



**SKUMATZ ECONOMIC  
RESEARCH ASSOCIATES**

# MEMORANDUM

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**DATE:** 2/13/18, Revised Review Draft

**TO:** CDM Smith and City of Nashville

**FROM:** Lisa A. Skumatz, Ph.D., SERA

**SUBJECT:** *Strategy Descriptions and City Budgeting for Nashville Strategies for Reaching “High Performance” Diversion*

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## 1. BACKGROUND / INTRODUCTION

Nashville is developing a Materials Management Plan to achieve Zero Waste (ZW). In addition to substantial data collection (waste composition, surveys, tonnages, status quo gaps) and extensive public / stakeholder engagement work, the consultant team is pursuing a three-pronged effort to develop the Plan to reach this goal:

- **Moving to High Performance**, implementing a set of tailored, targeted, but mostly enhanced traditional strategies in the residential, commercial, C&D, and government sectors to achieve diversion levels of about 75% of generation. This extensive portfolio of programs, services, incentives, and policies starts with “low-hanging fruit”, or relatively low cost / high impact strategies. To move beyond 40% takes more concerted efforts, and getting to 75% requires designing strategies that change the playing field for residential, commercial, and C&D generators. The next level of strategies move toward options that tend to include more mandates and strategies that may have somewhat lower impacts individually, and, naturally, increasing costs. This work was conducted by Skumatz Economic Research Associates (SERA)
- **Zero Waste Strategies**, including a set of advanced, cutting-edge strategies that move beyond the “High Performance” options to achieve 90% diversion. Although this set of strategies moves the needle beyond 75% by only about 15%, this group of strategies is increasingly complex (and sometimes costly) to implement, because they may involve cooperative agreements among multiple parties, efforts on a “bigger stage” (market development and higher-level legislation), or major changes to traditional waste management infrastructure and policy. This work was conducted by Resource Recycling Systems (RRS)
- **Build-Up of Supporting Infrastructure:** Both the High Performance and the ZW strategies move materials dramatically from traditional disposal and landfilling toward various processing and materials management facilities, most importantly: composting facilities, recycling processing, and C&D separation

/ processing facilities. These represent the third element of the Plan. This portion of the work was conducted by Resource Recycling Systems (RRS).<sup>1</sup>

## 2. TWO ESSENTIAL “FIRST STEPS”

**To set the stage for moving forward, Nashville / Davidson County needs to first implement two essential first-steps.** The City will need

- the service, oversight, planning, enforcement, and funding authority to move the system forward, and
- the data to monitor the resulting progress.

The importance of these two steps cannot be overemphasized. Without that fundamental change, progress toward High Performance and Zero Waste will not be possible. The strategies needed to reach ZW require enforceable authority over services provided by and to a variety of stakeholders and generators. These programs are the first two presented below.

## 3. DESCRIPTION AND FUNDING NEEDS FOR HIGH PERFORMANCE PROGRAM STRATEGIES – PHASE 1 AND 2 STRATEGIES

The list of all High Performing strategies included in the “Aggressive” package is provided in Figure 1. This package – including all the listed strategies – are necessary to move Nashville from its current diversion rate, to a level close to or achieving **High Performance – 70-75% diversion**.

- **Scenarios:** We have crafted additional scenarios for Nashville – a “moderate” and “conservative” strategy. Each of these scenarios omits subsets of specific programs that tend to be more difficult to implement, or that encroach on the commercial sector. However, note that each of these scenarios results in Nashville / Davidson County falling far short of 75% from the High Achieving List, and also far short of its Zero Waste goal. This memo focuses on a discussion of the costs of all strategies, and therefore, the “Aggressive” scenario. Costs for the other scenarios are easily calculated by omitting specific programs. The other scenarios are explored in more detail in the summary chapter of the report.
- **Phasing:** The strategies are “Phased”; not all begin in Year 1, and the strategies are grouped into four “Phases”, assumed to take place generally sequentially. All programs are modeled. This the “aggressive” strategy.

This memo focusses on providing two main things:

- 1) **Descriptions of the strategies**, so the City may understand key elements of each High Performing Strategy<sup>2</sup>, including the material / sector streams targeted by the strategy; and
- 2) **City Budget information** for the High Performance Strategies developed for Nashville’s Zero Waste Plan.

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<sup>1</sup> Landfill and transfer station elements and other assignments not related to the strategies were conducted by CDM Smith and other team members.

<sup>2</sup> In order to keep the section as succinct as possible, the descriptions include sources for more information on the strategy.

Planning level descriptions of each strategy are provided in this memo.<sup>3</sup> Estimated tons are provided in Figure 1. The City Budget needs are summarized in Figures 5 and 6 on the last pages of this document. Strategies are numbered according to their position in Figure 1; each is preceded with an “S” for Strategy.<sup>4</sup>

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<sup>3</sup> Information is provided in a later chapter on the quantitative results of the Benefit/Cost Analysis and Economic and Environmental financial assessments for Triple Bottom Line.

<sup>4</sup> Note that multiple strategy numbers are included in many cases, because SERA’s Waste Diversion Assessment Model (WDAM) models individual combinations of sectors and streams; if more than one stream or more than one sector is targeted in a strategy, the model includes them as separate numbers.

**Figure 1: List of “High Performing Strategies” – Phases 1-4**

(Results based on Draft tonnages for 2019, if programs were fully implemented; tonnage results to be revised based on updated Residential / Commercial split and updated forecasting)

		<b>YEAR SHOWN ==&gt; 2019</b>			1,562,200
Selected=>		<b>Scenario=&gt;Aggressive - All, Soon GSD Authority In Place?=&gt;Yes</b>			
Timing Phase	Diversion Option / Program - Source: SERA WDAM/ZW Model	All Res	All Com'l	Pct of Total Generation Diverted	
1	1 Tracking, Goals, Measurement PRR	-	-	0.0%	
1	2 Pass Legislation for Authority	-	-	0.0%	
1	3 Residential SAYT with 3-Stream and Food Waste Ban (charging methods vary by district)	118,300	-	7.6%	
2	4 Enforce FW Ban - Res	9,300	-	0.6%	
2	5 Enforce FW Ban - Com'l	-	28,000	1.8%	
2	6 Add EOW Trash (improves FW)	7,500	-	0.5%	
3	7 Com'l SAYT with Targeted 3-Stream, ABC Law, and Food Waste Ban	-	262,700	16.8%	
1	8 Enforce Existing Bans	14,600	-	0.9%	
1	9 Enforce Existing Bans	-	23,500	1.5%	
10	10 C&D - Require Recy. Containers	-	-	2.3%	
1 or 2	11 C&D and Compost - City Requirements or Preferences	-	-	1.1%	
3	12 C&D Deposit System - Big Jobs; 50% goal	-	-	10.5%	
3	13 C&D Deposit System-Res	-	13,500	0.9%	
3	14 C&D Deposit System - Com'l	-	13,500	0.9%	
2	15 Convenience Access Mins	-	-	0.0%	
3	16 Incentive Surcharges	29,000	-	1.9%	
3	17 Incentive Surcharges	-	122,800	7.9%	
3	18 Contracted Residential Collection	13,400	-	0.9%	
1	19 Small Business Policies	-	28,800	1.8%	
1	20 Public Space Recycling	-	-	0.0%	
1	21 Public Education	7,100	-	0.5%	
3	22 SAYT Higher Incentives	8,900	-	0.6%	
4	23 More Aggressive Res Incentives (No Bin No Barrel; higher rates for Not Recyc	8,900	-	0.6%	
2	24 MF Pilots	-	-	0.0%	
3	25 Add Glass - Res	1,500	-	0.1%	
3	26 Add Glass - Com'l	-	4,200	0.3%	
2	27 Add Textiles-Res	1,800	-	0.1%	
2	28 Add Textiles- Com'l	-	5,300	0.3%	
3	29 Ban Containers - R	3,400	-	0.2%	
3	30 Ban Containers - C	-	8,300	0.5%	
3	31 Ban Paper - R	3,000	-	0.2%	
3	32 Ban Paper - C	-	7,300	0.5%	
2	33 Ban Single Use Bags (or fee) - R	1,300	-	0.1%	
2	34 Ban Single Use Bags (or fee) - M	-	-	0.0%	
2	35 Add Diapers to FW - R	3,600	-	0.2%	
3	36 Ban Textiles - R	1,800	-	0.1%	
3	37 Ban Textiles - C	-	5,300	0.3%	
4	38 Contracted Com'l Coll'n	-	65,700	4.2%	
4	39 EOW Trash Allowed Com'l	-	5,600	0.4%	
4	40 Roll Out Major MF Programs TBD	-	-	0.0%	
1	41 Landscapers must bring mat'l to compost	-	-	0.0%	
3	42 Bag-based Coll'n in CBD	-	-	0.0%	
2	42b Change Building Codes to Require Use of Local Compost	-	-	0.0%	

Source: Skumatz Economic Research Associates WDAM Model, 2018. Strategy 42 is omitted on purpose.

## S1. Tracking, Goals, and Measurement – Phase 1

**Description: Mandatory Reporting (with enforcement) and Measurement / Metrics are Key.** Nashville will need an ordinance or enhanced hauler / facility licensing requirements or other strategies to be able to compel residential and commercial haulers, private haulers, and facilities to report disposed, recycled, composted, and otherwise diverted tonnages. Nashville will also need to develop a robust tracking system that will support the regular, periodic, and monitoring of progress from the status quo diversion levels to the Zero Waste goal. Our team recommends tracking both:

- **Recycling, composting, and diversion rates**, computed as percentage of generation, based on hauler and stakeholder reporting, with the goal of reaching diversion levels of 90% or better for ZW.
- **Percent Recoverables Remaining (PRR)**,<sup>5</sup> tracking the recoverables remaining in the disposal stream (using periodic waste composition studies) with a goal to minimize the percent of materials disposed that are potentially recoverable through the City's series of programs and services. This metric indicates the total percent of recoverables left, the most prevalent materials, the impact on emissions, and the potential value. Goals from other city for this metric are PRR less than 10% or similar.

The City should require monthly or every-other-month hauler tonnage reporting for the first 6 months (to work out the kinks), and twice annual reporting going forward. Enforcement for failing to report tonnages should include warning letter, increasing fines, and potential revocation of license. The PRR metric will require the city to implement periodic waste composition studies, either at the can, disposal sites, or trucks.

**Diversion Modeling Targets:** The modeling did not assign tonnage directly to this strategy.

### City Role:

- City / consultant reviews data reporting currently; identifies strategies for better reporting from haulers / develops reporting form(s) and rules for haulers (residential and commercial), stakeholders (facilities, etc.) and associated calculation worksheets for City to use going forward.
- City / consultant develops monitoring protocol for PRR metric; where measured, how often, precision level needed, etc. Estimates costs.
- City / consultant drafts language for ordinance or licensing changes to require reporting
- City passes ordinance / licensing changes, posts and advertises to relevant stakeholders
- City implements measurement protocol hiring consultant for periodic waste composition work.
- City tracks / monitors progress against the two goals – percent diverted, and the percent and types of materials remaining in the disposal stream.

### City Budget Needs:

- Staff time: 10% FTE (2 weeks) to identify gaps and reporting to date; 5-10% city staff on-going time for tracking / nudging / calculating performance for percent diversion. 10% FTE (2-3 weeks) of consultant or statistical person's time FTE to identify preferred measurement approach for PRR metric, and identify monitoring protocols.

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<sup>5</sup> For more on Percent Recoverables Remaining (PRR), See Skumatz, "Better Tracking Metrics – Noting what's not recovered", *Resource Recycling*, Aug/Sept 2016; and Burn and McDonnell and Skumatz Economic Research Associates, "State of Colorado Integrated Materials Management Plan", 2015, prepared for Colorado CDPHE, and other publications /research.

- Direct costs: Estimate for annual 2-season waste composition study, county-wide, residential and commercial, is approximately \$75-150K; other options include random collection truck sorts and other strategies. The estimates for conducting this work on an on-going basis is \$250-300K/year.<sup>6</sup>
- Funding Source: No dedicated funding source. Recommended as part of an “environmental” or generator fee or enterprise Fund, or rates

## ***S2. Obtain Needed Planning, Service, Enforcement and Funding Authorities - Phase 1***

**Description: Revised Authorities are an Essential First Step.** Waste management in Nashville / Davidson County is currently conducted in a fairly complex arrangement of responsibilities and authorities. In order to reach High Performance and Zero Waste, it is essential that a first set of efforts are undertaken to **provide the (integrated) platform of responsibilities and authorities, enabling both service / enforcement powers, and funding authorities**. Nashville needs to be able to:

- Implement enforceable and area-wide ordinances, services, mandates, regulatory authority, and other policies regarding solid wastes management, that cover all generator sectors
- Be able to regulate the variety of service providers in the region
- Be able to recover funds to provide services, and be able to charge for any and all services provided.
- Be able to issue RFPs and undertake contracting arrangements for services covering the variety of generator sectors;
- Be able to work cooperatively to develop facilities that serve the region in order to assure sufficient capacity and reach cost-effectiveness.
- Establish Enterprise Fund.

**Diversion Modeling Targets:** The modeling did not assign tonnage directly to this Strategy.

### **City Role:**

- City / city attorney / consultants inventory the authorities needed for the Comprehensive Plan programs, and compare against authorities currently in place to identify gaps and best approaches to obtaining authorities.
- City staff provide leadership and relationship-building
- City / attorney / consultants craft new language and start the processes or agreements needed to achieve the authorities.
- Posting, advertising / notice.

### **City Budget Needs:**

- Staff Time: Assume 1 week (3-5%) FTE for attorney and assistant; 2 weeks (5-10%) City staff; 1 week (5%) consultant. Leadership needed from senior PW staff for perhaps 1-2 weeks of time (5%) spread over half a year.
- No direct costs.
- Funding Source: No dedicated funding source; general fund activity; or Enterprise Fund, generator fee, or rates

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<sup>6</sup> Based on SERA research for other clients, developing consistent, defensible, statistical monitoring plans with reporting.

## S3, 29-32. Residential SAYT & 3-Stream Package with Supporting Bans-Phase 1

**Description:** “Save as you throw / Pay as you Throw” is the most effective and cost-effective strategy in the residential portfolio<sup>7</sup>, incentivizing recycling and organics diversion in addition to a substantial amount of source reduction<sup>8</sup> – on a continuing basis, all user-fee funded under a program that is essentially no more than a new billing system. A “Bundle” of strategies for the residential sector is a key early strategy, and is presented as an integrated package on purpose. Integrated decisions and incentives are presented to households to provide key diversion services to all (recycling and organics). Price incentives (SAYT with embedded program fees) are provided to encourage use of the services, and basic bans are put in place to support and further encourage diversion of the material. The integrated system allows households to make wholly new decisions regarding their waste management behavior. This strategy (and associated ordinance / requirement) includes:

- SAYT: Save as you Throw trash rates, including providing trash service in graduated trash can sizes with incentive-based increasing costs for larger trash containers. There must be one trash service level available that is no larger than 32 gallons.
- Embedded Services and Costs: Recycling and organics containers and service are provided for all households. Containers are provided for all services. No extra fee for recycling or organics service. Frequency and accepted materials to be established by City ordinance. This includes minimum every other week service, 96 gallon bins default for all diversion programs, materials continually updated and expanded to match (and push) local MRFs, and City may change list of materials by Memo from City Manager or PW Director.
- Food waste ban implemented; for simplicity, include residential and commercial sectors in ban.<sup>9</sup>
- Containers Ban: Along with addition for food waste ban, ban containers (plastic, metal, and consider other products) and add to enforcement strategy in an ordinance that implements several bans (paper, food, etc.).
- Broad Paper Ban: Along with new food waste ban, ban containers and add to enforcement strategy in an ordinance that implements several bans (containers, food, and possible other key materials).
- Once or twice per year outreach materials explaining the program / incentives (City approval required)
- Ability to check Hauler books for compliance<sup>10</sup>

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<sup>7</sup>Source: SERA research. See Skumatz, et. al., “PAYT / Variable Rates for Trash Collection: 2014 Update”, Econservation Institute / Skumatz Economic Research Associates (SERA), Superior, CO for EPA Region 9, 2015; Skumatz et. al., “PAYT: 2006 Update” for SERA and EPA, January 2007; and other updates since Skumatz, “Nationwide Diversion Rates Study – Quantitative Effects of Program Choices on Recycling and Green Waste Diversion: Beyond Case Studies”, Skumatz Economic Research Associates, Prepared as Multi-client Study and Reason Foundation Study 214, 1996.

<sup>8</sup> Source: SERA Research. See Skumatz; “Source Reduction can be Measured”, Resource Recycling, 8/2000; Skumatz, “Measuring Source Reduction: Pay As You Throw (PAYT) / Variable Rates as an Example”, SERA Technical report, included on EPA website, 5/2000.

<sup>9</sup> Integrate into the ban a clause for diaper composting, to be implemented when the City deems the process is mature and the city requires area composting facilities used by the City to allow this material. Do not advertise this portion of the ban, and it is not invoked until a letter / memo by DPW is issued. This is recommended in order to avoid having to pass a separate ban.

<sup>10</sup> The key components of Best Practices in PAYT / SAYT include: embedded recycling program / provide service to all households with no separate fees; 50-80% price differentials for trash rates; at least one trash service size no larger than 35 gallons; parallel containerization; and ability to inspect hauler books. Source: “Skumatz, “Variable Rates in Solid Waste: Manual for Local Solid Waste Officials” for EPA Region X (1990), updated periodically in Resource Recycling and State

- Outreach to explain the program and solicit responses regarding desired container sizes
- Modifications to City billing system
- Phase-in schedule

Through an area-wide ordinance (or stringent hauler licensing regulations) the City requires any hauler providing residential trash service in the City / County limits to provide recycling service (minimum 96 gallons every other week, with materials specific by letter/memo of City manager to allow updating and consistency with MRFs), plus organics service including yard waste (minimum 96 gallon container with service at least every other week). This service is to be upgraded to include food along with Yard waste as soon as the first composting site that can take food waste is established within (50) miles of the City limits. The hauler may not charge separately for the recycling or organics service; the cost of the three services must be embedded in the graduated trash bill. There must be a trash option available that is no larger than 32 gallons. The differential costs between service levels will be established by the City (and periodically revisited), and must be no less than 50% extra for double the service for the first 30-35 gallons;<sup>11</sup> the same price differential is used for additional increments of 30-35 gallons. Containers must be provided for all services. A system for paying for “extra” waste is introduced through pre-paid bags or stickers, or automatic billing (with photo or other documentation) for waste set out beyond subscribed amount. Haulers not complying lose the license to provide any residential collection services in the County. City enforcement is conducted through street inspections and review of hauler records, among other strategies.

The City implements an ordinance mandating a food waste ban – for the residential and commercial sector -- immediately, with enforcement to be invoked as soon as a facility is available to take the material. Enforcement is at the generator (not hauler) level. A system of fines is put on the books. The ordinance authorizes inspectors to perform random inspections at home and business containers. First infraction leads to a warning letter (to generator); second infraction involves a fine; third infraction assesses a larger fine. Enforcement of payment may include extra assessment on the water bill (with threat of water shutoff if not paid). Heavy enforcement is implemented with Phase 2 or when a food waste facility is on-line.

**Implementation of the SAYT program for Metro’s section** of the city itself will require considerable out-of-pocket costs and a drain on the near-term budget; however, these costs are directly paid back over time by user fees. Costs include: SAYT multiple-sized container purchase and delivery, truck and labor costs for new services and associated containers, outreach, cart replacement / maintenance costs, changes to billing system, rate study, changes to tipping fees (between trash, recycling, and organics with tonnage shifts) and other costs. If the City wishes to reduce the environmental impacts of the program, it should consider the integration of CNG trucks. The trucks will have lower emissions, with higher up-front costs, but potentially lower operating costs. However, it will require the development of a CNG refill station, which is quite costly. If other City trucks move to adopt CNG, the costs attributable to solid waste will be lower.

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*Manuals. Latest, Skumatz, et. al, “PAYT/ Variable Rates for Trash Collection: 2014 Update”, Econservation Institute / Skumatz Economic Research Associates (SERA), Superior, CO, 2015.*

<sup>11</sup> *The optimal price differential range calculations from Skumatz Economic Research Associates statistical research on data from 1,300 communities. A 50% differential in cost for twice the service (e.g. 30 gallons to 60 gallons) is sufficient to result in substantially more recycling and organics diversion than smaller financial differences; and a differential of 80% results in the same diversion as differentials of 100% (“doubling” the fees, or “a can is a can” rate). See Skumatz, “PAYT in the US: Implementation, Impacts, and Experience”, Waste Management Journal, Elsevier Publications, 2008. Skumatz, “Pay As You Throw (PAYT) in the US: 2006 Update and Analyses”, prepared for USEPA and SERA, January 2007. Skumatz, “Recycling Incentive Alternatives: Results of an Analysis of Performance, Pros, and Cons of RecycleBank™, Recycling Credits, and PAYT”, Resource Recycling, Feb and March 2011; Skumatz, “Getting to More: Review of Option for an Area with Robust Recycling”, Prepared for King County WA, December, 2014; and elsewhere.*



**Diversion Modeling Targets:** The modeling for this Strategy assumed high levels of diversion of residentially-generated single-stream recycling mix, yard waste, food waste, and also assigned waste diversion / source reduction to the strategy, in accordance with extensive statistical analysis documenting these effects from SAYT.<sup>12</sup>

**City Role:**

- Required Public process
- Ordinance or Updated Hauler Regulations for SAYT / Embedded; Discussions with Haulers; Notice; Enforcement
- Ordinance for Food Waste Ban; Notice; Enforcement
- Encourage expansion of Recycling and Organics facilities; encourage expansion for acceptance of food
- Outreach to explain the program and solicit responses regarding desired container sizes
- Modifications to city's billing system

**City Budget Needs (in two parts):**

**Costs for Designing / implementing the ordinance, Public process:**

Staff Time: 25% FTE for public process, ordinance, and outreach development. Enforcement of hauler compliance is significant; assume 50% FTE for 1<sup>st</sup> year, and rest covered by inspectors checking compliance with bans.

Direct costs: Education materials \$2/hh (outreach is covered by strategy 21).

Funding Source: Combination of General Fund or Enterprise Fund (education) and hauler surcharge (compliance).

**Costs for SAYT Rollout in Metro Area:**

Staff Time: Updating billing system capabilities may cost up to \$20K (repeated billing of a set fee) to \$100K or more depending on existing system capabilities (specialized consultant or staff time). City Staff time for SAYT roll-out: If 25%-40% of the City's 55,000 households calls 10 minutes, temp CSR staff needs are 3-4 FTE (will need about twice as many for 6 months, then let go, but for budgeting purposes we show annual figures). Approximately 30 new drivers are needed on an on-going basis.

Direct costs for switch to 3-bin service (adding 2 bins for most households), assume 30 new trucks for Metro area at \$350K each is \$10.5 million (spread over 8 years minimum). 2 new containers per household at \$55 each is \$6 million plus 10% for spare carts. Assembly / Cart delivery can add another \$7/cart, but we exclude here assuming the City may receive discounts for large orders. Ongoing costs \$13-19/hh/month for service, including maintenance, etc.<sup>13</sup> Assumed no major new billing costs once system is running.

Funding: Note these funds are generally paid out of / can be embedded into the SAYT user fees (self-funding).

***Because the cost of the residential SAYT (S3 strategy) roll-out is so much greater than for other programs, and because these fees are directly paid by household rates, the numbers in Figures 3 and 4 are presented with and without these costs.***

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<sup>12</sup> See Skumatz, et. al., "PAYT / Variable Rates for Trash Collection: 2014 Update", Econservation Institute / Skumatz Economic Research Associates (SERA), Superior, CO for EPA Region 9, 2015, and Skumatz; "Source Reduction can be Measured", Resource Recycling, 8/2000; Skumatz, "Measuring Source Reduction: Pay As You Throw (PAYT) / Variable Rates as an Example", SERA Technical report, included on EPA website, 5/2000.

<sup>13</sup> Costs from Skumatz PAYT manuals and SERA PAYT residential collection / cost computation model.

## S41. Landscapers must bring Compostables to Composting Site – Phase 1

**Description:** Landscapers will be required to bring organic materials to City-recognized sites that divert the organics for composting. This may include separate streams at transfer stations, or directly to composting facilities. Landscape services may be fined, and ultimately lose their business license for violations (TBD).

**Diversions Modeling Targets:** The modeling for this strategy assumed moderate levels of diversion of residentially-generated and some commercially-generated yard waste.

### City Role:

- City or consultant researches ordinance language; City drafts and pass ordinance, post / advertise to landscaping firms and to the general public (notifying households and businesses that contract for the service)
- Enforcement inspectors to randomly inspect transfer station and landfill truck traffic and take complaints (from a City hotline); and to implement / follow-up on fines.

### City Budget Needs:

- Staff time: 5% FTE developing ordinance, passing, notifying. Enforcement plan assumes 10% FTE, due to volume of building in the city.
- Direct costs: No significant direct costs assumed.
- Funding Source: No significant on-going City costs; if necessary, enterprise fund, generator fee, or rates

## S8 & 9. Enforce Existing Bans - Phase 1

**Description:** Bans can be among the most effective and cost-effective solid waste management strategies in the portfolio.<sup>14</sup> Nashville has done the hard work – getting the bans in place. This strategy helps these bans realize their potential by adding stronger enforcement. The City enforces the bans it currently has on the books, including Yard Waste, Cardboard, Construction Debris, and Electronic Waste. If penalties do not currently involve substantial fines, city refines ordinances to make generators responsible, and a series of penalties should be incorporated into the ordinance.<sup>15</sup> Inspectors perform random inspections at home and business containers. First infraction leads to a warning letter; second infraction involves a fine; third infraction assesses a larger fine. Enforcement of payment may include extra assessment on the water bill (with threat of water shutoff if not paid).

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<sup>14</sup> SERA research indicates that portfolios with bans can deliver 11 to 30 times more tonnage than plans that rely on more voluntary strategies including education, incentives, and opt-in programs – at similar City cost. See Burns and McDonnell and Skumatz Economic Research Associates, “CDPHE – Colorado Integrated Solid Waste and Materials Management Plan”, June 2016, and Skumatz, “Some Things that are Cooking in Recycling Research...”, Colorado Association for Recycling (CAFR), spring 2013 newsletter for more information.

<sup>15</sup> According to SERA case studies, interviews, and research, these features represent our assessment of best practices in bans / mandates / enforcement. Skumatz, “Mandates and Bans: SERA White Paper”, Skumatz Economic Research Associates, 2012, updated.

**Diversion Modeling Targets:** The modeling for this Strategy assumed substantial diversion of residentially-generated and commercially-generated Yard Waste, Cardboard, and Electronic Waste, as well as Construction Debris.

**City Role:**

- Enforcement inspectors to randomly inspect household and business trash containers for the presence of more than trace amounts of the banned materials, and take complaints (from a City hotline); and to implement / follow-up on fines.

**City Budget Needs:**

- Staff Costs: Conservative estimate for enforcement for ALL bans (including upcoming bans) is 7 FTE, with potential to ramp to that number.
- Direct Costs: Cars assumed to be \$20K each per year in direct costs.
- Funding Source: Enterprise Fund, generator fee, or rates.

## ***S10. C&D – Require Recycling Containers with all C&D Trash Service - Phase 1***

**Description:** By ordinance, haulers providing trash service or containers to a C&D job site must provide a recycling container of at least half the size of the main container. Include the flexibility that the size of the second container may be scaled up over time by the City as more recovery facilities become available. Inspection / enforcement is to hauler, and inspectors drive to job sites and view. First infraction leads to a warning letter to hauler; second infraction involves a fine; third infraction assesses a larger fine and potential loss of business license.

Optional added inspection (if needed): Enforcement of reasonable degree of diversion by the C&D site. In this case, the haulers inspect the containers, and if reasonable care has not been taken to separate valuable / easily-recycled materials (wire, metal, cardboard, etc.), the construction firm at the job site may be penalized. In this case, enforcement is first infraction receive a warning letter, second infraction results in a fine, and third infraction involves a larger fine. Payment enforcement TBD.

**Diversion Modeling Targets:** The modeling for this Strategy assumed low-to-moderate diversion of C&D, largely from the separate C&D sector (less from household-generated C&D).

**City Role:**

- City or consultant researches ordinances language; Draft and pass ordinance, post / advertise to haulers and builders / C&D / demo firms, etc. on new requirements
- Enforcement inspectors to randomly inspect job sites (and take complaints on a hotline); implement / follow-up on fines.

**City Budget Needs:**

- Staff: City staff or consultant time 1-2 weeks (5% FTE), assumed inspectors identified under strategy 8/9 can enforce.
- Direct Costs: None.
- Funding Source: No significant on-going City costs; if necessary, enterprise fund, generator fee, or rates

## ***S20. Public Space Recycling - Phase 1 (carrying over to Phase 2)***

**Description:** City installs paired trash and recycling bins with effective signage at City / County parks and Downtown Areas. The program starts in Phase 1 and carries over to Phase 2. The recycling bins must have special lids to discourage contamination. Bins must be emptied at such frequency that they are not overflowing or lead to litter. Over time, the City installs bins at more and more parks / downtown areas.

**Diversion Modeling Targets:** The modeling for this Strategy assumed relatively low diversion of single-stream-recycling mix materials because case studies and research shows fairly high contamination from these programs; however, they are usually considered an important and visible part of a City's recycling program.

### **City Role:**

- City or consultant research to identify key first parks and downtown areas for implementing the program; bulk purchase of containers suitable for the two different areas;
- Install paired containers and appropriate, instructional signage
- Perform regular, adequate collection (or contract for collection)
- Expand the program / coverage over time.

### **City Budget Needs:**

- Staff Time: City / consultant time about 3 weeks;
- Direct and On-going Costs: Containers, signage, placement, and service for 600-1000 paired containers (300-500 sites around the City) could cost about \$1 million. Capital costs are about \$650K plus, and operations would cost about \$200K-400K per year of staff, trucks, (net) tipping fees, and amortized containers.<sup>16</sup> This program is assumed to ramp up over a series of years; tonnages are quite low. Assume capital costs are spread over 5 years.
- Funding Source: Significant costs; will need to fund from grants (for some containers), enterprise fund, generator fee, or rates

## ***S21. Public Education / Outreach (including Businesses) - Phase 1 (all Phases)***

**Description:** City assesses its current outreach / education program and prepares enhanced outreach to support the rollout of the variety of Phase 1 strategies. Outreach to Businesses should be an important element, provided by the City and in partnership with appropriate agencies (e.g. Chamber of Commerce, City Business or licensing departments, building permit division, and elsewhere). The outreach should address the variety of programs; however, residential outreach should focus on explaining the SAYT / 3-bin program, including why the City is implementing the program, how the program works for the household, and tips for successful use. Social marketing approaches should be part of the outreach work, potentially working with City non-profits and NGOs, or others. The City may elect to include a contract for production of outreach materials. Outreach should be

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<sup>16</sup> Information on Best Practices for Public Space Recycling from Skumatz and D'Souza, "Public Space Recycling...", Skumatz Economic Research Associates, 2018, prepared for Keep America Beautiful.

conducted via a range of media including radio, newspaper, newsletters, web, Facebook and others. The impacts of outreach strategies have been measured;<sup>17</sup> they do not deliver the most tonnage, nor are they the most cost-effective, but they are an important part of a solid waste management portfolio and should be delivered as cost-effectively and effectively as possible.<sup>18</sup>

**Diversion Modeling Targets:** The modeling for this Strategy assumed relatively low net diversion of residential and commercial single-stream mix, yard waste, food, and source reduction. Even with strong programs, education itself does not show itself (statistically)<sup>19</sup> to be a large contributor to diversion; however, we used higher-end numbers because we assumed best practices in the outreach / education approach. Education is an important component of successful programs.

#### City Role:

- City or consultant assesses the effectiveness of current outreach methods; Identify the outreach needs for residents and businesses / key programs
- Working with professionals or the City's department, craft outreach strategy, key messaging, test, and deliver messaging to residential and business sectors.

#### City Budget Needs:

- Staff time: High diversion cities can spend considerable funds on outreach, and the City will need a substantial push in the early years to roll out the new programs. Some staff assumed already assigned; we assign one extra FTE in the first year, and increase by 20% FTE (ongoing) because there will be periodic roll-outs of new initiatives.
- Direct Costs: Based on estimated costs of \$1/capita - \$1.50/capita, Nashville might see costs of \$600K-\$1 million; assume costs are spread over two years. This will include some business outreach. Social marketing costs, and inclusion of schools programs could increase this by 50-100%. Assume outreach consultant assistance of \$75K periodically. Basic on-going outreach is not a new cost; adding about \$200K for enhancing the quality of outreach in the City.
- Funding Source: Enterprise fund, generator fee, or rates

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<sup>17</sup> From Skumatz Economic Research Associates research. See "Education / Outreach Programs in Recycling: Impacts and Effects", SWANA Wastecon, 2006; "Optimizing Education and Program Outreach: Measuring the Impacts of Recycling and Resource Conservation Programs", prepared for SWANA WasteCon 2001 proceedings, October 2001; "Evaluating the impact of recycling education", Resource Recycling, August 2001; Skumatz, "Evaluating The Impacts Of Education / Outreach Programs – Lessons On Impacts, Methods, And Optimal Education", Proceedings of the 2000 ACEEE Summer Study, Asilomar, CA, 2000; Skumatz and Green, "Evaluating the Impacts of Recycling / Diversion Education Programs – Effective Methods and Optimizing Expenditures" for Iowa DNR, Econservation Institute, 2002, updated periodically.

<sup>18</sup> See Skumatz and Freeman, *Spending Your Outreach Dollar Wisely: Increasing Recycling Using Community-Based Social Marketing*, Waste Advantage, February 2012; *Measuring the Impacts of Social Marketing on Recycling – What is the "Bang for the Buck"? Is it Worth It?*, Proceedings of the SWANA WasteCon Conference, 2011; Skumatz, "Does Social Marketing Work: Addressing Measurement Gaps in Impacts and Retention for Behavioral Programs, Proceedings of the IEPEC Conference, 2011, Skumatz, "Social Marketing – How Cost-Effective is it?", Resource Recycling, April 2010.

<sup>19</sup> Skumatz, "Social Marketing – How Cost-Effective is it?", Resource Recycling, April 2010; Skumatz and Green, "Evaluating the Impacts of Recycling / Diversion Education Programs – Effective Methods and Optimizing Expenditures" for Iowa DNR, Econservation Institute, 2002, updated periodically; and other sources.

## ***S19. Small Business Policies / Programs and Space for Recycling Ordinance for MF and Commercial - Phase 1***

**Description:** The City implements a multi-pronged program to aid small businesses in increasing recycling. The strategies should include, at a minimum:<sup>20</sup>

1. Ordinance requiring “Space for Recycling” in All Commercial and MF Remodeling & New Construction: City / County passes an ordinance requiring that all new construction and substantial remodels in the commercial and larger MF sector (>4 units) must include allocation of space to accommodate space for recycling (meaning recycling and organics combined) that is at least as large as the required space for trash. This is to be included in building codes / permit process, and ideally, no COO is provided unless the condition is met.
2. Ordinance requiring that MF buildings must have a dumpster for recycling as well, with effective signage. The size should be no less than half the trash size.
3. Clear Invoicing:<sup>21</sup> An ordinance should be passed that requires that invoices for commercial collection service from haulers must clearly / transparently label all services, sizes, and frequencies of the services being delivered, the cost for the service, and provide information on where to call for additional information on recycling.
4. Technical Assistance: Technical assistance, using City staff / contractors or consultants to individual businesses that request the service, can provide tailored in-business advice on strategies to recycle or compost more materials from the business. The service should be provided to small businesses at zero or token cost. The City may elect to explore savings-sharing relationships for larger businesses. Many cities also conduct targeted outreach to advertise the program, targeting certain business types first (offices, restaurants, etc.).
5. Recycling Plans: Require business recycling plans by businesses. The city or consultants will design a web-based drop-down form that all businesses must complete; a copy retained on-site for inspection. Less commonly, the plan is “filed” with the City (or less preferably, with the hauler). The form does not require behavior change, but forces the business to walk through the process of determining if they might save money by recycling or composting more. In addition, it makes it clear where they can look for services.
6. Web Information and Optional Hotline: The City or consultants should develop a website targeted to small businesses. It includes information on how to recycle or compost /divert, where to look for haulers that recycle, tips and case studies from peer-type businesses, and other information.
7. Small businesses may be put on Residential Recycling Collection Service: The City may elect to route through areas with small businesses using residential containers and service (up to 1 96-gallon cart). The service should be provided a no charge or low fee. This addresses a critical recycling barrier for small businesses – the fact that trash plus recycling costs more than trash alone.
8. Recognition Programs: The City develops a program to establish criteria by which businesses can receive a version of a “Green” certification / label that is recognized within the City. The certification is different / increasing levels (one star, two stars, etc.), and the criteria is usually somewhat tailored to major business categories (e.g. office criteria are different from restaurants, dry cleaners or auto shops). Businesses start with a self-report form on program basics, as part of the request to the City to be inspected for the program. Certified businesses receive a door / window static sticker large enough to be noticed by customers, and may be highlighted in the City’s newsletter or website.

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<sup>20</sup> These strategies from SERA Research. See Burns and McDonnell and Skumatz Economic Research Associates, “State of Colorado Integrated Materials Management Plan”, prepared for CDPHE, 2015 and other SERA studies.

<sup>21</sup> From SERA research, see Skumatz, Resource Recycling, “Cracking Commercial Contracts: Commercial recycling can be thwarted by codes and clauses within hauler contracts that leave businesses ignorant of diversion opportunities”. *Resource Recycling*, September 2014.

9. Possible Grants for Bins: To reduce one of the recycling / composting barriers some businesses see in the cost of internal recycling / composting bins, the City establishes a fund that buys and distributes bins to businesses requesting the containers. A request system is established.
10. Possible First Three Months of Service Free: The City sets aside a determined pot of funds and businesses that sign up for organics or recycling service (prior to the implementation of Commercial SAYT) for at least a year, can receive the first 3 months of service “for free”.<sup>22</sup>
11. Other programs, to be developed.

**Diversion Modeling Targets:** The modeling for this Strategy assumed low to moderate diversion of commercial single-stream mix (focused on paper / cardboard, and other commercial constituents). Diversion expectations are not high because the programs exclude large firms, and because these strategies exclude significant financial incentives.

**City Role:**

- City or consultant researches ordinances language designs suite of programs, pre-test, advertise
- Set up web sites
- Hire consultants or train in-business technical advisors; develop technical assistance program, business recognition program, and business plan documents / program.
- Set aside funding for the grant-type programs; identify sourcing for in-house containers
- We assume no significant enforcement for the business plans at this level; enforce clear invoicing through inspection of hauler records conducted through enforcement of other programs like SAYT.

**City Budget Needs:**

- Staff time: 25% FTE staff or consultant to plan the suite of programs. 4-8 FTE city or consultant for technical assistance program and business recognition program.
- City Service Costs: Adding businesses onto residential service (GSD) \$50K-\$100K.
- Direct costs: Grants for 3 months service \$25K-\$50K grant; bin grant program \$25K-\$50K (flexible based on City budget).
- Funding Source: Enterprise fund, generator fee, or rates

## ***S11. C&D and Compost – Require / Reward Recycling and Reuse of C&D and Use of Local Compost in City Contracts and Jobs - Phase 1 or 2***

**Description:** City contracts involving any construction and demolition require recycling of materials of a threshold percentage of material generated during the process (the threshold percentage increases over time). Firms not specifying their planned practices are ineligible to receive the contract; firms specifying more aggressive recycling strategies receive higher points.

In addition, the city requires that any construction, road / transportation, or other jobs that involve soil amendment of any kind must use locally-generated compost. Firms proposing must do so or they are ineligible;

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<sup>22</sup> For additional description of many of these strategies see *City of Denver and Skumatz Economic Research Associates, “USDN: 2013 Roadmap to Commercial Waste Reduction”, 2013.*

again, firms that identify ways to use more material may receive more points. All work done by the City must also use these materials. The city “walks the talk” and helps pave the way for firms to hone practices related to reuse and recycling of building / demolition-related materials.

**Diversion Modeling Targets:** The modeling for this Strategy assumed very low diversion of C&D and organics, mainly because government sector construction does not represent the majority of development in the City.

**City Role:**

- City / consultant develops standards and language for ordinance; pass ordinance; post and advertise
- City / consultant identifies appropriate language for RFPs / contracts
- City notifies all departments of changes in rules on C&D, compost, road projects, etc.

**City Budget Needs:**

- Staff time: 5% -10% staff time to craft language suitable for legal contracting and purchasing / procurement, and make sure the language is inserted into all relevant contracting.
- Direct Costs: No direct costs assumed; this may be a simplification if required C&D reuse increases cost of city contracts; however, pre-planning can reduce costs.
- Funding Source: No significant on-going City costs beyond potential increases in contracts. Short term, enterprise fund, generator fee, or rates

## S24. MF Pilots - Phase 2

**Description:** This strategy establishes a proposal-based grant program that allows haulers and potentially non-profits to propose ideas for programs that will increase recycling in larger multi-family buildings (>75 units) that will be an incubator for strategies that might work as a city-wide roll-out. The grant program should require significant metrics and tracking and record keeping on costs so the results may be used by the City to compare options and allow the city to develop a full-scale program in Phase 3 or 4. The goal is to try to work with as many haulers with different ideas as possible.<sup>23</sup>

**Diversion Modeling Targets:** The modeling for this Strategy assumed nearly zero diversion of MF-generated single stream recycling mix, because it is only a pilot program. Food waste may also be diverted, depending on the pilot submittals, but significant tonnage does not occur until programs expand beyond the pilot level.

**City Role:**

- City or consultant develops RFP, City advertises to haulers and potentially Non-profits. Staff / consultant personal outreach to haulers and potential bidders to encourage participation. Accept proposals at least twice a year in the early phases to allow word to grow.
- Score proposals, and award grants to strong-scoring proposals
- Monitor and check paperwork / reporting, pay as agreed.
- Review results / performance and examine the results for programs with potential on a wider scale.

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<sup>23</sup> Design based on helpful discussion with Bob Gedert, RRS, based on programs he developed in Austin and Fresno (January 2018)



**City Budget Needs:**

- Staff needs: Assume this is an important preparation project for meeting the needs of this sector. Assume 50% or more staff person.
- Direct costs: Approximately \$25-50K each for 7-12 projects (\$400K).
- Funding Source: May include significant on-going City costs; consider enterprise fund, generator fee, or rates

## **S33-34. Fee for Single Use Bags (or Ban) - Phase 2**

**Description:** City develops / passes an ordinance for a fee for single use paper and plastic bags. The small fee (5-10 cents) is shared in some proportion with the retailers. The program will likely result in an 80% or greater reduction in plastic (and paper) bags in the waste stream. Although they do not represent large tonnages, plastic bags in particular are an issue in recycling facilities, litter, and drainage, as well as wildlife safety.<sup>24</sup> Single use bag fees (or bans) can also be an effective strategy for achieving these other goals, for providing a visible and constant reminder to households to remember that behaviors and choices matter, and that there are alternative to the traditional choices, and they are often desired by factions of the local “green” community.

The City will need to identify an administration system, identifying all covered retailers through the city business license system; in addition, a Nexus study to identify the direct city cost (in litter clean-up, etc.) to justify the fee will be needed. The City may wish to notify useful supporters / interested groups as the legislation comes forward (environmental groups concerned with clean rivers, hunters, school children) and to craft the program. The program represents a revenue source to the city for certain programs / efforts. The city may wish to establish a canvas-bag giveaway program, focusing on low income neighborhoods.

**Diversion Modeling Targets:** The modeling for this Strategy assumed strong diversion of the small (by weight) share of residential and multi-family-generated plastic bags; the case studies upon which this strategy is crafted show fees and bans can reduce this stream by more than 80%.

**City Role:**

- City contracts to have Nexus study conducted, City / consultant researches and crafts ordinance; City passes / posts ordinance, advertises widely to residents and businesses
- Sends information to retailers explaining program and setting up administration system.
- Considers reusable bag giveaway program, focused on low income neighborhoods

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<sup>24</sup> SERA Research. For more information on design choices, impacts, and case studies, see Skumatz, Freeman, and Friend, “Of Bags, Bans, and Fees”, *Resource Recycling*, March 2012; Skumatz, et. al., “The Bag Basics”, *Resource Recycling*, November 2016. Research on costs, administration, and options from Skumatz, “Advance Disposal Fee (ADF) Options Research, Skumatz Economic Research Associates, 2010.

#### **City Budget Needs:**

- Staff Costs: City or Consultant research on design, administration options, funding, and development of ordinance 15% FTE. On-going the program may take up as much as 10% FTE potentially if administration requires significant special outreach to businesses.
- Direct costs: For Nexus study: \$40-75K; Administration notification costs and coordination on taxes with businesses: Zero if already conducting outreach for businesses; otherwise, assume \$50K. Costs for Bag giveaway: \$25K-75K, depending on City's perceived need; optional add-on.
- Funding Source: No significant on-going City costs; if necessary, enterprise fund, generator fee, or rates

### ***S4&5. Enforce Food Waste Ban in the Residential and Commercial Sectors - Phase 2***

**Description:** City adds enforcement of the residential and commercial food waste ban to the responsibilities of the inspectors assigned to enforce the “existing bans”. Inspectors perform random inspections at home and business containers. First infraction leads to a warning letter; second infraction involves a fine; third infraction assesses a larger fine. Enforcement of payment may include extra assessment on the water bill (with threat of water shutoff if not paid). This is especially important to enforce once facilities that can take food waste are on-line.

**Diversion Modeling Targets:** The modeling for this Strategy assumed moderate-to-fairly strong impacts on the remaining food scraps in the residential and commercial sector. Additional tonnages of this material are diverted later when collection frequency for trash changes.

#### **City Role:**

- Enforcement inspectors to randomly inspect household and business trash containers for the presence of more than trace amounts of the banned materials, and take complaints (from a City hotline); and to implement / follow-up on fines.
- We assume no additional inspectors are needed.

#### **City Budget Needs:**

- Staff time: No additional staff costs or direct costs beyond those enforcing existing bans (listed above).
- Direct Costs: As listed above.
- Funding Source: No significant on-going City costs / covered by another strategy.

### ***S6. Allow / Incentivize and (Eventually) Require Every Other Week Trash Collection at Lower Cost - Phase 2; Phase 4***

**Description:** City or consultant conducts research and take steps to eliminate any city, county, or state health department or other barriers to every other week collection of trash, and/or change existing regulations to modify language from trash to “putrescible”. Once barriers are removed – and once a facility is available to take food waste -- modify the SAYT hauler ordinance to require that haulers offer an every other week trash collection rate

at a non-trivially-lower rates (recommended thresholds to be established with more research). In Phase 4 this changes to a mandatory EOW trash collection regulation. Ordinance requires haulers to advertise the option to all residential customers annually on the bill. The optimal ordinance would include requiring all haulers to move yard waste / food waste service to weekly for all households.

Haulers provide stickers or different lids to clearly mark households on every-other-week (EOW) service on the containers to identify households on the service (and to effectively advertise the service to other customers. This program is expected to drive food waste from the trash can to the organics can; a share of households have proven reluctant to move food to the organics container without this added incentive and EOW collection of trash can help modify this behavior.<sup>25</sup>

**Diversion Modeling Targets:** The modeling for this Strategy assumed fairly strong impacts on the remaining food scraps in the residential sector.

#### **City Role:**

- City or consultant conducts research to find and eliminate city / county / state health department or other regulations that pose barriers to EOW collection of trash; include research of any barriers on the commercial side to prepare for a later Task 4 strategy.
- City/ consultant identifies the appropriate price discount/ incentive threshold for the service. Pass 2-part ordinance, allowing incentivized optional EOW trash collection, and giving the authority to the DPW (via memo) to modify the ordinance to require EOW as an option, unless households elect to pay a premium fee for weekly collection. City invokes this strategy if City waste sorts indicate significant food waste remains in the trash, or if goals are not being met.
- City crafts an ordinance; passes, posts, and specifically notifies haulers. City inspectors check routes for reasonable number of customers on EOW service, and inspects hauler records to assure haulers are complying. No new inspectors are needed; assumed the same inspectors enforcing SAYT will add this to the inspection list.

#### **City Budget Needs:**

- Staff Time: City / consultant staff time for research 10%-15% FTE. Assume no new inspection staff.
- Direct Costs: New container costs do not involve full container purchases, but do include new lids or decals (assume 10% of containers switch to the service, with a retrofit cost of \$25 each). Some savings in routing.
- Funding Source: Costs reimbursed from user fees.

## **S15. Convenience Center – Minimum Requirements for Access and Services - Phase 2**

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<sup>25</sup> From Skumatz “Every Other Week for Everything”, *Resource Recycling*, November 2013; 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, Burns and McDonnell and Skumatz Economic Research Associates, “State of Colorado Integrated Materials Management Plan”, prepared for CDPHE, 2015 and other updates.

**Description:** City draws maps with concentric circles around the existing convenience centers / recycling centers with reasonably complete services and identifies areas without good access. Ideal is that citizens are not more than 1.5-2 miles away from convenience centers (TBD). City looks for service deserts (especially around multi-family households), and looks for locations (either new land or partners willing to use part of their lot) to establish additional convenience centers. The centers should accept an enhanced list of recyclables (including, potentially, color separated glass), and possibly compost / brush (TBD, or may be phased in). The city will need to comply with regulations, including steps, potentially lighting / power, specially-designed lids, etc. The site should be staffed when open.

There are currently 3 (or 4) convenience centers providing service for Nashville's 680,000 residents (200K:1). This number is not dramatically different than the ratio in Austin (4 sites for 930,000 households), or ratios in other cities like San Jose, San Francisco, or other locations.<sup>26</sup> However, comparisons are difficult. Inevitably there are also networks of private and non-profit drop-off centers that augment access to some degree.<sup>27</sup> Comparisons are also difficult because reliance on drop-offs decreases as enhanced (and mandatory) curbside services become available.

Drop-offs can be an important part of a system. Drop-off / convenience centers can provide access for some multi-family, small commercial, and most importantly, can be set up to allow recycling of materials that may not be collected at the curb – and can be particularly appropriate as a location for recycling glass, as it can allow color sorting and is kept separate from fibers and plastics, and improves cleanliness and market value of recovered materials

The bottom line is “convenient access” is needed for sites to be used – potentially defined in relation to simple distance, or potentially with an element introduced regarding places people would tend to go anyway (e.g. shopping centers, grocery stores, etc.). Developing guidelines for what constitutes appropriate and convenient “access” can draw on some precedents but it is complicated in a time when Nashville envisions implementing a set of strategies that dramatically improve access from residential and commercial curbside programs, mandates, bans, and incentives. Three miles<sup>28</sup> may be a suitable first-cut for convenience, and no matter what the distance, “similar” access may be a relevant goal.<sup>29</sup>

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<sup>26</sup> The other extreme is Dallas, with hundreds of little drop-offs / dumpsters scattered in areas like downtown and multifamily areas; contamination can be an issue in unstaffed sites like this. (SERA case study)

<sup>27</sup> *Some are one-material; others take more, but they are hard to quantify and classify. Furthermore, these facilities, usually suffer from being less well-known / advertised to the public, and less used (unlike sites we've analyzed in Anchorage and a few other locations with somewhat unusual recycling situations).*

<sup>28</sup> *In a bit of an inverse interpretation of the logic for “access” for bottle bill redemptions in California, it could be interpreted that convenient access was generally defined as about a half mile for urban / suburban areas, or else three miles in rural areas. This is for a very mature state, and was really defined to assure good distribution (rather than crowding) of redemption centers. We are proposing multiples of these values for minimum access to convenience centers. SERA case study.*

<sup>29</sup> *ignoring issues of grocery store magnets, and ignoring the presence of a separate network of private facilities)*

**Figure 2:** Davidson County Population Density Map superimposed with Convenience Centers with 3 mile distance radii

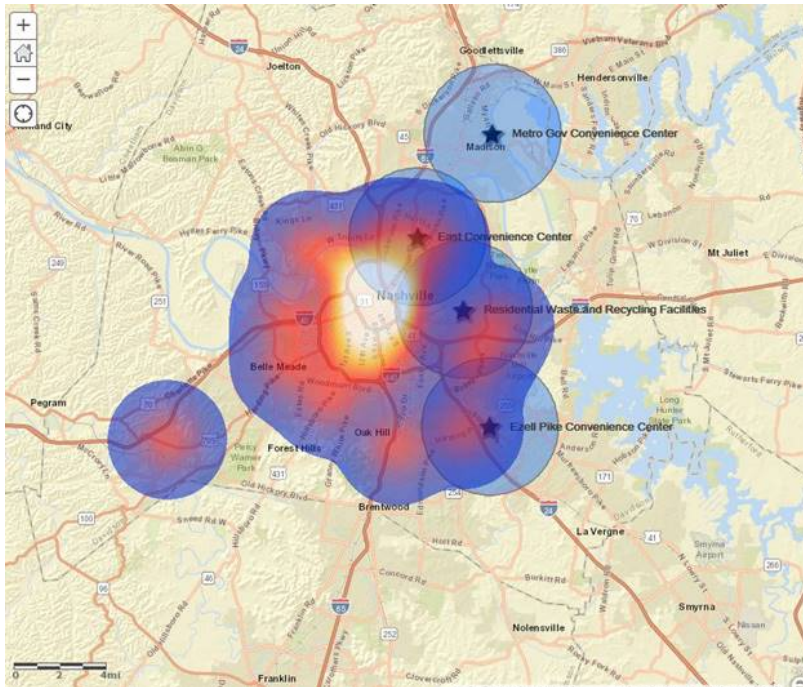


Figure 2 shows a map of the location of population centers in Davidson County, and the locations of the drop-off facilities. With a 3 mile radius around sites, the population in the eastern half of the county is well served; the western half is not served equally well.<sup>30</sup> We suggest the City will need a minimum of two (and possibly 3) additional sites, in the western areas, in order to provide similar convenience of service.

**Program Design:** For planning purposes, we assume the City / County sets a threshold of facilities within 3 miles of a large percent of the population (90%), and identifies that 2-3 staffed facilities are needed. In addition, these sites should provide full service and enhanced access for materials not currently / near term accepted in the curbside container. They should take separate colored glass (in bunkers or containers), major single stream materials, and potentially brush, textiles, and possibly Styrofoam or other materials for which markets can be identified / developed. This will be a focus of on-going study for the City. The City may save money by developing sponsors, or private partners.

**Diversion Modeling Targets:** The modeling for this Strategy assumed smaller effects on recycling and brush than the existing convenience centers. The materials were assumed to be drawn from the single family, multifamily, and (small) commercial sectors; however, the calculations assumed some diversion came from non-curbside materials.

**City Role:**

- City / consultant identifies locations of current facilities, and service deserts and confirms priority / valued materials to be diverted.
- City undertakes development of new site(s) over time.

**City Budget Needs:**

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<sup>30</sup> Fortunately examining the income distribution within Davidson County, it appears that the current sites are concentrated in the lower income areas; they are receiving fairly good access from the current sites.

- Staff Time: We assume 10% staff / consultant time to conduct the basic analysis of population distribution around existing convenience centers, examine materials and markets, discuss MRF needs, and conduct preliminary discussions around the need for site(s). On-going staffing time is also assumed. The planning for each site will be significant.
- Direct Costs: According to RRS, the cost for each site in capital costs (excluding land and site preparation), and annualized, may be \$310K/year. On-going costs for each site (RRS) is expected to be \$850K/year. If the City develops a second site, these costs will increase in step. Note there are some differences in the population per site ratio at current sites and the assumptions in the RRS planning numbers.
- Funding Source: Significant on-going City costs; if necessary, enterprise fund, generator fee, or rates

## ***S42b. Change Building Codes to Require Soil Amendment using Local Compost - Phase 2***

**Description:** Under this strategy, the City building code is amended to require that with all new residential and commercial construction, soil amendment must use locally-generated compost. On-site building inspectors enforce use of material, *and use of the material must be demonstrated for occupancy permit to be provided*. This is a critical step -- a secure demand for product -- that establishes markets for the product and allows local compost facilities to be profitable, and “closes the loop”. Compost is, at its best, a local product and cannot economically be shipped far; without this requirement, diversion (and processing) is required, generating a product with minimal demand, and the economics of the system (and facilities) are weak.

**Diversion Modeling Targets:** The modeling for this Strategy assumed limited tonnages of organics; the major impacts are the circular economy / economic market development effects, rather than direct tonnage.

### **City Role:**

- Change building code to require soil amendment must be locally-generated compost; advertise / publicize
- Change inspection procedures to incorporate this step

### **City Budget Needs:**

- Staff time: 10% FTE for development of ordinance and working with relevant departments to understand / incorporate into procedures. Assume it is integrated into existing enforcement / inspections of buildings and sites (simplification).
- Direct Costs: None for City.
- Funding Source: No significant on-going City costs; if necessary, enterprise fund, generator fee, or rates

## 4. DESCRIPTION AND FUNDING NEEDS FOR HIGH PERFORMANCE PROGRAM STRATEGIES – PHASE 3 AND 4 STRATEGIES

### *S7. Commercial SAYT and ABC Law (adapted), Supporting Bans, and Enforcement - Phase 3*

**Description:** The commercial sector is responsible for a majority share of waste disposal in Nashville, and this strategy focuses on removing barriers from commercial recycling and organics diversion, and allowing businesses to see more unambiguous financial incentives to reduce disposal. The main element of this strategy is to require that recycling (*and organics service*) be provided to all businesses with the cost of the program embedded in the trash fee – so that recycling plus trash is no longer more expensive than trash service only.<sup>31</sup> Significant increases in recycling are attributed to this strategy.

The strategy is implemented through an ordinance including the following key components:

- All haulers and businesses providing trash service in the commercial sector must provide recycling, and for limited business types, organics service. Costs to provide these services may not be separate and must be embedded in the trash bill. Minimum acceptable materials are identified, and updated / enhanced periodically by the City (Memo by DPW) to meet and push local MRFs.
- Recycling service no less than 96 gallons, (and food scraps in containers no smaller than 32 gallons) and the combination of organics and recycling service must be equal to the businesses' trash service volumes, with costs embedded in the trash fee (no separate fee). Recycling service may be provided in multiples of 96 gallon carts if screening, space, or other issues arise. Note that the City will want to increase the multiple as the City's goals move forward (e.g. 150%, etc.; equal service levels equate to just a 50% diversion achievement for the Commercial sector).
- The City may change the ratio of recycling / organics to trash service required with a PW Director memo. The program may phase in, starting with largest businesses first, according to the PW Director; however, it may not take more than 3 years to include all businesses.
- ABC law requires that business with liquor licenses must certify / demonstrate they have a program for recycling all beverage containers or their liquor license may be revoked. We also adapt this law to require that organics service (food) will be provided to all customers with food licenses/ targeted food businesses (groceries, cafeterias, schools / universities, restaurants, etc.) in containers from 32 gallons and larger, or their license may be revoked.<sup>32</sup>

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<sup>31</sup> Information on Commercial SAYT / PAYT from SERA Research. See Skumatz, et. al., "PAYT / Variable Rates for Trash Collection: 2014 Update", Econservation Institute / Skumatz Economic Research Associates (SERA), Superior, CO, 2015. For EPA Region 9, and Skumatz et. al., "PAYT: 2006 Update" for SERA and EPA, January 2007 and other research.

<sup>32</sup> For additional description of this ABC law strategy see City of Denver and Skumatz Economic Research Associates, "USDN 2013 Roadmap to Commercial Waste Reduction", 2013, Skumatz, "Cracking Commercial Contracts: Commercial recycling can be thwarted by codes and clauses within hauler contracts that leave businesses ignorant of diversion opportunities". Resource Recycling, September 2014; Skumatz, "Commercial Recycling, Incentives, and Innovations: Effective and Creative Programs and Collection Changes", Paper for Proceedings of the Global Waste Management Symposium (GWMS), Phoenix, September 2012, with Dana D'Souza; and other publications.

- City has the right to inspect company records to verify compliance; require clear invoices; require haulers to highlight the program and objectives twice a year on bills or bill inserts
- Violations result in a letter, increasing fines, and ultimately, potential loss of the license to haul commercial waste from businesses in the City / County.
- Be sure to add element for every other week (EOW) trash collection, assuming barriers are removed as part of the residential EOW research. Do not push / advertise; this additional strategy / incentive is invoked later.

**Diversion Modeling Targets:** The modeling for this Strategy assumed high levels of diversion of commercially-generated single-stream recycling mix, food waste, and also additional waste diversion / source reduction. Although statistical results for the commercial sector are scarce, we adapt the residential results and limited commercial case studies.

**City Role:**

- Research to identify specific language for ordinance; meetings with haulers
- Develop ordinance, pass, post / notify
- Enforcement of ordinance through inspectors reviewing business containerization (and potentially, bills), hauler records, and hotlines; issue violations and fines. Enforcement is key to level playing field for haulers.
- PW Director updates the phase in period and ratio of required recycling / organics to trash service.

**City Budget Needs:**

- Staff time: First year - 10% - 15% FTE for additional research on development of ordinance and working with relevant departments to understand / incorporate into procedures.
- On-going staffing needs: Assume enforcement includes 8 staff, per SF. This may decrease over time, but the program involves multiple elements, including a link with the business license department to carry out the enforcement of the ABC law.
- Direct Costs: 8 cars for commercial hauler and service set out enforcement.
- Funding Source: Significant on-going City enforcement costs to enforce level playing field; hauler surcharge to cover oversight. If necessary, enterprise fund, generator fee, rates. Fines may cover some costs, but should not be assumed to be a significant revenue source.

## ***S12, 13, 14. C&D – Require C&D Deposit System - Phase 3***

**Description:** One of the most effective C&D programs implemented to date has been the C&D deposit program pioneered by the City of San Jose California (and adapted by other communities since). This program requires that firms taking out building permits for construction or demolition projects for residential, multifamily, or commercial jobs must pay a financial deposit, which may be reclaimed if they demonstrate they recycled or reused a minimum threshold (e.g. 50%) of the materials generated as part of the job. The fee is based on the square feet of the job, and uses different “per square foot multipliers” depending on whether the job is new construction, remodel, or demo, and whether it is single family, multifamily, or commercial. Enforcement is through the building department; funds are not paid back unless the requirements are met. Piggybacking on an



existing approval / registration process is an important element. The financial factor must be sufficient to modify behavior. Over time, a refinement to the program evolved; as the mandatory diversion led to a more stable stream of C&D, processing facilities were established. The City conducted a certification program, and certain facilities were determined to “meet” the 50% (or other) threshold. After that point, any builder bringing appropriate (and sufficient) weight slips from these facilities were deemed to have complied and could receive their deposits back. Other refinements included excluding the smallest 25% of jobs (25% of administrative burden, and roughly 10% or less of material generated). Other variations were developed in other cities, based on this pioneering model.<sup>33</sup>

Nashville would implement a similar program, using an ordinance, changes to the building permit system, and ultimately, certification of C&D processing infrastructure.

**Diversion Modeling Targets:** The modeling for this Strategy assumed high levels of diversion of the C&D stream, diverting goal-level amounts of material (e.g. 25%, 50%). The program has been demonstrated to be highly effective in other locations.

#### **City Role:**

- City / consultant reaches out to existing C&D processing facilities and existing builders to discuss existing capacities and behaviors, and the potential for facilities to expand in the near and longer term.
- City / consultant investigate financial thresholds from other cities and their early implementation strategies, establish potential / feasible recycling thresholds and exemptions, and identifies “acceptable” methods to demonstrate certification with and without certified facilities; City works with building department to modify forms and implementation/ enforcement processes.
- City drafts ordinance, noting that changes to recycling / diversion / reuse threshold may be updated periodically by the PW director. A phase in period should be considered to allow some facilities to begin to be established.
- City monitors development of (regional) C&D processing facilities and ultimately establishes a certification protocol. City helps address bottlenecks or problems in infrastructure development as appropriate and feasible.

#### **City Budget Needs:**

- Staff time: 10% FTE for development of ordinance and working with relevant departments to understand / incorporate into procedures. Assume it is integrated into existing enforcement / inspections of buildings and sites (simplification; may require a portion of a person).
- Direct Costs: None for City.
- Funding Source: No significant on-going City costs; if necessary, enterprise fund, generator fee, or rates. Note that this deposit system (unclaimed deposits) has sometimes been a supplemental source of revenues and may cover some portion of the program’s cost.

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<sup>33</sup> For additional description of this strategy see Burns and McDonnell and Skumatz Economic Research Associates, “State of Colorado Integrated Materials Management Plan”, prepared for CDPHE, 2015; and Skumatz Economic Research Associates and City of Denver and Skumatz Economic Research Associates, “USDN 2013 Roadmap to Commercial Waste Reduction”, 2013 and other SERA publications.

## ***S16 & 17. Incentives (Surcharges / Discounts) for Clean Separated Streams and Diversion at Transfer Stations and Disposal Sites - Phase 3***

**Description:** Financial incentives can change behavior, especially in the commercial sector. In particular, a system of surcharges and tax reductions can help increase the financial incentive for recycling and organics programs over disposal. In this strategy, Nashville imposes a substantial surcharge on tons disposed (landfilled or other technologies that may be implemented) for City-generated waste that is disposed. This will include local / regional facilities directly (public and private transfer stations, landfills, etc.) and research will be needed to identify the best strategy for imposing the fee on waste leaving the region and not stopping at any local facilities (if any). In addition, the City should consider establishing zero sales or other taxes on recycling and organics streams. If the surcharge is set appropriately (large enough), the program will tend to reinforce the economics of robustly participating in recycling and organics programs.<sup>34</sup>

**Diversion Modeling Targets:** The modeling for this Strategy assumed low to medium levels of diversion of commercially-generated recyclables and food scraps, in accordance with relevant case studies and research.<sup>35</sup>

### **City Role:**

- City / consultant researches legality of the option, and works with attorney to remove barriers for strategy.
- City / consultant researches sufficient financial incentives to change behavior, policy options / sharing for funds, and appropriate administrative (money collection) and enforcement / compliance procedures.
- City crafts, passes, posts, and advertises new ordinance to appropriate stakeholders
- City works with affected entities to implement the option and administration departments collect / distribute funds as determined.

### **City Budget Needs:**

- Staff time: 10%-15% FTE to work with attorneys to confirm / identify authority, and with administrative department to work out on-going fund transfer arrangements, and to develop / pass / post / advertise /implement the ordinance.
- Direct Costs: None for City / no special enforcement envisioned as it is a pricing differential. Periodic checks of signage and separate pricing could be conducted by inspectors checking for violations of bans; inspection of books could be conducted by City inspectors or administration on an as-needed basis as well.
- Funding Source: On-going City costs are covered as part of the surcharges / self-funding.

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<sup>34</sup> Quantitative research by SERA has found that participation in organics programs was nearly three times higher for public / commercial entities that faced significant differentials from these two sources. See Skumatz, et. al., "The Costs and Benefits of Minnesota K-12 School Waste Management Programs", Prepared for Minnesota MPCA, July 2014. For additional description of this strategy see City of Denver and Skumatz Economic Research Associates, "USDN 2013 Roadmap to Commercial Waste Reduction", 2013.

<sup>35</sup> Op.cit.

## S18. Residential Service Contracts / Franchises - Phase 3

**Description:** Research indicates that ordinances can make delivery of programs and services (and incentives) uniformly available within a community with relatively low objections from haulers and affected stakeholders. However, if performance is not as desired, the City and its residents may gain additional advantages from considering contracting (or districting / franchising – basically specialized contracting arrangements) for residential service.<sup>36</sup> Contracting (including its districting / franchising) can gain three primary advantages for the City and its residents:

- Lower emissions and lower wear and tear on city streets because fewer trucks go over the same streets because collection is organized and multiple haulers no longer operate in an overlapping way in neighborhoods (enhancing Triple Bottom Line analysis);
- Lower costs or rates for households because: 1) collection is geographically concentrated and economies of scale exit for the remaining haulers, and 2) service is postage-stamp-priced, and achieved through a competitive bid process.
- The City gains greater control over haulers, including more uniform program design, education materials, service options, pricing, customer service and quality, reporting, and other factors that can enhance diversion and an integrated system.

The city<sup>37</sup> issues a notice publicly as well as to all haulers operating in the area / region that it intends to intervene in the sector, and issue an RFP for residential collection in the City (usually a minimum of 6 months before the service is anticipated to be transferred).<sup>38</sup> The City hires a consultant familiar with this process. We recommend the City uses a process involving a request for proposals (RFP), not a request for bids (RFB), for flexibility and ability to consider criteria beyond lowest cost. Nashville may also choose to open the entire City to RFP, or focus on the area not served by Metro. Although some cities have undertaken the first suggestion and allowed the City to participate in the Proposal process and compete for one or more areas, we assume this process is set up such that the City continues to serve its traditional area, and that the remainder of the area (currently served by “other” haulers) is the area competed under an RFP process.

Meetings with council will be essential to confirm whether the existing system of ordinances is sufficient, or whether a transition to contract / district / franchising, or to municipal collection is desired. The rest of this design is written assuming a contract / district / franchise arrangement is selected. Consultant researches options for the RFP and brings a discussion of these elements to staff and a work session of the Councils to determine the key elements of the RFP. Since SAYT, embedded recycling, and other elements are already part of the system, the remaining decision items include:<sup>39</sup> how many districts / contracts will be offered (or general guidelines), whether

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<sup>36</sup> For more information on contracting, and comparisons to the ordinance option, see Skumatz et. al., “PAYT: 2015 Update”, Econservation Institute / Skumatz Economic Research Associates (SERA), Superior, CO, 2015 (For EPA Region 9), See Burns and McDonnell and Skumatz Economic Research Associates, “State of Colorado Integrated Materials Management Plan”, prepared for CDPHE, 2015, and other SERA research in presentations and reports.

<sup>37</sup> This process reflects process SERA has used with multiple cities, and additional information is available in Skumatz, “Taking Control: How Do Municipalities Organize Collection? What is the Best Way?” Resource Recycling, January 2013; and other SERA publications / presentations.

<sup>38</sup> There are reasons to provide or not to provide this announcement before consideration of the strategy is widely known; note that there is generally no penalty if the city changes its mind in the event of a change in Council direction, no favorable bids, or other reasons.

<sup>39</sup> There are pros and cons to each of these options; SERA has developed “decision trees” and other tools to help councils and staff wade through the pros and cons of the various options, and maintains examples of RFPs and contracts from many jurisdictions around the nation. E.g. city billing can reduce bill collection / bad debts for the haulers, and can result in lower

one or more districts will be set-aside for small haulers or local haulers (and how small and local will be defined), specific rate structure, program requirements, periodic outreach requirements, what additional services may be assigned (e.g. public parks, bulky, metro buildings, etc.), container ownership (and possible financing help for small haulers), whether destination of various materials to facilities will be included (e.g. recycling, landfill, organics facilities, or “certified facilities”, etc.), specifying container requirements, whether the City will separately contract for disposal or processing service and only issue the RFP for collection services, who will do billing (important), associated data transfer design (high level), and other topics. An extensive public, and/or public hearing process will likely be required at one or more points during this process, depending on the City’s requirements, and can be beneficial.<sup>40</sup>

After these decisions are made, the Consultant gathers information on the collection areas to identify the “districts” to be bid on<sup>41</sup>, and researches other topics as needed. The consultant gathers information on the City’s procurement process and requirements, develops an RFP, with criteria and associated scoring and review process, schedule for pre-bid meetings and Q&A procedures, and with appropriate contract penalties for non-performance and sample contract. The RFP is submitted to the City for review, and consultant revised after discussion with the City and Council. The consultant develops a list of a large list of haulers to which the RFP should be distributed; a large list (including local, regional, and national firms) ensures the process is considered open and competitive, and better allows the City to “designate” facilities if it wishes. The City issues the RFP, requests notification of “intent to bid” by a date certain, complies with the schedule, pre-proposal meetings, Q&A (and posts / distributes any resulting revisions to the RFP), and accepts proposals per the specifications listed in the RFP. A public opening is usually arranged, announcing those submitting proposals. The City and consultant review the proposals to eliminate those not qualified for failing to meet submittal requirements, and distributes the qualified documents to the evaluation team. The Independent Consultant may review first and provide an interpretation / translation of the price differences, and possibly summarize key differences between the proposals (this second element may occur after preliminary scoring). Preliminary scoring by all of the evaluation team occurs, and an internal discussion / Q&A meeting is held. Revised scoring occurs, and the leading firms are identified. Follow-up questions may be issued; interviews are usually conducted. Best and final offers may be requested; scheduling is discussed.<sup>42</sup> The results are discussed with the Council, and negotiations proceed. If negotiations with the leading firm(s) are not successful, the next most qualified proposers are approached for negotiation. After tentative agreements are reached, the results are discussed with Council; Council approves and contracts are announced

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*bills; however, the City must modify the billing system and develop a strong data transfer system with each of the selected haulers. City conducting CSR duties provides more control, but requires developing an information transfer system. The City will want to construct contracts that provide the containers to the City after the contract period is over (potentially for a nominal fee); otherwise the second proposal process will provide a distinct advantage to the existing contract-holders because they will not have to purchase and distribute containers – an expensive proposition and new bidders would not realistically be able to compete. Some cities consider pros / cons of carts vs. bags, and many other discussions / choices are also part of this phase.*

<sup>40</sup> *However, our experience has shown that sometimes the public process can be more fruitful if it is conducted after a point in which the (range of) savings households are likely to gain from the new system are known and can be advertised. One concern that will be noted is some customers prefer to keep the hauler they already have. Under contracts the city cannot ban another from providing service, but the City can compel that the households must pay for the City-wide service provided. That is, a citizen can keep their hauler, but they would basically be paying twice for the service.*

<sup>41</sup> *In addition, best practices should be used in selecting the districts to ensure sensible routing, and competitive proposals – and For instance, SERA case studies indicate that districts should not necessarily be the same size – especially large districts. In the simple case of two districts, and potentially two large firms that would expect to win. Awarding the larger district to the lower-bid proposer will cause both firms to sharpen their pencils and provide a better proposal to the City. Another option SERA implemented in cities is that the lower cost proposer is awarded an extra area located between two districts.*

<sup>42</sup> *Usually avoiding mid-winter in areas with potential for weather issues, etc.*

and signed. Whether multiple districts or franchises (likely with a City this size), or one contractor (unlikely), the City will have the flexibility to impose fees or add its costs for overarching duties onto the customer rates (within limits).<sup>43</sup> This is a key funding source.

The implementation phase depends on the contract arrangements and options selected. This will likely involve: container purchase and distribution, truck purchase, methods for data transfer (for billing, or customer service, if City has a role), public outreach, and many other elements. Roll-out for a reasonable-sized city rarely takes much under a year after contracts are signed. The transition phase will involve an extensive public process, and considerable temporary work load increases for the City as it answers questions from customers, and facilitates the transfer to new service providers.

**Diversion Modeling Targets:** The modeling for this Strategy assumed low to medium levels of additional diversion of residentially-generated recyclables and food scraps, given that mandatory programs were already in place. The diversion effects derive from more integrated program (and information) delivery, and cost savings are also assumed.

#### **City Role:**

- Post intent to consider RFP for city contracts for collection.
- Hire consultant with a work scope matching the above responsibilities; hold needed meetings with Staff and council; likely meetings with haulers; public process
- Review and issue RFP, conform to conditions, select / negotiate with winners
- Staff up to handle transition period.
- On-going contract oversight and any other duties assigned to the City
- Re-bid periodically.
- Note that flexibility for invoking other strategies (bans, mandates, every other week trash collection, outreach, pilots, and other strategies must be built in).

#### **City Budget Needs:**

- Staff Time: Assumes City-delivered collection services do not change; assumption is that City / County implements RFP and contract process for the remainder of the County. City works with City hires consultant to handle independent contracting process. City staffing needs are for RFP contract oversight, administration / attorney / procurement staffing time for review, and staffing / procurement time to participate in evaluation process and to negotiate contracts and briefing council. Assume a total of 75% FTE. On-going staff time is 1 FTE or less, with 50% assistant time to manage contractors, check for violations, etc. Costs can be significantly higher depending on whether City vs. haulers handle billing, outreach, customer service, etc. This can be identified in early phases of the consultant work, provided as options in the RFP so cost assessments can be made; full costs to city cannot be determined without these decisions, but all costs are paid through rates or contract management fees. Significant public outreach needed; included under direct costs.
- Direct Costs: Consultant to conduct RFP process and for the City (\$40-100K) depending on amount of public input handled by the contractor.
- Funding Source: Significant on-going City costs, but funded through surcharges through the rates / add-on to hauler costs.

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<sup>43</sup> The city can identify the total it needs to pay the contractors and establish its own (postage-stamp) rates (and rate design) to be imposed that will cover the costs of contracts plus an array of related city costs / responsibilities, as with several Cities SERA has worked with.

## S22. SAYT Higher Incentives and Smaller Service Levels - Phase 3

**Description:** To encourage additional residential diversion, the City introduces mini- and / or micro-cans (smaller trash service levels in the 20 and 10 gallon range, possibly through further extension of the EOW program) and updates the SAYT incentive thresholds to the high end of the 50-80% range<sup>44</sup> or moves beyond the range.

**Diversion Modeling Targets:** The modeling for this Strategy assumed low-to-medium levels of additional diversion of residentially-generated recyclables and food scraps, extrapolating from the diversion achieved optimal pricing research on PAYT.<sup>45</sup>

### City Role:

- City updates DPW memo requiring additional service levels and higher incentives between service levels and haulers must comply or lose license. Require of / modify contractors or franchisees if these strategies are in place.
- Inspectors continue to enforce using street inspection, inspection of company records and subscribed service distributions, and hotline violation reports. Violators receive letters, increasing fines, and potential loss of license.
- The City will be conducting periodic SAYT rate studies; this element would merely be introducing a more aggressive rate incentive into that periodic calculation, so the attributable cost is minimal. Furthermore, the costs are paid back by the resulting rates.

### City Budget Needs:

- **Staff Time:** Zero. Rate studies are conducted already; no additional time. A brief set-out survey and/or survey could be conducted to enhance estimation work, but the costs are minimal (less than \$5-10K) and should be conducted periodically as part of metrics and performance work anyway.
- **Direct Costs:** Zero. As above, costs would be low. An outside rate study or review by a consultant – which should be considered every few years in any case – should not cost more than \$35-75K, and this element is a tiny incentive design variation. Costs strictly attributable to this study are: a small portion of the rate study, and any investment in container changes that may result, largely planned by attribution / replacement or changes in collection frequency with existing containers. Both are directly paid by the new rates.
- **Funding Source:** Small on-going City costs that are covered as part of inspector staff brought on in Phase 1.

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<sup>44</sup> Information on SAYT / PAYT incentive levels from SERA research. See Skumatz, Skumatz, "PAYT in the US: Implementation, Impacts, and Experience", *Waste Management Journal, Elsevier Publications, 2008*. Skumatz, "Pay As You Throw (PAYT) in the US: 2006 Update and Analyses", prepared for USEPA and SERA, January 2007; Skumatz, "Recycling Incentive Alternatives: Results of an Analysis of Performance, Pros, and Cons of RecycleBank™, Recycling Credits, and PAYT", *Resource Recycling, Feb and March 2011*; Skumatz, "Getting to More: Review of Option for an Area with Robust Recycling", Prepared for King County WA, December, 2014; and elsewhere.

<sup>45</sup> *Op.cit.*

### **S35. Add Diapers to Organics Program - Phase 3 or 4**

**Description:** Nashville’s waste composition study showed diapers were a non-trivial share of the waste stream, and demographic trends indicates this will be an increasing waste constituent. The City should monitor communities and processes that allow for the inclusion of diapers in composting operations and encourage the adoption of these technologies in local composting facilities when the processes are mature.

**Diversion Modeling Targets:** The modeling for this Strategy assumed that this is one of the few strategies that will lead to recycling of this specialty material; convenient curbside collection (whether in the traditional containers or a separate system) was targeted on residentially-generated diapers.

**City Role:**

- City / consultant periodically monitors the state of diaper composting processes and whether strategies are implementable in the area.
- When the process is deemed ready, the City (DPW memo/letter) requires that the capability be integrated into regional facilities in order to stay certified or be contracted by the City.
- City checks that any ordinances requiring composting do not exclude diapers so organics bans may be more fully enforced.

**City Budget Needs:**

- Staff Time: Periodic City staff time to research the topic is not significant; it is one of multiple programs the staff should keep on top of. Assume that once the technology is to be triggered, it uses the same 5-10% FTE needed to craft procedures or any ordinances / letters that might be needed, and keeps in touch with regional facilities on any problems once implemented.
- Direct Costs: None.
- Funding Source: Minimal to no on-going City costs

### **S23. More Aggressive Residential Diversion Strategies - Phase 4**

**Description:** After implementation of SAYT, aggressive incentive levels, and small service levels, the City should conduct a container audit. If substantial materials remain, the City may elect to implement one or more of the following strategies that have been implemented in other locations<sup>46</sup>:

- No Bin No Barrel: Trash is not collected if recycling / organics is not set out.
- Higher rates for Not setting out recycling or organics: Higher trash rates are charged for households not using the recycling or organics programs. This may be monitored by RF tag or other technologies that may become available.

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<sup>46</sup> Information on more aggressive strategies in the residential sector from SERA research. See Skumatz, Skumatz, “Getting to More: Review of Option for an Area with Robust Recycling”, Prepared for King County WA, December, 2014; Skumatz et. al., “PAYT: 2015 Update”, Econservation Institute / Skumatz Economic Research Associates (SERA), Superior, CO, 2015 (For EPA Region 9), and other SERA research.

- Or other strategies that may be developed over time.

**Diversion Modeling Targets:** The modeling for this Strategy assumed low to medium levels of diversion of residentially-generated recyclables and food scraps, in accordance with relevant case studies and research.<sup>47</sup>

**City Role:**

- City / consultant conducts a waste composition study or can audit to determine if substantial divertible materials still remain in household containers. If so, it conducts research on best strategies available to achieve higher diversion.
- City / consultant develops ordinance and other associated procedures to implement and enforce the strategy / strategies.

**City Budget Needs:**

- Staff Time: 5-10% staff time to discuss diversion performance, and potential new strategies with the (contracted) hauler(s); implements ordinance or contract changes, as needed, to implement the new strategies. Assume it can be handled using contract oversight or in-house staff.
- Direct Costs: Any container or procedural changes will be implemented into next rates. Several are rate incentives; no direct costs.
- Funding Source: Minimal to no on-going City costs

## **S25-28, 36-37. Add – then Ban – Additional Materials to Residential and Commercial Collection Programs - Phase 3**

**Description:** Nashville should continuously expand the list of materials that must be accepted by haulers in the residential and commercial programs (by DPW memo, integrated with SAYT strategies above), in a way that is designed to match and push those materials accepted by regional MRFs. We expect additional plastics, and other materials to be added periodically. However, in addition to these materials, the City should work with MRFs and haulers to identify feasible programs for additional materials that represent significant portions of the Waste Composition study. Once programs are available for key materials, bans should follow to help drive materials to higher diversion levels.<sup>48</sup> These include:

- Glass – Program and then Ban: Tradeoffs exist with glass in a recycling program. The materials are heavy and help reach goal, and are linked with recycling in households’ minds; however, the material breaks and is not easily separated from paper and some other materials, hurting the quality of these other materials. Strategies other communities have used include: establishing aggressive drop-off programs for glass with

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<sup>47</sup> Op.cit.

<sup>48</sup> Again, bans are highly effective and cost-effective, and drive much more diversion than voluntary measures. They may be among the most effective strategies in the commercial sector. See Skumatz, “Identifying Best “Next Steps” in Diversion Programs, Outreach, and Policies: What do the Real Numbers Tell Us?”, Paper for Proceedings of the Global Waste Management Symposium (GWMS), Phoenix, September 2012; McDonnell and Skumatz Economic Research Associates, “State of Colorado Integrated Materials Management Plan”, prepared for CDPHE, 2015; City of Denver and Skumatz Economic Research Associates, “USDN 2013 Roadmap to Commercial Waste Reduction”, 2013; Skumatz, et. al., “The Costs and Benefits of Minnesota K-12 School Waste Management Programs”, Prepared for Minnesota MPCA, July 2014; Skumatz Economic Research Associates, “Options for Increasing Diversion in Salt Lake City, Utah: Impacts and Analysis”, 2012.



strong supporting education<sup>49</sup>; using glass “inserts” or separate containers for glass, encouraging early separation of glass as a first step in MRFs, or other strategies. Note that technology is improving for separation of glass at MRFs; at the same time, glass is a decreasing part of the waste stream as plastics and other containers are growing in share.

- Textiles – Program and then Ban: Working with the haulers or with non-profits, identify a feasible collection program for this constituent that has a market, and is a non-trivial share of the City’s waste stream. Options include: once-monthly truck route collecting the materials (by haulers or non-profit), allowing it in the stream if the MRF can separate; provide easily pulled colored bags and collection via the traditional
- Consider other materials as processing improves and waste stream percentages change, e.g. Styrofoam packaging, film packaging, pallets, wood, C&D, etc.

**Diversion Modeling Targets:** The modeling for this Strategy assumed medium to strong impacts on the remaining levels of these targeted materials in the residential and commercial sector from traditional / moderate levels of enforcement of bans on these materials (recognizing that additional diversion is achieved when the bans are more strongly enforced in the ZW strategy section).<sup>50</sup>

#### **City Role:**

- City / consultant reviews options for programs for glass and textiles, and other products that are significant in waste stream, or for which feasible programs have been developed elsewhere. For example, textiles may be a periodic set out in logoed bags for once monthly pick up by a non-profit, etc. Minimal costs assumed.
- City works with haulers and / or MRFs to integrate into programs / processing
- City crafts and passes a ban; posted and advertised
- Enforced with other residential and commercial bans.

#### **City Budget Needs:**

- Staff Time: Assign 5-10% staff FTE to research the option(s) and meet with regional processors and stakeholders (e.g. Goodwill, etc.) when City diversion performance lags and/or MRF or other expansions are planned or become possible.
- Direct Costs: No new containers assumed; costs assumed included in rates. Changes in market prices and MRF rates are not possible to predict in advance. Our research indicates adding each of these materials (textiles excluded) can be profitable after retrofits, but there are associated pros and cons.
- Funding Source: Minimal extra on-going City costs; covered by inspectors included in Phase 1

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<sup>49</sup> See a variant of this in Skumatz and Gordon, “Beyond Success: Taking the Next Steps Toward 50% (Glass in Fort Collins)”, Resource Recycling, November 2011. In this program, the City elected to allow glass in the curbside program but strongly discourage it with education, letting customers know that far less of that material makes it to market – and strongly encouraging they bring the material to the drop-off centers instead. The program was deemed quite successful.

<sup>50</sup> Op.cit.

## S38. Contracted Commercial Collection - Phase 4

**Description:** It can be difficult to assure that commercial haulers are following the programs and services that the City wishes (and enforcement can be complicated), or that collection is efficient, cost-effective, and integrated. Multiple haulers can cause duplication of services and the City may determine that the City's commercial sector could realize advantages from more organized collection. Some cities have taken on this challenge, and have contracted for service, either City wide with one or more haulers, or in districts, or in some cases, municipalization has occurred for part of all of the City. Many elements of his process are parallel to the discussion in S18; we concentrate on those elements that differ.

The prospect of contracting in the commercial sector is considerably more complicated and less common, but there are examples. The consultant or city must work with the city attorney to identify any special conditions that must be met. It may be necessary to form a kind of a "business improvement district" or other arrangement to allow the intervention into this traditionally-private market. Sub-areas may be easier (and more important) to address, than city-wide or county-wide contracts. All these options should be considered before embarking on this path. However, the control it provides is a substantial improvement over the operation of myriad large and small haulers collecting on intersecting and overlapping routes with rampant inefficiencies. Pricing becomes more transparent and less "negotiated", eliminating some of the deal making that can be harmful, especially to small businesses. Uniform programs, and well-advertised access to programs can result. Good rate incentives, balancing efficient collection (frequency and size) and incentives for behavior change from disposal to diversion can be mandated.<sup>51</sup> Clarity, postage-stamp pricing, and better compliance with program requirements can be a result.

If the Council elects to move forward with this process, the steps beyond the initial analysis to identify a legal "mechanism" would be fairly similar to the steps for S18.<sup>52</sup>

**Diversion Modeling Targets:** The modeling for this Strategy assumed medium levels of additional diversion of commercially-generated recyclables and food scraps, given that mandatory programs were already in place. The diversion effects derive from much more integrated program (and information) delivery, given the City will be managing the system. Cost savings are also assumed.

### City Role:

- Post intent to consider RFP for city contracts for collection.
- Hire consultant with a work scope matching the above responsibilities; hold needed meetings with Staff and council; likely meetings with haulers; public process
- Review and issue RFP, conform to conditions, select / negotiate with winners
- Staff up to handle transition period.
- On-going contract oversight and any other duties assigned to the City

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<sup>51</sup> SERA research and rate studies we have conducted on the commercial side have highlighted the degree to which very dramatic improvements can be made in the area of rate incentives for collection efficiencies and for diversion.

<sup>52</sup> From SERA Research. See sources including Skumatz, "PAYT: 2015 Update", Econservation Institute / Skumatz Economic Research Associates (SERA), Superior, CO, 2015; Skumatz, "Taking Control: How Do Municipalities Organize Collection? What is the Best Way?" Resource Recycling, January 2013; Skumatz and D'Souza, "Commercial Recycling, Incentives, and Innovations: Effective and Creative Programs and Collection Changes", Paper for Proceedings of the Global Waste Management Symposium (GWMS), Phoenix, September 2012; City / County of Denver and Skumatz Economic Research Associates, "USDN 2013 Roadmap to Commercial Waste Reduction", 2013.

- Re-bid periodically.
- Note that flexibility for invoking other strategies (bans, mandates, every other week trash collection, outreach, pilots, and other strategies must be built in).

#### **City Budget Needs:**

- Staff Time: City hires consultant to handle independent contracting process. City staffing needs are for RFP contract oversight, administration / attorney / procurement staffing time for review, and staffing / procurement time to participate in evaluation process and to negotiate contracts and briefing council. Assume a total of 75% FTE. On-going staff time for overseeing the contract(s) is 1 FTE or less, with 50% assistant time. Costs can be significantly higher depending on whether City vs. haulers handle billing, outreach, customer service, etc. This can be identified in early phases of the consultant work, provided as options in the RFP so cost assessments can be made; full costs to city cannot be determined without these decisions, but all costs are paid through rates or contract management fees. Significant public outreach needed; included under direct costs. This is in addition to the residential contract.
- Direct Costs: Consultant to conduct RFP process and for the City (\$60-100K) depending on amount of public input handled by the contractor.
- Funding Source: Significant on-going City costs, but funded through surcharges through the rates / add-on to hauler costs.

### ***S39. Every Other Week (EOW) Trash Collection Allowed for Commercial - Phase 4***

**Description:** Moving to less frequent trash collection can help drive use of food / organics programs.<sup>53</sup> In this strategy, the City follows-on to the residential EOW program and expands the flexibility in trash collection to the commercial sector – once putrescible are largely moved to the organics stream. This program would likely be targeted to food-rich businesses.

**Diversion Modeling Targets:** The modeling for this Strategy assumed fairly strong impacts on the remaining food scraps in the commercial sector.

#### **City Role:**

- Research is conducted when fortnightly collection of residential trash is explored. Once made legal (if possible), our preference is that this option is included in the original language for the commercial SAYT ordinance, but not emphasized until this strategy is triggered.
- We assume the city monitors progress in the commercial sector. When additional incentives are needed for diversion (food diversion in particular), outreach can highlight this strategy, require lower costs for this service, and the enforcement staff can begin to look for sufficient uptake in this strategy.

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<sup>53</sup> *Research on commercial every-other-week food collection has not been conducted. This strategy is adapted from residential research by Skumatz. See Skumatz “Every Other Week for Everything”, Resource Recycling, November 2013; 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, Burns and McDonnell and Skumatz Economic Research Associates, “State of Colorado Integrated Materials Management Plan”, prepared for CDPHE, 2015; City / County of Denver and Skumatz Economic Research Associates, “USDN 2013 Roadmap to Commercial Waste Reduction”, 2013, and other updates.*

- No special costs are assigned to this strategy.

#### City Budget Needs:

- **Staff Time:** Researched as part of the residential strategy, and early ordinances incorporate – but do not emphasize / invoke -- the strategy. When the City needs additional incentive, it starts an outreach campaign and requires the service be available at a lower cost than weekly collection. No staff time; integrated into periodic outreach and existing enforcement.
- **Direct Costs:** None; integrated into periodic outreach and existing enforcement.
- **Funding Source:** Minimal extra on-going City costs; covered by staff included in commercial contracting and ban-enforcement efforts.

## S40. Implement / Roll-out Multifamily Program / Strategy - Phase 4

**Description:** The larger MF sector is a large sector within Nashville / Davidson County; however, successful MF strategies in this sector are rare, even in leading cities. It has proven difficult to reach sustained recycling levels much beyond 20% in this sector without outside-the-box strategies.<sup>54</sup> Fundamental problems related to split incentives (different generators vs. bill-payers), unit turnover, space, anonymity and the associated inability to enforce individual violations, and other factors. Strategies that have been tried have included hauler bounties (rewards for diversion in buildings in the sector), recycling champions in buildings, bag-based SAYT with bag sales by managers,<sup>55</sup> and reports of technical solutions like multiple trash chutes, etc. This strategy anticipates that several solutions will be needed for the sector, including some tailored to new buildings, different strategies for medium vs. very large buildings, etc. We will assume that the MF pilots program will generate solutions that are 1) effective, 2) practical / implementable, and 3) well-suited to the Nashville situation.

**Diversion Modeling Targets:** The modeling for this Strategy depends on the program designed, which is unlikely to be known until after the MF pilot programs / grants are conducted and evaluated.

#### City Role:

- Staff or consultant reviews the results of the pilot studies, conducts literature review and researches strategies employed by leading communities nationwide.
- City introduces ordinances, programs, policies, incentives or other strategies designed to result in improved recycling and food scraps<sup>56</sup> reduction from the section.

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<sup>54</sup> The most-cited example of non-traditional options are San Jose cycling this sector's material through a "dirty MRF" to achieve substantially higher diversion from the sector (SERA research, multiple sources including Skumatz, et. al., "PAYT: 2015 Update", Econservation Institute / Skumatz Economic Research Associates (SERA), Superior, CO, 2015.).

<sup>55</sup> PAYT / SAYT in small MF buildings is not an issue; those that have collection similar to SF are treated as SF. However, the same is not true of larger buildings. According to research by SERA, multiple options to develop PAYT / SAYT in the multi-family sector have been tried and are described in several sources: Skumatz, Resource Recycling, 1996, through Skumatz, et. al., "PAYT: 2015 Update", Econservation Institute / Skumatz Economic Research Associates (SERA), Superior, CO, 2015. For EPA Region 9.

<sup>56</sup> For example, the City may explore in-sink food disposals. See Skumatz and Freeman, "Philadelphia's Clean Kitchen / Green Community Project Evaluation Report", Skumatz Economic Research Associates, May 2013. The City may even elect to provide contracts or franchising as part of the commercial franchising option described above.

- City implements, enforces, and/or funds the various strategies, conducting tracking and monitoring for performance, cost, and cost-effectiveness.

**City Budget Needs:**

TBD based on design / research.

- Staff Time: TBD.
- Direct Costs: TBD.
- Funding Source: Possible significant on-going City costs; if necessary, enterprise fund, generator fee, or rates

## ***S99. Implementation Consultant Assistance for “High Performing Strategies” – Phases 1-4***

**Description:** A Comprehensive Plan provides the multi-year set of strategies needed to allow the City to reach goals. However, while Plans provide robust information and analysis of the strategies, these plans do not develop strategy-by-strategy design and implementation plans; that would be a very expensive and lengthy plan, and would not be a guidance / vision document.

On-going assistance on the strategy implementation is an element of the Plan, and Figure 3 below provides an assessment of the relative level of effort associated with various strategies – from Very High (VH) to Low (L). The Figure presents the strategies in “implementation year” order. It lists the strategy’s phase, implementation year, strategy number and name, and the associated consultant effort level. Naturally, there will be some shift as some strategies implement smoothly and according to plan, but others are held up for infrastructure, funding, political, or other reasons.<sup>57</sup> However, Figure 3 serves as a guide.

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<sup>57</sup> For this reason, we smoothed the dollars for 2022-2024 in Figure 6.

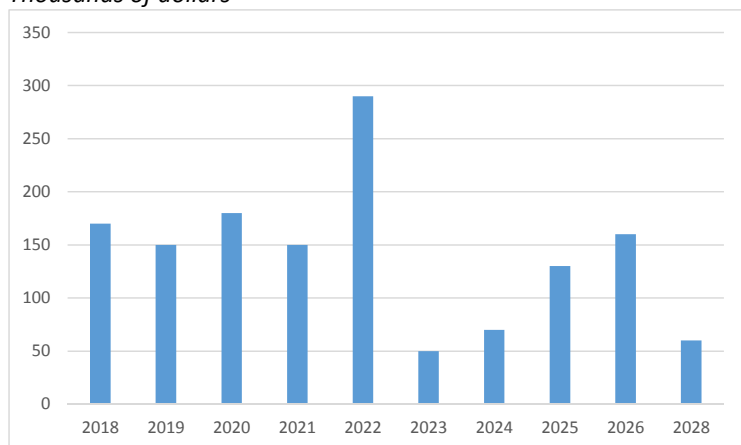
**Figure 3: Implementation Consultant - Relative Level of Effort by Strategy for “High Performing Strategies”**

Impl.					Impl.					Impl.				
Phase	Yr	S#	Strategy	Consult Effort	Phase	Yr	S#	Strategy	Consult Effort	Phase	Yr	S#	Strategy	Consult Effort
1	2018	S1	Tracking, Goals, & Measurement	H	1 or 2	2020	S11	C&D and Compost - Require / Reward Recycling and Reuse of C&D and Use of Local Compost in City Contracts and Jobs	M	2	2023	S15	Convenience Center - Minimum Requirements for Access & Services	ML
1	2018	S2	Obtain Needed Planning, Service, Enforcement, and Funding Authorities	M	1-2	2021	S20	Public Space Recycling	M	3	2023	S22	SAYT Higher Incentives and Smaller Service Levels	L
1	2018	S41	Landscapers must bring Compostables to Composting Site	ML	2-Jan	2021	42b	Change Building Codes to Require Soil Amendment using Local Compost	MH	3	2024	3, 14	Require C&D Deposit System	VH
1	2018	S10	C&D - Require Recycling Containers with al C&D Trash Service	M	3-Jan	2021	5-37	Add - then Ban - Additional Materials to Residential and Commercial Collection Programs	H	3	2025	& 17	Incentives (Surcharges / Discounts) for Clean Separated Streams and Diversion at Transfer Stations & Disposal Sites	H
1	2019	S3,24	Ordinance - Residential SAYT & 3-Stream Package with Supporting Bans	H	2-Jan	2022	S24	MF Pilots	VH	3	2025	S18	Residential Service Contracts / Franchises	VH
1	2019	S8 &	Enforce Existing Bans	MH	2-Jan	2022	3-34	Fee (or Ban) for Single Use Bags	MH	4	2026	S38	Contracted Commercial Collection	VH
1 & all	2019	S21	Public Education / Outreach (including Businesses)	M	2-Jan	2022	4&5	Enforce Food Waste Ban in the Residential and Commercial Sectors	M	4	2026	S39	Every Other Week (EOW) Trash Collection Allowed for Commercial	L
1	2020	S3,2	Metro Service - Residential SAYT & 3-Stream Package with Supporting Bans	VH	and 4	2022	S6	EOW Trash - Allow / Incentivize and (Eventually) Require at lower cost.	H	4	2026	S40	Implement / Roll-out Multifamily Program / Strategy	VH
1	2020	S19	Small Business Policies / Programs and Space for Recycling Ordinance for MF and Commercial	VH	3-Jan	2022	S7	Commercial SAYT & ABC Law (adapted), Supporting Bans, and Enforcement	VH	3 or 4	2028	S35	Add Diapers to Organics Program	L
									ML	4	2028	S23	More Aggressive Residential Diversion Strategies	M

Aggregated level of effort by year is provided in the Figure below, assigning greater levels of effort to those strategies needing “VH” assistance, and low effort to those with “L”. Implementation assistance. The figure at the left is an approximate amount of effort, translated into approximate thousands of dollars (150= \$150K). These figures, somewhat smoothed (and rounded after applying inflation), are included as the last strategy / row in the annual budget table shown in Figure 6.

**Figure 4: Estimated Level of Consultant Assistance Budget by Year for “High Performing Strategies”**

*Thousands of dollars*



## 5. SUMMARY OF ANNUAL CITY STAFFING AND BUDGET NEEDS, BY PROGRAM, AND TOTAL

**Phasing:** The Plan includes an array of strategies, not all of which can be implemented in any one year. Instead, the plan relies on sensible “Phasing” of the strategies. The Phases are presented in the second columns; and within each phase, strategies are further assigned into Years. The years and phasing assigned are based on an array of factors:

- programs that must precede other programs;
- taking advantage of cost-effective strategies first;
- moving forward strategies for which groundwork has been set (enforcing bans);
- moving forward in residential before commercial;
- delaying some programs until sufficient recycling infrastructure can be ready (e.g. SAYT, C&D deposit); and
- other considerations.

The annual pattern of cost needs is directly dependent on these assignments and phasing, and can be changed based on discussions with the City and their considerations regarding feasible ramp-up, negotiations that might be needed, etc.

**Detailed Cost Tables:** Two sets of tables are provided in this section:

- Figure 5 repeats the cost explanations by program, and translates the explanations into cost elements. Figure 5 includes columns, in turn, for:
  - ID information, including row, Strategy number (or groups corresponding to Figure 1 at the beginning of this memo), strategy name,
  - Summary Description of the cost elements and assumptions
  - Whether program is included / excluded from the computation
  - Start, and where relevant stop, year for the strategy
  - First year and on-going staffing needs, presented as a portion of FTE
  - Staffing needs (first year and on-going), translated into dollars, using approximate city staff costs (fully loaded) of \$86K/year.
  - First year and on-going direct costs, and the years the first-year costs are spread over when calculating annual costs for the model.

Figure 6 computes and aggregates these costs into annual buckets. We include the following.

- The strategy identification information, whether the strategy is included or not in the total, and what year the strategy is implemented.
- The total costs, per year, including first year costs (in one year or more), plus the on-going costs (at the top).
- The aggregated City staff needs, by year (at the top)
- These costs include an **inflation rate** over time.
- The data are presented by program and by year.

- Notice that, ***because the cost of the residential SAYT (S3 strategy) roll-out is so much greater than for other programs, and because these fees are directly paid by household rates, the Totals in Figure 4 are presented including and excluding this part of the costs.***
- ***Note the City may elect for similar “separate” treatment of the cost of convenience centers or some other strategies.***

Finally, Figure 6 includes a summary of our estimate of the consultant budget for refining and implementing this set of “High Performing” strategies. The description of efforts needed, by several-year-batches, is presented at the bottom of Figure 4, and is described as Strategy 99 above.



**Figure 5(a): City Budget Assumptions by Year and Strategy; Phasing Reflected in Start Year**

Dollars in Thousands. Source: Skumatz Economic Research Associates WDAM Model, 2018

Row	Phase	Strategy Number	Strategy	Cost Description	Pgm In/Out	\$86.0 <==FTE Cost \$K/Yr							Direct cost Ongoing (thous)	Yrs to Spread
						Start Year	Stop Year	FTE Yr 1	FTE Ongoing	Labor Yr 1 (thous)	Labor Ongoing (thous)	Direct Cost Yr1 (thous)		
1				TOTAL INCLUDING ROLL-OUT OF RESIDENTIAL SAYT IN METRO AREA										
2				TOTAL EXCLUDING ROLL-OUT OF RESIDENTIAL SAYT IN METRO AREA										
3	1	S1	Tracking, Goals, & Measurement	Staff time: 10% FTE (2 weeks) to identify gaps and reporting to date; 5-10% city staff on-going time for tracking / nudging / calculating performance for percent diversion. 10% FTE (2-3 weeks) of consultant or statistical person's time FTE to identify preferred measurement approach for PRR metric, and identify monitoring protocols. <u>Direct costs</u> : Estimate for annual 2-season waste composition study, county-wide, residential and commercial, is approximately \$75-150K; other options include random collection truck sorts and other strategies. The estimates for conducting this work on an on-going basis is \$250-300K/year. Funding Source: No dedicated funding source. Recommended as part of an "environmental" or generator fee or enterprise Fund, or rates	1	2018		0.27	0.1	\$23.2	\$8.6	\$350.0	\$275.0	1
4	1	S2	Obtain Needed Planning, Service, Enforcement, and Funding Authorities	Staff Time: Assume 1 week (3-5%) FTE for attorney and assistant; 2 weeks (5-10%) City staff; 1 week (5%) consultant. Leadership needed from senior PW staff for perhaps 1-2 weeks of time (5%) spread over half a year. <u>No direct costs</u> . <u>Funding Source</u> : No dedicated funding source; general fund activity; or Enterprise Fund, generator fee, or rates	1	2018	2020	0.22	0	\$18.9	\$0.0	\$0.0	\$0.0	1
5	1	S3,29-32	Ordinance - Residential SAYT & 3-Stream Package with Supporting Bans	Staff Time: 25% FTE for public process, ordinance, and outreach development. Enforcement of hauler compliance is significant; assume 50% FTE for 1 <sup>st</sup> year, and rest covered by inspectors checking compliance with bans. <u>Direct costs</u> : Education materials \$2/hh (outreach is covered by strategy 21). <u>Funding Source</u> : Combination of General Fund or Enterprise Fund (education) and hauler surcharge (compliance).	1	2019		0.75	0	\$64.5	\$0.0	\$0.0	\$0.0	1
6	1	S3,29-32	Metro Service - Residential SAYT & 3-Stream Package with Supporting Bans	Staff Time: Updating billing system capabilities may cost up to \$20K (repeated billing of a set fee) to \$100K or more depending on existing system capabilities (specialized consultant or staff time). City Staff time for SAYT roll-out: If 25%-40% of the City's 55,000 households calls 10 minutes, temp CSR staff needs are 3-4 FTE (will need about twice as many for 6 months, then let go, but for budgeting purposes we show annual figures). Approximately 30 new drivers are needed on an on-going basis. <u>Direct costs</u> for switch to 3-bin service (adding 2 bins for most households), assume 30 new trucks for Metro area at \$350K each is \$10.5 million (spread over 8 years minimum). 2 new containers per household at \$55 each is \$6 million plus 10% for spare carts. Cart delivery excluded. Ongoing costs \$13-19/hh/month for service, including maintenance, etc. Assumed no major new billing costs once system is running. <u>Funding</u> : Note these funds are generally paid out of / can be embedded into the SAYT user fees (self-funding).	1	2020		3.5	30	\$301.0	\$2,580.0	\$17,200.0	\$7,140.0	8
7	1	S41	Landscapers must bring Compostables to Composting Site	Staff time: 5% FTE developing ordinance, passing, notifying. Enforcement plan assumes 10% FTE, due to volume of building in the city. <u>Direct costs</u> : No significant direct costs assumed. <u>Funding Source</u> : No significant on-going City costs; if necessary, enterprise fund, generator fee, or rates	1	2018		0.15	0	\$12.9	\$0.0	\$0.0	\$0.0	1
8	1	S8 & S9	Enforce Existing Bans	Staff Costs: Conservative estimate for enforcement for ALL bans (including upcoming bans) is 7 FTE, with potential to ramp to that number. <u>Direct Costs</u> : Cars assumed to be \$20K each per year in direct costs. <u>Funding Source</u> : Enterprise Fund, generator fee, or rates	1	2019		7	7	\$602.0	\$602.0	\$140.0	\$140.0	1
9	1	S10	C&D - Require Recycling Containers with al C&D Trash Service	Staff: City staff or consultant time 1-2 weeks (5% FTE), assumed inspectors identified under strategy 8/9 can enforce. <u>Direct Costs</u> : None. <u>Funding Source</u> : No significant on-going City costs; if necessary, enterprise fund, generator fee, or rates	1	2018		0.05	0	\$4.3	\$0.0	\$0.0	\$0.0	1
10	1-2	S20	Public Space Recycling	Staff Time: City / consultant time about 3 weeks; <u>Direct and On-going Costs</u> : Containers, signage, placement, and service for 600-1000 paired containers (300-500 sites around the City) could cost about \$1 million. Capital costs are about \$650K plus, and operations would cost about \$200K-400K per year of staff, trucks, (net) tipping fees, and amortized containers. This program should ramp up over a series of years; tonnages are quite low. Assume capital costs are spread over 5 years. <u>Funding Source</u> : Significant costs; will need to fund from grants (for some containers), enterprise fund, generator fee, or rates	1	2021		0.06	0	\$5.2	\$0.0	\$650.0	\$400.0	5
11	1 & all	S21	Public Education / Outreach (including Businesses)	Staff time: High diversion cities can spend considerable funds on outreach, and the City will need a substantial push in the early years to roll out the new programs. Some staff assumed already assigned; increase by 20% FTE because periodic new roll-outs. <u>Direct Costs</u> : Based on estimated costs of \$1/capita - \$1.50/capita, Nashville might see costs of \$600K-\$1 million; assume costs are spread over two years. This will include some business outreach. Social marketing costs, and inclusion of schools programs could increase this by 50-100%. Assume outreach consultant assistance of \$75K periodically. Basic on-going outreach is not a new cost; adding about \$200K for enhancing the quality of outreach in the City. <u>Funding Source</u> : Enterprise fund, generator fee, or rates	1	2019		0	0.2	\$0.0	\$17.2	\$1,000.0	\$200.0	2

**Figure 5(b): City Budget Assumptions by Year and Strategy; Phasing Reflected in Start Year**

Dollars in Thousands. Source: Skumatz Economic Research Associates WDAM Model, 2018

Row	Phase	Strategy Number	Strategy	Cost Description	Pgm In/Out	Start Year	Stop Year	FTE Yr 1	FTE On-going	Labor Yr 1 (thous)	Labor Ongoing (thous)	Direct Cost Yr1 (thous)	Direct cost Ongoing (thous)	Yrs to Spread
12	1	S19	Small Business Policies / Programs and Space for Recycling Ordinance for MF and Commercial	Staff time: 25% FTE staff or consultant to plan the suite of programs. 4-8 FTE city or consultant for technical assistance program and business recognition program. <u>City Service Costs:</u> Adding businesses onto residential service (GSD) \$50K-\$100K. <u>Direct costs:</u> Grants for 3 months service \$25K-\$50K grant; bin grant program \$25K-\$50K (flexible based on City budget). <u>Funding Source:</u> Enterprise fund, generator fee, or rates	1	2020		3.25	7.25	\$279.5	\$623.5	\$150.0	\$150.0	1
13	1 or 2	S11	C&D and Compost - Require / Reward Recycling and Reuse of C&D and Use of Local Compost in City Contracts and Jobs	Staff time: 5% -10% staff time to craft language suitable for legal contracting and purchasing / procurement, and make sure the language is inserted into all relevant contracting. <u>Direct Costs:</u> No direct costs assumed; this may be a simplification if required C&D reuse increases cost of city contracts; however, pre-planning can reduce costs. <u>Funding Source:</u> No significant on-going City costs beyond potential increases in contracts. Short term, enterprise fund, generator fee, or rates	1	2020		0.1	0	\$8.6	\$0.0	\$0.0	\$0.0	1
14	2	S24	MF Pilots	Staff needs: Assume this is an important preparation project for meeting the needs of this sector. Assume 50% or more staff person. <u>Direct costs:</u> Approximately \$25-50K each for 7-12 projects (\$400K). <u>Funding Source:</u> May include significant on-going City costs; consider enterprise fund, generator fee, or rates	1	2022		0.5		\$43.0	\$0.0	\$400.0	\$0.0	2
15	2	S33-34	Fee (or Ban) for Single Use Bags	Staff Costs: City or Consultant research on design, administration options, funding, and development of ordinance 15% FTE. <u>Direct costs:</u> For Nexus study: \$40-75K; Administration notification costs and coordination on taxes with businesses: Zero if already conducting outreach for businesses; otherwise, assume \$50K. Costs for Bag giveaway: \$25K-75K, depending on City's perceived need; optional add-on. <u>Funding Source:</u> No significant on-going City costs; if necessary, enterprise fund, generator fee, or rates	1	2022		0.25	0.1	\$21.5	\$8.6	\$125.0	\$0.0	2
16	2	S4&5	Enforce Food Waste Ban in the Residential and Commercial Sectors	Staff time: No additional staff costs or direct costs beyond those enforcing existing bans (listed above). <u>Direct Costs:</u> As listed above. <u>Funding Source:</u> No significant on-going City costs / covered by another strategy	1	2022		0	0	\$0.0	\$0.0	\$0.0	\$0.0	1
17	2 and 4	S6	EOW Trash - Allow / Incentivize and (Eventually) Require at lower cost.	Staff Time: City / consultant staff time for research 10%-15% FTE. Assume no new inspection staff. <u>Direct Costs:</u> New container costs do not involve full container purchases, but do include new lids or decals (assume 10% of containers switch to the service, with a retrofit cost of \$25 each). Some savings in routing. <u>Funding Source:</u> Costs reimbursed from user fees	1	2022		0.15	0	\$12.9	\$0.0	\$0.0	\$0.0	1
18	2	S15	Convenience Center - Minimum Requirements for Access & Services	Staff Time: We assume 15% staff / consultant time to conduct the basic analysis of population distribution around existing convenience centers, examine materials and markets, discuss MRF needs, and conduct preliminary discussions around the need for site(s). On-going staffing time is assumed. The planning for each site will be significant. <u>Direct Costs:</u> According to RRS, the cost for each site in capital costs (excluding land and site preparation), and annualized, may be \$310/year. On-going costs for each site (RRS) is expected to be \$850K/year. If the City develops a second site, these costs will increase in step.	1	2023		0.15	0.75	\$12.9	\$64.5	\$2,480.0	\$785.5	8
19	2	S42b	Change Building Codes to Require Soil Amendment using Local Compost	Staff time: 10% FTE for development of ordinance and working with relevant departments to understand / incorporate into procedures. Assume it is integrated into existing enforcement / inspections of buildings and sites (simplification). <u>Direct Costs:</u> None for City. <u>Funding Source:</u> No significant on-going City costs; if necessary, enterprise fund, generator fee, or rates	1	2021		0.1		\$8.6	\$0.0	\$0.0	\$0.0	1
20	3	S7	Commercial SAYT & ABC Law (adapted), Supporting Bans, and Enforcement	Staff time: First year - 10% - 15% FTE for additional research on development of ordinance and working with relevant departments to understand / incorporate into procedures. <u>On-going staffing needs:</u> Assume enforcement includes 8 staff, per SF. This may decrease over time, but the program involves multiple elements, including a link with the business license department to carry out the enforcement of the ABC law. <u>Direct Costs:</u> 8 cars for commercial hauler and service set out enforcement. <u>Funding Source:</u> Significant on-going City enforcement costs to enforce level playing field; hauler surcharge to cover oversight. If necessary, enterprise fund, generator fee, rates. Fines may cover some costs, but should not be assumed to be a significant revenue source.	1	2022		0.15	8	\$12.9	\$688.0	\$0.0	\$160.0	1
21	3	S12, 13, 14	Require C&D Deposit System	Staff time: 10% FTE for development of ordinance and working with relevant departments to understand / incorporate into procedures. Assume it is integrated into existing enforcement / inspections of buildings and sites (simplification; may require a portion of a person). <u>Direct Costs:</u> None for City. <u>Funding Source:</u> No significant on-going City costs; if necessary, enterprise fund, generator fee, or rates. Note that this deposit system (unclaimed deposits) has sometimes been a supplemental source of revenues and may cover some portion of the program's cost	1	2024		0.1		\$8.6	\$0.0	\$0.0	\$0.0	1
22	3	S16 & 17	Incentives (Surcharges / Discounts) for Clean Separated Streams and Diversion at Transfer Stations & Disposal Sites	Staff time: 10%-15% FTE to work with attorneys to confirm / identify authority, and with administrative department to work out on-going fund transfer arrangements, and to develop / pass / post / advertise / implement the ordinance. <u>Direct Costs:</u> None for City / no special enforcement envisioned as it is a pricing differential. Periodic checks of signage and separate pricing could be conducted by inspectors checking for violations of bans; inspection of books could be conducted by City inspectors or administration on an as-needed basis as well. <u>Funding Source:</u> On-going City costs are covered as part of the surcharges / self-funding.	1	2025		0.15		\$12.9	\$0.0	\$0.0	\$0.0	1

**Figure 5(c): City Budget Assumptions by Year and Strategy; Phasing Reflected in Start Year**

Dollars in Thousands. Source: Skumatz Economic Research Associates WDAM Model, 2018

Row	Phase	Strategy Number	Strategy	Cost Description	Perm. In/Out	Start Year	Stop Year	FTE Yr 1	FTE On going	Labor Yr 1 (thous)	Labor Ongoing (thous)	Direct Cost Yr1 (thous)	Direct cost Ongoing (thous)	Yrs to Spread
23	3	S18	Residential Service Contracts / Franchises	<u>Staff Time:</u> Assumes City-delivered collection services do not change; assumption is that City / County implements RFP and contract process for the remainder of the County. City works with City hires consultant to handle independent contracting process. City staffing needs are for RFP contract oversight, administration / attorney / procurement staffing time for review, and staffing / procurement time to participate in evaluation process and to negotiate contracts and briefing council. Assume a total of 75% FTE. On-going staff time is 1 FTE or less, with 50% assistant time to manage contractors, check for violations, etc. Costs can be significantly higher depending on whether City vs. haulers handle billing, outreach, customer service, etc. This can be identified in early phases of the consultant work, provided as options in the RFP so cost assessments can be made; full costs to city cannot be determined without these decisions, but all costs are paid through rates or contract management fees. Significant public outreach needed; included under direct costs. <u>Direct Costs:</u> Consultant to conduct RFP process and for the City (\$40-100K) depending on amount of public input handled by the contractor. <u>Funding Source:</u> Significant on-going City costs, but funded through surcharges through the rates / add-on to hauler costs.	1	2025		0.75	1.5	\$64.5	\$129.0	\$100.0	\$0.0	2
24	3	S22	SAYT Higher Incentives and Smaller Service Levels	<u>Staff Time:</u> Zero. Rate studies are conducted already; no additional time. A brief set-out survey and/or survey could be conducted to enhance estimation work, but the costs are minimal (less than \$5-10K) and should be conducted periodically as part of metrics and performance work anyway. <u>Direct Costs:</u> Zero. As above, costs would be low. An outside rate study or review by a consultant – which should be considered every few years in any case – should not cost more than \$35-75K, and this element is a tiny incentive design variation. Costs strictly attributable to this study are: a small portion of the rate study, and any investment in container changes that may result, largely planned by attribution / replacement or changes in collection frequency with existing containers. Both are directly paid by the new rates. <u>Funding Source:</u> Small on-going City costs that are covered as part of inspector staff brought on in Phase 1.	1	2023		0	0	\$0.0	\$0.0	\$0.0	\$0.0	1
25	3 or 4	S35	Add Diapers to Organics Program	<u>Staff Time:</u> Periodic City staff time to research the topic is not significant; it is one of multiple programs the staff should keep on top of. Assume that once the technology is to be triggered, it uses the same 5-10% FTE needed to craft procedures or any ordinances / letters that might be needed, and keeps in touch with regional facilities on any problems once implemented. <u>Direct Costs:</u> None. <u>Funding Source:</u> Minimal to no on-going City costs	1	2028		0.05		\$4.3	\$0.0	\$0.0	\$0.0	1
26	4	S23	More Aggressive Residential Diversion Strategies	<u>Staff Time:</u> 5-10% staff time to discuss diversion performance, and potential new strategies with the (contracted) hauler(s); implements ordinance or contract changes, as needed, to implement the new strategies. Assume it can be handled using contract oversight or in-house staff. <u>Direct Costs:</u> Any container or procedural changes will be implemented into next rates. Several are rate incentives; no direct costs. <u>Funding Source:</u> Minimal to no on-going City costs	1	2028		0.05		\$4.3	\$0.0	\$0.0	\$0.0	1
27	3	S25-28, 3	Add - then Ban - Additional Materials to Residential and Commercial Collection Programs	<u>Staff Time:</u> Assign 5-10% staff FTE to research the option(s) and meet with regional processors and stakeholders (e.g. Goodwill, etc.) when City diversion performance lags and/or MRF or other expansions are planned or become possible. <u>Direct Costs:</u> No new containers assumed; costs assumed included in rates. Changes in market prices and MRF rates are not possible to predict in advance. Our research indicates adding each of these materials (textiles excluded) can be profitable after retrofits, but there are associated pros and cons. <u>Funding Source:</u> Minimal extra on-going City costs; covered by inspectors included in Phase 1	1	2021		0.1		\$8.6	\$0.0	\$0.0	\$0.0	1
28	4	S38	Contracted Commercial Collection	<u>Staff Time:</u> City hires consultant to handle independent contracting process. City staffing needs are for RFP contract oversight, administration / attorney / procurement staffing time for review, and staffing / procurement time to participate in evaluation process and to negotiate contracts and briefing council. Assume a total of 75% FTE. On-going staff time for overseeing the contract(s) is 1 FTE or less, with 50% assistant time. Costs can be significantly higher depending on whether City vs. haulers handle billing, outreach, customer service, etc. This can be identified in early phases of the consultant work, provided as options in the RFP so cost assessments can be made; full costs to city cannot be determined without these decisions, but all costs are paid through rates or contract management fees. Significant public outreach needed; included under direct costs. This is in addition to the residential contract. <u>Direct Costs:</u> Consultant to conduct RFP process and for the City (\$60-100K) depending on amount of public input handled by the contractor. <u>Funding Source:</u> Significant on-going City costs, but funded through surcharges through the rates / add-on to hauler costs	1	2026		0.75	1.5	\$64.5	\$129.0	\$100.0	\$0.0	2
29	4	S39	Every Other Week (EOW) Trash Collection Allowed for Commercial	<u>Staff Time:</u> Researched as part of the residential strategy, and early ordinances incorporate – but do not emphasize / invoke -- the strategy. When the City needs additional incentive, it starts an outreach campaign and requires the service be available at a lower cost than weekly collection. No staff time; integrated into periodic outreach and existing enforcement. <u>Direct Costs:</u> None; integrated into periodic outreach and existing enforcement. <u>Funding Source:</u> Minimal extra on-going City costs; covered by staff included in commercial contracting and ban-enforcement efforts.	1	2026		0	0	\$0.0	\$0.0	\$0.0	\$0.0	1
30	4	S40	Implement / Roll-out Multifamily Program / Strategy	<u>Staff Time:</u> TBD. <u>Direct Costs:</u> TBD. <u>Funding Source:</u> Possible significant on-going City costs; if necessary, enterprise fund, generator fee, or rates	1	2026		0	0	\$0.0	\$0.0	\$0.0	\$0.0	1
31		S41	Implementation Consultant	Implementation Consultant	1	2018	2030							
32			Total	Total including all strategies.										

**Figure 6(a): City Budget Additions by Year and Strategy; Phasing Reflected in Budgeting**

Dollars in Thousands. Source: Skumatz Economic Research Associates WDAM Model, 2018

Row	Phase	Strategy Number	Strategy	Pgm In/Out	Start Year	Yrs to Spread 1st cost	Total City Cost in Thousands, By Year														
							2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
1a			TOTAL INCLUDING ALL				\$ 569	\$ 1,860	\$ 4,980	\$ 14,917	\$ 15,917	\$ 17,333	\$ 18,231	\$ 18,615	\$ 19,110	\$ 19,161	\$ 19,329	\$ 19,609	\$ 19,903	\$ 21,441	\$ 23,098
1b			TOTAL EXCLUDING ROW 6				\$ 569	\$ 1,860	\$ 2,442	\$ 2,443	\$ 3,257	\$ 4,482	\$ 5,188	\$ 5,376	\$ 5,673	\$ 5,522	\$ 5,486	\$ 5,558	\$ 5,641	\$ 6,077	\$ 6,547
2a			FTE INCLUDING ALL				1.0	9.0	14.0	45.0	46.0	53.0	54.0	54.0	56.0	56.0	57.0	56.0	56.0	56.0	56.0
2b			FTE EXCLUDING ROW 6				1.0	9.0	11.0	15.0	16.0	23.0	24.0	24.0	26.0	26.0	27.0	26.0	26.0	26.0	26.0
3	1	S1	Tracking, Goals, & Measurement	1	2018	1	\$ 373.2	\$ 289.3	\$ 293.6	\$ 298.0	\$ 302.5	\$ 307.0	\$ 311.6	\$ 316.3	\$ 321.0	\$ 325.9	\$ 330.8	\$ 335.7	\$ 340.7	\$ 367.1	\$ 395.5
4	1	S2	Obtain Needed Planning, Service, Enforcement, and Funding Authorities	1	2018	1	\$ 18.9	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
5	1	S3,29-32	Ordinance - Residential SAYT & 3-Stream Package with Supporting Bans	1	2019	1	\$ -	\$ 65.8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
6	1	S3,29-32	Metro Service - Residential SAYT & 3-Stream Package with Supporting Bans	1	2020	8	\$ -	\$ -	\$ 2,538	\$ 12,473	\$ 12,660	\$ 12,850	\$ 13,043	\$ 13,239	\$ 13,437	\$ 13,639	\$ 13,843	\$ 14,051	\$ 14,262	\$ 15,364	\$ 16,552
7	1	S41	Landscapers must bring Compostables to Composting Site	1	2018	1	\$ 12.9	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
8	1	S8 & S9	Enforce Existing Bans	1	2019	1	\$ -	\$ 756.8	\$ 768.2	\$ 779.7	\$ 791.4	\$ 803.3	\$ 815.3	\$ 827.6	\$ 840.0	\$ 852.6	\$ 865.4	\$ 878.3	\$ 891.5	\$ 960.4	\$ 1,034.6
9	1	S10	C&D - Require Recycling Containers with al C&D Trash Service	1	2018	1	\$ 4.3	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
10	1-2	S20	Public Space Recycling	1	2021	5	\$ -	\$ -	\$ -	\$ 142.0	\$ 565.3	\$ 573.8	\$ 582.4	\$ 591.1	\$ 600.0	\$ 459.6	\$ 466.5	\$ 473.5	\$ 480.6	\$ 517.7	\$ 557.8
11	1 & all	S21	Public Education / Outreach (including Businesses)	1	2019	2	\$ -	\$ 597.7	\$ 747.0	\$ 232.8	\$ 236.3	\$ 239.8	\$ 243.4	\$ 247.0	\$ 250.7	\$ 254.5	\$ 258.3	\$ 262.2	\$ 266.1	\$ 286.7	\$ 308.9
12	1	S19	Small Business Policies / Programs and Space for Recycling Ordinance for MF and Commercial	1	2020	1	\$ -	\$ -	\$ 444.7	\$ 812.8	\$ 825.0	\$ 837.4	\$ 849.9	\$ 862.7	\$ 875.6	\$ 888.8	\$ 902.1	\$ 915.6	\$ 929.4	\$ 1,001.2	\$ 1,078.6
13	1 or 2	S11	C&D and Compost - Require / Reward Recycling and Reuse of C&D and Use of Local Compst in City Contracts and Jobs	1	2020	1	\$ -	\$ -	\$ 8.9	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
14	2	S24	MF Pilots	1	2022	2	\$ -	\$ -	\$ -	\$ -	\$ 259.2	\$ 216.5	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
15	2	S33-34	Fee (or Ban) for Single Use Bags	1	2022	2	\$ -	\$ -	\$ -	\$ -	\$ 89.6	\$ 77.0	\$ 9.4	\$ 9.6	\$ 9.7	\$ 9.9	\$ 10.0	\$ 10.2	\$ 10.3	\$ 11.1	\$ 12.0
16	2	S4&5	Enforce Food Waste Ban in the Residential and Commercial Sectors	1	2022	1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

**Figure 6(b): City Budget Additions by Year and Strategy; Phasing Reflected in Budgeting**

Dollars in Thousands. Source: Skumatz Economic Research Associates WDAM Model, 2018

Row	Phase	Strategy Number	Strategy	Pgm In/Out	Start Year	Yrs to Spread 1st cost	Total City Cost in Thousands, By Year														
							2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
1a			TOTAL INCLUDING ALL				\$ 569	\$ 1,860	\$ 4,980	\$ 14,917	\$ 15,917	\$ 17,333	\$ 18,231	\$ 18,615	\$ 19,110	\$ 19,161	\$ 19,329	\$ 19,609	\$ 19,903	\$ 21,441	\$ 23,098
1b			TOTAL EXCLUDING ROW 6				\$ 569	\$ 1,860	\$ 2,442	\$ 2,443	\$ 3,257	\$ 4,482	\$ 5,188	\$ 5,376	\$ 5,673	\$ 5,522	\$ 5,486	\$ 5,558	\$ 5,641	\$ 6,077	\$ 6,547
2a			FTE INCLUDING ALL				1.0	9.0	14.0	45.0	46.0	53.0	54.0	54.0	56.0	56.0	57.0	56.0	56.0	56.0	56.0
2b			FTE EXCLUDING ROW 6				1.0	9.0	11.0	15.0	16.0	23.0	24.0	24.0	26.0	26.0	27.0	26.0	26.0	26.0	26.0
17	2 and 4	S6	EOW Trash - Allow / Incentivize and (Eventually) Require at lower cost.	1	2022	1	\$ -	\$ -	\$ -	\$ -	\$ 13.8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
18	2	S15	Convenience Center - Minimum Requirements for Access & Services	1	2023	8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 349.6	\$ 1,274.6	\$ 1,293.8	\$ 1,313.2	\$ 1,332.9	\$ 1,352.9	\$ 1,373.2	\$ 1,393.7	\$ 1,501.5	\$ 1,617.5
19	2	S42b	Change Building Codes to Require Soil Amendment using Local Compost	1	2021	1	\$ -	\$ -	\$ -	\$ 9.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
20	3	S7	Commercial SAYT & ABC Law (adapted), Supporting Bans, and Enforcement	1	2022	1	\$ -	\$ -	\$ -	\$ -	\$ 13.8	\$ 918.0	\$ 931.8	\$ 945.8	\$ 960.0	\$ 974.4	\$ 989.0	\$ 1,003.8	\$ 1,018.9	\$ 1,097.6	\$ 1,182.5
21	3	S12, 13, 14	Require C&D Deposit System	1	2024	1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 9.4	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
22	3	S16 & 17	Incentives (Surcharges / Discounts) for Clean Separated Streams and Diversion at Transfer Stations & Disposal Sites	1	2025	1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 14.4	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
23	3	S18	Residential Service Contracts / Franchises	1	2025	2	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 127.7	\$ 202.6	\$ 148.2	\$ 150.4	\$ 152.7	\$ 155.0	\$ 167.0	\$ 179.9
24	3	S22	SAYT Higher Incentives and Smaller Service Levels	1	2023	1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
25	3 or 4	S35	Add Diapers to Organics Program	1	2028	1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5.0	\$ -	\$ -	\$ -	\$ -
26	4	S23	More Aggressive Residential Diversion Strategies	1	2028	1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5.0	\$ -	\$ -	\$ -	\$ -
27	3	S25-28, 3	Add - then Ban - Additional Materials to Residential and Commercial Collection Programs	1	2021	1	\$ -	\$ -	\$ -	\$ 9.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
28	4	S38	Contracted Commercial Collection	1	2026	2	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 129.6	\$ 205.7	\$ 150.4	\$ 152.7	\$ 155.0	\$ 167.0	\$ 179.9
29	4	S39	Every Other Week (EOW) Trash Collection Allowed for Commercial	1	2026	1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
30	4	S40	Implement / Roll-out Multifamily Program / Strategy	1	2026	1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
31		S99	Implementation Consultant	1	2018		\$ 160.0	\$ 150.0	\$ 180.0	\$ 160.0	\$ 160.0	\$ 160.0	\$ 160.0	\$ 140.0	\$ 170.0	\$ 70.0	\$ -	\$ -	\$ -	\$ -	\$ -