstances present that when taken together, have the ability to create a very efficient and cost-effective MWPF-based program.

As part of the evaluation of modern MWPF's and there performance, public information has been generated from the MWPF in Montgomery Alabama that has been operating for slightly over a year. An independent test for acceptance of the MWPF was conducted by a city-designated consultant and the test results are presented in Table 13.31. The facility also seperates the organics/fines for a back-end composting facility that eventually intended to be updated into an anaerobic digestor used for biogas generation and CNG for the city trash truck fleet.

Table 13.31 - IREP MWPF Acceptance Test Dates: May 5-9, 2014

Independent City Testing Group:	
CDG Environmental Engineers	
Acceptance Test Results:	
Processing Rate of MWPF:	32.36 TPH
Confirmed Overall Waste Diversion:	Above 60%
Constituent Recovery Rates During Test:	
Plastics	96%
Mixed Paper	95%
OCC	97%
Tin/Steel	94%
Aluminum Cans	90%

(1) IREP Facility is located in City of Montgomery, Alabama
Note: Data released at the REW Conference in San Jose CA in October, 2015

Section 13.6 introduced the physical components and technical performance of the modern MWRF. Section 13.7 has presented a preliminary review of the costs and operational expectations of these facilities, including materials recovery and sales expectations, including potential revenue generation data. Table 13.29 presented an overview of the current cooperative regional program that exists between the city and county, with the main shared assets being the County owned/operated Ann St. landfill and the Wilkes Road woody waste and yard waste facility.

The ESD budget for FY2014/2015 is $10.8 million. The summary of this overall budget, by key cost category or services provided, is broken in Table 13.32. This current allocation is important in understanding the implication of modifying the current ESD programs and costs to accommodate a potential MWPF.

Table 13.32 - EDS Budget for FY 2014/2015, Presented by Functional Areas or Services Provided

Item		Annual Cost, as Budgeted, $	Tons Handled	$/Ton	Net $/Ton of Total Waste Managed
	City ESD Costs(1)				
1	Administration	$924,993	76,725	$12.06	$12.06
2	Non-Program Expenditures	$740,511	76,725	$9.65	$9.65
3	Residential Trash Collection	$4,051,159	45,732	$88.58	$52.80
4	Recycling Collection	$2,346,892	9,280	$252.90	$30.59
5	Residential Yard Waste Collection	$1,454,420	19,861	$73.23	$18.96
6	Bulky Item Collection	$1,315,186	1,852	$710.14	$17.14
7	**FY 14/15 ESD Budget Total**	**$10,833,161**	**76,725**		**$141.19**

(1) First column: expenditures from FY 14/15 Adopted City Budget

Table 13.33 has been developed to integrate the adjustments to the status quo, as summarized on Table 13.29, with the changes created by considering MWPF Option 2 as presented in Table 13.30. Since any MWPF option would impact the flow of certain waste materials and the use of certain current assets, city or county costs that would be expected to change. The impacted areas and the initial preliminary estimates are summarized in Table 13.33.

Table 13.33 indicates that approximately $2.5 million might be able to be saved through a regional MWPF, with the bulk of this projected savings, as expected, coming from the city eliminating a costly single-stream collection system that provides very minimal financial credit to the city through the current revenue sharing that is part of the collection agreement. Additionally with Item 15, GBB has assumed that the $1.3 million cost of the county recycling program would be absorbed into the functionality and economics of the MWPF, and thus this activity was assumed to be eliminated as a separate cost center. Finally, as indicated in Item 9, certain landfill operating costs should be reduced with the reduction of about 40,000 TPY coming to the landfill site. GBB estimated this incremental savings to be about a $10 per ton equivalent.

GBB points out that we are not as familiar with the county budget and cost details as we are with the city and thus a review of all the county costs centers for potential savings and/or reconfiguration should be undertaken if the concept of a MWPF advances for further consideration. Additionally, GBB wishes to note that other benefits could potentially accrue from the implementation of a MWPF including:

- Reduced GHG emissions produced in the region from the recycling, versus continued burial, of the waste in the county landfill;
- Reduced collection trucks- less wear and tear on city and county road ways, increased safety, and less dependence on fossil fuels
- Convenience- no more homeowner separation of recyclables, or items thought to be recyclable;
- Only one waste cart set-out to deal with, which increases homeowners space and trips to the curb;
- Less waste going into the landfill extended the life of the very strategically located site;
- Achieving a higher level of recycling with minimal public relations and 100% participation in the program; and

- Possibility of MWPF acting as a catalyst for a shared collection service plan between the county and city and act as one entity under further reducing overhead costs.

Table 13.33 - Estimated City and County Budget Changes Based on Implementation of MWPF Option 2

Combined County and City Cost for Trash, Recyclables and Yard Waste Collection and Disposal Facility Operations
(Revised to Illustrate the Financial Implications of Option 2)

Item	City and County Expenditures	FY14/15 Budget, Final As Adopted (Excl. of Table 4.14 ESD Credits)	Est. of Modified FY14/15 Budget; Adjusted with Option 2 MWPF	Total Tons Managed By Regional System	Net $/Ton of Total Waste Managed w/Option 2 MWPF Included
	A. City ESD Costs(1)(2)				
1	Administration	$924,993	$924,993		
2	Non-Program Expenditures	$740,511	$740,511		
3	Residential Trash Collection(1)	$4,051,159	$4,300,000		
4	Recycling Collection(2)	$2,346,892	$0		
5	Residential Yard Waste Collection	$1,454,420	$1,454,420		
6	Bulky Item Collection	$1,315,186	$1,315,186		
7	Projected Option 2 MWPF Cost (3)	**Not Applicable**	$1,380,714		
	City of Fayetteville ESD Fund	**$10,833,161**	**10,115,824**		
	B. County Solid Waste Fund - Expenditures				
8	Administration	$1,382,437	$1,382,437		
9	Ann Street(4)	$12,120,478	11,720,478		
10	Wilkes Road	$1,394,615	$1,394,615		
11	Container Sites (5)	$1,293,206	$1,163,885		
12	Transportation	$770,066	$770,066		
13	White Goods	$359,636	$359,636		
14	Construction &Demolition	$252,130	$252,130		
15	Recycling	$1,304,515	0		
	County Sub Total	**$18,877,083**	**17,043,247**		
	Total(6)	**$29,710,244**	**27,159,072**	**298,186**	**$91.08**

(1) Assumes approximately $250,000 for one additional city trash route per day.
(2) Eliminated with One-Cart-For-All Program
(3) MWPF net costs based on table 13.30 and does not consider any potential benefit of any building construction credit, if Cost Reductions were to occur.
(4) FY 14/15 budget Based on 83% MSW and 17% C&D from Section 5.02 of County SWMP with about 140,000 tons of MSW to Landfill currently. MWPF will increase reduce the Trash to landfill by about 40,000 TPY at %10/ton O&M savings
(5) Based on 16 sites and assumes 10% cost savings by operated as only a consolidator of materials at receiving stations to go to MW
(6) Total of County and City Costs

13.7.11 Closing Comment and Recent Public Information

GBB wishes to note that any potential public discourse and consideration, let alone an implementation process of a MWPF, has recently become an industry lightning rod, sparking heated debate and even lawsuits, between municipal governments and some environmental groups and recyclers around the

country. While this Report is not intending to get the city into this "charged climate", it is GBB's responsibility to note that Pratt Industries, the current owner-operator of a MRF in Fayetteville, is one of leading anti-MWPF companies in the US.

In addition to the presentation by IREP about their $30 million Montgomery Alabama MWPF that is currently operational, and was noted earlier as Attachment A in the Report, GBB is also providing a Covanta PowerPoint presentation of December 4, 2014 (see Attachment B) about their proposed $45 million MWPF to be located in Indianapolis Indiana. This privately financed MWPF (called an Advanced Recycling Center by Covanta) was the subject of a recent local lawsuit, filed by two paper companies and a private citizen. It was recently decided by a Marion County judge in favor of the City of Indianapolis and the MWPF project.

On the other side of the discourse, and over the past six months, Pratt Industries representatives have spoken out against the MWPF concept in several public forums. For full disclosure and without trying to interpret their position, GBB is providing Attachment C as an example of a recent PowerPoint presentation that a Pratt Industries employee presented in Washington DC in December 2014.

It is also important for the city to know that several of the 100% recycled paper manufacturing companies have teamed up with a Washington DC public relations firm and have organized a group that calls itself the Paper Recycling Coalition (PRC). A copy of a recent PowerPoint presentation by spokesperson of this firm (presented in early April 2015) is provided as Attachment D. As you will see, Pratt Industries is a named member of this coalition. Two of the PRC members were also part of the Indianapolis lawsuit noted about. There are many recovered paper purchasers around the US and there still exists an international marketplace buying about 40% of the US recovered paper from MWPF and single-stream MRF's. While these PRC-member firms are definitely not the largest consumers of recycled fiber in the US, they still are vocal and will be anti-MWPF activists, especially with the location and current MRF business activity of Pratt.

GBB notes that in advancing and expanding single-stream MRF's, and the desire to add more and more recyclables into set-out recycling carts, more trash and non-recyclables have been showing up in the feedstock of MRF's and creating issues for the owners/processors. An example of the stated issues and a nationwide circular published in August 2014 calling attention to this issue is found in Attachment H. Thus, even when the goal is to source-separate recyclables, other mixed waste streams are found in this material creating issues not anticipated by the MRF operators.

As a final note to this Section 13 of the Report, GBB's Project Manager attended a regional recycling conference in Wilmington DE on April 7, 2015. The regional business development manager of ReCommunity, a company with 32 MRF's and headquartered in Charlotte NC, gave a formal presentation. His slide #7 was titled: No Conflicts: A "Pure Play" Model. The last bullet point on that slide was the following:

> **"We don't own collection trucks, landfills or paper mills because if we did, our decisions would not be based solely on maximizing recovery and revenue for communities."**

14 Conclusions and Recommendations

14.1 City Waste Stream Characterization

14.1.1 Conclusions

In an effort to better understand the nature of the city waste stream, and the level of resident participation in the current city-wide programs, a detailed waste sort was completed by GBB during the week of March 23-27, 2015. During this period, over 10,000 pounds of discarded trash and recyclables were systematically collected from around the city and the samples were hand-sorted into 30 separate categories of materials with each constituent weighed. During each day of the normal 4-day per week cycle of the city collection program, approximately 75 trash carts and 75 recycling carts were randomly selected for sorting from the front of homes that set-out both carts. This selection identified materials from representative homeowners that had elected to actively participate in both the city recycling program and trash set-out programs.

As a result of this sort, conducted in the old BCH building adjacent to the county landfill, it was found that 24.7% of all the material in the trash cart stream was recyclable material and that 22.2% of the material in the recycling carts was found to be “residual” or garbage materials.

Also, during the study week, 889 tons of waste was delivered from residential collection routes in the city to the county landfill and 165 tons of recyclables were collected by Waste Management and delivered to the Pratt Industries MRF. This represented an average diversion rate of 16% for the City overall during that week, lower than the 21.6% diversion rate found for the sort study homes.

Based on the total tons delivered from City residential collection routes to the landfill during the sort study week, the make-up of the trash showed an estimated 35 percent of the City trash disposed at the County landfill that week had the potential for recovery or diversion into the recycling stream.

While this data is good information, GBB cautions the city that the waste sort only included a one week snapshot of the city’s waste stream and not the typical four season waste sort that is normally conducted for implementation of new disposal technologies, such as a mixed waste processing facility, or other project implementation.

14.1.2 Recommendations

While this was only a one-week waste sort and not a more extensive four-season activity, it is clear that the guidelines and/or requirements for the set-out of recyclable materials into the recycling carts is not being followed by the participants. Also, a significant amount of recyclable materials is being placed into the trash cart. GBB recommends that the city, along with Pratt Industries, review the public relations information that has been created and consider using some of the information presented in this Report to initiate a targeted public relations campaign to improve the quantity and the quality of recyclables set out by the city households.

The current business arrangements of paying Waste Management for recyclables collection services, as well as the city charge associated with trash going into the county landfill, are not “tonnage” oriented. Rather, they are “charge per household” oriented. Therefore, creating more acceptable recyclables per household does not increase or decrease those two city cost elements at this time. However, the city

does share in recyclable material revenues through their current contract with Waste Management. Thus, the more tons of recyclables set out by city residents will, at $11 per ton, create more rebate funds for the city. Also, creating less trash into the county landfill does have environmental benefits and will help preserve space within the permitted landfill for future use. Any targeted public relations campaign to improve the quantity of recyclables should also address the environmental benefits of less landfilled materials.

The city should also begin to monitor the "fullness" of the 35 gallon recycling carts as that cart size is typically the minimum size for a single-stream recycling program. Charging extra for a larger cart might, in some cases, be acting as a detriment to more recyclables being placed out for the recycling service. If the small recycling cart is full before collection, recyclables may just be getting thrown into the larger trash cart for weekly convenience and necessity. After the fullness data review, a small "Recycling Habits and Cart Use Study" centered on resident field interviews might be appropriate to consider in this regard.

There is a significant difference in the allowable material inputs to a single-stream MRF (like the Pratt MRF) versus a MWPF (like that in Montgomery AL), as well as the marketable materials that are created and sold. Based on the waste sort information, GBB recommends a side-by-side review be developed of the acceptable Pratt single-stream input streams and the Pratt marketable materials and compare this with the same input/output information based on the current experience at modern MWPFs, such as at the Montgomery location.

14.2 Benchmarking of Municipal Hauling and Collection Services

14.2.1 Conclusions

A benchmarking of seven (7) North Carolina municipalities with similar solid waste collection services was conducted as part of this study. The benchmarked municipalities were selected, in part, based on population, proximity, and solid waste disposal funding availability. The explanatory information collected provided high-level observations of the key differences or anomalies in the various solid waste collection programs. All of the cities that were benchmarked have four basic core collection programs including: residential refuse, residential recycling, bulk item, yard waste and brush and leaf collection. Additionally, they all provide cart service for refuse and recyclable collection, and most have some sort of cart/containerized waste program for their yard waste collection program. All cities provide 96-gallon trash carts and use a variety of trucks to provide trash service the most common type of truck is the automated side loader.

All benchmarked cities provide single-stream recycling with carts with a mix of public and private providers. Four (4) benchmarked municipalities (Durham, Greensboro, High Point and Wilmington) provide 96-gallon single-stream recycling carts for every-other-week (EOW) collection. The most significant difference found was that Fayetteville is the only city to use 35-gallon carts for recyclables collection. Fayetteville has a privatized weekly recyclables collection program with the majority of the households using a 35-gallon cart supplied by the city.

Three (3) bulky item collection programs (Fayetteville, Greenville and Wilmington) have call-ahead service where the resident must call to have items collected. Durham runs a similar program in that residents leave out items on collection day so that crews can note locations for collection by the bulk

item crew that collects a day later. Winston-Salem has a limited program where collection is scheduled over a partial year period.

14.2.2 Recommendations

GBB's study recommends a transition of the recyclables collection program to an EOW program using larger carts such as a 96-gallon cart. The larger cart will provide a greater capacity and provide for expansion of additional material as the markets allow. For example, some areas of the country have added metal kitchen utensils, pots and pans and other metal cookware to the recyclables menu. Still others have added bulk plastic in the form of children's toys and plastic lawn furniture. A 96-gallon cart will provide additional capacity to help increase the City's diversion rate.

The current recycling contract with Waste Management, Inc. is set to expire Mid-July, 2015. At the time of this Report, the notification window to terminate the Contract has come and gone, creating a two-year extension. GBB recommends that the City conduct a study on the potential for EOW recyclables collection that includes the current contractual situation versus a City-provided collection. Any changes to the current program would have to be negotiated with Waste Management, Inc. and comply with applicable procurement regulations.

There are a variety of government and private grant programs such as Curbside Value Partnership (now The Recycling Partnership) that can assist with the procurement of additional recycling equipment such as carts. Zero interest loans are also available for municipalities to increase diversion to get material back into the supply chain for the manufacturers that need it. One example of a zero interest loan fund is the Closed Loop Fund started in 2013. GBB also recommends the City attempt to take advantage of these types of financial assistance to reduce the cost of transition to an EOW recycling program.

14.3 City's Solid Waste Resource Allocation and Costs

14.3.1 Conclusions

ESD is authorized to use 75 full time and seven (7) temporary employees to provide solid waste trash, recycling, bulky item and yard waste collection services on an average of 148-to-164 weekly routes. Solid waste collection is provided using 67 vehicles maintained by PWC's Fleet Services. The main component in use is the automated side load (ASL) collection truck for weekly trash service. Yard waste collection uses rear load packers and is labor intensive, as workers must rip and tear bags when yard waste is not containerized in the optional city carts or homeowner cans.

Trash collection consists of 32 front line vehicles. Of these, 22 vehicles can be normally routed as/if needed, with ten (10) vehicles identified as spares. The spare factor for the frontline collection equipment, minus any supervisory trucks, is 45%. Trash collecting trucks cost an average $15,000/year. Additionally, spare trash truck maintenance cost the city approximately $150,000 annually.

Of the 18 frontline yard waste trucks, all consisting of 2007 and 2008 model year chassis', three (3) are designated spares which gives the yard waste collection program a 20% spare factor and the entire spare yard waste trucks cost the city approximately $81,000 annually. Average costs are $18,100 /truck.

The average ASL trash load of approximately nine (9) tons for the 24 cubic yard Heil packer truck body is well within the capacity for compacted MSW. Our review indicates that the ASL trucks are currently

averaging 1.2 disposal loads per day. The trucks are utilized as designed, considering limitations of collection hours available due to the operating hours at the county landfill and start times. However, GBB also notes that approximately 33% of the ASL loads in CY 2014 were above the average with 50% of those loads between 9 and 11 tons and the other 50% between 11 and 13 tons.

Using data from the ASL collection trucks, the average annual number of households serviced is 89 households/hour. On a typical collection route approximately two (2) hours are spent in non-collecting actions such as pre-and post-route activities, disposal trips and traveling to and from the route. Excluding these "non-collecting" times provides the actual on-route average annual collection of 111 households/hour, assuming a 100% set out rate. This is within industry standards.

Over the past few years the department has transitioned from 20 cubic yard bulky Item collection trucks to 40 cubic yard to increase capacity on the streets. This provides not only bulky item collection, but complements the yard waste fleet with brush and limb collection. The larger capacity trucks also gives the ESD better response time for disaster clean up.

Until the recent installation of FleetMind, reliable metrics or historic numbers at the daily and route level were not available to provide more details on the truck disposal times vs. loads and productivity findings. This Report used four weeks over four seasons for a high level evaluation of productivity statistics.

Due to turnover, ESD is training the equivalent of one employee year-round, as it takes approximately 6 weeks from the interview to hire and then an additional 6 weeks to train for solo work. This costs the ESD approximately $46,000 per year in total compensation not including the loss of productivity. In addition, ESD plans to spend an estimated 8.38 hours in FY14/15 providing additional operations and safety training to all of its employees at a cost of approximately $200/employee/year. ESD holds periodic cookouts, and similar functions to engage employees.

14.3.2 Recommendations

GBB recommends that ESD and Fleet Services work closely to reduce total trash trucks by seven (7) creating a spare factor of 12% (3 spares), which could reduce trash maintenance costs by over $100,000/year. Reduce yard waste spares by one (1) by to 11% (2 spares), could also reduce yard waste maintenance by almost $20,000/year.

Utilizing FleetMind for real-time route productivity and customer service analysis will allow the ESD to make route adjustments sooner to further reduce costs and to complement customer service initiatives. GBB recommends that ESD personnel fully implement FleetMind as soon as possible, and have this technology on each front line collection vehicle.

With the addition of the final three (3) automated side loaders, trash collection service has now become fully automated. GBB recommends conducting a route optimization every five years, and/or when operating parameters have changed as they have now. In addition, fully utilizing FleetMind tracking and reporting to track actual set-out rates, and other operating parameters, will maximize efficiency.

As trash collection has become fully automated, the ability to transition older rear load packers into the yard waste program has been eliminated as rear loaders are retired. As the city moves forward, a plan will be needed to address replacing the yard waste collection vehicles and/or how to provide yard waste service. GBB recommends mothballing spare trucks for the short term as a result of reducing spare

trucks to use as replacements for older rear loads ready to be retired. GBB recommends the city work with the County to accept, and local retailers to sell, biodegradable paper lawn bags and eliminate the use of the plastic bags. This will reduce labor costs associated with ripping and tearing bags. Also, the ESD should develop a plan to modify yard waste collection in the near future before the City's rear load fleet becomes too costly to maintain this increasing the cost of the overall program.

Employee turnover is often thought of as a cost of doing business. Workers leave for a variety of reasons, both personal and work related. While the former is difficult to overcome in the workplace, the later can be addressed through employee engagement programs that starts with a solid on-boarding process. GBB recommends ESD work with Human Resources Department to ensure the right candidates are hired. Engage employees from top-to-bottom on a regular and personal basis to motivate employees to be productive, and not dread doing a good job with the reward of extra work. Even something as simple as the director standing by the fuel pumps at the end of the day thanking employees for their work today, and engaging in small talk, has shown to provide benefits without cost.

14.4 Private Hauling and Collection Services Benchmarking

14.4.1 Conclusions

GBB attempted to collect data from municipalities within close proximity with Fayetteville, however gathering data from private companies in a highly competitive industry is a challenge. The GBB/DAA team was able to gather and evaluate data from six (6) communities of varying sizes around the state where services were provided by a mix of private contractors and by the municipality itself. Those areas and companies reviewed included: Brunswick County- Waste Industries; Cornelius- Republic Services, Inc.; Fayetteville - Waste Management, Inc.; Huntersville - Advanced Disposal; Siler City - Waste Management, Inc. and Winston-Salem - Waste Management, Inc. Those that did participate supplied the total price for services and did not distinguish costs between the services, as it is often considered proprietary, and communities tend to request an all-in price, as they do not plan to contract with separate haulers.

Trash collection services are very similar in nature with weekly collection at single family homes in 96-gallon carts that are collected with either automated or rear-load packers (manual) vehicles. Bulky items are collected at a variety of frequencies and with various types of equipment. Both Brunswick County and Cornelius do not collect bulky items and have residents either call a hauler and pay for it separately or the resident hauls it to a county owned facility for disposal either at cost or not charge depending on the item. Five of six municipalities provide weekly containerized yard waste with the exception of Brunswick County which leaves it up to the incorporated municipalities within the County to contract separately or conduct the service itself. It should be noted that the Huntersville contracted hauler, Advanced Disposal, provides 96-gallon cart for containerized yard waste collection.

All municipalities in this review provide single-stream curbside recycling in carts. There are notable differences in the size of carts and frequency of collection. Four communities have EOW automated recyclables collection by private haulers; Brunswick County, 96-gallon cart; Cornelius, 64-gallon cart; Huntersville-96-gallon cart and Siler City-64-gallon cart. Both Winston-Salem and Fayetteville have weekly automated collection by private haulers. Winston-Salem uses 96-gallon carts and Fayetteville uses 35-gallon and 96-gallon carts. Fayetteville is near the middle of the communities at 16.9% diversion rate. Wilmington is the highest at 24%.

The City provides solid waste services at an annual net cost of $217.42/household ($18.12/household/month) this includes outside source revenue. This cost includes the additional city-provided services of bulk collection, rapid response, special services such as dead animals, services not provided by other solid waste departments.

14.4.2 Recommendations

As noted earlier, GBB recommends the City investigate the potential gains of transitioning to EOW single-stream recycling with larger carts to reduce the overall cost of collection. This should also increase the City diversion rate. With just a modest 20% increase of the current amount of recyclables collected, this would push diversion to over 20 percent. GBB has seen the amount of recyclables increase by as much as 40% when communities have transitioned to larger carts and EOW collection.

14.5 Estimated Value of Value-Added Services

14.5.1 Conclusions

The City provides numerous value added services that may not be apparent as to the intrinsic value they provide. In addition, sometimes city-provided services become a program that people are reluctant to give up as the have been in place for so long that change may cause temporary heartache. The study found examples of both.

After the tornado struck Fayetteville in 2011, the ESD crews assisted with the initial debris push on all roads where the devastation occurred. Within 28 hours of the tornadoes event, streets were made passable for first responders. This service would need to have been conducted by a private hauler should ESD services be contracted out, leaving the city without its own equipment to provide such post-event clean-up activities. The city provides rapid response at $45.65/hour less than half of comparable outsourced services.

The city provides special event support for 14 events for a total cost $24,500 ($0.41/household) annually. To outsource this service could cost the city approximately $89,000 ($1.47 per household annually) for the equivalent hours of special events support.

The city also provides recycling services to city owned facilities and five recyclables drop off sites for an annual cost of $23,000. Pratt Industries pays the city $11/ton for the recyclables material the city delivers to them. ESD currently spends approximately $25,000 on promotional programs to promote recycling.

Fayetteville ESD provides an illegal dumpsite program that mitigates an average of five (5) illegal dumpsites per week, helping keep Fayetteville clean and beautiful. This service would have to be absorbed by another department or outsourced.

14.5.2 Recommendations

GBB recommends keeping the emergency response service in place. While it may be an unbudgeted cost, outsourcing the service would be as well. However, with the city personnel and equipment already in place, the city has the ability to be on the streets the day after a disaster to rapidly clear streets for emergency personnel and utility companies. The valuable emergency response service gives the city the

ability to get back on its feet sooner. Not only is there a cost savings as the city can provide the service cheaper. There is a moral victory as well, residents hear and see things happening immediately following a disaster providing a sense of calm that the city has the situation under control. While the city contracts storm debris removal, the contractor is not required to be in place for 48 precious hours.

GBB recommends that at a minimum the city re-negotiate with Pratt Industries to match the $22/ton rebate for recyclables that Waste Management receives from Pratt Industries. While this will not cover the cost of collecting the material from city facilities it will at least make it more palatable. Based on the study the better option at this time would be to negotiate with Waste Management to provide recycling services at city facilities and drop off sites. They already have the trucks on the street and could tuck the service into their existing routes. This could be done immediately and would greatly reduce the cost of the one-off service.

14.6 City Employee Benefits and Limitations versus Private Hauling Companies

14.6.1 Conclusions

The city provides an extensive wage and benefits package that is available to ESD employees. The list of items include, but not limited to, health and dental benefits, paid time off, retirement, discipline policies, promotion, quality of life programs, etc. that are beneficial to city employees that are not available with private sector solid waste companies.

City employees may earn two (2) fewer days over the length of their employment, however, they also have the ability to accrue their vacation time and carry it over from one year to the next with a maximum of 35 days kept on the books. The private sector typically has a “use it or lose it” vacation policy.

The city offers school leave to allow employees to attend school meetings with their children. In addition, the city offers voluntary shared leave and sick leave both of these are not offered in the private sector. The private sector typically provides for six (6) paid holidays per year, whereas the city provides 11 days. The city also provides sick leave, which is not typically found in the private waste sector.

The city offers a retirement benefit that the private sector does not. Based on the review of benefits, the city does offer a robust benefits package that is very rewarding and comparable to the private sector. It should not be considered a limitation to hiring and keeping quality employees in the ESD.

14.6.2 Recommendations

GBB does not recommend any changes to existing packages. Often employees perceive they are earning less than their private sector counterpart on their base wage/hourly rate, however, this is not always the case. The additional time off, health and welfare benefits and retirement benefits are not always readily apparent. GBB recommends ESD conduct a wage rate study to ensure the base wages stay comparable to the private sector and also provide an extensive review of the benefits package to illustrate to potential new hires and current employees the benefits of city employment and how it adds to their spending power.

14.7 Equipment and Vehicle Maintenance Cost Comparison

14.7.1 Conclusions

PWC Fleet Services Division maintains and repairs police, airport, parks and rec, administration, fire department and ESD equipment. The supervisors at Fleet Services decide how the work load is performed. Two maintenance shifts, working 5:30a.m. – 3p.m. and 2:30p.m. - 11:30p.m. Monday through Friday to maintain the entire City's fleet of vehicles. The first shift has a heavier workload and more maintenance technicians. Fleet Services repairs the majority of vehicles during the day when the sanitation vehicles should be running. When a solid waste collection truck breaks down the repair is made one full shift cycle later as the repairs are made during the day.

ESD has 23 trucks that are 2010 or newer model years. Solid waste trucks built after 2010 have a complex emission system that requires a periodic regeneration (Regen) of the Diesel Particulate Filter that traps exhaust soot. High temperature exhaust is applied to the filter and burns off the soot. However, as with any filter, it eventually becomes clogged and must be cleaned. While it is not tracked, many regen issues that put a truck out of commission during the work day can be contributed to driver error not fully understanding the Regen process.

Preventative maintenance work is typically done on Wednesday, so as not to interrupt the ESD collections. Tire repairs are actually completed at the ESD facility by Fleet Services. If repairs need to be outsourced, Fleet Services uses local and regional truck repair services.

No comparable municipalities' solid waste departments repair their own vehicles and outside of Fayetteville, most lease their vehicles from the respective Fleet Services department, with the lease cost including capital, repair and maintenance expenses.

14.7.2 Recommendations

To reduce maintenance costs, ESD has to work closely with Fleet Services to develop quality maintenance practices by both ESD and Fleet Services. It is recommended that warranty items be carefully tracked to ensure the full benefit is realized. All warranty is not on a new vehicle, as there may be warranty opportunity missed due to replacement parts on older vehicles as well as outsourced repairs. Large national haulers track warranty with a goal of capturing at least 10% of repair costs as warranty work. It is recommended that the ESD implement more detailed maintenance and cost tracking based on these observations.

The private sector repairs vehicles on the second shift after the day is completed, and keeps a skeleton crew on during the day to handle road calls and major repair projects. GBB recommends that the city shift the work on the ESD collection trucks to the second shift. This would allow sanitation vehicles to be repaired at night versus waiting a full shift cycle, reducing down time, use of spare trucks and cost. This will require cooperation between the two departments with both mutually benefitting.

Additionally, adding a certified mechanic with a service truck to the ESD to handle pre-route repairs and road calls can be a benefit to both ESD and Fleet Services. This is a practice conducted by private sector companies to provide the aforementioned benefits. GBB recommends city personnel conduct a field visit to Raleigh, North Carolina Solid Waste Service Department to better understand how the road call mechanic program works, and work with Raleigh to help implement a similar program in Fayetteville.

The road call mechanic position would reduce the need for spare trucks, improve customer service and increasing overall efficiency.

GBB recommends two practices to reduce down time due to Regen issues. First, it is recommended to keep an extra filter or two in-house at Fleet Services, so that the filter can be swapped out between vehicles while the dirty filter is cleaned. Second, ESD should partner with the engine manufacturer who can provide operator training at little or no cost. This will provide drivers the knowledge to properly Regen a truck on the street. The combination of both of these practices will keep trucks rolling rather than parked, waiting on the filter to be cleaned and returned.

14.8 Use of Collection Software and Technology

14.8.1 Conclusions

Prior to 2007, ESD collection routes were scattered across the city as annexation took place and new subdivisions were built. The ESD purchased route optimization software in 2007 to optimize routes. ESD continues to use RouteSmart today, and adjusts routes, as-needed, to address equipment breakdowns, provide helper trucks, service new areas, and also uses it where a quick and efficient temporary or permanent reroute is needed.

ESD has recently purchased FleetLink Virtual OBC On-Board Waste Package-GD4010 Flat Screen Kits and Virtual OBC On-Board Waste Package – Entry Level Tablet Kits. The city began installing the FleetMind fleet management solution in curbside trash and yard waste trucks in Q2 FY15. FleetMind has a BIN Monitor function to pinpoint the geocode location of a cart versus the centroid of the property as it is now.

ESD estimates about 1,000-1,150 homes per day are serviced per trash collection truck. FleetMind has the ability to provide a Summary-of-Calls per Route report to determine actual residential set-out rates.

Based solely on the fuel and maintenance cost reported in FY14/15, the projected annual savings from the use of FleetMind could range from approximately $30,000-$60,000 for the three primary city-provided waste services.

FleetMind technology will provide both improved customer service and savings in customer service time. With the deployment of the FleetMind system, the Customer Service Representative (CSR) does not need to call the driver. All the GPS data and event data is uploaded from the truck's FleetLink Mobile System to the office's FleetLink route system in real time. The CSR is enabled to answer the citizen's questions in real time. With mobile computer technology, there is simultaneous customer service improvements and cost savings.

14.8.2 Recommendations

GBB recommends ESD employees get proficient in the use of FleetMind. Encourage all personnel involved with customer service at both ESD and the Corporate Call Center to bring forth ideas in a stakeholder setting on how FleetMind could be used in their role to fully utilize its functionality.

GBB recommends the use of the FleetMind BIN Monitor function to pinpoint the geocode location of a cart versus the centroid of the property to allow for more accurate service verification and reduce the likelihood of misses.

Alternatively, RFID could provide the information without human interaction in the field. RFID technology is currently not being considered by ESD due to its cost versus ROI. GBB recommends further investigating the cost vs. benefit study to potentially incorporate it for service verification and cart inventory management.

GBB recommends the city also use RouteSmart, in combination with FleetMind, to efficiently route the bulky item work orders on a daily basis. This will reduce time/miles, and give the bulky item crews the ability to complete more stops on a daily basis, improving customer service.

14.9 Service Delivery Privatization

14.9.1 Conclusions

ESD provides a variety of solid waste collection services including automated weekly collection of household trash, weekly yard waste, and a private contractor providing weekly collection of recyclables. Also included through ESD staff are specialized services; scheduled bulk collection, dead animal collection, seasonal leaf collection, C&D collection, and cart maintenance and delivery. Around the country, and locally in North Carolina, many of these services are contracted with private firms for a variety of reasons.

All the cities in this Report receive curbside recycling from private haulers. Four (4) of six (6) cities receive both private curbside refuse and recyclables collection and two (2) of six (6) private contractors provide services for all three: curbside refuse, recycling and yard waste. None of the private companies reviewed in this study provide bulk item collection. Three of the six municipalities have five days per week contracted trash collection, while the other three have four days per week contracted trash collection.

The city provides solid waste collection services for a monthly estimated net cost of $18.12/household. Should the city privatize both trash and recycling services (with the city still providing yard waste and bulky item services), the potential monthly net cost is estimated to be $22.52/household. If the city decides to provide trash, recycling and yard collection, and the city still providing bulky item pick up, the monthly net cost of service is estimated at $21.94/household. The city is providing solid waste collection services at a lower cost than other communities that have outsourced a significant portion or most of their collection services.

The city entered into a recyclables collection agreement with Waste Management on April 9, 2008 for an initial fee of $2.62/household. Over the past seven (7) years, the rate has increased 9% to $2.91/household. The initial term ran from July 1, 2008 through June 30, 2013 with two additional 2-year terms of which WM is currently in the first extension which is set to run through early June, 2015.

The contract scope of work includes once-per-week single-stream collection of recyclables from residential units within the city limits. WM currently takes the recyclables to Pratt Industries located on Owen Drive. As part of the agreement between WM and Pratt, for all recyclables delivered by WM, Pratt Industries rebates WM $22/ton, which in turn passes along 50% ($11/ton) to the city.

In addition to the above review of the WM contract, GBB also conducted a preliminary analysis of the City actually pulling in-house the current recyclables collection program. Based on the number of city households requiring weekly service and ASL hourly collection capability, it was determined that twelve

(12) collection trucks with two spare trucks would most likely be required for this once-per-week collection. It was determined that the service with 12 new ALS's would cost 20% more for the City to provide than the current WM contracted costs. As an alternative, GBB also reviewed the economics of eleven (11) ASL's performing this recyclables collection, again assuming two spare trucks. Using the city costs developed for the current fleet of newer ASL vehicles that are collecting trash If a weekly city recyclables collection service could be done with only 11 ASL's, the annual cost estimate to be 10% greater than the current WM contracted cost. These estimates also assumed that the city would receive the full $22/ton rebate that Pratt is currently crediting to WM for each ton delivered to their single-stream MRF.

14.9.2 Recommendations

As stated earlier GBB recommends evaluating the potential to provide EOW single-stream recyclables collection in lieu of weekly collection.

Should the city decide to outsource, GBB recommends to contract out collection services only, and direct the waste loads to county facilities and have the city continue to pay the county's $48/household/year assessment as a Solid Waste Fee. This fee helps finance the operation of the county solid waste facilities. Also, it appears that a full cost accounting study would be helpful to provide data on how the county-city financial relationship would financially need to evolve if these city services were privatized.

Two items that would be beneficial to the city that Waste Management does not seem to be providing under the current contract at this time are:

1) Section 2. A.6 Public Awareness Program, where WM is to participate in a Public Awareness Program with assistance of the City. WM is to work with the city to establish a mutually agreeable cost effective program. Part of this program is a semi-annual meeting with the ESD and the Public Information Office; and

2) Section 13.04 Documentation related to weights, set-out rates and complaint calls that are to be submitted as part of the semi-annual meeting.

Regardless of the above discussion and opportunities more fully presented in Section 11 of this Report, the findings for this Report show the ESD is operating cost effectively and GBB considers it not cost effective to privatize additional collection services at this time. The only exception might be adding the recyclables collection from city-owned facilities based on the current collection programs and as described previously in Section 14.5.

Based on GBB's review of the alternative city costs to conduct the current recyclables collection activities by ESD owned/operated vehicles, versus the WM contracted cost, the projected costs per household do not currently generate any savings to justify a capital investment by the city of over $3 million in additional ASL trucks and the hiring of a dozen additional city employees as drivers, plus a supervisor, to provide such services.

14.10 Call-Back Comparison to Industry Standards

14.10.1 Conclusions

Ask 100 people what customer service means to them and you will probably receive 100 different answers. Case in point, the UNC School of Government survey of solid waste collection services measures both collection complaints and valid collection complaints. Customer service is a subjective topic. However, to improve service it must be tracked and measured.

Measuring missed collections is arguably one of the most important indicators of the city's ability to satisfy the resident's service delivery expectations. These findings assume that a service error is the same as a missed pick-up/missed collection point.

During FY13/14 the City estimated the number of residential waste collection service errors to be 3.60 per 10,000 collection points. Based on the size of the city, this is equivalent to one miss for every 16,813 households (approximately 22 misses/week).

Waste Management, Inc. sets its acceptable standard of performance for missed pickups (MPU) at 1 MPU or less per 1,000 customers for all services on a weekly basis. This is equivalent to an allowable 60.5 MPU's per week for all three services (refuse, bulky item, and yard waste).

GBB is of the opinion that the city is doing a good job of providing customer service based on these standards.

14.10.2 Recommendations

GBB recommends setting and managing goals, and incorporating a set of best practices as illustrated in Section 12. It is recommended that service errors not be classified as valid or not. Investigate all services errors to determine the root cause and address the real reason behind it. Track and address errors down to the employee level which means more than the driver, and includes customer service and ESD personnel alike.

GBB recommends the broad use of FleetMind and Cityworks® as these software applications are already used by the City, and will achieve the quickest results to provide improved solid waste services.

Why Capitalize the Word Customer? GBB recommends anyone providing a service should know who pays them. By capitalizing the word Customer, it puts the service emphasis where it belongs. It provides the focus on the Customer. In addition there are two types of Customers; the external Customer (the taxpayer); and the internal Customer. Internal Customer service is where each employee of the city and PWC is a customer of each other. The better the internal Customer service, the better external customer service will follow. GBB recommends improving internal and external Customer service with consulting firms who provide such services.

14.11 Regional MSW Analysis and Recommendations

14.11.1 Conclusions about Regional Waste Generation and Disposal

The eight regional counties have nearly 380,000 households (US Census 2013 est.) with Cumberland County the most populous with 121,226 households and Fayetteville representing 63% of that total County population. The City ESD provides waste collection services to over 65,000 households.

There are five major regional landfills in the region, with three county-owned landfills and two private landfills. Robeson, Johnston and Cumberland Counties own their landfills and most of the residential waste from those counties go to these respective landfills. The two major private landfills are the Waste Industries-Sampson County Landfill (WI-Sampson County) to the east of Cumberland County, and the Uwharrie Environmental Landfill to the west of Moore County. Nearly all of the remaining commercial and residential waste in the region goes to these two large private landfills, with the majority going to the WI-Sampson County landfill.

A high percentage of the regional commercial waste is disposed at the WI-Sampson landfill, although this represents only a portion of the total waste disposed at this large 3,000 TPD permitted landfill.

Fort Bragg has a Net Zero Waste goal by 2025 and a Net Zero Energy goal as well. The solid waste currently generated on the base is about 30,000 ton per year.

14.11.2 Conclusions about Waste-to-Energy and Alternative Conversion Technologies

As it pertains to Fort Bragg involvement in the regional evaluation, based on their strict Zero Waste and Zero Net Energy military programs, Fort Bragg should (1) not be considered as a waste supplier to any long-term regional project opportunity, and (2) should not be considered as either a potential steam or power market from any possible regional waste-to-energy project.

As it pertains to any other waste-to-energy project in the region, the availability of low cost regional landfills and low energy and power prices does not currently present any economic opportunity for this technology for a regional program.

Reviewing the current state of advanced conversion technologies, GBB also concludes that while a myriad of different technologies are advancing and have shown commercial size technologic viability, the lack of longevity, operational experience, high expense and potential issues with by-product stability and revenue values, continues to be a deterrent to current implementations in the United States. Thus, this is not a regional opportunity at this time.

14.11.3 Conclusions about Enhanced Recycling Opportunities with a MWPF

Due to several unique circumstances found within the city and county, one technology offering that does appear to provide a great opportunity to consider is a modern mixed waste processing facility (MWPF) which greater expands the production of recyclables versus the current single-stream MRF. While the city has a third collection bin for yard waste, this material is not directly considered in this discussion but could be integrated as an add-on as part of a later application. However, some small quantities of yard waste still end up in the trash container and are included in the organics commodity amounts reviewed in this Report.

GBB's estimate of the current city total recyclables diversion rate, which is the percentage of the total recovered recyclables as a percentage of all the generated residential materials collected in both the trash and recyclables bins, is only 16 percent of the total waste stream. The cost of the current curbside recyclables collection and processing system, including the city rebates from the value of recyclables, is costing city residents $242 per ton. This is six times higher than the posted tipping charge at the county landfill.

For a broader and potentially more cost effective opportunity for the city, GBB received in-County waste flow information from DENR summarizing their FY12/FY13 annual facility reports which include waste destinations as well. The following table presented the waste quantities and the destination locations for in-County generated waste sources at that time. That information noted that of almost 300,000 tons generated in the year, only about 40% of the in-county generated waste goes to the county landfill and over 50% went to the private WI-Sampson County landfill.

Based on the current waste origin and supply logistics, GBB evaluated four options providing a combination of annual capacities, with all considered the trash tonnages from the city going to the existing County landfill. The two options that considered using the existing single-stream MRF and building a new second facility to just process the trash were not as cost competitive. With only a small percentage of recycling going on in the City, and the high cost of the current program, the integration and absorption of the current city-recyclables material into two options developed as a "one-cart-for-all" collection system, that delivered all of the materials into a new MWPF, were both extremely cost competitive waste disposal options and, at the same time, obtained significantly higher recycling rates.

A brief overview of each option is as follows:

5. Option 1 assumed that the current Pratt MRF continued to receive the city-generated curbside recyclables and all of the trash currently going directly to the County landfill would be processed through a MWPF. Any resultant residue from either the MRF or the MWPF would go to the county landfill;
6. Option 2 assumed that all of the city-generated trash and recyclables, as well as the recyclables and county trash going into the county landfill would be processed in a MWPF. The city-system waste collection would became a "one-cart-for-all" collection program;
7. Option 3 was similar to Option 1 in that the Pratt MRF would continue to receive the city curbside recyclables, however, the MWPF would also receive and reprocess the MRF residue to have a second chance at removing additional recyclables; and
8. Option 4 was similar to Option 2 with all of the countywide trash going into the MWPF with a city-wide one-cart-for-all program instituted; plus, as a sensitivity, the MWPF would competitively attract another 50,000 TPY of waste generated in the County that is currently being landfilled out of the County, either by direct haul or use of the private transfer station.

Based on the GBB preliminary evaluation, significantly more recyclables are generated and less demand for County landfill space consumption is possible with Options 2 and 4. For the Option 2 regional city-county program, GBB estimates over 45,000 tons per year or recyclables could be captured versus the about 9,000 tons from the combined city single-stream and county drop-off programs now. If additional commercial waste could be economically attracted to the MWPF, over 60,000 tons per year of recyclables could potentially be generated based on the GBB estimates. This provides an increase in recyclables of over 400 percent countywide.

Due to the close proximity of the city to the county landfill, and the ongoing active waste collection routes that already exist, the Report suggests that the potential siting of a MWPF be considered for location at or near the County landfill. While the preliminary GBB capital cost estimate for is $30 to $35 million for a completely new MWPF, GBB estimates that the use and conversion of the existing BCH building could potentially provide a $7-$9 million reduction in this initial cost due to savings in site development and facility construction costs. This provides a strategic cost advantage usually not seen when you are talking about a nominal 80,000 square feet building.

GBB has reviewed the potential weight for a one cart collection system to handle the volume and weight of the mixed trash and recyclables for a MWPF opportunity. The data shows that a household in the city sets out an average of 34.6 pounds of MSW (trash and recyclables) per week. Our analysis also showed that the ASL trucks have the weight capacity with their two loads per day to handle a single cart with the aggregated MSW waste stream. Therefore, the compaction ratio for the trucks would not be expected to hinder load size or customer service.

The route time spent collecting may not increase as the ASL trucks would still service only one cart per household like they typically do for trash now. However, collection costs may slightly increase if the location of a potential MWPF were not at the landfill, as disposal distance could increase from that mileage to the county landfill.

Since the current estimates indicate actual city collection operation could be over more than one shift, the processing of waste received from routes later in the work-day and processed soon thereafter at the MWPF should not be an issue.

By adding both the current trash and recyclables streams together, which is a key consideration with a MWPF to save money and increase recyclables through mainly mechanical systems, the City could eliminate the need for the citywide recyclables collection service which is quite expensive. A typical MRF generates recovered and marketable materials that have a value of more than $100 per ton. The city currently only receives $11/ton as a rebate for their recyclables feedstock.

The current full private curbside recycling program, with Waste management as the collector and Pratt Industries as the processor/recycler, costs the city on average almost $242 per ton. It is estimated that at least 90% of this cost basis could be eliminated by a MWPF.

GBB estimates that the net cost of the Option 2 MWPF would be approximately $35 per ton under normal cost circumstances. Even with a 10% cost contingency, this is still under the current posted landfill cost and provides five times the amount of recyclables than the current MRF.

This previous MWPF cost number does not address two of the other strategic circumstances present that will make this alternative option even more cost effective. Deleting the $2 million per year extra collection cost is equivalent to a savings of about $15 per ton of all MSW going to the Option 2. This is a significant savings and strategic because the city only has a short-term contract and the city has no invested in any vehicles to perform the work. Thus, all of these costs terminate with the end of the service contract.

The baseline cost for Option 2 is a “greenfield” facility costing $31 million creating $1.9 million per year with a 25 year debt service. Instead of a completely new structure, GBB has allocated a preliminary cost of only $5 million in design and retrofit costs to modify and use the BCH building creating a substantial

retrofit savings. If this savings were realized, this would reduce the Option 2 MWPF by another $6 per ton.

Additionally, GBB wishes to note that other benefits could potentially accrue from the implementation of a MWPF including:

- Reduced GHG emissions produced in the region from the recycling, versus continued burial, of the waste in the county landfill;
- Reduced collection trucks- less wear and tear on city and county road ways, increased safety, and less dependence on fossil fuels
- Convenience- no more homeowner separation of recyclables, or items thought to be recyclable that are actually contaminants to a single-stream MRF and become residue that is landfilled;
- Only one waste cart set-out to deal with, which increases homeowners space and trips to the curb;
- Less waste going into the landfill extended the life of the very strategically located site;
- Achieving a higher level of recycling with minimal public relations and 100% participation in the program; and
- Possibility of MWPF acting as a catalyst for a shared collection service plan between the county and city and act as one entity under further reducing overhead costs.

14.11.4 Recommendations

As would be expected in a very competitive industry, there is a lot of misinformation going around about the ability of MWPF's to both perform at expected levels, and to generate marketable commodities. Therefore, if this advanced recycling concept is of interest to the city and county, GBB encourages members of the leadership and city-staff to travel to locations to meet with, and talk to, your peers and see these projects in operation first-hand. The city and county would then be able to formulate your own opinions about the interest, as well as merits of continuing to evaluate the concept of a MWPF.

While the Report puts forth the current BCH building as the optimum facility location, GBB has not specifically talked to the County or evaluated the current use and sizing opportunity of the large BCH building for its potential to be retrofitted to accommodate a MWPF. However, because of the initial use of the building, this is not deemed a technical detriment.

GBB is not as familiar with the county budget and cost details as we are with the city. Thus a review of all the county costs centers for potential savings and/or reconfiguration should be undertaken if the concept of a MWPF advances for further consideration. It is noted that several private developers have been marketing MWPF projects and there is interest in privately funding such opportunities, including entering into long-term contracts for the ownership and operations of such projects with materials marketing contracts as part of the private-sector responsibilities.

Based on the preliminary cost benefits of a MWPF, it is recommended that the city develop a more detailed cost review of the MWPF opportunity and have discussions with the county on all of the potential benefits of working together in this regard as discussed in this Report. Initial discussions with DENR should also be initiated in a timely manner to discuss the project concept and state permitting requirements.

Finally, it is worth keeping in mind what the regional business development manager of ReCommunity stated in a formal presentation at a recycling conference in Wilmington DE on April 7, 2015. The company, with 32 MRF's and headquartered in Charlotte NC, gave a presentation and one slide was titled: No Conflicts: A "Pure Play" Model. The last bullet point on that particular slide stated the following:

> **"We don't own collection trucks, landfills or paper mills because if we did, our decisions would not be based solely on maximizing recovery and revenue for communities."**