Metropolitan Nashville and Davidson County

SOLID WASTE MASTER PLAN:
Achieving Zero Waste

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CDM Smith

In association with:

RRS

SERA

wilmot inc
sustainability services ♻ consulting

LDA ENGINEERING

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Section 1

INTRODUCTION

The Metropolitan Government of Nashville & Davidson County (Metro) has a strong history of implementing progressive changes and investing in the future of the City. These changes started in 1963, when a new form of government was implemented; continued in the 90's when Metro aggressively invested in infrastructure and facilities to attract professional sports teams, which brought the NFL (Titans) and NHL (Predators) to Nashville; and in the recent past developed business and cultural attractions such as the Music City Center, Country Music Hall of Fame, and the Frist Art Museum. This proposed plan for investment and strategic initiatives in solid waste diversion, recovery, and overall management is similar to the character Nashvillians have demonstrated with each progressive change successfully initiated to make Nashville the City and region it is today.

Growth in waste generation, low recycling and diversion rates, and the approaching closure of the Middle Point Landfill in Murfreesboro may portend an operational and financial challenge for Metro to manage the myriad of solid waste materials generated by residents and businesses. When Middle Point Landfill closes, the costs to haul waste to distant private landfills are expected to more than double the current hauling costs due to the longer haul distance. The lack of regional landfill competition is also likely to result in increased tipping fees.

Continuing the current approach of trucking waste over long distances to other communities for burial in a landfill will result in higher costs and maybe the lost potential for reuse or recovery of waste materials. Maintaining the status quo will be a missed opportunity to create a new waste management paradigm for future generations of Davidson County residents. Metro's decision to develop an actionable Solid Waste Management Plan (Plan) designed to divert 90% of waste materials away from landfills will provide long-term economic, environmental, and social benefits.

The unprecedented growth in population, local economy, tourism, and commercial, industrial, retail, and residential development experienced across the Metro region has come with the typical challenges: housing affordability, traffic and public transit issues, and the need for infrastructure improvements. In order to create a solid waste management paradigm shift, this plan focuses on addressing the impact of increased consumption and waste through a long-term move from reliance on landfilling to a portfolio of other, more sustainable methods, including reuse, recycling, anaerobic digestion, and composting.

During the development of the Plan, an online survey was conducted that yielded positive responses for Metro's Zero Waste goals. The primary goal of this Plan is to develop an integrated system capable of increasing waste reduction, diversion, and re-use to the point of reaching the goal of 90% diversion or greater. The Plan offers Metro a useful planning document that includes:

- An evaluation of the current solid waste management system
- Development of goals that meet or exceed the State of Tennessee 2025 Material Management Plan
- Program recommendations for increasing waste reduction, reuse, and recycling
- Programmatic long-term waste diversion projections
- An analysis of the financial, environmental, and social costs and benefits related to achieving the goal of zero waste

One of the most important concepts of zero waste is the idea of a circular economy, which represents an alternative approach to the linear system of making, using, and disposing of products. A circular economy is based on a loop or circular system that approaches manufacturing with the goal of minimizing waste and maximizing the use and re-use of natural resources. Davidson County and the regional community can create a circular economy around the discards of residents and businesses through economic development, which supports growth in infrastructure and local jobs. Strategies associated with the idea of a circular economy and job creation are addressed in **Sections 6** and **7**.

While developing this Plan is the beginning of Metro's path to a zero waste goal, it builds on numerous previous and existing initiatives to advance diversion locally. The Plan also provides an approach to changing how Davidson County and the region thinks about waste materials, methods of managing these materials, and the metrics by which the value and success of recovering materials currently being disposed of are measured.

The new programs, services, and infrastructure required to implement the Plan and significantly decrease the materials being landfilled will result in increased costs to most waste generators, but any higher costs can be mitigated by waste reduction strategies and offset by triple bottom line (TBL) benefits. The economic, environmental, and social benefits discussed in the TBL analysis provided in **Section 10** show that the TBL is significantly positive, and the benefits of this Plan outweigh the increased costs to waste generators.

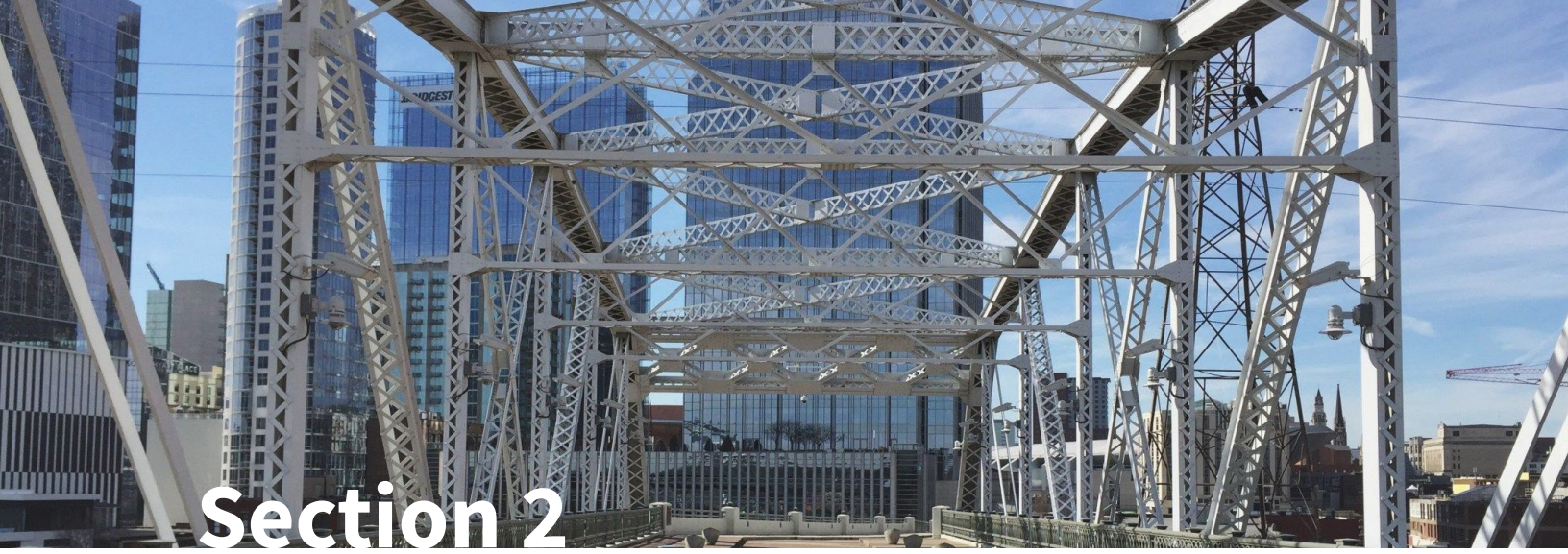
The Plan has been developed to provide general direction for achieving diversion goals with the key to success driven by the timely and successful implementation of the strategies. The Plan's strategies are organized into three scenarios—conservative, moderate, and aggressive with implementation to occur in phases over 20-30 years. The aggressive scenario includes all the strategies required to achieve 90% diversion while the moderate and conservative scenarios omit specific programs that are considered more difficult to implement but still allow for modest improvement in diversion.

Because buy-in from a diverse group of stakeholders and building momentum for the plan is vital in the beginning, the Plan allows for flexibility in the implementation schedule. Implementation of the Plan can be adjusted to account for changing priorities, funding, or preferences. **Section 13** discusses an extended schedule that allows more time in the early years for establishing policies, authority, and funding to support the Plan strategies.

The Plan's framework is captured in the ten foundational building blocks presented in **Table 1-1** with additional information provided in **Appendix A: Introduction**.

Table 1-1: The Plan's 10 Foundational Building Blocks

WHAT IT IS		WHAT IT MEANS	YOU'LL FIND MORE INFORMATION IN
	**Enacting County-Wide Waste Reduction And Diversion Policies**	*Adoption ordinances, mandatory recycling, and material bans with expanded solid waste enforcement staff*	SECTIONS 6, 7, & 12
	**Strengthen Public Education and Outreach Programs**	*Ensure residents and businesses are continuously informed and educated about reduction, reuse, and recovery of "waste" materials*	SECTIONS 4, 6, & 7
	**Implement Improved Metrics and Reporting Requirements**	*Achieving 90%+ diversion requires enhanced metrics and comprehensive reporting to track the Plan's performance and progress*	SECTION 6
	**Provide Enhanced Residential Curbside Collection Services**	*Increase residential curbside recycling to bi-weekly, and staggered implementation of save-as-you-throw (SAYT) system with three bins for organics, recyclables, and trash/ solid waste*	SECTION 6
	**Increased Recycling and Diversion Within Commercial, Institutional, And Industrial Sectors**	*Increase organics/food scrap recovery and diversion; and implementation of SAYT system*	SECTION 6
	**Adopt Recycling and Recovery Programs for the Construction and Demolition (C&D) Waste Stream**	*Metro's C&D waste stream consists of materials capable of being diverted to viable recycling end-markets if effective diversion programs exist*	SECTION 6
	**Develop Metro- and Privately-Owned Facilities to Support Diversion**	*The pursuit of zero waste will shift the infrastructure focus from landfills to recycling, composting, and anaerobic digestion facilities, as more organic and recyclable materials are diverted*	SECTION 8
	**Partner with Businesses, Community Organizations, And Local Economic Development Engines to Grow the Local Recyclable Material Market**	*A growing local recycling market is key to ensuring that viable outlets exist for the increased amount of diverted materials*	SECTION 7
	**Encourage Private Investment in Infrastructure and New Technologies.**	*Improved product design, expansion of viable commercial-scale processes and development of new end-use markets are investments needed to solve diversion of "challenging" materials*	SECTIONS 7, 9, & 12
	**Deliver Consistent Programs and Service-Levels Across Both the Urban Services District (USD) And General Services District (GSD).**	*Establishment of a Solid Waste Authority, or similar umbrella entity, with a sustainable source of funding separate from the Metro General Fund*	SECTIONS 11 & 12



Section 2

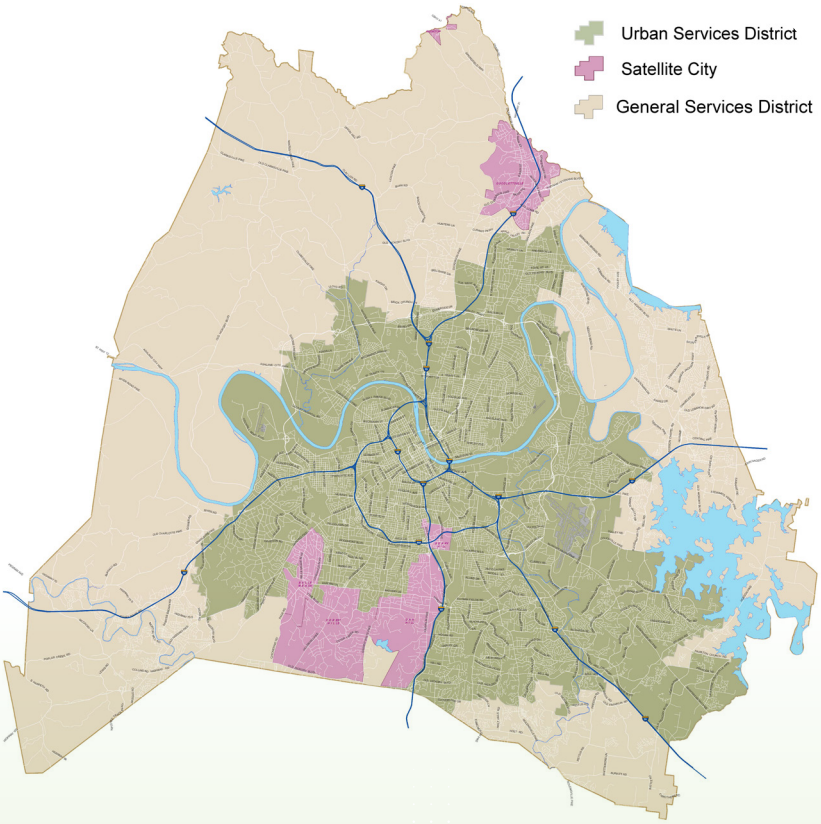
EXISTING SOLID WASTE SYSTEM

Nashville's two-tiered solid waste service system includes the Urban Services District (USD) and General Services District (GSD). The USD, **(Figure 2-1, green shaded area)** is roughly the same size as the former city boundary with a population of approximately 496,000. Because USD property owners pay a higher tax rate (e.g., in 2017, USD's assessed property value (APV) was $3.155/$100 vs. GSD's APV of $2.755/$100), they receive more municipal services, including trash and recycling collection. The GSD (Figure 2-1, brown shaded area) includes the largely suburban and rural areas of Nashville and has a population of approximately 195,000.

Property owners in the satellite cities of Goodlettsville, Berry Hill, Belle Meade, Forest Hills, Ridgetop, and Oak Hill (Figure 2-1, magenta shaded area) pay taxes at the GSD rate, allowing them to use Nashville schools. Gas and sales taxes and franchise fees fund other services in the satellite cities.

Please note that **Appendix B: Existing Solid Waste System** provides more detailed information on the existing solid waste system.

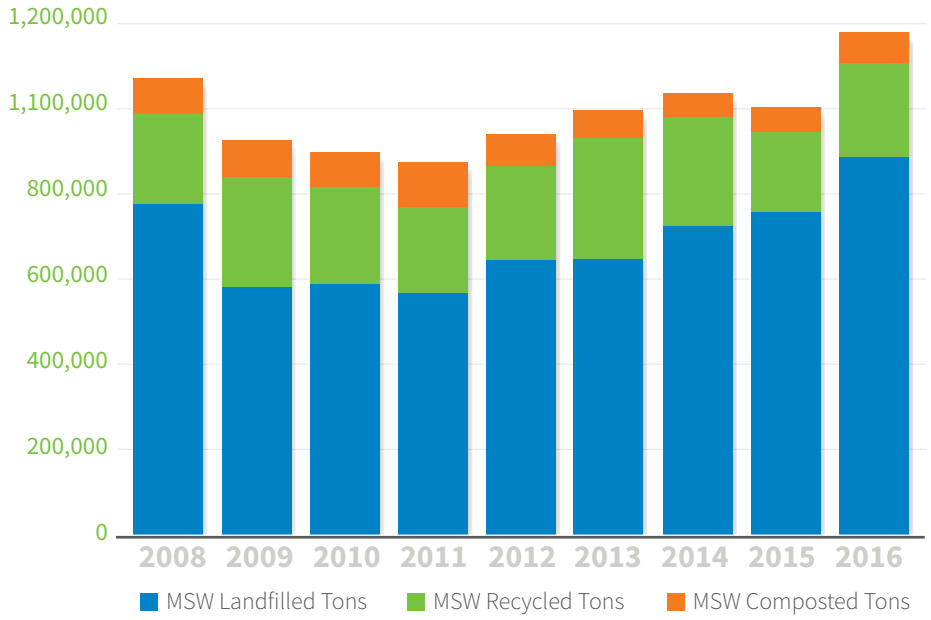
Figure 2-1: Services Districts and Satellite Cities



WASTE GENERATION

Nashville divides its MSW management into three main categories: landfilling, recycling, and composting. Since 2008, municipal solid waste (MSW) generation has fluctuated between 881,000 and 1.16 million tons per year (**Figure 2-2)**. More than 80% of total waste is landfilled, while less than 20% is recycled or composted (**Figure 2-3**). Details on the annual tonnage values are in Appendix B, Table B-9.

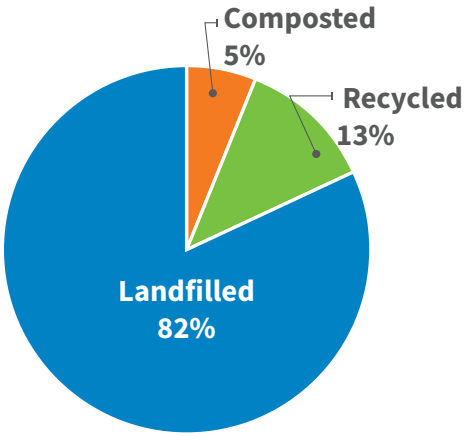
Figure 2-2: Nashville MSW Generation from 2008-2016



Based on population and business data for the USD and GSD, waste generation is estimated to be 75% and 25% respectively. The collection truck surveys conducted as part of the Waste Characterization Study (July and October 2018) concluded that the residential sector generates 33% of waste while 67% from the commercial sector.

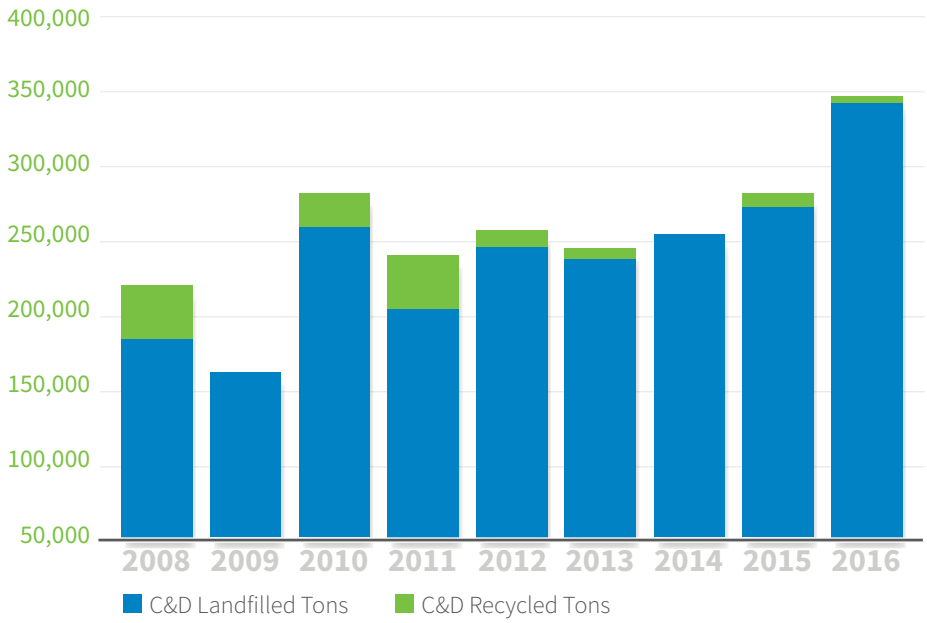
Figure 2-3: Management of 2016 Total Waste in Davidson County

DISPOSAL METHOD	QUANTITY (TONS)
Landfill	1,235,222
Recycling	207,104
Compost	69,151



Since 2008, Nashville's construction and demolition (C&D) waste generation has nearly doubled while C&D waste recycling has decreased to minimal levels (**Figure 2-4**). In 2016, C&D waste was 23% of the total waste stream.

Figure 2-4: Nashville C&D Waste Landfilled and Recycled



Tonnages for C&D waste landfilled and recycled are likely underreported because:

- Some C&D waste is disposed of in MSW landfills and recorded as MSW tonnage. According to a 2008 Waste Composition Study completed by TSU, approximately 5% of the waste landfilled in the Bi-County and Cedar Ridge Landfills was C&D waste. [1]

1 *TDEC, 2008 Tennessee Waste Characterization Study*

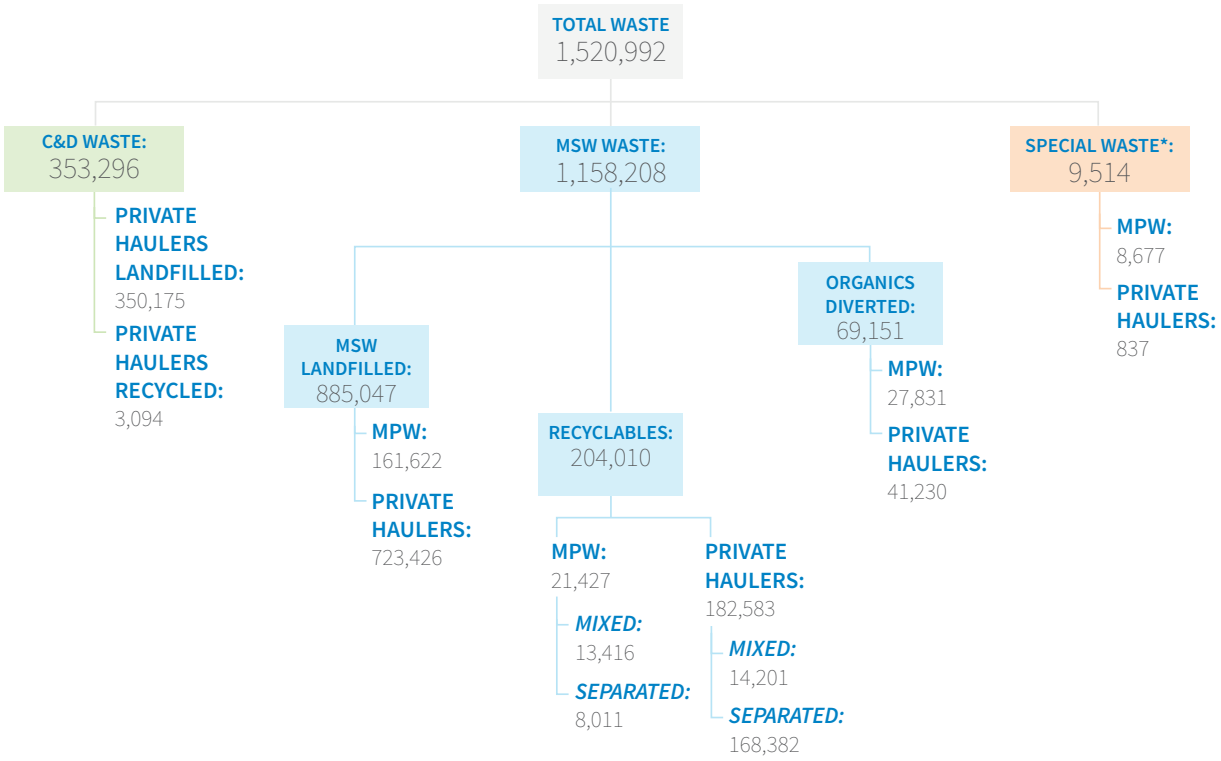
- Unrecorded C&D recycling occurs when contractors reuse materials on-site or haul materials, e.g. scrap metal, directly to a recycler.

COLLECTION SERVICES

The waste flow diagram below provides a comprehensive overview of Nashville's collection services by waste type and public vs. private collection.

In the USD, Metro Nashville Public Works (MPW) provides trash collection to single family residences, multi-family residences (less than four units), Metro-owned buildings, Metropolitan Development and Housing Agency (MDHA) public housing, and Central Business District (CBD) establishments that use a maximum of two trash carts. Multi-family housing with more than four units is responsible for providing their dumpsters. If more service is needed for a business or large multi-family housing unit to meet the trash collection requirements, they contract directly with private haulers.

Figure 2-5: Flow Diagram of Waste Collected in Davidson County (2016 Tons)



** Special waste includes electronics, pharmaceuticals, and household hazardous waste.*

Curbside recycling collection is available to single-family residences and multi-family residents with four or fewer attached units, Metro-owned buildings, and small businesses in the CBD that are Public Works trash collection customers. MPW residential trash collection occurs weekly while recycling collection is monthly.

The Downtown Code, a subset regulation of Metro Nashville Code, requires MPW to collect two trash carts, six days a week from all CBD businesses. However, many of these are restaurants that fill ten or more carts, and require trash collection twice a day. There is one trash route, which runs twice a day for seven days per week, that provides trash and cardboard collection services to the downtown area that includes 209 sites with 447 carts. Additionally, MPW empties public trash and recycling receptacles.

All waste generators in the GSD must contract with a private hauler for collection services including C&D waste. Some homeowners' associations in the GSD negotiate contracts with private haulers on behalf of their members. MPW requires trash haulers to be permitted and offer their customers recycling service. To incentivize recycling, MPW does not require recycling haulers or their equipment to be permitted. GSD residents also have the option to haul their trash and recyclables to one of the convenience centers or recycling drop-off sites. These sites do not charge for small amounts of trash (three or fewer bags a day).

MPW collects brush, grass, and leaves four times per year. Metro's contractor, Living Earth, receives the material for processing into mulch or compost at its two facilities. Residents may haul brush and yard waste to the Ezell Pike Convenience Center (limited to a level pickup truck load) or to one of Living Earth's facilities (larger amounts are allowed) at no cost. Compost Nashville and The Compost Company offer food waste collection services for businesses, while Compost Nashville also provides services to residents. All four convenience centers will accept food waste free of charge.

The Sheriff's Office offers bulky waste collection pick-ups by appointment through its inmate work program. Bulky waste, depending on the material, is hauled either to a scrap metal recycler or the Republic Waste Transfer Station.

Collection services are not available for household hazardous and electronic wastes. The Ezell Pike and East convenience centers accept household hazardous and electronic wastes and the Omohundro Convenience Center accepts electronic waste. Both the Ezell Pike and East convenience centers, which are staffed by MPW, are open five days a week.

METRO SOLID WASTE MANAGEMENT FACILITIES

MPW has four convenience centers that accept trash and recyclables from Davidson County residents (**Table 2-1**). The convenience centers accept a variety of materials, including household trash, furniture, appliances, and recyclables such as aluminum, ferrous cans, plastics #1-#7, cardboard, newspaper, mixed paper, and glass bottles. Accepted materials vary slightly by convenience center. Lists of the exact materials accepted at the centers are provided on the MPW website.

Table 2-1: MPW Convenience Centers

FACILITY NAME	HOURS OF OPERATION	ADDRESS
Omohundro	Tue. - Sat.7:30 am - 4:30 pm, Closed for lunch 12 - 1 pm	1019 Omohundro Place Nashville, TN 37210
Ezell Pike	Mon., Wed. - Sat.7:30 am - 4:30 pm, Closed for lunch 11 am - 12 pm	3254 Ezell Pike Nashville, TN 37115
Anderson Lane	Tue. - Sat. 7:30 am - 4:30 pm, Closed for lunch 11:30 am - 12:30 pm	939A Anderson Lane Madison, TN 37115
East Center	Mon. - Tue., Thu. - Sat.7:30 am - 4:30 pm, Closed for lunch 11:30 am - 12:30 pm	943A Doctor Richard G. Adams Drive Nashville, TN 37207

Nashville's ten recycling drop-off sites, most of which are on Metro property, will accept recyclables from residents (**Table 2-2**). The recycling drop-off sites receive the same recycling materials as the convenience centers (newspaper, mixed paper, paper board, cardboard, aluminum, tin, glass containers, plastic bottles, and containers) except for the Old Ben West Library Building Recycling Drop-off which does not accept glass. MPW does all the hauling from the recycling drop-off sites. Metro employees do not staff the drop-off sites; most have a community sponsor group funded by MPW.

Table 2-2: MPW Recycling Drop-off Centers

FACILITY NAME	HOURS OF OPERATION	ADDRESS
Bellevue Metro Transit Authority's Park and Ride	24 hours	Coley Davis Road and Highway 70 S. Nashville, TN 37221
Cane Ridge High School	24 hours	12848 Old Hickory Blvd. Antioch, TN 37013
Granbery Elementary School	Sat. 9:00 am - Noon.	5501 Hill Road Brentwood, TN 37027
Hillsboro High School	Mon. - Sat. 9:00 am - 5:00 pm Sun. Noon - 5 pm	3812 Hillsboro Pike Nashville, TN 37215
Joelton Middle School	24 hours	3500 Old Clarksville Highway Joelton, TN 37080
Lakewood City Hall	24 hours	3401 Old Hickory Blvd. Old Hickory, TN 37138
McGavock High School	24 hours	3150 McGavock Pike Nashville, TN 37214
Old Ben West Library Building	24 hours	Polk Avenue and Union Street Nashville, TN 37219
Tennessee State University	Daily 7 am - 7pm	38th Ave. N. and Albion Street Nashville, TN 37209
Whites Creek High School	24 hours	7277 Old Hickory Blvd. Nashville, TN 37189

PRIVATELY OWNED SOLID WASTE MANAGEMENT FACILITIES

The Waste Management River Hills Materials Recovery Facility (MRF) is the only facility in Nashville that accepts single stream recyclables. There are also several other privately-owned and operated recycling processing facilities that allow source separated recyclables.

Nashville has not had an active MSW landfill since Bordeaux Landfill closed in 1996, although Nashville has two MSW transfer stations. Republic Services owns and operates an MSW transfer station that is two miles east of the CBD on Freightliner Drive. The other transfer station is the Waste Management Antioch Transfer Station located just south of the Nashville International Airport off Antioch Pike. Waste from these transfer stations is hauled to landfills owned by their respective companies. Republic Services hauls waste 37 miles to their Middle Point Landfill in Rutherford County and Waste Management hauls waste 53 miles south to their Cedar Ridge Landfill near Lewisburg, TN, or 103 miles west to their West Camden Landfill near Camden, TN.

In addition to the two facilities owned and operated by Living Earth, which has an exclusive contract with Metro to take all MPW collected brush and yard waste, several other facilities take organic waste generated in Nashville (**Table 2-3**). According to Metro Water Services, private grease recyclers processed a total of 8,012 tons of recycled fats, oils, and grease.

Table 2-3: Compost and Mulch Facilities in the Region that Accept Materials from Nashville

FACILITY	CONFIRMED MATERIALS ACCEPTED	2016 TONS REPORTED TO TDEC	CURRENT OPERATING RATE TONS/YR	OPERATING CAPACITY TONS/YR	CAPACITY WITH FACILITY EXPANSION TONS/YR
Ground Up Recycling	Wood Pallets	N/A	21,000	30,000	N/A
AEP Inc	Wood	N/A	13,505	unknown	N/A
The Compost Company, LLC	Food Waste, Yard Waste, Brush	750	6,000	22,500[1]	75,000 (max. for site)[2]

Notes: [1] *22,500 tpy comprises 7,500 tpy of food scraps and 15,000 tpy of woody waste.*

[2] *75,000 tpy comprises 25,000 tpy of food scraps and 50,000 tpy of woody waste.*

Nashville has one dedicated C&D waste landfill and one mixed C&D waste processing facility (**Table 2-4**). Republic Transfer Station and Waste Management Antioch Pike Transfer Station also accept C&D waste. Several facilities allow source-separated C&D material for recycling.

Table 2-4: C&D Waste Management Facilities

FACILITY	MATERIALS ACCEPTED	CURRENT OPERATING CAPACITY TONS/YR	AVAILABLE OPERATING CAPACITY TONS/YR	CAPACITY AFTER FACILITY EXPANSION TONS/YR
C&D Waste Processing: Atomic Resource Recovery, LLC	Mixed C&D	78,000	89,700	260,000
C&D Waste Landfill: Waste Management, Inc. Southern Services C&D LF	Mixed C&D	327,000	Expected to reach capacity in 2024	None

Section 3

WASTE AND RECYCLING MATERIALS CHARACTERIZATION STUDY

A characterization study of landfilled municipal solid waste (MSW) was performed to provide supporting data for the Solid Waste Master Plan (refer to **Appendix C** for the complete study results). With the benefit of a grant provided by the Tennessee Department of Environment & Conservation (TDEC), the study was able to include materials collected through the single stream, curbside recycling program in the Urban Services District and various private hauler curbside collection services in the USD and GSD.

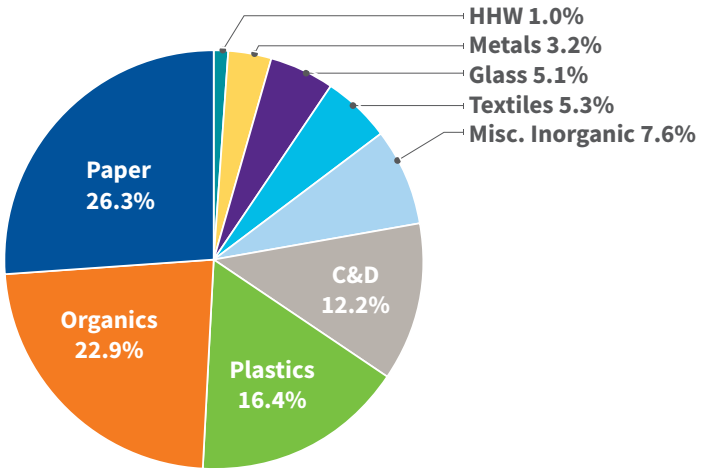
The study was conducted over two seasons. The first event was performed in July 2017 over a two-week period with the first week dedicated to sampling MSW at the Republic and Waste Management transfer stations and the second week focusing on single stream recyclables received at the Waste Management River Hills Material Recovery Facility. The second sampling event occurred over a two-week period in October 2017 and followed the same sampling plan as the summer event. Over the two seasons, 285 samples, with a combined weight of 30 tons, were sorted into 50 categories.

THE OBJECTIVES OF THE STUDY WERE TO DETERMINE:

- *Compositional differences in landfilled MSW and recycled materials between:*
  - *The Residential and Commercial sectors*
  - *The Urban Services District (USD) and the General Services District (GSD)*
  - *The summer and fall seasons*
- *The types and percentages of non-recyclable materials being placed in curbside recycle bins (i.e.; contamination).*
- *The types and percentages of recyclables remaining in landfilled MSW.*

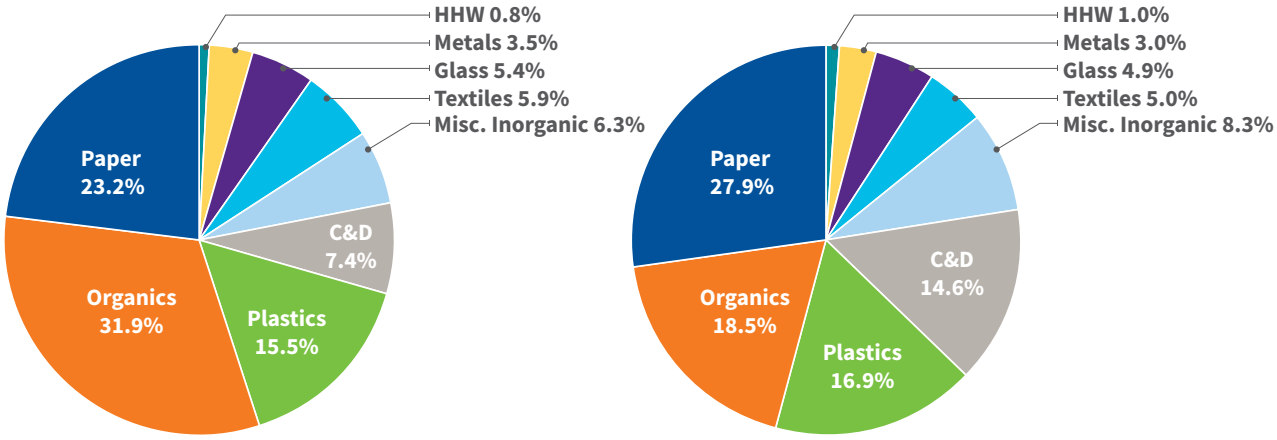
Figure 3-1 shows that Paper, Organics, and Plastics account for approximately two thirds of the landfilled MSW. A significant amount of construction and demolition (C&D) waste was also present.

Figure 3-1: Composition of Landfilled MSW by Weight



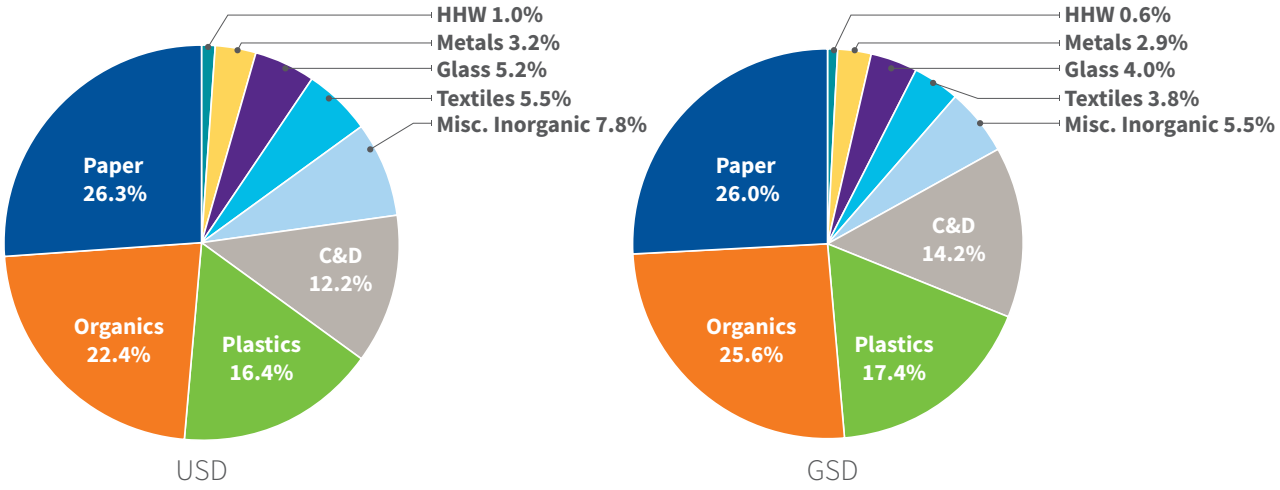
Comparison of landfilled MSW from the Residential and Commercial sectors, as illustrated in **Figure 3-2**, shows similar amounts of Paper and Plastics. However, the Residential sector has much higher Organics content and the Commercial sector has significantly higher C&D Waste content.

Figure 3-2: Comparison of Residential and Commercial Landfilled MSW by Weight



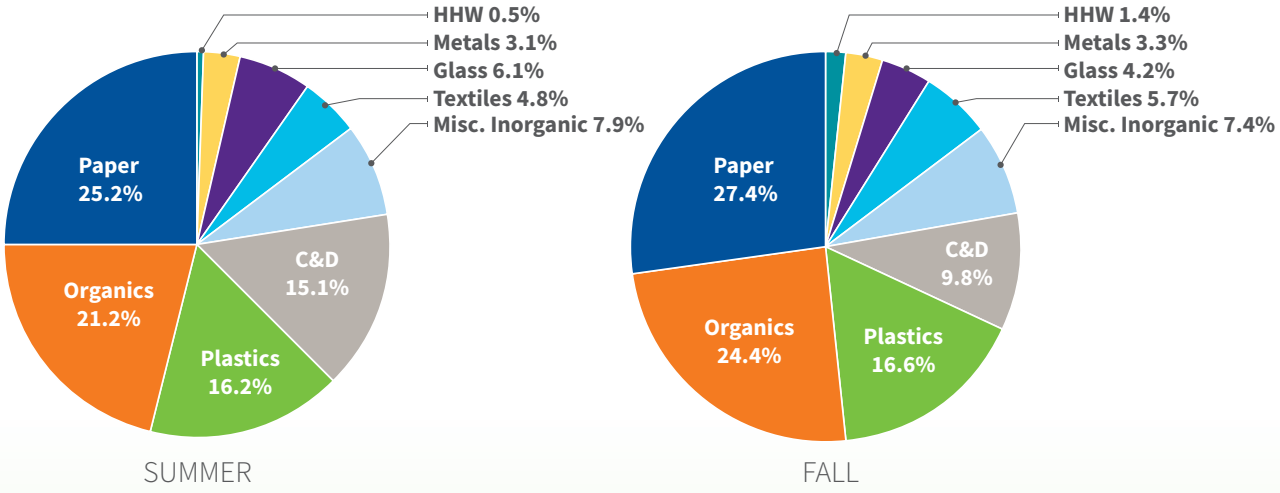
Comparison of landfilled MSW from the USD and GSD is provided in **Figure 3-3**. The results show slight variations but, overall, the composition of the two districts are quite similar.

Figure 3-3: Comparison of USD and GSD Landfilled MSW by Weight



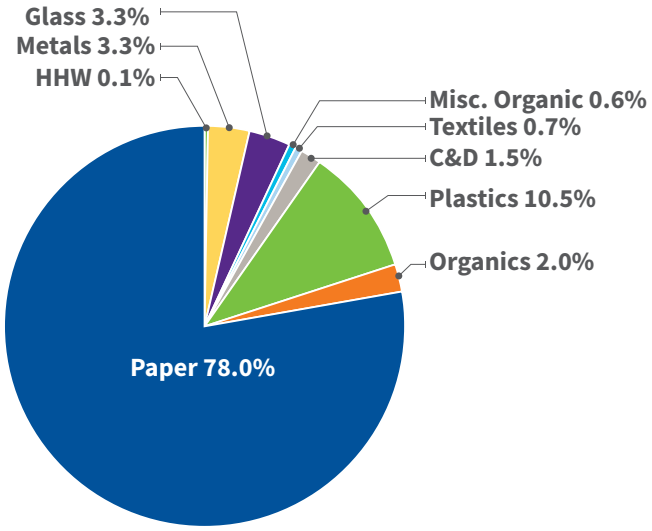
Seasonal variations in waste composition were evaluated by comparing the Summer and Fall sampling results as shown in **Figure 3-4**. The most notable difference was the higher percentage of C&D Waste in the Summer. Minor differences included: Organics and Paper (higher in the Fall) and Glass (higher in the Summer).

Figure 3-4: Comparison of Summer and Fall Landfilled MSW by Weight



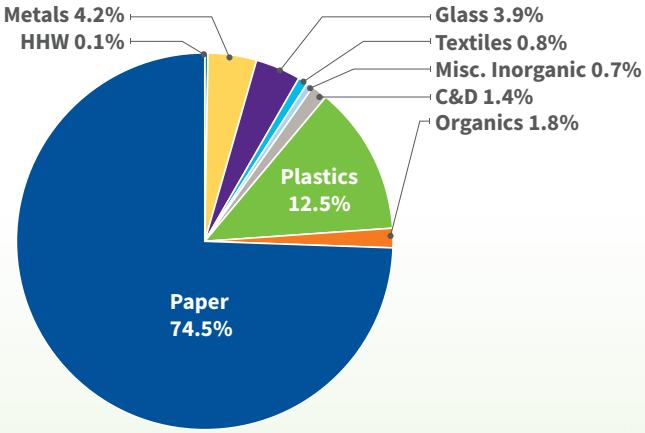
Paper and Plastics, as shown in **Figure 3-5**, account for nearly 90 percent of the material collected in the single stream recycling program (the program accepts: Paper, Uncoated OCC, Plastic Bottles and Containers, Ferrous Cans and Aluminum Cans, Foils and Trays). Glass, which is not accepted in the program, is the largest source of contamination at 3.3%. Organics and C&D waste are other major contaminants.

Figure 3-5: Composition of Materials Collected from the Single Stream Curbside Recycling Program

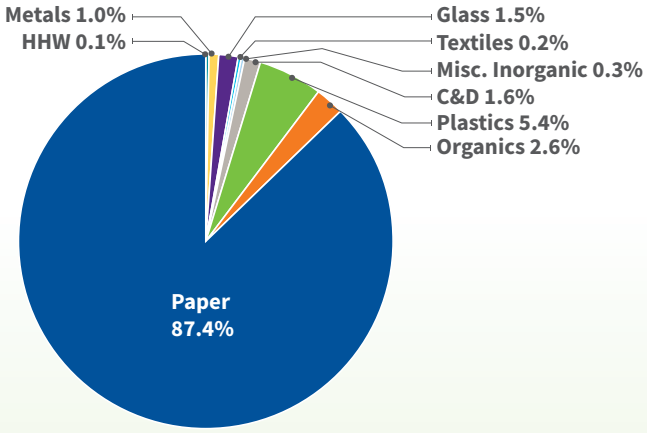


Comparison of recycled materials from the Residential and Commercial sectors, as provided in **Figure 3-6**, shows that Commercial has a higher percentage of Paper but lower amounts of Plastic and Metals. With the exception of Organics and C&D Waste, the level of contaminants is higher for the Residential recycle stream as it shows higher percentages of Glass, Textiles, and Misc. Inorganics.

Figure 3-6: Comparison of Residential and Commercial Materials Collected for Recycling



RESIDENTIAL



COMMERCIAL

Section 4

STAKEHOLDER ENGAGEMENT

Stakeholder engagement and public outreach will continue to be a vital focus of the Plan's implementation of its multiple phases and initiatives. Outreach was essential to receiving feedback and opinions on potential aspects of the Plan and gathering new and innovative ideas. The stakeholder engagement effort included numerous meetings with stakeholder groups to gather input, ideas, and concerns for the Plan. Also, a public online survey was created for Nashville residents and businesses to provide feedback on potential aspects of the Plan as well as their opinions and rankings on the Plan's recommended features.

Stakeholder meetings were conducted with the Solid Waste Region Board, Solid Waste Master Plan Task Force, members of the Metro Council Public Works Committee, key local environmental groups and the Tennessee Department of Environment and Conservation (TDEC). There were six public meetings hosted throughout the Metro service area to garner public feedback and comments.

SOLID WASTE REGION BOARD AND TASK FORCE MEETINGS

During the Plan's development, there were three meetings with the Solid Waste Region Board to provide Plan updates and gather input from Board members. Also, the Board identified priorities for the Plan including implementing clear goals, metrics and timelines for reaching zero waste within 30 years (as well as the potential for quicker implementation); addressing organics diversion; evaluating community equity components; and determining the best approaches to public education and community and regional promotion. Interaction with Board

members during meetings resulted in more in-depth discussions on topics such as organics recycling (focus on food waste), reuse and reduction, end-use markets for recyclable materials, and alternative processing technologies.

The Task Force was developed by the Metro Nashville Public Works (MPW) department to allow various agencies, organizations, educational institutions, and individuals the opportunity to provide input into the Plan. Task Force members represent a broad range of interests and issues and have offered a variety of options for discussion. There were three meetings with the Task Force throughout the development of the Plan. The third meeting was structured to allow for breakout sessions where there were focused discussions on the following topics: organics, commercial sector programs, construction and demolition, residential sector programs, and solid waste facilities. These discussions resulted in a variety of ideas and opinions; many were incorporated into the Plan.

PUBLIC COMMENT MEETINGS

Six public meetings were conducted throughout Nashville and Davidson County to share the potential aspects of the master plan and receive feedback and comments from the residential and business communities. The meetings were throughout the County to increase community participation. The session locations included Madison, Hermitage, Bordeaux, West Nashville, Downtown Corridor/Business District, and South Nashville. These community and downtown meetings structured as “open houses” with separate stations representing the critical aspects of the Plan’s objectives and elements of waste diversion.

The details for each meeting are included in **Figure 4-1**.

Figure 4-1: Public Meetings

METRO COUNCIL INPUT

The Metro Council Public Works Committee, which consists of ten members, is responsible for reviewing and acting on solid waste measures before being placed on the Metro Council agenda for a final vote. To allow this committee to provide feedback throughout the planning process, there were meetings with the Public Works Committee members to gather their feedback. The six council members that participated were: Chairperson Jeremy Elrod and council members Fabian Bedne, Mina Johnson, Bill Pridemore, John Cooper, and Jim Shulman. In addition to these meetings, various other council members attended the Solid Waste Region Board, Task Force, or public meetings to provide feedback on the Plan. The meetings took place in the spring and early summer of 2018 via face-to-face discussions or conference calls.

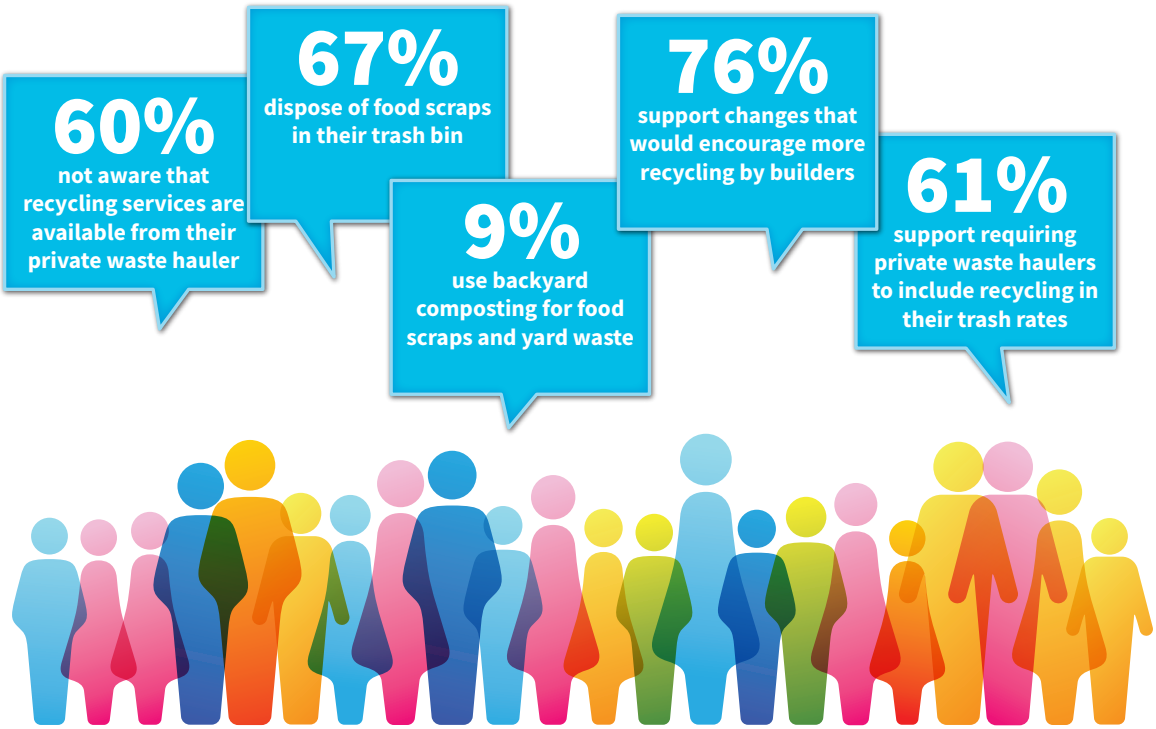
STAKEHOLDER INPUT ADDRESSED IN PLAN

Various stakeholders offered valuable input throughout the public outreach and involvement process, including thoughts and opinions on the programs and services needed to increase landfill diversion through recycling, composting, recovery, and reuse programs. Community leaders, environmental groups, concerned citizens, and business owners discussed and collaborated on a variety of approaches to achieving zero waste within the Metro area.

Table 4-1 provides a summary of some of the key concepts and approaches received during the public and stakeholder engagement meetings. The table also indicates where the concepts and approaches are specifically addressed and further discussed in the Plan for easy reference. Additional detailed information on the stakeholder engagement process is provided in **Appendix D, Stakeholder Engagement**.

Table 4-1: Citizen/Stakeholder Group Input

STAKEHOLDER INPUT	HOW IS IT ADDRESSED IN THE PLAN?	WHERE WILL I FIND IT?
Solicit input from citizen and stakeholder groups	Increased education and outreach requirements.	SECTIONS 6 & 7
Achieve 100% diversion by 2022	Stepped approach to reaching 90+% over 10+ years. Although all parties want to achieve zero waste as soon as practical, many of the programs must be staggered; and the community properly educated, to be successful and reach the overall Plan goals.	SECTIONS 6, 7, & 11
Adopt minimum 2-stream wet/dry source separation with inclusion of GSD	Both the current system, 2-stream systems and 3-stream source separation systems were evaluated. The 3-stream program was recommended within the USD and GSD with the expansion or implementation of MRF, AD, and composting facilities.	SECTIONS 5 & 6
Franchise collection and processing. Divide Metro into service zones.	Franchising is identified as a key policy to support implementation.	SECTIONS 5, 6, & 12
Provide mandatory recycling	Residential and commercial price incentive programs with material bans.	SECTION 6
Ban plastic shopping bags	Single-use bag fee or ban.	SECTION 6
Increase per ton disposal fees to deter landfilling	Strategy for incentive surcharges.	SECTION 6
Develop local diversion markets	Use of economic development tools to develop re-manufacturing hub.	SECTION 7
Account for benefits of jobs from recycling and composting	Triple bottom line analysis incorporates benefits of local and regional job creation.	SECTION 10
Design and adopt reuse programs	Reuse programs and policies included as zero waste strategies.	SECTION 7
Install observation areas within processing facilities for education	New facilities will be evaluated for education areas.	SECTION 8
Maintain momentum during implementation – early progress	Provide phases of implementation timeline.	SECTION 11
Enforcement of banned materials	Recommended increases in Public Works staff for enforcement.	SECTION 6
Role of publicly-owned facilities in diversion goals	Combined public/private approach to facility infrastructure.	SECTION 8
Require builders to show C&D recycling plans to receive building permits	The plan recommends the development and implementation of a C&D Deposit Program.	SECTION 6
Require zero waste in event permits	A public space recycling strategy is included in the plan.	SECTION 6
Integrate digesters and composting facilities	Anaerobic digesters and composting are identified as key infrastructure recommendations in the plan.	SECTION 8
Reduce organics contamination in residential and commercial waste	Increased education, inspections and enforcement.	SECTIONS 6 & 7
Improve promotion of backyard composting	Increased education and outreach is a key theme of the plan.	SECTIONS 6 & 7
Implement food waste rescue and source reduction strategies	Early adoption of surplus food rescue and redistribution ordinance.	SECTION 7
Embed equity in plan to protect small businesses	Multi-pronged approach to aid small businesses with recycling.	SECTION 6
Improve reporting of diversion	Mandatory reporting, measurement and tracking requirements.	SECTION 6



PUBLIC ONLINE SURVEY

Citizen and stakeholder engagement efforts are essential to understanding the status quo solid waste situation in the Metro region, and to garner support for possible strategies for the analyses conducted as part of the Plan development. Two web-based surveys were conducted to ascertain the community's satisfaction with existing services, perception of costs, support for new services, and ideas for improvement:

- First, a survey of a statistical sample of single-family households (SF), multi-family households (MF), and businesses was designed and conducted to be reliably representative of responses for the Metro region.

- A follow-up survey, widely advertised, was designed to solicit feedback from as many residents and businesses throughout the region as possible. More than 3,000 responses were received over the course of the survey.

These surveys provided a great deal of information, enumerated in detail in **Appendix D**, paragraph D.6 Statistical and Open Residential and Commercial Survey Responses. The results for the two surveys did not differ substantially in their outcomes. Key results that influence the analysis are summarized below.

KEY SURVEY RESULTS RELATED TO STATUS QUO

There were several primary topics addressed in the status quo section of the survey:

Trash Service Use: One-quarter to one-third of SF households use half or less of the volume in their existing trash containers, while about half fill or overfill their containers. A substantial number of homes are paying for excess capacity, which in the USD means more than 2 carts, and diversion incentives may help encourage others to reduce and recycle. More than half the households surveyed were uncertain about the trash, recycling, and organics options their current service provider offers.

Recycling Service Use: Approximately 75% of all SF respondents are recycling in some form, with almost half using curbside service at no additional cost, but over 75% of those live in the USD. Less than a quarter of respondents outside the USD report having recycling included with their existing trash service. While 25% of SF respondents indicate they don't recycle or are unsure, the percentage increases to 62% for the MF group. Almost 45% of the SF respondents receive curbside service at no additional charge; however, this approach to recycling service is more commonly used in the USD area than GSD (78% vs. 23%). About 15% of respondents use only the drop-off center. Of those recycling, over 50% estimate they recycle between half and a majority of all the material that would go in their trash cans, most commonly aluminum, plastic, and cardboard.

Organics Behaviors: There are a variety of options used by residents for yard waste materials from composting, landfilling, or having landscaping contractors be responsible for disposal. About 10% of the SF respondents are composting both yard material and food scraps at home; Grass-cycling (leaving clippings on lawn) is practiced by a little over half of the respondents and about a third are using Metro's Brush Collection for their branches and shrubs. About a quarter of the SF respondents report they don't have yard waste materials. Only around 5% say they take yard waste material to the landfill. Between 40% and 60% of SF respondents are not aware if their hauler offers curbside composting service. Food scraps are mostly thrown "in the trash" (67%), followed by putting it down the garbage disposal (33%). Less than 5% report using a curbside service or taking food waste to a drop-off center.

Satisfaction: Generally, SF respondents using curbside garbage collection service are very or somewhat satisfied (78%) with the service, with higher satisfaction inside the GSD for both garbage and recycling services. But satisfaction of SF respondents is lower for all other curbside services, including recycling (44% average) and organics (27%). Satisfaction with rates, or the value of service, is lower. Half (48%) are satisfied with garbage service rates (41% in USD), 30% with the value from recycling service rates, and 14% are satisfied with

the rates and value for organics services. Half are not using recycling services, and two-thirds do not use organics services.

Barriers: Information on barriers to recycling (**Table 4-2**) is important to program planning. The survey shows that program availability is a barrier to MF households; but for SF households, not knowing what can be recycled or if materials get recycled are among the top barriers, along with the belief they are already recycling the maximum. As a group, access and cost for single family (no program, HOA doesn't offer, the expense of recycling and cheapness of trash,

Table 4-2: Reported Barriers to Recycling

WHAT DO YOU SEE AS PRIMARY BARRIERS TO RECYCLING?	ALL SF	ALL MF	SF-USD	SF-GSD
No curbside program	17%	**29%**	12%	19%
Don't know of any drop-off sites	12%	**28%**	14%	8%
Too hard to take materials to drop-off	17%	22%	17%	17%
Garbage service is inexpensive	5%	4%	5%	5%
Collection is not often enough	17%	4%	**28%**	12%
Not enough materials accepted	15%	4%	17%	13%
Don't know what can / can't be recycled	**18%**	18%	17%	18%
I already recycle a lot – no barriers	**21%**	14%	**21%**	**22%**
Busy / not interested / too much effort	14%	19%	7%	**21%**
Expensive to sign up for service	13%	4%	5%	19%
What I do doesn't make a difference	3%	3%	5%	1%
Not sure it really gets recycled anyway	**18%**	18%	**21%**	15%
HOA doesn't offer recycling	10%	13%	5%	14%

**Highlighted/colored cells represent the highest responses in each column, from each sector. Source: SERA Survey*

infrequent collection, not enough materials accepted) are the most common barriers to recycling more. Lack of knowledge about the program and mistrust of recycling is also a leading barrier.

The surveys related to businesses and C&D waste largely solicited information about status quo behaviors and barriers to additional recycling, which were used to develop strategies. Over half of the existing business recycling or organics programs are only for employees, and about a third include customers. ***Nearly two-thirds of the businesses report having a recycling program, but only 5% report having an organics program; however, the scale of needed business organics programs varies by business type.*** Office paper and plastic bottles are the most commonly recycled materials followed by aluminum cans and cardboard. Food scraps are the largest remaining material followed by office

paper and plastic packaging. Businesses reported recycling only about 25% of the available material. One-third of the responding companies described their programs as working "great" with no barriers to recycling. The most common barriers to recycling were no space for containers indoors (15%) or outside (11%) and that employees would not participate (10%). Eight percent said it was too expensive, and six percent said it was too much of a hassle. Only five percent said they don't generate enough recyclable materials, but for organics that was the most significant barrier, followed by "it's too expensive." Space for containers is a similar barrier for organics as with recycling.

Most of the respondents generating C&D debris report working 1-2 job sites a year and recycling 50% or less of the material. Over a third report sending the material to the landfill and less than 20% hire a company for recycling. The largest barriers reported are no financial incentive to recycle and that it is too time-consuming.

KEY RESULTS RELATED TO RESIDENTIAL SUPPORT FOR NEW STRATEGIES

Important feedback related to the new types of strategies being considered for the Plan was received. Residential feedback is included in **Tables 4-3** and **4-4**. The results show that more than 50% of the households support most of the new strategies under consideration, while only a small percent of households strongly oppose the initiatives. These results were considered in the direction and design of strategies for reaching 75% and beyond for Nashville.

Table 4-3: Support for Program Changes

	SOMEWHAT & STRONGLY SUPPORT				STRONGLY OPPOSE			
Support for Program Changes	All SF	All MF	SF-USD	SF-GSD	SF all	MF all	SF -USD	SF -GSD
Add curbside glass collection	69%	57%	76%	63%	1%	1%	0%	1%
Add weekly food-waste & yard waste programs	61%	51%	70%	52%	2%	1%	0%	**4%**
Backyard composting training & discounted backyard compost bins	63%	52%	71%	56%	2%	0%	2%	3%
Encourage more recycling by builders and re-modelers	**76%**	**68%**	**81%**	**70%**	1%	1%	0%	1%
Increase curbside recycling from monthly to every-other-week	65%	58%	74%	56%	2%	1%	0%	3%
Metro's goal for Zero Waste to Landfills	71%	**64%**	79%	62%	1%	0%	2%	1%
Programs and incentives to encourage more recycling by businesses	**76%**	61%	**84%**	**68%**	1%	3%	0%	1%

**Highlighted/colored cells represent the highest responses in each column, from each sector*

Table 4-4 shows public support for operational changes, if trash service fees are not included in taxes, i.e., residents must pay separately for the respective service.

Table 4-4: Support for Operational Changes

	SOMEWHAT & STRONGLY SUPPORT IF TRASH SERVICE NOT IN TAXES (PAY FOR SERVICE)				STRONGLY OPPOSE			
Support IF trash service not in taxes (or if pay for service)	All SF	All MF	SF-USD	SF-GSD	SF all	MF all	SF -USD	SF-GSD
Require haulers include curbside recycling within trash rates	**64%**	**48%**	**71%**	**55%**	3%	3%	0%	6%
One Hauler- Metro uses bid process to select 1 hauler	**61%**	43%	**67%**	**55%**	2%	1%	0%	4%
Require haulers include curbside yard-waste in trash rates	59%	42%	62%	53%	3%	1%	2%	4%
Save-As-You-Throw (pay less for smaller cans, incl. recycling)	55%	**47%**	55%	51%	3%	1%	5%	3%
Require trash haulers to offer yard waste service (extra fee)	47%	34%	55%	43%	6%	3%	2%	8%

**Highlighted/colored cells represent the highest responses in each column, from each sector.*

Section 5

RESEARCH AND SCREENING OF DIVERSION STRATEGIES

In Section 5 of the report, we outline the research and screening process for the strategies designed to help Nashville achieve Zero Waste, using strategies focused on reaching 75% and then additional strategies designed to move Metro Nashville beyond 75% to 90% or better.

PRIORITIZATION PROCESS

The strategy prioritization process used inputs from two main sources.

1 Waste Characterization and "Percent Recoverables Remaining (PRR)": The waste characterization study identified the individual materials from each waste stream that were still ending up in the landfill disposal stream. The waste stream was analyzed using three methods (per the PRR approach[1]). We analyzed the priority based on relative tonnages of each material, based on the greenhouse gas emissions represented by each material, and by the market value associated with the materials remaining in each stream. These analyses identified similar priorities for material for both the residential and commercial streams—organics (especially food), aluminum, cardboard, compostable paper and C&D. The commercial sector analysis also identified composite plastics and film as priorities.

2 Criteria Assessment: A series of criteria were used to assess high-performing strategy options. These included: sustainability, cost, diversion potential, suitability to the waste sector and service districts, proven effectiveness, and consistency with zero waste principles.

1 *See Skumatz, "Percent Recoverables Remaining/PRR: analyzing what is left…", Resource Recycling, 2016.*

STRATEGIES INCLUDED IN THE PLAN

To begin the screening process, an inventory of strategies from leading waste diversion communities across the US and Europe was assembled. Then, a multi-step process based on PRR and key criteria was used to rank the strategies on a scale from high to low.

The highest scoring strategies based on these criteria were:

- **Funding –** Establishing an enterprise fund or a solid waste authority
- **Metrics –** Tracking the percent of recoverables remaining in the landfill waste stream by performing annual waste composition audits.
- **Food Waste –** 3-Bin collection, food waste landfill ban, and required use of food waste compost for Metro and large-scale commercial construction projects
- **Construction Demolition Debris –** Deposit System and landfill ban on select materials
- **Participation –**Mandated recycling, close proximity convenience centers
- **Collection –** Save-As-You-Throw, franchised collection, every other week recycling collection, every other week trash collection (must be coupled with organics collection).

STRATEGIES NOT INCLUDED IN THE PLAN

A number of strategies were screened out of the portfolio development based on the criteria analysis and are illustrated in **Figure 5-1**. More detail on the rationale for each elimination is provided in **Appendix E**.

Figure 5-1: Strategies Screened Out/Not included in Portfolio Development

Single Family Residential	■ **Wet-Dry:** Use of three bins (recyclables, organics and trash) has replaced the two bin Wet/Dry collection approach as it provides less contamination ■ **CNG trucks:** costly conversion, doesn't affect diversion amounts or efficiency ■ **In-sink food disposers:** Nashville area is growing quickly; important to conserve wastewater capacity ■ **Recycling credits:** Less effective and more expensive than Save-As-You-Throw (SAYT) in achieving diversion ■ **Rural strategies:** would provide negligible impact in the increasingly urban/suburban Metro area
Multi-Family (MF) Residential	■ **MF strategies are complicated and not cookie-cutter;** selected strategy recommends grant-based exploratory option first, with further funding of successful demonstrations. ■ **Likely options to test via grant may include:** Mandates for all MF buildings; Recycling champions in individual buildings; Hauler incentives for MF achievements; possibly SAYT In MF (bags or other)
Commercial	■ **Special commercial routing:** more flexible options recommended are expected to perform better ■ **Hauler diversion requirements:** same as above ■ **Requirements for rentals and hotel, etc.:** same as above
Regulatory	■ **Multi-tier goal:** Most important in areas with significant rural areas; not appropriate in Nashville ■ **Bottle bill/deposit legislation:** most appropriate at state level ■ **Broad state-wide diversion regulations similar to Vermont:** most successful implemented at state level ■ **Minimum content standards:** most suitable at state level
Facilities	■ **Alternative Disposal Technologies:** lack of full-scale field experience, high cost and violation of Zero Waste Highest and Best Use Principles and material destination inflexibility associated with "put or pay" agreements required for many high-capital-cost facilities funded by bonds

Section 6

UNDERSTANDING THE STRATEGY SELECTION PROCESS

Development of the Plan's strategies focused on providing diversion opportunities for all waste generators in Davidson County. The analysis shows that improvements are needed in all sectors and employing diverse strategies will build resiliency into the program (refer to **Appendix F** for the detailed results). In addition to the results of the diversion modeling, Appendix F presents cost modeling and analysis for each of the strategies and scenarios. Adopting the proposed strategies will require a fundamental change to the existing solid waste management system. However, without the changes in services, incentives, and enforcement, Davidson County can expect only minor improvement to the existing 18% diversion rate, which means continued reliance on landfills for waste management, over-consumption of natural resources, and increased levels of greenhouse gas emissions and other pollutants.

The proposed strategies reflects programs that have been implemented successfully in many communities throughout North America and address the priorities of the Livable Nashville Committee, NashvilleNext, the Tennessee Department of Environment & Conservation's 2025 Material Management Plan, the State of Tennessee requirements for 10-Year Solid Waste Plans, and Mayor Dean's Green Ribbon Committee.

Strategy development was performed in three steps:

STEP 1 **Moving to High Performance (75% diversion):** The High-Performance (HP) programs start with the high impact strategies that dramatically increase diversion. Mandates and landfill disposal bans are introduced with the HP programs to increase their impact and encourage private investment through the creation of new diversion markets. Landfill bans can motivate waste generators to recycle better and more thoroughly.

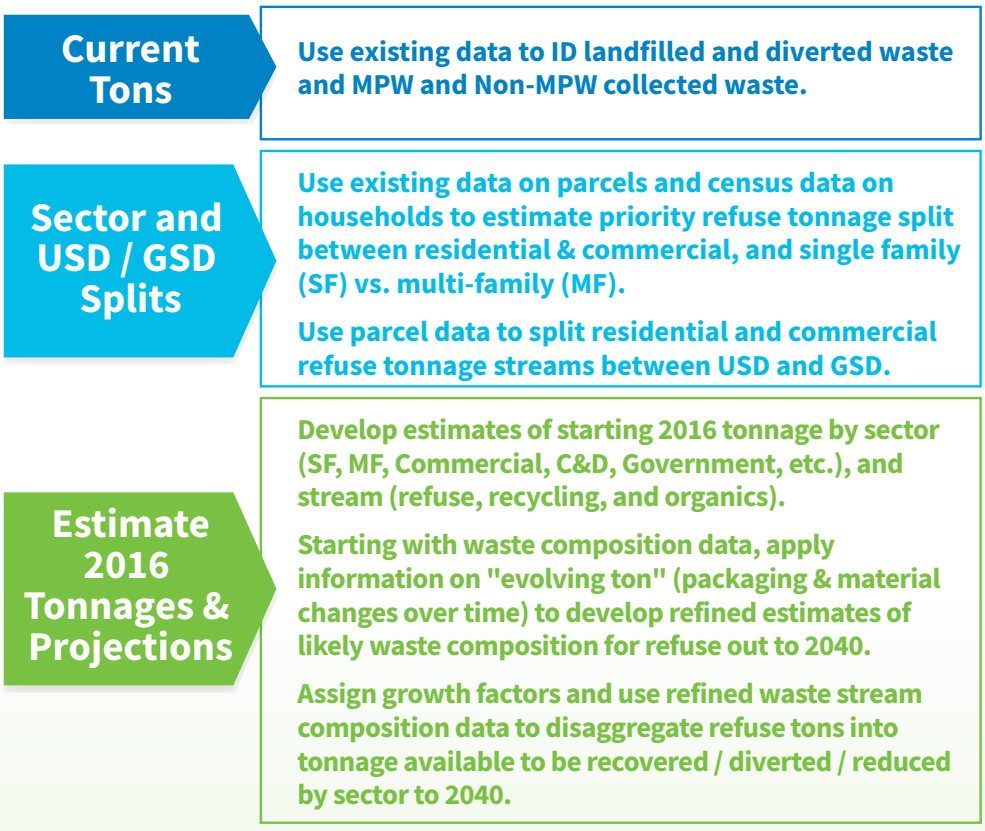
STEP 2 **Achieving Zero Waste (90+% diversion):** Cutting-edge strategies are needed to move beyond the HP level. Zero Waste (ZW) strategies focus on the "bigger stage" (regional market development and state level legislation) and involve cooperative agreements among multiple parties.

STEP 3 **Build-Up of Supporting Infrastructure:** The HP and ZW strategies of Steps 1 and 2 will divert large quantities of materials away from landfilling toward facilities that will provide composting, recycling, and C&D waste processing. Diversion modeling was used to estimate infrastructure needs based on estimated diversion tonnages. Implementation scheduling of infrastructure was made based on the program phasing plan.

ESTIMATING TONNAGES

The first step in the diversion modeling work was to develop estimates of the tonnages available to divert for each sector. This task was challenging as there are numerous haulers and facilities involved in managing solid waste in Davidson County. The process for estimating tonnages is described in **Figure 6-1**. Calculations were performed to develop the "starting tonnage" 2016 values, allocated by sector, material, and district.

Figure 6-1: Steps for Estimating Tonnages by Sector, Material, and District



Landfilled and recovered tonnages for 2016 were divided by district and generator sector as shown in **Table 6-1** and input into the diversion model. The data indicate that C&D waste represents nearly a quarter of the total waste managed and is a large portion of the waste stream which represents a challenging sector from which to gain diversion.

Table 6-1: 2016 Tonnage Allocation Per Generator Sector

	USD			GSD			TOTAL GENERATED	% OF TOTAL TONS
Estimated Tons	**Landfilled**	**Recycled**	**Composted**	**Landfilled**	**Recycled**	**Composted**		
Single Family	126,900	15,000	27,600	74,700	5,700	300	250,200	16%
Multifamily	80,100	-	-	47,100	-	-	127,200	9%
Commercial	364,100	119,900	27,000	213,700	63,300	14,300	802,300	52%
C&D Waste	225,900	2,000	-	124,200	1,100	-	353,200	23%
Total	797,000	136,900	54,600	459,700	70,100	4,600	1,532,900	100%
Percent	52%	8%	4%	30%	5%	1%	100%	

EVOLVING TON COMPUTATIONS

The composition of MSW has changed dramatically over time and will continue to do so. Information on trends in packaging materials was used to forecast compositional changes[1] and refined using the results of the waste composition study described in **Section 3**. A 1% growth factor was applied to the percentages shown for each material based on the information from the NashvilleNext Plan. The refinements include

- Plastic has increased more than 55% since the early 1990s, and will most likely continue at a similar rate
- Food has increased by 18% since the early 1990s (with recent slowing), but this sector was expected to increase, barring substantial changes in food recovery.[2]
- Metals have been increasing and modest upward trend is expected
- Paper has decreased by 21% since the early 1990s, and a continued declining trend is anticipated
- Glass use has decreased by 30% and a continuing decline is expected

1 *SERA data and research*

2 *Note that a food recovery program is included in the Zero Waste strategies outlined in Chapter 7.*

SELECTING THE HIGH-PERFORMANCE STRATEGIES

Following a rigorous screening process, more than 40 programs were selected and organized into three groupings—conservative, moderate, and aggressive—to model what can be accomplished with minimal change to the existing system, and what it will take to reach the High-Performance level (**Figure 6-2**).

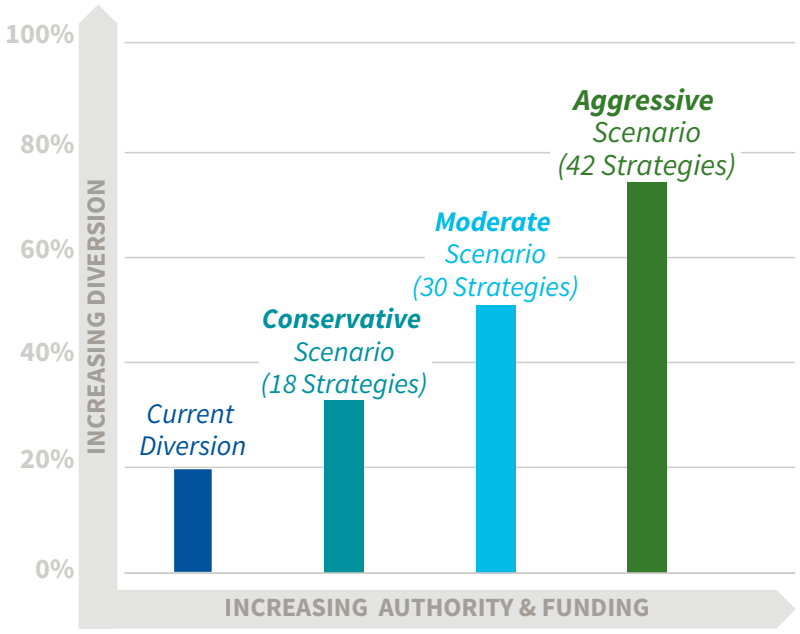
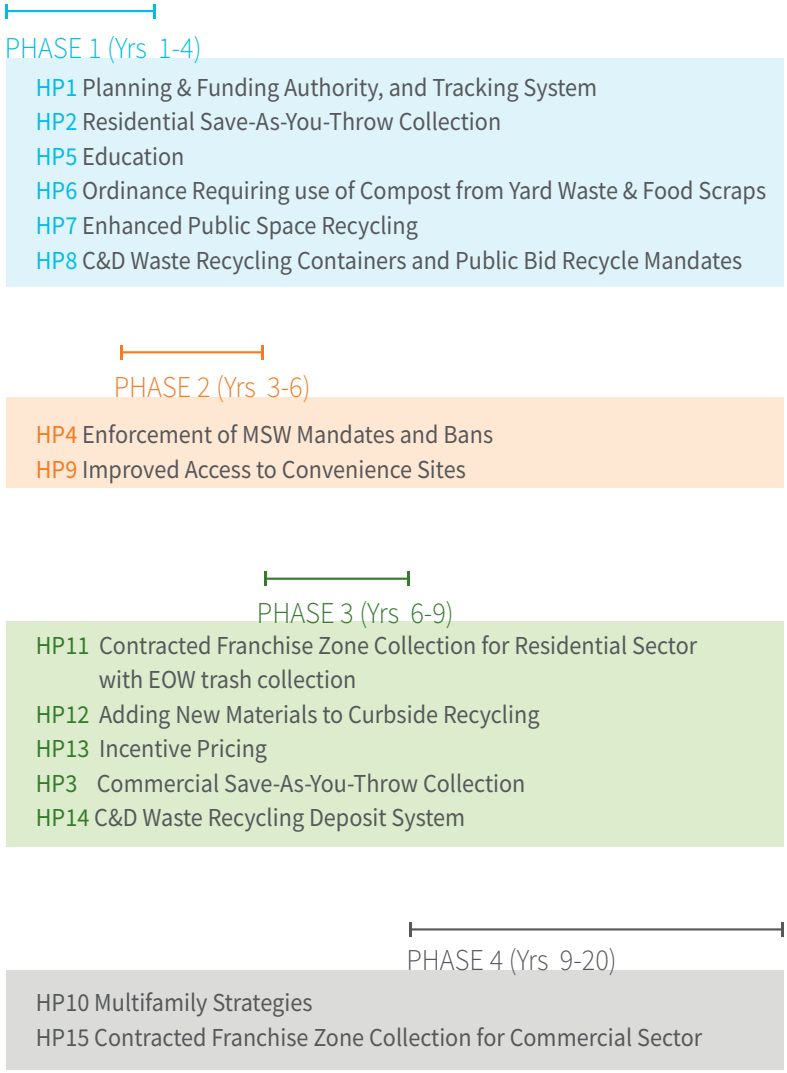


Figure 6-2: Diversion Estimates for Conservative, Moderate, and Aggressive Approaches

The aggressive scenario includes all the HP strategies while the moderate and conservative scenarios omit specific strategies that are more difficult to implement. Note that only the aggressive scenario achieves the HP goal of 75% diversion. A more detailed discussion of the HP strategies included in each scenario is provided in **Appendix F, paragraph F.4**.

As anticipated, the analysis shows that major changes are needed to reach 75% diversion. Implementing these programs must occur over phases (**Figure 6-3**) to provide adequate time to establish new infrastructure.

Figure 6-3: Phased Implementation of Diversion Strategies Example Plan

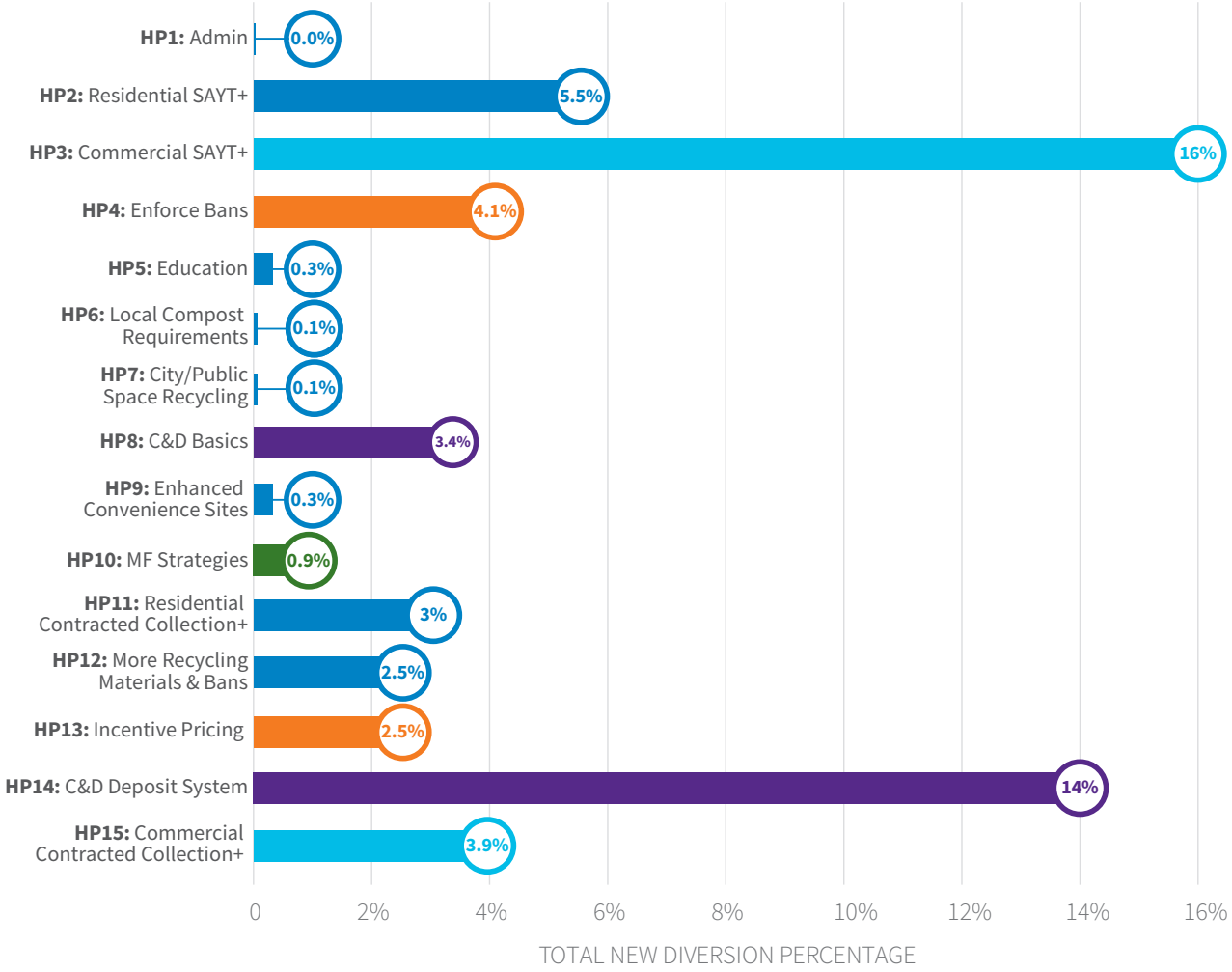


Given the significant changes required to reach the Plan's diversion goals, an extended schedule that allows for a more gradual implementation is provided in **Section 13**.

MODEL RESULTS FOR THE HP STRATEGY GROUPS

Forty-two programs were modeled and packaged into 15 High-Performance Strategy Groups (HP1-HP15). Together, these strategy groups are expected to divert approximately 60% more materials than are currently diverted. **Figure 6-4** shows the diversion contribution of each of the High-Performance Strategy Groups.

Figure 6.4: Estimated Diversion Percentages for High Performance Strategy Groups



Two of the groups, showing very high diversion rates, warrant special attention in the program:

- HP3 Commercial Sector Save-As-You-Throw (SAYT) Collection
- HP14 C&D Waste Recycling Deposit System

Most of the other groups affect the residential sector. The multi-family group (HP10) is expected to be a relatively small contributor. Other groups that provide lower levels of diversion are relevant because residential programs are multi-faceted. These strategy groups also provide diversification to the overall program.

The High-Performance Strategy Groups are described below:

HP1 PLANNING AND FUNDING AUTHORITY, AND TRACKING SYSTEM

Planning and Funding Authority: The service, oversight, planning, enforcement, and funding authority to move the system forward is critical to the success of nearly all the programs.

Tracking System: An effective tonnage and program data collection system is essential for monitoring program performance and the progress toward zero waste.

HP2 SAYT COLLECTION FOR RESIDENTIAL SECTOR

Trash, Recycling, and Yard/Food Waste service with SAYT incentive rates and embedded program fees is a core program in the High-Performance portfolio. There are Save-As-You-Throw programs in more than 10,000 communities nationwide, and SAYT has been adopted by nearly all communities with Zero Waste goals.

In coordination with a Food Scrap Ban, each household receives two large bins, one for recycling and the other for diverting yard waste and food scraps. Each household then selects a third bin for trash, with the size decided by households. Smaller trash bins cost less than larger trash bins, and the price incentive is sufficient to encourage households to recycle, compost, and source reduce more.[3]

3 *Based on SERA's published statistical work (Skumatz and Freeman, "Pay As You Throw (PAYT) in the US: 2006 Update and Analyses", 12/2006, Prepared for US EPA OSW and SERA, Superior, CO, https://archive.epa.gov/wastes/conserve/tools/payt/web/pdf/sera06.pdf), this incentive should be 50%-80% more costly for the 2nd can (twice the service) as the 30 gallon container, and that same dollar differential for each additional 30 gallons. Higher incentives can certainly be provided, but 50% is the minimum that the statistical analysis shows changes behavior, and 80% achieves nearly as strong a recycling amount as programs charging 100% more (double, or "a can is a can"), and results in somewhat less revenue risk than 80% premium levels. Mature programs may elect to charge more as risks are better known. Mini- and micro-cans may make sense as the recycling and organics programs mature. Illegal dumping and other effects are also discussed in Skumatz and Freeman, "Illegal Dumping and Pay As You Throw: Should You Be Worried?", Recycle Florida Newsletter, December 2010.*

The recommended collection frequency is every other week (EOW) for recycling[4] and trash collection[5] and weekly for organics collection.[6] The cost for the recycling and composting collection are recovered through the trash rates, so trash plus recycling and organics is not more expensive than trash alone.[7]

HP3 SAYT COLLECTION FOR COMMERCIAL SECTOR WITH SUPPORTING LAWS AND STRATEGIES

The most significant barrier to recycling in the commercial sector is that trash plus recycling costs more than trash alone, harming the business case for recycling. The SAYT strategy changes the economics and brings the service and incentives in line with those of the residential SAYT program. Recycling and food scraps collection service is provided to all businesses, and the cost is embedded in the trash bill.

A new law to drive diversion in the commercial sector is the "ABC" law; all businesses serving liquor must have a recycling program for beverage containers or risk losing their liquor license. Utilization of the ABC law to drive diversion at businesses that serve liquor would require implementation at the state level; however, on the local level the Metropolitan Beer Permit Board Rules and Regulations could be updated to require businesses with beer permits to have a recycling program. The HP3 strategy group also includes programs designed explicitly for small businesses and schools, including ordinances that require, recycling plans, web information and hotlines, recognition programs, grants for bins, space for recycling bins and other initiatives.

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4 Detailed statistical research shows that every other week (EOW) recycling delivers only 1-3 percentage points less tonnage but decreases the cost of collection by 40%. This means that these last 1-3 percentage cost almost as much as the first 10-15 percentage points that a curbside program delivers. It would be half the cost (because half the visits and staffing) except the majority of tons is retained, the container is still purchased, and administrative costs remain. These last 1-3 percentage points are very expensive marginal tons. Given that the cost of "getting the truck to the door" – is commonly 80% or more of the cost of service – regardless of what material is collected. Therefore, it is far more effective to use that "stop" to collect an entirely new material stream (organics) that can potentially divert 20% or more, than waste the stop on 1-3 percentage points. Weekly organics collection is effective at removing putrescibles on a weekly basis. Coupled with EOW trash, it tends to help drive the organics out of the less-frequently-collected trash into the more-frequently collected / convenient organics bin. This set of analytical results represent the underpinnings of our recommendation for the residential sector. The source for this statistical research is Skumatz, "Nationwide Diversion Rate Study: Quantitative Effects of Program Choices on Recycling and Green Waste Diversion", – prepared for Reason Foundation and others, Los Angeles, CA, 1996 (https://reason.org/policy-study/nationwide-diversion-rate-study) and additional corroborating SERA statistical analyses through 2015. See also Skumatz, "Every Other Week for Everything", Resource Recycling, 11/2013 and Skumatz "Alternating Weeks: options and opportunities for garbage and recycling. Can every other week provide greater efficiencies and incentives for the future?", Resource Recycling, September 2007.

5 Skumatz, "National Overview: Food Scraps Programs in the United States", Biocycle, July 2011 and "Overcoming Barriers: Accelerating Implementation of Food Scraps Programs", Biocycle, August 2011

6 The program should allow those customers that need more than one recycling bin to have one (recommended collection frequency is every other week). That unlimited service is not expected for yard waste service; one large bin, weekly is the expected service

7 The program should allow those customers that need more than one recycling bin to have one (recommended collection frequency is every other week). That unlimited service is not expected for yard waste service; one large bin, weekly is the expected service.

HP4 ENFORCEMENT OF MANDATES AND BANS

Mandates and bans are needed to achieve 75% diversion as they provide the motivation that drives increased participation. Metro already has some bans in place, including yard waste, electronics, cardboard, and C&D waste (residents only). The HP4 strategy helps these bans realize their potential by adding stronger enforcement. Appendix F provides additional information on the enforcement components of this strategy. The most important modification associated with this strategy is the introduction of a food scraps landfilling ban as food scraps are the largest single item remaining in the waste stream. The second modification is to make recycling mandatory for all of Davidson County, including residential and commercial sectors. Recycling also should be required at all construction sites with responsibilities, enforcement, and escalating penalties specifically stated.

HP5 EDUCATION

Education is an essential element of the Plan. A well-designed, targeted education program will inform and encourage increased use of diversion alternatives and waste reduction measures while discouraging disposal. Outreach will be conducted using a range of communication methods, including radio, newspaper, newsletters, web, and social media. Partnerships will be needed to provide effective outreach to businesses, (e.g., chamber of commerce, Metro business or licensing departments, the Building Permit Division, and others) and schools (e.g., Metro Nashville Public Schools, local universities and colleges).

HP6 SUPPORT FOR COMPOST MADE FROM YARD WASTE AND FOOD SCRAPS

The intent of this strategy is creating demand for recovered materials compost, improving the economics of collection, and processing yard waste and food scraps. First, landscapers are required to bring organics materials to composting facilities. Secondly, new ordinances and mayoral directives will require recovered materials compost be used for building and roadway construction projects in Davidson County.

HP7 ENHANCED PUBLIC SPACE RECYCLING

This strategy sends the message to the public that Metro Nashville is committed to recycling. MPW will support efforts by Metro Parks and Recreation to install or improve paired trash and recycling bins with restrictive lids and effective signage at parks and other public spaces. Metro Nashville will also institute requirements that events

renting public spaces must comply with separation and recycling requirements. Also, the City will expand/update the recycling programs in its buildings and events to include well-signed three-stream containers and appropriate education for workers and custodial staff.

HP8 C&D WASTE DIVERSION

By ordinance, haulers providing trash service to a construction or demolition job site must provide a designated container for recyclables that is at least half the size of the trash container. Container signage identifying suitable materials must be provided.

As a second element, public bids should include requirements for recycling and reuse of site-generated materials or offer evaluation points for bidders committing to high levels of reuse and recycling.

HP9 EXPAND NUMBER OF CONVENIENCE SITES

Convenience center sites offer a vital diversion option for residents in more rural areas, as well as for residents in multi-family buildings that may have more limited access to service. This strategy identifies areas of Davidson County that are farther from current convenience centers and identifies potential siting locations. After exploring markets, identify locations for convenience sites to collect specialized materials that cannot be collected curbside (separated glass colors, etc.).

HP10 MULTIFAMILY STRATEGIES

Unlike the single-family sector, residents living in multi-family (MF) buildings do not generally have access to convenient recycling programs, nor do they have effective incentives to divert materials from their trash cans. The multi-family sector is a challenge in nearly all aspects—outreach, participation, turnover, bin space (in-unit and building), anonymity, contamination, and other issues. A lesson learned from the City of Austin is that there is not a one-size-fits-all strategy for the multi-family sector because it is large, diverse, and decentralized. Successful multi-family programs have been difficult to develop in even leading Zero Waste communities.

This strategy includes testing pilot ideas and rolling out successful models more widely. One way to identify strategies that may succeed locally, is to establish a proposal-based grant program for ideas that will increase recycling in large multi-family buildings (>75 units). The grant program will be an incubator for strategies that might work countywide.

HP11 AND HP15 CONTRACTED FRANCHISE ZONE COLLECTIONS

Introducing contracted franchise zones for collection will increase diverted tonnages by providing unified control of collection at greater economies of scale. This strategy eliminates the routing of multiple haulers operating on the same streets, reducing inefficiencies, road wear, noise, and emissions. Contracted franchise zone collections also allow for the introduction of critical elements of the Plan such as SAYT and EOW trash collection for households and businesses. It is proven that if trash is collected less frequently than recycling and organics, waste generators will divert much larger shares of their recyclables and food scraps. Also, on the residential side, enhanced recycling incentives are provided through higher SAYT price incentives and smaller bins.

HP12 ADDING NEW MATERIALS TO THE RECYCLING PROGRAM

New materials will need to be added to the recycling program and coordinated with bans to encourage diversion of these materials. In particular, the High-Performance goal cannot be met without adding textiles (representing 5-6% of disposal) and glass (representing 4-5%). New materials would be taken to designated collection sites rather than be added to the curbside program to avoid contamination of existing curbside materials.

HP13 INCENTIVE PRICING

Metro currently applies $6/ton on MSW and $2/cubic yard on C&D waste surcharges to landfilled materials. In this strategy, existing surcharges will be significantly increased and/or fee reductions applied to recycled and source-separated organic materials. These types of surcharges and incentive pricing change the economics of diversion and can be enough to change waste generator behavior.

HP14 C&D WASTE RECYCLING DEPOSIT SYSTEM

The very high tonnages of C&D waste generated due to the booming development represent a priority waste stream. This program is intended to follow the HP8 strategies described earlier in this section. Under a C&D Waste Recycling Deposit System, developers filing for a construction permit must make a financial deposit that can be reclaimed when they provide documentation that they recycled or reused a prescribed amount of the C&D waste generated on-site. Many communities using a deposit system have established a 50% recycling goal. Handling that much C&D material will require a significant

increase in Davidson County's existing processing capacity, making them among the highest priority for new facilities in the Plan. A C&D waste ban should be implemented to support the deposit system.

Diversion in Davidson County can reach 65% by implementing the top four recommended programs while maintaining a baseline diversion of 18%.

Section 7

GOING BEYOND HIGH PERFORMANCE TO ZERO WASTE

Why develop strategies to go beyond 75% diversion? Simply put, even after 75% diversion, there are still many valuable resources going to the landfill that could be given an extended life in the local economy. Zero Waste is a change in mindset—recyclables are what we once kept out of the trash. As Davidson County advances along the path toward Zero Waste, it will be transforming from a community focused on waste management to one focused on materials resource management and the formation of a sustainable market economy.

One of the most essential concepts of the Zero Waste philosophy is the promotion of a circular economy, which encourages keeping resources in use for as long as possible to extract their maximum value. A local community can create a circular economy around the waste discards of residents and businesses through economic development based on the principles of sustainable materials management.

Sustainable Materials Management (SMM) provides a coherent framework for pursuing the elusive waste management hierarchy of 'reduce, reuse and then recycle.' Waste Management is a linear path to final disposal while SMM leads to a circular economy that supports domestic reuse and recycling infrastructure, local jobs, and sustainable clean feedstock for remanufacturing. Beyond the traditional recycling measures, SMM supports the highest and best use principles that bring us back to the basic three R's: Reduce, then Reuse, then Recycle.

MPW VISION AND MISSION

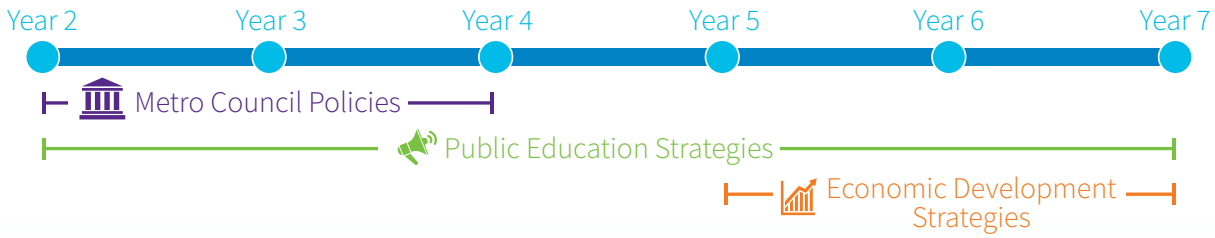
An organization's vision and mission should lead its staff and funding priorities in a direction to support the organization's goals. As Zero Waste is the adopted goal of Metro, then it follows that MPW should select supporting vision and mission statements. Also, the Zero Waste mission and vision can be supported by the following strategies:

- Adopt the Highest and Best Use Hierarchy and incorporate its principles in department practices and all collection programs.
- Adopt the SMM framework where applicable, including the management of materials generated and recovered for secondary reuse, recycling, or compost.

ZERO WASTE STRATEGIES

The following strategies were used in Zero Waste model cities and included in the Plan based on their proven effectiveness. **Appendix G, Going Beyond High Performance to Zero Waste** provides a more detailed discussion along with case studies that illustrate how these strategies were implemented in various municipalities. The strategy descriptions include an explanation of the strategic goals, actions to implement the strategies, potential challenges, financial impact, and diversion impact.

If Davidson County implemented all the strategies in this Plan then Davidson County would, in theory, reach Zero Waste—90+% diversion. The Zero Waste (ZW) strategy recommendations include the following categories: **Metro Council Policies, Public Education Strategies, and Economic Development Strategies**. These policies, which may consist of ordinances, incentives, bans, take-backs, purchasing specifications, and advocacy, are discussed below in no order of importance.



METRO COUNCIL POLICIES (YEARS 2-4)

METRO POLICY	STRATEGY GOAL	METRO ACTION PLAN
ZW1: Enhance Metro Green Procurement practices that support buying recycled content and minimizing waste	Implement changes in the Metro Green Procurement processes to encourage buying recycled content, minimize waste, and support reuse of discarded office equipment.	Review Metro purchasing practices and establish an Environmentally Preferable Product (EPP) procurement program for electronics and office supplies. Establish office furniture reuse, surplus disposition and related policies. Give preference to vendors that prioritize waste reduction and recycling.
ZW2: Net Zero / Sustainability Ordinance	Require Metro departments to prevent waste, maximize recycling, maximize energy and water efficiency, and appoint a Net Zero Coordinator for each major department.	Require Metro departments to develop an Action Plan that provides waste reduction, recycling and composting goals, administered through the Mayor's Office of Transportation and Sustainability.
ZW3: Collaboration with local communities toward regional zero waste support	Enter into working agreements with surrounding local governments, universities, school systems, and state/ federal facilities to coordinate education and social media messaging in a consistent manner to local citizens.	Develop and implement interlocal agreements with adjoining communities to create a regional zero waste education effort in the greater Nashville media market and regional school systems.
ZW4: Metro Government Construction Recycled Content Ordinance	To promote diversion from landfilling of material generated on Metro contracted construction sites.	Develop recycled content requirements for construction materials.
ZW5: Deconstruction and Reuse of C&D Waste Ordinance (expansion)	Establish a building code ordinance requiring deconstruction, repair, reuse and/or recycling of valuable materials before demolition permits are awarded.	Develop and implement new building codes requiring deconstruction, reuse and/or recycling of valuable materials before demolition permits are awarded.
ZW6: Special Events and Festivals Zero Waste Ordinance	To provide the public with diversion opportunities at public events and festivals and enhance zero waste awareness that will translate to better recycling habits at the home and office.	Require public special events and festivals that currently require a Metro permit to achieve sustainability standards such as providing recycling and organics collection, regulating vendor food service-ware and collateral, reducing litter, and other means to increase diversion toward making it a Zero Waste event.
ZW7: Surplus Food Rescue and Re-distribution Ordinance	Find ways to rescue surplus food for consumption rather than disposal.	Develop and implement an ordinance that supports a food scrap capture program based on the research supported by the NRDC study Modeling the Potential to Increase Food Rescue.
ZW8: Recycling/Organics Collection Compliance and Contamination Ordinance	Develop and implement enforcement procedures and rules to support universal implementation of mandatory recycling and organics collection.	Enforcement provisions regarding requirements for recycling and organics collection. Perform frequent route monitoring for participation and contamination.
ZW9: Extended Producer Responsibility Resolution	Adopt an Extended Producer Responsibility (EPR) resolution to capture difficult-to-divert materials (e.g. chemicals, carpet, paint, sharps, etc.).	EPR makes producers financially and/ or physically responsible for sustainable management of their products in the post-consumer phase.

PUBLIC EDUCATION STRATEGIES (YEARS 2-7)

PUBLIC EDUCATION STRATEGY	STRATEGY GOAL	METRO ACTION PLAN
ZW10: Multi-Year Public Education Campaign	Achieve higher participation, higher capture rate, and stronger bond to zero waste brand by reaching those not engaged in diversion programs.	Develop and implement a multi-year public education campaign. This strategy should roll-out with the food waste ban and the SAYT collection program.
ZW11: Promote "Reduce, Reuse and Repair" as a priority	Adopt "Reduce, Reuse and Repair" as a priority message, incorporating the best use hierarchy principles of Zero Waste.	Offer grants to promote establishment of reuse businesses (e.g. mattress recycling, electronics disassembly and fix-it clinics).
ZW12: Develop a brand for Metro Public Works Waste and Recycling Operations	Adopt a new title and brand that reflects Metro's commitment to Zero Waste principles.	Adopt a name change from waste management to a resource recovery that will be displayed on vehicles, carts, publications, outreach materials, Metro code references and Metro communications.
ZW13: Rebrand the collection programs through color identification	Utilize new color-coding to reduce contamination levels and as a form of zero waste messaging.	Color coding equipment and containers reduces confusion regarding which bin to place an item, thus increasing diversion and lowering contamination.

ECONOMIC DEVELOPMENT STRATEGIES (YEARS 5-6)

Economic development initiatives can increase diversion through the creation of new programs facilities and public/private partnerships. Implementation of strategy ZW16 will be prioritized for years 2-4 to maximize the benefit of a new three-year grant (current grant ends in 2020) utilized to fund the Tennessee Materials Marketplace.

PUBLIC EDUCATION STRATEGY	STRATEGY GOAL	METRO ACTION PLAN
ZW14: Use local economic development tools for support of Zero Waste diversion goals	Bring new recycling and reuse industries to Davidson County.	Create a new job position to promote recycling and reuse within the framework of the Mayor's Office of Economic and Community Development and regional collaboration through the Greater Nashville Regional Council.
ZW15: Support local Zero Waste businesses	Encourage local businesses to support Zero Waste in their business practices.	Develop and implement cooperative agreements with local businesses to create a regional business incentive package to support Zero Waste initiatives.
ZW16: Support of the Tennessee Materials Marketplace	Increase the size of the marketplace and its users.	Offer grants to develop new local reuse and recycling opportunities for inclusion in the Tennessee Materials Marketplace.
ZW17: Support of Research and Development	Development of new strategies that lower costs and increase waste reduction, reuse and recycling.	Working with local universities, encourage student research projects that study and recommend new waste reduction, reuse, and recycling strategies.
ZW18: Development and support of Eco-Industrial Park	Develop an industrial park to host companies that reprocess locally generated materials and create local green jobs with living wages.	Provide a site for an eco-industrial park to host companies that reprocess locally generated waste materials, and in regional collaboration through the Greater Nashville Regional Council.

Table 7-1: Implementation Timeline and Diversion Summary

Total Generation = 1,710,208 in 2027
Above 75% Target = 256,531 in 2027 when programs are fully implemented

Aggressive Approach Strategies

Zero Waste Above 75% Strategy	Above 75% Strategy	Approach Conservative, Moderate, Aggressive	Initial Year of Implementation	Government	Residential	Multi-Family	Commercial, Industrial, Institutional	Total Waste Stream Diversion Potential
ZW1-City Govt Ord	City Procurement Ord	C/M/A	1	-	-	-	-	-
ZW2-City Govt Ord	Net Zero Ord & Practices	C/M/A	1	-	-	-	-	-
ZW3-City Govt Ord	Regional Collaboration Ord	M/A	1	-	-	-	-	-
ZW4-City Govt Ord	Govt Const Ord & Policies	M/A	2	40,000	-	-	-	40,000
ZW5-City Govt Ord	Deconstruction / Reuse Ord	M/A	2	-	-	-	1,000	1,000
ZW6-City Govt Ord	Special Events Ord	C/M/A	2	1,000	-	-	-	1,000
ZW7-City Govt Ord	Food Scrap Redistribution Ord	A	2	500	-	-	2,000	2,500
ZW8-City Govt Ord	Recycling/Org Compliance Ord	M/A	3	-	32,500	25,000	20,000	77,500
ZW9-City Govt Ord	EPR Ord & Policies	A	3	1,000	-	-	-	1,000
ZW10-Education	Public Educ / Social Media	C/M/A	6		6,000	4,000		10,000
ZW11-Education	Reduce / Reuse / Repair	C/M/A	2		2,500	1,500		4,000
ZW12 Education	New Brand for Waste & Recycling	C/M/A	2					-
ZW13 Education	Color Rebranding	C/M/A	2					-
ZW14- Econ Dev	Econ Dev Tools	A	4				10,000	10,000
ZW15- Econ Dev	Support ZW Businesses	A	4				1,000	1,000
ZW16-Econ Dev	Materials Marketplace	A	4				36,000	36,000
ZW17-Econ Dev	R&D in Technologies	A	4				-	-
ZW18- Econ Dev	Remanufacturing Hub	A	5				80,000	80,000
Totals:				42,500	41,000	30,500	150,000	264,000

	Baseline Diversion	High Performance Diversion	Above 75% Diversion	Total Diversion
High Performance and Above 75% Strategies: Aggressive	304,700	969,300	264,000	1,538,000
	18%	57%	15%	90%
High Performance Strategies: Moderate	304,700	549,500	89,750	943,950
	18%	32%	5%	55%
High Performance Strategies: Conservative	304,700	286,000	10,000	600,700
	18%	17%	1%	35%

Section 8

MATERIALS MANAGEMENT INFRASTRUCTURE

Implementing the diversion strategies proposed in this Plan will shift infrastructure needs away from transfer stations and regional landfills and toward diversion related infrastructure such as recycling material recovery facilities (MRFs), C&D processing facilities, and composting/anaerobic digestion sites. As new diversion strategies are phased in, material quantities will eventually exceed the capacity of existing recycling and composting infrastructure. This capacity shortage prompts the need for more aggressive waste reduction policies in addition to expanding infrastructure capacity.

Davidson County's existing materials management infrastructure is predominantly addressed by transfer stations and landfills (over 80% of waste materials are disposed of in MSW and C&D landfills). Recycling and composting facilities in the area currently have excess capacity, but that is expected to be exceeded over the first ten years of the diversion planning period.

Comparison of additional diversion tonnage projections (**Table 8-1**) to the processing capacity of existing infrastructure shows a significant shortfall in Year 10—prompting a need for new diversion infrastructure as summarized in **Table 8-2**.

Table 8-1: Additional Processing Capacity Requirements for Diversion Strategies in Year 10

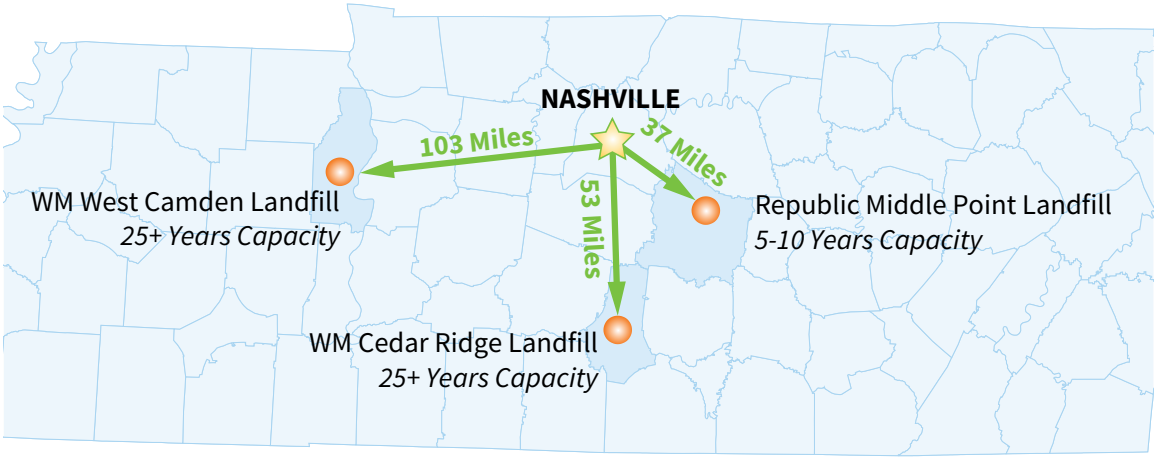
MODELING SCENARIO	SINGLE STREAM MRF (TONS)	FOOD WASTE COMPOSTING/ DIGESTION (TONS)	C&D DEBRIS RECOVERY (TONS)
Aggressive	368,000	207,100	298,600
Moderate	132,500	89,000	298,600
Conservative	109,600	89,000	58,600

Table 8-2: Additional Facility Requirements for Diversion Strategies in Year 10

MODELING SCENARIO	SINGLE STREAM MRF (EACH)	FOOD SCRAPS COMPOSTING OR ANAEROBIC FACILITY (EACH)	C&D DEBRIS RECOVERY FACILITY (EACH)
Aggressive	2	5	2
Moderate	1	2	2
Conservative	1	2	0

TRANSFER STATIONS AND LANDFILL FACILITIES

The existing transfer stations have adequate capacity to meet the long-term transfer needs of the area and, based on conversations with Republic and Waste Management representatives, they can operate indefinitely with proper maintenance and upkeep. For example, as part of their maintenance program, Republic resurfaces their tipping floor once every three years to prevent structural damage to the flooring.



Republic's Middle Point Landfill in Rutherford County receives the majority of MSW from Davidson County but is slated to close sometime in the next five to ten years. With no known plans for new landfills to be built in middle Tennessee, the remaining disposal options after Middle Point Landfill closes are two Waste Management landfills located in Marshall County and Benton County. Both landfills are located on large properties with ample space for expansion.

With Metro Nashville aggressively working to reduce reliance on landfills, this Plan does not include recommendations for any new or expanding landfills in Davidson County. Permitting new or expanding landfills would be inconsistent with the goals of the Plan.

Section 9

MANAGING THE REMAINDER

The amount of material that will remain after implementation of the recommended strategies and programs will vary depending upon which scenario or approach—aggressive, moderate, or conservative—is implemented. The aggressive scenario leaves less than 10% of the waste stream to be managed by other means. The moderate and conservative approaches leave more material to be landfilled or managed using alternative methods.

The results of the diversion modeling were used to estimate the amount of material remaining after the diversion programs have been fully-implemented (assumes Year 9 in the aggressive scenario), as provided in **Table 9-1**.

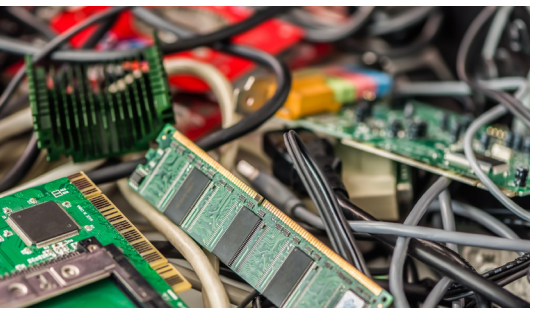
Table 9-1: Remaining Waste for Aggressive, Moderate, and Conservative Diversion Scenarios in Year 9

	AGGRESSIVE (TONS)	MODERATE (TONS)	CONSERVATIVE (TONS)
Total Waste Generated (2027)	1,710,208	1,710,208	1,710,208
Current Baseline Diversion (all sectors)	304,700	304,700	304,700
Additional Diversion from High Performance Programs			
Residential Diversion	214,500	169,600	153,000
Commercial Diversion (incl. C&D)	754,800	380,000	130,100
Total Additional High-Performance Diversion	*969,300*	*549,600*	*283,100*
Remaining Waste after New Programs	436,208	855,908	1,122,408
Zero Waste Program Diversion	264,000	89,750	10,000
Remaining Waste after New Diversion Programs	*172,208*	*766,158*	*1,112,408*
Total Percent Diversion	**90%**	**55%**	**35%**

Without employing the aggressive approach, Metro will continue to heavily rely on private MSW landfill and C&D landfill infrastructure to manage the growing waste stream.

After addressing the infrastructure required to process traditional recyclable materials, organics, and C&D material, the remaining materials in the waste stream must be managed. The materials listed below represent a few of the most difficult and/or most costly materials to manage:

- Household hazardous waste (HHW)
- Electronic waste
- Food-contaminated paper
- Biosolids
- Bulky wastes
- Tires
- Other materials without viable end-use markets



Sustainable management of these materials will require using existing and new facilities and alternative technologies—some of which have yet to be commercially developed. New technological investments will reduce reliance on out-of-county disposal for these materials and promote economic development within the region.

There are several private and Metro-owned facilities available to support managing difficult-to-divert materials. **Table 9-2** provides a summary of several disposal and processing outlets for remaining waste materials. A detailed discussion on the programs and facilities required to manage the remaining 10% of waste materials is provided in **Appendix I, Managing the Remainder**.

Table 9-2: Remaining Material Disposal/Processing Outlets

WASTE MATERIAL	CURRENT COLLECTION OR DISPOSAL FACILITY	LOCATION(S)	CURRENT PROCESSING FACILITY	PROGRAM EXPANSION OPTIONS	POTENTIAL OTHER OUTLETS
HHW	Convenience Centers	Ezell Pike Center & East Center	Clean Harbors Environmental Services	New center for West Nashville	New end-uses for oil-based paints
Electronic Waste	Convenience Centers (residential only)	Ezell Pike Center, East Center, & Omohundro Center	Dynamic Recycling, Inc.	Two new centers for West Nashville	EPR collection & recycling
MRF Residual	MSW Landfill	Middle Point, Cedar Ridge, and West Camden	N/A	Further sorting for marketable recyclables	Plastics to biofuels, fiber to composting
Biosolids	Class A pellets for agricultural land application and landfilling of Class B biosolids	Metro Water Services Central and Dry Creek Wastewater Facilities	Metro Water Biosolids Facility		100% production of Class A pellets for agricultural applications
Bulky Waste	MSW Landfill	Middle Point, Cedar Ridge, and West Camden	N/A	Further sorting for reuse and recycling opportunities	Plastics to biofuels, shredded wood to composting
Non-recycled material	MSW Landfill	Middle Point, Cedar Ridge, and West Camden	N/A	Further sorting for marketable recyclables	Product redesign and creation of new end-use markets
Tires	Convenience Centers and Liberty Tire Recycling Holdco, LLC	Ezell Pike, East Center, Omohundro, & Anderson Lane	Liberty Tire Recycling Holdco, LLC	Utilize existing centers and one new center for West Nashville	Grind/recycle; creation of new end-use markets

SUBTITLE D AND C&D LANDFILLS

As Metro advances towards its Zero Waste goal, Subtitle D and C&D landfills will serve a decreased role in the integrated solid waste management system. The Republic Middle Point Landfill (Rutherford County) and Waste Management's West Camden (Benton County) and Cedar Ridge (Marshall County) landfills are the Subtitle D facilities currently handling disposal of almost 900,000 tons of waste generated within Davidson County.

Waste Management's Southern Services C&D Landfill, located within Davidson County, accepts approximately 90% of Davidson County's landfilled C&D waste.

Estimates of remaining life for the Middle Point Landfill range from five to ten years based on industry volatility and rapid growth in the region, while Cedar Ridge and West Camden are estimated to have twelve years and more than twenty-five years of disposal capacity, respectively. The Southern Services C&D Landfill is projected to exhaust its disposal capacity within five years.

The availability of long-term landfill disposal capacity for managing materials remaining after 90% diversion will depend on the West Camden Landfill. Since this landfill is almost 100 miles away from Nashville, Metro should continuously evaluate new programs and end markets to minimize the amount of materials where landfills are the last management option.

Furthermore, with Metro Nashville aggressively working to reduce reliance on landfills, this Plan does not include recommendations for any new or expanding landfills in Davidson County. Permitting new or expanding landfills would be inconsistent with the goals of the Plan.

CONVENIENCE CENTER SITES

Because all recyclable, reusable, or compostable materials are not collected curbside, convenience centers will play an essential role in implementing the Plan. These facilities offer residents access to collection/drop-off services for materials not picked-up at their locations. The addition of new convenience centers will provide staffed and secured facilities where residents will be able to properly dispose of HHW, electronic waste, tires, and other waste materials not captured through other Plan strategies.

BENEFICIAL USE OF BIOSOLIDS

Wastewater treatment plant operators are increasingly viewing their residuals as a resource—a product that can be beneficially reused rather than being disposed of at a landfill. Dewatered biosolids meeting Class B standards can be used as a feedstock for composting and fertilizer-manufacturing operations, or it can be directly applied at permitted land application sites as a soil amendment. Treated biosolids, such as dried and pelletized biosolids meeting Class A standards, can be used in agriculture, and they can also be sold or given away to the general public for use in lawns and gardens.

Metro Water Services (MWS) manages the treatment and disposal of sludge from the wastewater treatment plants using anaerobic digestion (AD). MWS currently operates a biosolids facility at the Central Wastewater Treatment Plant, which produces dried Class A fertilizer pellets; and a biosolids facility at the Dry Creek Wastewater Treatment Plant that produces Class B biosolids that are currently landfilled. A key infrastructure requirement of the Plan is using AD either as co-digestion at an existing wastewater treatment plant or creation of a standalone facility to process increased amounts of diverted food waste.

MIXED WASTE PROCESSING (MWP) FACILITY

MWP facilities are generally considered ineffective and unsuitable as a stand-alone system for achieving recycling and diversion goals. MWP facilities may present many challenges including operational yield (i.e., recovery), quality end products, commodity prices, costs, and available feedstock.

Even though MWP facilities as primary recycling operations have not proven to be successful, the technology can be employed as a secondary (post-recycling) approach used to capture remaining recyclable or recoverable materials. Using MWP facilities is discussed solely as a potential technology that could be introduced by a private developer to manage the materials remaining in the waste stream after the recommended high-performance diversion strategies are implemented.

TIRE RECYCLING

Metro's tire program currently manages approximately 7,500 tons of tires annually. Most tires are provided by private companies like Walmart and Firestone, with a small amount received at the convenience center sites. Metro contracts with Liberty Tire Recycling to process the tires into a variety of useful products such as crumb rubber, rubber mulch, tire-derived fuel, tire-derived aggregate, and rubberized asphalt. TDEC provides assistance grants to counties to support beneficial reuse for waste tires.

Continued utilization of companies that process scrap tires into beneficial products is considered an integral part of the Plan. Metro will also continue to support state-level efforts to develop scrap tire recycling and beneficial use end markets.

DEVELOP NEW END-USE MARKETS/FACILITIES

Identifying and understanding the secondary materials markets that exist for diverted materials is critical to achieving the Plan's diversion goals. As a rule, the secondary materials markets follow the global, regional, and local fluctuations of their corresponding primary materials markets with respect to demand and pricing. Local governments that own and/or operate recycling and diversion facilities in this marketplace must be prepared to produce high-quality secondary materials. In addition, their systems must be able to weather declines in commodity prices, store unmarketable products temporarily, and economically ship materials to buyers who are often located overseas.

Given the current export restrictions on recyclables, it is important to utilize economic development initiatives to develop local end-markets for collected recyclables and compostables. Economic development initiatives will create new program facilities, public/private partnerships, local green jobs, and a reduction in the carbon-footprint.

To develop local end-markets for diverted materials, MPW should partner with the Mayor's Office of Economic & Community Development to develop and implement new economic development strategies.

Section 10

TRIPLE BOTTOM LINE

A detailed analysis of the direct financial effects of the high performing strategies to both Metro and the residential and commercial generators is provided in **Sections 6** and **7**. However, financial effects represent only part of a comprehensive analysis of environmental strategies such as solid waste management and its broader effects. This section assesses the Triple Bottom Line (TBL)—Economic, Environmental, and Social—impacts of the Metro solid waste program recommendations to communicate the true overall investment cost-benefit analysis. The quantitative elements of the economic, environmental, and social elements of the TBL were estimated by Skumatz Economic Research Associates (SERA) utilizing their Waste Diversion Analysis Model (WDAM) and EPA's Waste Reduction Model (WaRM). Additional social effects were provided by Wilmot, Inc.

Using TBL to inform assessment and decision-making in leading communities is growing; however, our interviews with communities nationally show most TBL analyses include quantified information on financial / economic, and environmental results, but only qualitative information for the social analysis since this component is much harder to quantify.[1] Social factors can arguably be very important for consideration by public entities. The societal impacts

1 A SERA review of the TBL reports from a number of leading communities finds their analysis doesn't include analysis of the social elements or includes non-quantified discussions of the social effects. Some of the social impacts include social justice, health and safety, and quality of life impacts such as noise, odor, and employment. The few TBL analyses that have dollar amounts relate to health impacts and are part of transportation projects, energy utilities, and some sewer projects, but almost never solid waste projects or programs.

are more difficult to quantify, because the impacts are varied, project- and neighborhood-specific, and often represent "hard to measure" effects that defy easy categorization into transferable "multipliers." The analysis attempted to quantify these effects because when qualitative information is considered with quantitative information in a benefit-cost equation, the "qualitative" is treated as zero, leading to biased decision-making and investment.

TBL ELEMENTS INCLUDED IN THE ANALYSIS

The TBL analysis conducted for this Plan includes the effects listed in **Table 10-1**. The analysis also constructed the relevant benefit-cost ratios and conducted a "breakeven analysis," identifying the minimum level of "hard to measure" effects needed for a positive benefit-cost ratio.[2]

Table 10-1: TBL Effects Analyzed

	MEASUREMENT METHOD	ECONOMIC	ENVIRONMENTAL	SOCIAL
Emissions impacts from recycling & composting vs. landfill (health, social damage)	WDAM & WaRM models & social cost of carbon valuations		✓	✓
Emissions from truck vehicle miles traveled (VMT) changes	WDAM & WaRM models & social cost of carbon valuations		✓	✓
Street damage from truck VMT changes	SERA factors from literature	✓		✓
Program costs to Metro	WDAM model	✓		
Tipping fee differences	WDAM model	✓		
Economic activity and jobs creation; monetization of labor income & output	IMPLAN – third party input-output model	✓		✓
Impacts on generators and Metro	WDAM Model	✓		
Other societal effects	Interviews / case studies by Wilmot, Inc.			✓

2 *For which the research from one community can be applied elsewhere without new, original, expensive, tailored research*

TBL RESULTS

The inclusion of financial as well as environmental and social benefits and costs in a TBL analysis of the recommended strategies provides a complete picture of the Plan's value. Based solely on financial costs, an evaluation of re-structuring a solid waste system compared to keeping the status quo will almost always result in the existing system being the least expensive option. The advantage of using TBL modeling is incorporating benefits into the model in a way that can communicate a true overall analysis of the costs and benefits to the public or private sector stakeholders. The TBL calculations and quantitative results presented in **Appendix J** focus on the changes from the status quo current system for solid waste management in the Metro area—the changes represented by the recommended programs and policies.

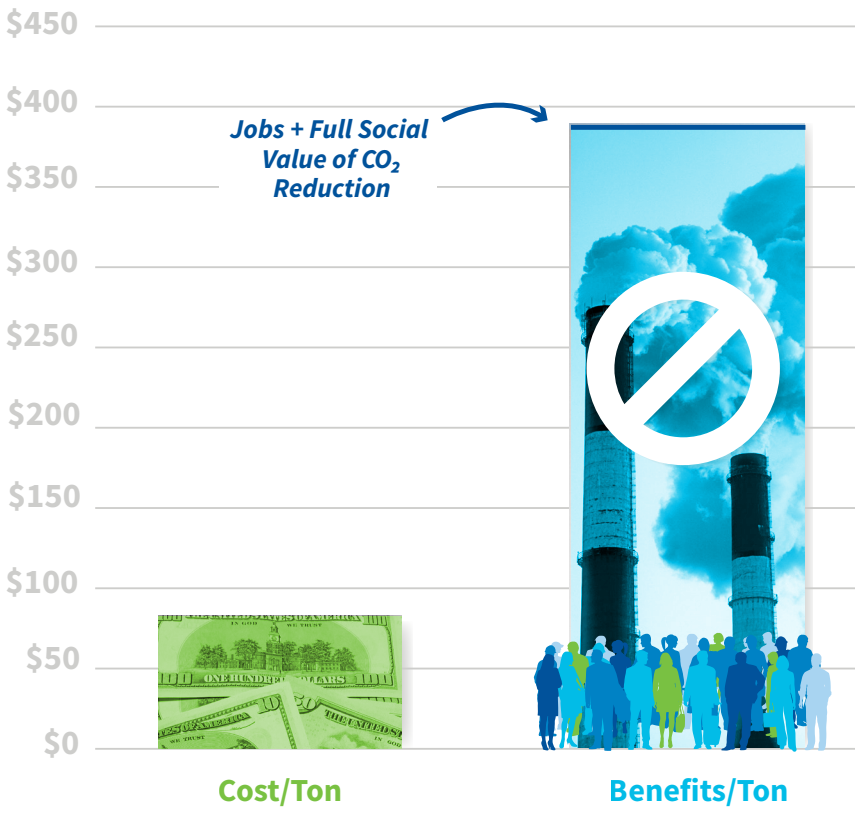


Table 10-2 shows the TBL results from the overall list of strategies (combining the High Performing strategies and the zero waste strategies) for each of the three scenarios (conservative, moderate, and aggressive). The results show that the TBL is significantly positive, even without the addition of the non-quantified components of a TBL. The benefits exceed costs, and the Benefit-Cost ratios are greater than one in all cases.

Table 10-2: Summary of TBL Results

	TOTAL VALUES			PER TON VALUES		
	Conservative	Moderate	Aggressive	Conservative	Moderate	Aggressive
Costs - Metro	$6,517,000	$8,447,000	$9,499,000	$22	$13	$8
Costs - Generators plus Tip plus Metro	$37,717,000	$56,667,000	$91,319,000	$127	$89	$80
Total TBL Benefits	$105,790,000	$188,070,000	$442,160,000	$357	$294	$385
Net TBL Benefits (benefits minus all costs)	$68,073,000	$131,403,000	$350,841,000	$230	$206	$306
TBL Benefit-Cost Ratio	3	3	5			

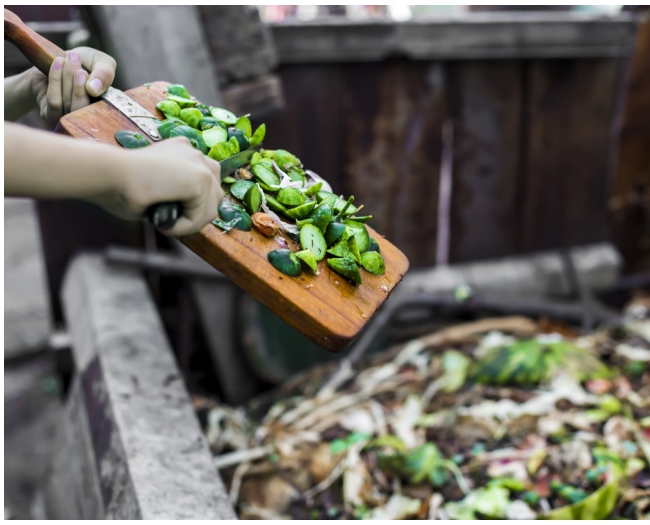
There are several primary outcomes from this TBL analysis. Recall that the set of recommended High-Performance strategies can deliver 75% diversion for Metro but can only do so if the aggressive scenario is undertaken. The positive side of working with the more aggressive strategy mix is that the cost per ton is relatively low—including the cost to all generators. The progress comes from all sectors—residential, commercial and schools / institutional sector, government sector, construction, multifamily, and public spaces. The core performers include:

- Enforcement of existing bans and enforcement of requirements for Metro-provided services.
- SAYT incentive-based rates for both residential and commercial sectors, including universal access to three-bin systems (trash, recycling, and organics) at no separate fee, and a system of supporting food scraps bans.
- Introduction of new materials in the recycling collection programs which ultimately leads to implementation of new bans and associated enforcement. New materials potentially include glass, textiles, and other recoverable materials.
- Enhancements over time to make the SAYT programs perform better—including introduction of enhanced incentives, and introduction of every-other-week collection of trash to provide greater cost savings opportunities and to drive diversion into the food scraps bin and recycling container.
- In the near-term, construction and demolition sites must receive recycling bins in addition to trash service. Metro's contracting for projects involving C&D should introduce requirements for a threshold percentage of C&D recycling and reuse.
- Construction and debris deposit program, using a recoverable financial deposit to incentivize builders to meet diversion goals.
- Implementation of disposal surcharges, increasing the cost of trash disposal relative to recycling streams, to provide greater incentives for uptake of recycling initiatives, and to provide incentives to self-haulers.

- A multi-family innovation grant program to identify programs that are Davidson County-centric and designed to work here, and then roll-out of the most successful strategies to the wider multifamily sector.

- Contracts for collection in the residential and commercial sector, to gain program uniformity, collection efficiencies, and potentially lower cost.

- Public education designed to focus on incentives, barriers, and motivation.



The strategies recognize and embrace the goals, recommendations, and directions from previous task forces and work conducted in Nashville. Based on the "readily calculated" benefit-cost and Triple Bottom Line analysis, these programs provide an array of benefits to Davidson County and its residents.

The implementation of Metro's Plan is expected to have multiple benefits to the region, Metro residents and the environment. It would support a circular economy by making more efficient use of resources. Implementing the Plan will create better quality jobs than the waste management industry and will attract businesses with similar goals to the area. To support this effort, several facilities such as transfer stations, MRFs, and composting or anaerobic digesters must be put in place. If planned and designed with an inclusive approach that mitigates the potential negative impacts, these facilities may become an asset to these communities while reducing the need to develop landfills or truck waste long distances to other disposal facilities. Additionally, it has the potential to address Metro's meal gap through the enhancement of local donations of fresh foods to Metro's disadvantaged populations.

Section 11

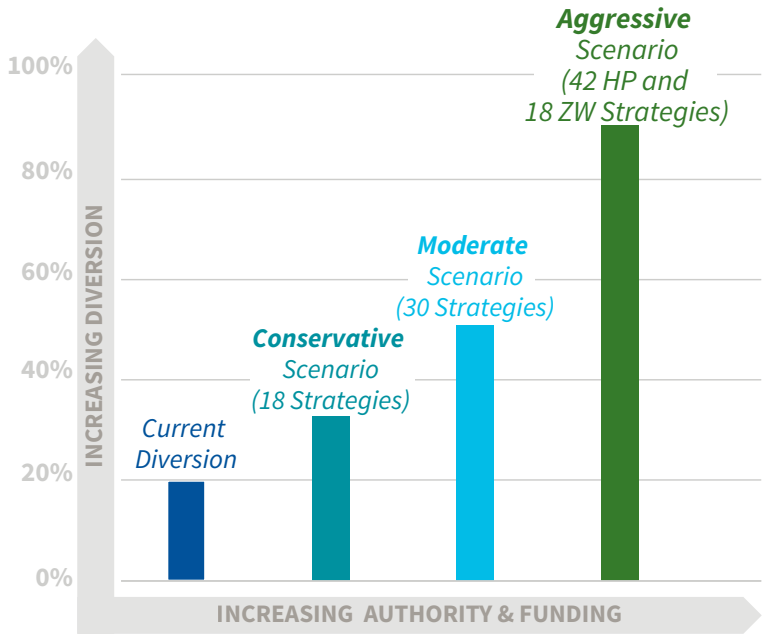
METRO FUNDING APPROACH

The current solid waste program funding mechanism depends on a variety of disposal fees and distribution of the allocated general fund support (via taxing district). The full implementation of the Plan requires a combination of new policies, programs, and expanded Metro staff and infrastructure, which will require increased funding through either public or private sources, or a combination of both.

Over recent years, an additional program and funding challenge has been the disconnect between revenues collected and the services delivered by MPW, particularly regarding the level of services provided in the central business area. MPW faces the operational challenge of collecting "unlimited" amounts of trash even though the current service rate structure is based on limited levels of curbside cart service. One goal of the Plan is to better align costs and service levels for the variety of residential and commercial waste generators.

The Metro Charter doesn't allow charges for new waste collection or disposal services within the USD because residential curbside and some commercial waste services are part of the defined tax base. The combination of delivering enhanced service levels, beyond Metro Charter requirements, to MPW customers and the inability to charge for additional waste collection or disposal services within the USD has created a funding strain for MPW.

Based on the assessment of High Performance and Zero Waste programs in **Sections 6** and **7**, three implementation approaches were identified to align with the adoption of required policies and authorities. The approaches—aggressive, moderate, and conservative—vary the level of programs, costs, and anticipated diversion for the Plan. The total costs and cost per ton of diversion will vary depending on whether the aggressive, moderate, or conservative program scenarios are implemented.



AVAILABLE FUNDING SOURCES

The MPW Solid Waste Operations are primarily funded through general fund distributions, special revenue funds, and special purpose funds. Actual program revenues come from waste generation fees charged to haulers, waste disposal fees, convenience center fees, grants, and the recyclable material sales. The Solid Waste Operations operating revenues are typically generated from General Fund transfers (78%) and program revenues (22%). The General Fund revenues are primarily provided from the USD since operating expenses are heavily derived from services offered to USD residents and businesses.

The solid waste fees are set by ordinance and any adjustments to the fee amounts must pass council with a majority (21 members) vote. Special purpose funds cover the solid waste grants and tire waste grants provided by TDEC. These program revenues are minimal compared to the on-going operational expenses.

FUNDING STRUCTURE

Implementation of the Plan's recommended policies and programs will depend on the funding structure and access to more sustainable funding sources. These key funding components will be a part of the short-term steps necessary to get the Plan off the ground.

- Re-align the funding structure for solid waste management services to transition from the tax-base General Fund to an Enterprise Fund. A key issue to be addressed is the provision and enforcement of base-level services and

fees for USD residents and businesses. A discussion on alternative funding structure policies is provided in **Section 12, Importance of Supportive Policies**.

- Develop a staggered approach to decreasing funding for waste collection and management services (in both the USD and GSD) from the General Fund. The approach will allow for dedicated stepped fees, over several years to residents and commercial customers and ease the reliance on General Fund revenues.

- Develop public and public/private partnership funding options for the array of new facilities needed to handle the increase in diverted and disposed materials.

- Develop new fee structure across the entire system to support the implementation of the identified "high-performance" programs.

Creating an enterprise fund for solid waste operations will allow Metro to equitably shift payment of collection, processing, and disposal costs to specific users based on the actual levels of services provided and utilized.

In Tennessee, solid waste collection fees are considered "restricted revenues" that can only be spent on authorized expenses. Restricted revenues can't be transferred from one fund to another to cover expenses associated with non-authorized uses. Therefore, MPW will need to determine if solid waste collection fees captured in the General Fund can be transferred to an enterprise fund if the revenue is used for solid waste services.

An initial step towards a sustainable funding structure is the creation of a solid waste authority (Authority) to guide planning, implementing, and funding of programs associated with the Plan. One critical responsibility of an Authority is imposing and collecting solid waste disposal fees. The Authority's ability to establish fees sufficient for programs and services is paramount to establishing a long-term, sustainable source of funding independent of the General Fund. A detailed discussion on the creation of an Authority and its benefits is provided in **Section 12**.

PLAN INCREMENTAL PROGRAM COSTS

The program costs associated with the high-performance and zero waste strategies are outlined in **Sections 6** and **7**. The estimated costs are considered incremental (and not inclusive) to the existing solid waste operation costs. The incremental program costs for the Plan have been developed and allocated to Metro, residential sector, commercial sector, and a marginal tip fee, which

represents the difference in costs between landfilling the wastes and delivering the waste to a series of other destinations. The marginal tip fee calculation uses a blend of current costs and costs of future facilities. **Table 11-1** provides a summary of the incremental costs for all three scenarios (aggressive, moderate, and conservative) based on program participant and the marginal tip fee. The table also provides per ton costs to provide a perspective on the relationship between costs and diverted material tons.

If the aggressive scenario is implemented, the high-performance and zero waste strategy costs borne by Metro are estimated to result in annual incremental costs of approximately $9.5 million. Metro's costs under the moderate diversion scenario are about $8.4 million and are approximately $6.5 million for the conservative scenario.

Table 11-1: Costs for High Performing and Zero Waste Strategies for the Three Scenarios

	PROGRAM COSTS, ALL PHASES-YEAR SHOWN ➡ YEAR 9		
	AGGRESSIVE PORTFOLIO	MODERATE PORTFOLIO	CONSERVATIVE PORTFOLIO
Total Percent Diverted (incl. Existing 18-19%)	85%[1]	55%	35%
Total New Tons Diverted from Landfill	1,148,300	638,950	296,000
Metro Cost: Avg. Annual Cost	$9,499,000	$8,447,000	$6,517,000
Generator Costs	$46,881,000	$21,463,000	$22,003,000
Marginal Tip Fee Cost – (LF savings minus new tip fee)	$31,540,000	$23,030,000	$6,010,000
Total Costs	$87,920,000	$52,940,000	$34,530,000
Metro $/Ton (new)	$8	$13	$22
Total Cost per Ton	$80	$89	$127

Note: The term LF savings minus new tip fee computes the difference in costs between the cost of landfilling waste and delivering the waste to a series of other destinations. A blend of current costs and costs of future facilities was utilized in the calculation.

Both the moderate and conservative approaches yield lower incremental annual costs for Metro; however, the resulting lower diversion tonnage results in higher per ton costs compared to the aggressive scenario. The moderate and conservative costs per ton are $13 and $22, respectively, compared to $8 for the aggressive strategies.

Tip fees are also expected to increase at local and regional disposal facilities that serve the Metro region. Total annual costs associated with all programs for all generators and Metro are anticipated at approximately $88M.

1 Note one program is not projected to be fully rolled out by 2027, so the portfolio numbers don't quite reach 90% in the table.

The additional funding required by Metro to implement the Plan will be used to provide additional program management staff; MPW vehicles; new containers; education, social marketing, and outreach materials; and capital costs associated with development of Metro-owned facilities, such as convenience centers and anaerobic digestion.

PROGRAM FUNDING SOURCES

Reaching the Plan's diversion goals will involve an array of changes in responsibilities and behaviors—and costs—by participants, users of services, and other stakeholders around the region. The new integrated system will cost more in infrastructure development, services, and outreach. In general, the costs for the array of programs and policies are funded based on creating an equitable user pay structure for services, providing integrated incentives, and generating stable and diversified funding sources. Specific funding sources include:

- **Residential and Commercial Rates/User Fees:** New residential and commercial collection revenue sources will be needed to support equipment and services for integrated trash, recycling and organics collection, whether by Metro, Authority, independent haulers or potential franchise contracts. These funds come directly from user fees assessed directly to the households and businesses, with rates designed to cover the sector's total cost of service, including the portion needed for facility use.

- **Hauler Costs:** Hauler costs will increase, as they are requested to provide containers, new services and develop combined SAYT rates, etc. The costs of doing business under the new system—including extra fees assessed by Metro—are expected to be directly passed on to their customers.

- **Sources for Metro Costs:** Metro expenditures of staff time for policy and program development, implementation, enforcement, and tracking/ monitoring and other Metro expenses are covered by a fee that Metro charges for the hauler to operate within Metro's jurisdiction.

- **Tipping Fees/Rates for facilities:** Incentive-based subsidies and premiums on landfill disposal fees or the subsidies for lower fees for organics and recycling tons.

- **Tipping Fees for surcharges/discounts:** New facilities will recover the cost of construction and operations through rates charged for use of the facilities.

- **Construction and Demolition Deposit Program:** This program is self-funding through deposit fees that are not returned (in-full or partial) to builders who do not reach defined diversion goals. This program's policy goal is that funds from non-compliant builders will be used by Metro or an Authority to support diversion programs.

- **Zero Waste Economic Development Strategies:** The five economic development strategies discussed in **Section 7** of the Plan are assumed to be covered under the Economic Development Department budget.

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION (TDEC) GRANTS

TDEC has developed an Online Grants Management System that will allow MPW staff to research grant funding opportunities, application deadlines, apply for grants, and manage all applications. Priorities for waste reduction grants are: applicants located in distressed counties; applicants located within the top five counties, which includes Davidson County; and applicants that develop public-private partnerships that contribute resources. MPW, as an applicant, could meet two of the three priorities for grants that will help implement the Plan. Each grant program has specific eligibility, priority, and funding requirements for projects. Grant funding will not be provided for projects that are considered normal, recurring operating expenses.

Materials Management Grants: TDEC offers an extensive portfolio of grants designed to promote materials management throughout the waste management system. TDEC keeps an 18-month window with these funding options. The grants applicable to supporting programs and policies associated with the Plan include:

- **Waste Reduction:** Grants for waste reduction equipment required to establish new collection or processing capacity, improve existing collection or processing operations, or prepare materials for transport and marketing. Funding maximum per applicant is $500,000. A local match of 50% is required based upon certain economic criteria.

- **Education and Outreach:** Grant support for projects needed to expand education and outreach in communities already informing residents about the basics of recycling.

- **Convenience Centers:** Grants are provided in support of projects that replace or eliminate unstaffed sites or develop new centers in underserved areas.

- **Recycling Rebate:** Rebates are eligible for use in establishing new programs or collection sites; preparing recovered materials for transport and marketing; identifying markets for recovered materials; and developing educational programs for adults and children.

- **HHW Collection Facility:** Competitive grants are available for collection of household hazardous waste at a permanent site.

- **Measurement Equipment:** Grants are provided for measurement equipment including, scales, software and software subscriptions, computers, and metering/monitoring devices.

- **Organics Management:** Grant funds can be used to provide new or expanded organics management services to residents. Funds can be used to address food waste through education, feeding people, feeding animals, industrial uses, anaerobic digestion, and composting.

Appendix K offers a detailed discussion on the various aspects of the funding approach, including funding sources, funding and management structure, and strategies.

Section 12

IMPORTANCE OF SUPPORTIVE POLICIES

One of the Plan's driving philosophies is to shift the opinions and behaviors of residents and businesses regarding waste management from "disposal-centric" to material and resource management (reduction, recovery, and reuse). The limited amount of waste disposal airspace remaining at the Middle Point Landfill is a big driver for why waste reduction, recycling, and diversion are critical to Davidson County, the surrounding counties, and the Middle Tennessee region.

Communities across the country that are successfully diverting large portions of the waste stream have one common focus: developing a myriad of program strategies supported by the adoption and enforcement of key coordinated public policies.

One of the fundamental policy challenges to implementing this Plan is the current consolidated city-county form of government that has established two distinct tax districts: the USD and GSD. The Metro Charter has created separate levels of responsibility and authority for the MPW relative to the delivery of solid waste management activities across both districts.

The strategies, funding and implementation activities discussed in this Plan require Metro to strive to create consistency throughout the USD and GSD regarding policies and ordinances relative to funding, material disposal bans, mandates, recycling, curbside collection services, and enforcement.

THE CRITICAL POLICY TOOLS AND CONCEPTS ESSENTIAL TO SUCCESSFULLY IMPLEMENTING THIS PLAN ARE:

- Creation of a Solid Waste Authority, or similar overarching agency, with geographical boundaries that include all service areas, inclusive of the USD and GSD.
- Grant authority to implement household and hauler license fees across Davidson County.
- Adopt disposal bans for organics and targeted recyclable materials.
- Implement residential and commercial franchise collection ordinances.
- Develop incentives for private-sector investment and partnerships.

One of the largest concerns with the long-term success of the Plan is the lack of waste stream control countywide. The MPW, under the current Charter structure, will not have direct responsibility and authority over the implementation of the Plan within the GSD. The inability to fully implement components of the Plan in the GSD will limit the Plan's effectiveness throughout Davidson County and require MPW to lower the diversion goal from 90% to below 50%.

To effectively implement the Plan, Metro will have to improve data reporting and metrics relative to waste and recycling collection activities within the USD and GSD, and potentially will require future coordination with the satellite cities. Therefore, ordinances and policies will be a vital component of increasing education and public outreach, establishing requirements for recycling and handling banned materials, and reinforcing the appropriate behaviors and desired outcomes. Some of the most essential and primary components associated with the key development policies are summarized below and discussed in detail in **Appendix L: Importance of Supportive Policies**.

SOLID WASTE AUTHORITY

Given the challenges associated with amending the Charter to address the service boundary and reporting issues, Metro should consider developing a Solid Waste Authority (Authority) as a mechanism that would allow unification and uniformity of service delivery and program implementation across Davidson County. A Solid Waste Authority could implement the Plan across both the USD and GSD: **One Metro, One Plan**. Just as music, food, and outdoor activities

transcend across Nashville/Davidson County so can waste reduction, diversion, and recycling as we move towards zero waste.

The idea behind establishing an Authority is to treat the delivery of solid waste management programs as a countywide utility service; like water, wastewater, and stormwater services provided by Metro Water Services. The Authority would serve as the lead entity responsible for the implementation of the Plan providing consistency in policies, programs, services, funding, goals, and metrics across all of Davidson County.

In the future if other regional partners were to join, the Authority could be expanded to a regional authority, with the ability to share resources across the region and maximize the utilization of local government funds and resources.

CHALLENGE OF REVENUE STRUCTURE

MPW accounts for the activities related to the management of solid waste as special revenue and special purpose funds. Currently, the special revenue fund is not generating enough revenues to cover all expenses; therefore, significant financial contributions are required from the General Fund. Based on the 2019 fiscal year budget revenues, the solid waste program revenues account for approximately 22% of operating revenues while the General Fund transfers account for 78% of the operating revenues.

The level of General Fund support is subject to the annual budget process and yearly fluctuations due to the programmatic needs of other critical departments such as schools, police, fire, and transportation. Implementation of the myriad of recommended strategies described in **Sections 6** and **7** of this Plan will recommend MPW to implement household and hauler license fees that generate adequate revenues which can be utilized to support all programs across the entire county. These types of fees will help address the USD/GSD funding dichotomy (tax base vs. subscription) and provide long-term sustainable funding sources for the proposed program. This fee structure flexibility is often found in solid waste operations that are established as enterprise funds.

One of the reasons solid waste operations have shifted to enterprise fund accounting was the fact that user fees and charges established in enterprise funds promoted efficiency by equitably shifting payment of costs to specific users of services based on the types and levels of services received while avoiding the need for increased general taxation. An enterprise fund would provide MPW the flexibility to account separately for all financial activities associated with Metro providing the full range of solid waste services throughout both the USD and GSD.

ADOPTION OF DISPOSAL BANS

Metro has implemented bans on yard waste, corrugated cardboard, and corrugated cardboard boxes, electronic wastes, and curbside residential C&D waste previously. The waste and recycling characterization study (**Section 3**) offers information on identifying valuable recyclable materials and currently banned materials that are being placed in the residential and commercial waste streams.

Organics (including food scraps), paper, and plastics are the top three categories of materials found in landfilled waste from the residential and commercial sectors. A third of the overall residential waste is comprised of organics (i.e., compostable material), while a third of commercial waste is food scraps, cardboard, and C&D waste. This Metro-specific data will help frame the development of new ordinances and policies that target organics (particularly food scraps) and other recyclable materials.

Expanding the types of material banned from landfill disposal without effective and continual enforcement of the bans will reduce the overall effectiveness of the strategy. Enforcement must be taken as seriously as the development of policy, implementation of programs, and sustainable funding.

Material disposal bans with effective enforcement provide an incentive for public and private investment in infrastructure and processing facilities because the marketplace is virtually guaranteed a "feedstock" for the facilities. The benefits of the potential expansion of facilities are addressed in **Sections 8** and **10**.

FRANCHISED COLLECTION

The Metro GSD area is currently provided with residential waste collection services through subscription services. By dividing up the GSD, and potentially the USD, into a small number of exclusive franchise service areas, it is possible that three curbside collection services—residential waste, bi-weekly recycling, and organics collection—could be provided for a similar or reasonable price compared to what residents are paying for weekly waste collection service alone. The provision of regularly scheduled curbside collection services for recyclables and organics to residents in both the GSD and USD areas will significantly increase the quantities of these materials that are diverted from landfill disposal.

The establishment of a franchise system throughout Davidson County wouldn't preclude MPW from competing to deliver services for specific residential or commercial/downtown "districts". This approach is often referred to as managed competition.

Also, the selection and control of haulers within the County will allow MPW to better account for the "true" disposal and diversion numbers of the entire Program, improving accounting for areas of success and areas to be further addressed with future programs. The importance of tracking progress versus our interim goals and milestones cannot be overstated and MPW must have a way to define the path that each piece of the waste stream travels.

PRIVATE SECTOR INVESTMENT AND PARTNERSHIPS

One of the critical steps associated with comprehensive waste diversion strategies is to identify and understand the secondary materials markets that exist for the materials diverted from landfills. Secondary material markets experience fluctuations created by changes in global, national, regional, and local manufacturing conditions. The recent recycling market impacts associated with China's material restrictions or the recently imposed tariffs are examples of the importance of local end-use markets that can provide some buffer against abrupt changes in global market conditions.

Partnerships with the private sector should and will need to become an important part of the conversation regarding the future of solid waste management. From a policy perspective, Metro should establish policies, guidelines and/or ordinances that encourage the development of local recycling, composting, and material reuse markets. Local and regional private partnerships encourage greater coordination, which lead to an increase in efficiency and a shared commitment to maximize the value of resources currently being landfilled. The resulting increased diversion, local economic development, and job creation all lead to significant environmental, social, and economic benefits for the community.

Section 13

PLAN IMPLEMENTATION

Based on Metro's solid waste goals and the recommended Plan's strategies and options, the schedule must balance an aggressive timeline with realistic capabilities and capacities. This schedule considers that a great deal of flexibility exists within the Plan so that Metro can adjust the schedule based on changing priorities, preferences, funding or immediate needs. The aggressive scenario strategies presented in **Sections 6** and **7** were developed with the idea that implementation and the full realization of the anticipated diversion benefits will occur in multiple "phased" approaches over the comprehensive implementation timeline ranging from 20-30 years. The high-performance and zero waste portfolios and the associated strategies, policies and projects are not "sequential"; that is, implementing the zero waste strategies discussed in **Section 7** does not depend on completing the 75% programs before the zero waste strategies commence. The overarching plan is to develop and execute both strategy portfolios on parallel tracks. Even with the technical, financial, and environmental components considered in developing the Plan, success will depend on the early adoption of the policy, authority, and funding requirements that are the key diversion strategies' foundation.

The Plan indicates the primary high-performance and zero waste strategies, responsible for reaching 90% diversion, will be implemented in four phases over 20 years, with each phase designed to build upon the previous one. Even though the Plan includes numerous strategies, implementing the SAYT (residential and commercial); C&D deposit program; franchising (residential and commercial); and enforcement of bans with mandatory recycling strategies will be pivotal to reach Metro's goals.

To meet this 20-year timeline, an aggressive implementation with early achievement of adequate funding and authority levels is required to launch the strategies. Stakeholder acceptance and participation in the new programs rollout will also be critical to achieving the rapid increase in diversion percentages over the initial nine years under the aggressive schedule. The process of establishing critical policies and funding levels to support the rollout of such an aggressive, but value-added program, will often run into setbacks and delays.

EXTENDED IMPLEMENTATION SCHEDULE

The Plan must be flexible and modifiable to address the potential for unknown setbacks and delays. Ultimately, the Plan provides general direction with the key to success driven by the timely and successful implementation of the strategies. Because buy-in from a diverse group of stakeholders and building momentum for the Plan during the early years is vital, an extended, and potentially more realistically paced, implementation schedule, which is based on a more deliberate timing for establishing policies, authority, and funding, has been developed. The extended schedule divides strategy implementation into the following six phases of development:

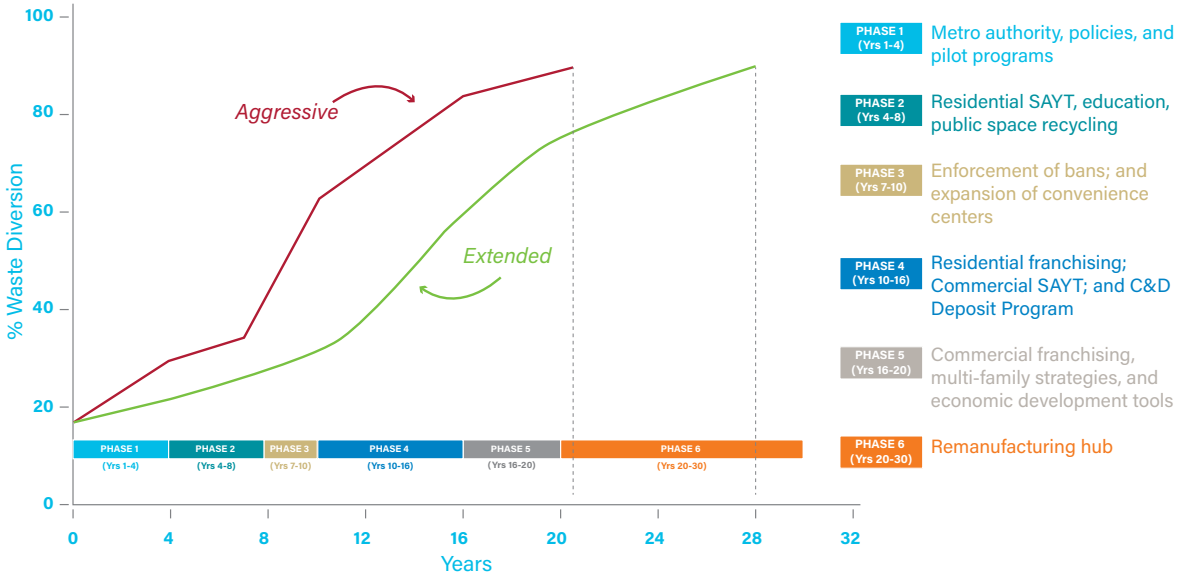
The primary difference between the aggressive and extended schedules is that the extended Phase 1 activities have been pared to focus solely on developing and implementing Metro authority, policies, and pilot programs; delaying the key diversion programs' rollout. This is primarily the rollout of full-scale residential SAYT that would be delayed until the policies and initial pilot programs are executed and any modifications in full-scale roll-out advanced and adopted. The shift in early implementation of strategies creates delays in the start-up of the other key diversion programs, which is the driver for the expansion of the implementation to six phases. **Table 13-1** compares the previously presented aggressive and extended schedules regarding the implementation of key diversion strategies. As previously stated, the phases will help guide Public Works and Metro Nashville toward successful diversion over the next 20-30 years; however, implementing the strategies, policies, and projects will vary over the time period. Therefore, it is crucial that the Plan is implemented with an adaptive strategy approach. One of the strengths of the Plan is the ability to adjust strategy and project implementation through the planning period in response to changes in available revenue and funding, population, environment, technology, and regulatory pressure.

Table 13-1: Comparison of Aggressive and Extended Schedules

KEY DIVERSION STRATEGIES	AGGRESSIVE SCHEDULE (20 YEARS)	EXTENDED SCHEDULE (30 YEARS)
Metro authority, funding and policies	Phase 1	Phase 1
Residential SAYT	Phase 1	Phase 2
Public Space Recycling	Phase 1	Phase 2
Enforcement of bans and mandates	Phase 2	Phase 3
Expansion of convenience centers	Phase 2	Phase 3
Residential franchising; commercial SAYT; and C&D deposit program	Phase 3	Phase 4
Commercial franchising and multi-family strategies	Phase 4	Phase 5
Re-manufacturing hub	Phase 5	Phase 6

Figure 13-1 presents a graphical representation of the two proposed implementation schedules. The 30-year extended timeline is more pragmatic given the significant magnitude of change to the waste management system required by the Plan. The anticipated diversion is more gradual under the 30-year timeline and reflects the challenges associated with establishing sustainable funding, gaining proper authority and control over the waste stream, and achieving the required changes in the waste management behaviors of residents and businesses. The extended schedule will have lower annual funding requirements initially due to the proposed first phase, which includes no major capital programs.

Figure 13-1: Implementing the Strategy in Phases



Naturally, there will be shifts as some strategies implement smoothly and according to plan, while others are delayed based on infrastructure requirements, funding availability, political priorities, or other reasons. Successful implementation of the Plan, regardless of schedule, will depend on a consistent public education and outreach process as Metro moves forward. Metro will need early implementation of a multi-year public education and outreach program to support rollout of the strategies.

EARLY PHASE 1 IMPLEMENTATION

An important part of advancing the Plan will be achieving momentum with early activities to energize and motivate residents and businesses to support the Plan. The following six components are actionable steps that Metro can take to advance the Plan in the initial years:

1. Issue an executive order on waste reduction within Metro Government
2. Establish an environmentally preferable purchasing program
3. Launch a residential food waste pilot program
4. Finalize approach for executing strategies under Metro Charter for greater solid waste control and authority
5. Draft recycling mandates for C&D waste
6. Draft food scraps diversion mandates for large generators

Effective implementation of the early strategies will require partnering with myriad stakeholders that will require varying levels of effort from Metro, residents, and other stakeholders. **Table 13-2** indicates key stakeholders and a general assessment of level of effort (minimal, moderate, and extensive) to implement early strategies.

Table 13-2: Stakeholder Engagement

STRATEGY	KEY STAKEHOLDERS	LEVEL OF EFFORT
Issue an executive order on waste reduction within Metro Government	Council Members, Metro legal and Public Works staff	Minimal
Establish environmentally preferable purchasing program	Various Metro department staff	Moderate
Launch residential food waste pilot	Council Members, Metro Public Works staff, citizens	Extensive
Finalize approach for executing strategies under Metro Charter	Council Members, Metro Legal and Public Works staff	Extensive
Draft recycling mandates for C&D waste	Various Metro department staff, construction industry	Moderate
Draft food scraps diversion mandates for large generators	Various Metro department staff, businesses, non-profits	Moderate

CURRENT PROGRESS TOWARDS HIGHER DIVERSION

As part of the Plan's development, Metro Public Works staff continuously worked on creating new programs and ideas to increase diversion of waste from landfills. Several of the on-going or planned activities that fall under the recommendations of the Plan are listed below.

- Initiating every-other-week recycling within the USD. (Anticipated February 2020)
- Advancing food waste management programs.
  - Providing food waste drop-off services at all four convenience centers
  - Conducting a study on anaerobic digestion of food waste
- Evaluating alternative approaches to improve the delivery of collection services in the downtown area.
- Supporting the NRDC/Nashville Food Waste Initiative.
- Working with the Greater Nashville Regional Council (GNRC) on regional solid waste planning initiatives

- Strengthening the foundation of local manufacturing capabilities through the Mayor's Nashville Made Initiative. Supporting the development of secondary material markets is critical to providing outlets for diverted materials.

Because change is required throughout the County, the successful, long-term implementation of the program needs to be built on a foundation that allows for consistent delivery of services. The initial Phase 1 activities, in combination with the current steps being implemented by Metro Public Works, will provide a significant start toward increased waste reduction, diversion, and recycling; and form the building blocks for growing new strategies and programs to drive increased diversion towards a Zero Waste Nashville.

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