# City of Baltimore

## RECYCLING AND SOLID WASTE MANAGEMENT MASTER PLAN

## Task 4 Report

Benchmarking Study

26 September 2019

Prepared for:

Baltimore City Department of Public Works

Prepared by:

Geosyntec consultants

Columbia, Maryland

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# 1. INTRODUCTION

## Background and Purpose

This Task 4 Report was prepared by Geosyntec Consultants for the City of Baltimore Department of Public Works as part of a master planning effort titled the "Less Waste, Better Baltimore" (LWBB) Plan. The LWBB Plan is intended to:

1. Outline a clear and realistic future vision for improving Baltimore City's solid waste and recycling system over both the near- and long-term, with the goal of maximizing long-term waste reduction, reuse/repair, recycling, and sustainable management of materials;
2. Develop actionable strategies to achieve this goal; and
3. Identify potential impacts on existing solid waste management systems, including programmatic and infrastructure needs, investment challenges, and policy or regulatory initiatives.

The purpose of this Report is to compare solid waste management systems and services in Baltimore with those in five other U.S. jurisdictions with broadly similar demographics, low rates of waste disposal, and high rates of recycling, thereby benchmarking the City's current performance against the programs and best practices of selected jurisdictions to reduce costs and improve services. The benchmarking effort includes a brief discussion of "counting methodologies" that are used in other jurisdictions relative to the Maryland Recycling Act (MRA) to ensure a fair comparison of program metrics is accomplished. However, Task 4 is not intended as an exhaustive review of every program and service provided by the benchmarked jurisdictions, but rather a high-level review in order to offer useful comparisons for Baltimore. Results from Task 4 should help identify options that may be considered by Baltimore as part of making improvements to the City's current waste diversion and recycling rates in Task 5.

It is noted that Baltimore's existing solid waste management system was documented in the Task 3 Report for the LWBB Plan. In preparing the Task 3 Report, Geosyntec reviewed the multifaceted solid waste and recycling programs, services, and facilities operated by the Department of Public Works and other municipal and private actors. Relevant regulations, population and housing projections, governance, finance, and contracts affecting solid waste management and recycling in the City are also summarized. In addition, Geosyntec reviewed private infrastructure and facilities in the local region, as defined by a 3-hour truck travel distance from the City. Given the work completed to date, a description of Baltimore's existing programs and services is not included in this Report, although specific information from the Task 3 Report is used in the comparative tables and graphics.

## Selection of Jurisdictions for Benchmarking

The benchmarking effort compares the solid waste management systems of five jurisdictions with those of Baltimore City. The selection process compared demographics in terms of population size and density, median household income, land area, poverty level, and number of foreign-born residents (as an indicator of diversity and potential challenges with language/cultural differences).

Jurisdictions were also selected to provide a range of solid waste system management styles that include different disposal techniques (i.e.,

landfilling versus incineration), ambitious recycling initiatives and/or zero waste goals, extensive composting programs, and usage-pricing models for waste services such as residential pay-as-you-throw (PAYT) programs or a tiered service fee structure based on the number and/or size of bins/carts set out. Jurisdictions that have historically relied on waste-to-energy (WTE) incineration as their primary means of waste disposal but that have enacted changes to reduce reliance on WTE, or plan to do so, were also of interest.

The metrics by which each selected jurisdiction was evaluated include the following:

- Residential waste management services
- Infrastructure and facilities
- Finances and funding sources
- Quantities of waste managed
- Recycling rates
- Regulations and future waste reduction objectives

All jurisdictions used in benchmarking were intended to be "aspirational" to Baltimore in that they have either achieved historically high waste diversion rates or have recently enacted plans to significantly improve diversion rates (e.g., through the implementation of circular economy initiatives or zero waste programs).

## Overview of Selected Jurisdictions

Selection of jurisdictions for benchmarking was a consultative process between Geosyntec and the City. After initial research, Geosyntec proposed the following 11 jurisdictions as candidates for benchmarking: Austin TX, Boston MA, Charleston SC, Charlotte NC, Fort Worth TX, Minneapolis MN, Nashville TN, Oakland CA, Portland OR, San Francisco CA, and Worcester MA. After due consideration, the following five jurisdictions were selected:

1. Austin TX
2. Boston MA
3. Charleston SC
4. Charlotte NC
5. Portland OR

A brief overview of these five jurisdictions, including the rationale for their selection as a useful benchmark for Baltimore City in this study, is provided below.

### Austin, Texas

Austin is the state capital of Texas with a population of 951,000. It is the fourth largest city in the state of Texas and has a foreign-born population of 18%. Austin covers a land area of 297 square miles and has a population density of 2,650 people per square mile. The city's median household income is $63,717 and its poverty level is 15.4%.

Austin was selected for the benchmarking study because its solid waste management program includes a mature tiered service fee program for waste collection and a new curbside food waste collection. While the city's current diversion rate is relatively modest, Austin's 2011 Resource Recovery Master Plan commits the city to achieving 90% diversion from landfills and incinerators by 2040. As such, Austin is actively investing in and upgrading its solid waste management infrastructure to meet this ambitious diversion goal. Overall, Austin offers both well-established and aspirational comparisons for Baltimore.

**Austin's curbside food waste collection program was initiated in October 2017 with service to 52,000 households**

Image: BioCycle December 2017, Vol. 58, No. 11, p. 20

## Boston, Massachusetts

Boston is the state capital of Massachusetts with a population of 685,000. It is the largest city in the state of Massachusetts and has a foreign-born population of 28%. Boston covers a land area of 48 square miles and has a population density of 12,793 people per square mile. The city's median household income is $62,021 and its poverty level is 20.5%.

Boston was selected for the benchmarking study because its solid waste management program has historical reliance on WTE with almost no landfilling; however, in 2018 the city launched the Zero Waste Boston initiative with the goal of reducing, reusing, recycling, and composting at least 80 to 90% of all solid waste. Boston thus serves as an aspirational benchmarking jurisdiction for Baltimore.

## Charleston, South Carolina

Charleston is the largest city in South Carolina with a population of 134,875 and has a foreign-born population of 4%. The city covers a land area of 109 square miles and has a population density of 1,101 people per square mile. The city's median household income is $61,367 and its poverty level is 14.6%.

The City of Charleston has historically relied on WTE and their solid waste management system has recently had trouble adapting to changes with its infrastructure. Following closure of the WTE plant in 2010, Charleston County also shut down its aging materials recovery facility (MRF) in 2015, leaving the city without a means to process recyclables locally. As the city awaits the imminent opening of the county's new, state-of-the-art recycling facility that will enable them to meet aggressive recycling targets, Charleston serves as an aspirational benchmarking jurisdiction for Baltimore as well as a cautionary tale.

## Charlotte, North Carolina

Charlotte is the largest city in the state of North Carolina with a population of 859,000 and has a foreign-born population of 16%. Charlotte covers a land area of 298 square miles and has a population density of 2,457 people per square mile. The city's median household income is $58,202 and its poverty level is 14.9%.

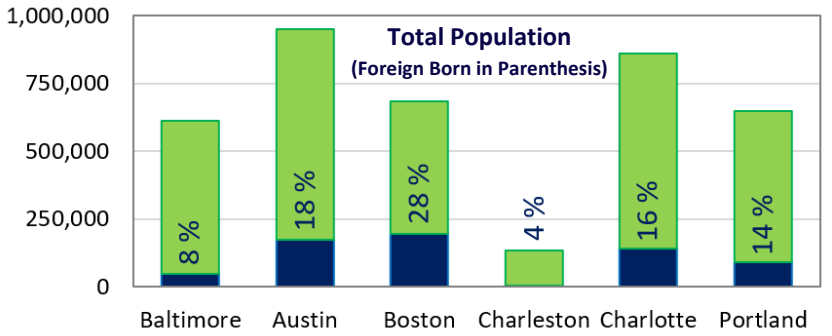
While Charlotte currently has a low diversion rate and poor recycling infrastructure, the city recently announced the Circular Charlotte initiative, which commits the city to achieving zero waste in the public

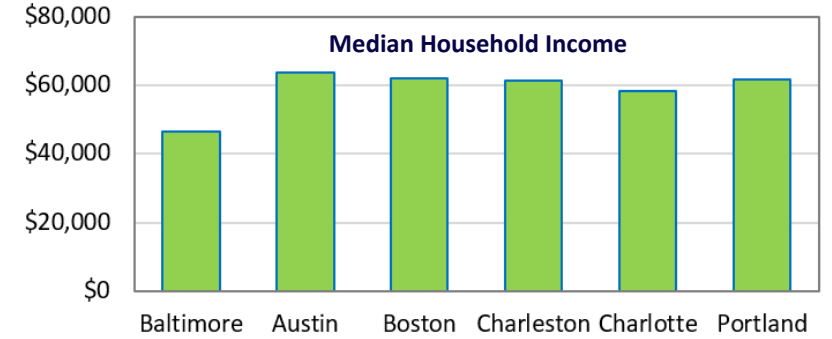
sector with an emphasis on recycling, recovery, and reuse. Charlotte thus serves as an aspirational benchmarking jurisdiction for Baltimore.

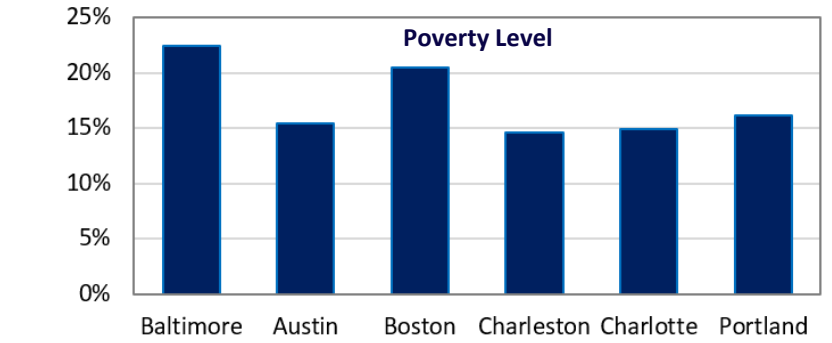
## Portland, Oregon

Portland is the largest city in the state of Oregon with a population of 648,000 and has a foreign-born population of 14%, a land area of 133 square miles, and a population density of 4,375 people per square mile. The city's median household income is $61,532 and its poverty level is 16.2%.

Portland achieves a high diversion rate from its robust solid waste management system that, among other successes, includes mature programs for curbside food waste collection and a tiered service pricing model for waste collection. Although Portland has not officially adopted any zero waste goals, the city represents a well-established benchmark for Baltimore by virtue of its past and continued focus on innovative policies and programs to increase waste diversion.




| Jurisdiction | Population | Foreign Born Rate | Median Household Income | Poverty Rate | Land Area (sq. mi) | Population Density (per sq. mi) |
|---|---|---|---|---|---|---|
| Baltimore | 611,648 | 8% | $46,641 | 22.4% | 81 | 7,671.5 |
| Austin | 950,715 | 18.4% | $63,717 | 15.4% | 297.9 | 2,653.2 |
| Boston | 685,094 | 28.3% | $62,021 | 20.5% | 48.28 | 12,792.7 |
| Charleston | 134,875 | 4.1% | $61,367 | 14.6% | 108.98 | 1,101.9 |
| Charlotte | 859,035 | 16.4% | $58,202 | 14.9% | 297.68 | 2,457.1 |
| Portland | 647,805 | 14% | $61,532 | 16.2% | 133.43 | 4,375.2 |

**Key Demographics Data for Benchmarking Jurisdictions**

# 2. WASTE COLLECTION SERVICES

## Methodology and Data Sources

Most municipal solid waste departments in the U.S. are responsible for providing curbside waste services to residents, but not necessarily for commercial or industrial customers. Because residential curbside customers typically represent the portion of the municipal solid waste (MSW) management market over which jurisdictions have the most control and set the standards for service, it is helpful to compare the type and frequency of these curbside services across jurisdictions. Even though the solid waste hauling system in a city or county is much larger than just the residential curbside services, these services indicate the priorities of each jurisdiction and can also have an indirect impact on the remaining portion of the municipal or other private waste management systems.

The information in this section was sourced primarily through the informational websites and flyers from each municipal solid waste department that are directed toward their residential customers. Additional information was taken from annual solid waste reports, city planning documents, or was provided directly to Geosyntec by city employees.

In the remainder of this section, a discussion of each jurisdiction's system for collection and handling of trash, recycling, bulk waste, yard waste and other organics, and household hazardous waste is presented. Graphical summaries that make quantitative comparisons between jurisdictions, including Baltimore, are provided at the end of the section.

## Austin, Texas

Residential waste management services are provided by the city's Resource Recovery Department and are partly financed through the tiered service fee (TSF) program. Single family homes, duplexes, and triplexes are eligible for residential waste management services. Waste management services for business and multi-family communities are provided by licensed private haulers.

The residential curbside services in Austin include pick-up for garbage, single-stream recycling, and yard trimmings and food waste. Trash and yard trimmings with food waste are collected once a week while recycling is collected every other week. Bulk items and large brush are collected twice per year.

### Trash

City-issued trash bins are offered in 24-, 32-, 64-, and 96-gallon sizes. Residents can pay for as many trash bins as they want, but the city requires that residents have the 96-gallon bin before adding additional bins. It is free to decrease the size of a trash bin but there is a one-time charge of $15 to increase the size of a trash bin.

### Recycling

Austin's single-stream curbside recycling service includes collection of:

- Mixed paper (including glossy paper, junk mail/envelopes, catalogs, magazines, newspapers, and non-foil wrapping paper).
- Boxboard and cardboard (including cardboard, toilet paper/paper towel rolls, and boxes).

- Metals (including steel and tin cans, aluminum foil baking pans, aluminum foil).
- Glass jars and bottles.
- Hard plastic items (including water/soda bottles, jars, tubs, non-battery toys, buckets, baskets, and lawn chairs).

Plastic film and bags, polystyrene (Styrofoam), water hoses, textiles, wood, and medical waste are not accepted. The city-issued recycling bin comes in a 96-gallon size and residents can request as many bins as they want for free.

## Yard Waste and Organics

Half of Austin's curbside customers currently have combined yard trimmings and food waste pick-up while the other half only have collection of yard trimmings. The city plans to continue rolling out combined yard trimmings and food waste pick-up to all customers by 2020. Acceptable materials include:

- Food waste, including cooked and raw meat, poultry and seafood, bones, cheese, dairy products, fruits, vegetables, grains, pasta, eggshells, bread, coffee grounds, tea bags, tea leaves, baked goods, nuts, jelly, candy, snack foods, leftovers, and spoiled food.
- Food-soiled paper such as paper bags, paper napkins, paper towels, paper plates, paper cups, paper take-out containers, pizza boxes, coffee filters, microwavable popcorn bags, newspapers, and tissues.
- Yard trimmings, including grass clippings, leaves, and small branches or limbs that are shorter than 5 feet and no larger than 3 inches in diameter.

Food items that are not accepted include liquids, fats, oils, and grease. The city-issued organics bin comes in a 32-gallon size and residents can request as many bins as they want for free.

Special collection dates are assigned to receive brush that is too large for the weekly yard trimmings pick up.


Source: austintexas.gov/austincomposts

## Bulky Items

Bulk items that can be picked up curbside include doors, carpet, furniture, small appliances, passenger car tires, lawn mowers, railroad ties, pallets, rolled fencing, and nail-free lumber. Items is good condition or in need of minor refurbishing are sent to the ReUSe Store at the Recycle and Reuse Drop-Off Center. Other items are landfilled.

Large appliances, construction and remodeling debris, and automotive-associated waste are not eligible for curbside collection but can be dropped off at the Recycle and Reuse Drop-Off Center.

## Hazardous Household Waste

Household hazardous waste (HHW) is not eligible for curbside collection but can be dropped off at the Recycle and Reuse Drop-Off Center.

## Electronics

Electronic equipment is not eligible for curbside collection but can be dropped off at the Recycle and Reuse Drop-Off Center.

# Boston, Massachusetts

Residential waste management services in Boston are provided by the Public Works Department while commercial waste management services are contracted by private haulers. Residential curbside services in Boston include pick-up for garbage, single-stream recycling, and yard trimmings. Trash and recycling are collected once a week for most residential buildings and twice a week for the downtown neighborhoods.


Source: https://www.boston.gov/sites/default/files/recycling-trash-guidelines.pdf

### Trash

The city does not provide specific trash cans and residents can use any type and size of bin they choose.

### Recycling

Boston's single-stream recycling service includes collection of pizza boxes, plastic, paper, books, glass, aluminum and tin cans, spiral cans, cardboard, and boxboard. It does not include collection of plastic bags, electronics, drink and food boxes, medical waste, plastic wraps, hoses, wires, chains, single-use items, containers for chemicals and motor oil, or clothes and textiles.

The city-issued recycling bin comes in a 64-gallon size, but residents can also convert bins that are smaller than 32-gallons into recycling bins using a sticker from the city. In neighborhoods with houses densely packed together with no room to store recycling bins, residents are allowed to put mixed recyclables out in clear plastic bags. However, residents must buy the official City of Boston bags. Bags have the advantage of being lighter and easier to use than bins; however, they must be ripped open and emptied prior to sorting, which adds to processing costs at the MRF.

### Yard Waste and Organics

Yard trimmings are picked up once a week for seven months of the year from April to early December with an additional two weeks in January for the removal of Christmas trees. Yard trimmings that can be collected curbside include leaves and yard debris that are placed in large paper bags or open barrels as well as bundled branches that are no longer than 3 feet and smaller than 1-inch in diameter.

Residential food collection and composting programs are under development, although they are not yet widespread or mandatory. Currently, residents can drop off their food scraps at five community compost bins located throughout the city.

### Bulky Items

Curbside collection of bulky items is available, but must be scheduled in advance. Acceptable items include electronics, mattresses and box springs, furniture, washers, dryers, stoves, dishwashers, and hot water heaters. Other appliances such as refrigerators, freezers, and AC units need to be scheduled for pick up by the city. No recycling program for bulky items is currently provided by the city.

### Hazardous Household Waste and Electronics

HHW is not eligible for curbside collection, but Boston offers four events per year where residents can drop off HHW along with textiles, electronics, and paper for shredding. Throughout the year, curbside collection of electronic equipment such as TVs and monitors is available, but must be scheduled in advance.

## Charleston, South Carolina

Solid waste management services in Charleston are provided by both the City of Charleston and Charleston County. Trash and yard waste are picked up by the city's Department of Environmental Services and recycling is picked up by the county's Department of Environmental Management. Residential curbside services include trash, single-stream recycling, and yard trimmings.

## Trash

The city provides weekly residential curbside services for trash and yard trimmings. Commercial businesses can also contract private haulers to pick up their recycling in addition to their waste.

The standard city-issued trash bin size is 95-gallons, but residents can also request 32- or 64-gallon trash bins. There is a limit of three bins per household. The first bin is provided and owned by the city (i.e. it stays with the residence when the occupants move away), while a second and third bin can be purchased from the city for a one-time fee of $37 for a 32-gallon bin, $44 for a 64-gallon bin, and $47.47 for a 95-gallon bin.

## Recycling

Residential and commercial curbside services in the city are provided bi-weekly by Charleston County. The single-stream recycling service includes collection of:

- Mixed paper (magazines, newspapers, office paper, envelopes, junk mail/envelopes, greeting cards, catalogs, books/textbooks, coupons, posters, sticky notes, paper bags, and wrapping paper).
- Plastic bottles and containers.
- Cardboard (corrugated cardboard boxes, soda/beverage boxes, shoe boxes, gift boxes, clean food boxes, paper towel rolls, and paper egg cartons).
- Aluminum and steel cans.
- Glass bottles and jars.

Unacceptable materials include plastic bags, plastic wrap, Styrofoam packaging or food containers, household garbage, shredded paper, food waste, yard waste, food cartons, bulky plastic items (toys, hangers), batteries, light bulbs, electronics, clothing and shoes, construction debris, rope-like items (garden hoses), medical waste, diapers or sanitary product, propane tanks, aluminum foil and trays, motor oil and cooking oil, and paint.

The standard county-issued recycling bin size is 95-gallons, but residents can also request 35- or 65-gallon recycling bins. Residents can also request additional recycling bins for free from the county.

## Bulky Items

Bulk items can be picked up with the weekly curbside services. Eligible items include old appliances, household junk, and furniture. No recycling program for bulky items is currently provided by the city.

## Yard Waste and Organics

Curbside collection of yard waste is provided weekly. Yard trimmings that can be collected curbside include leaves, twigs, weeds, and grass clippings. Tree limbs and stumps smaller than 4 feet in length and 4 inches in diameter are also included in the curbside collection.

Charleston does not currently offer separate curbside collection of food waste for composting.

## Hazardous Household Waste

HHW is not eligible for curbside collection services but can be dropped off at various convenience centers located within the county.

## Electronics

Electronics and appliances that are not eligible for curbside services can be dropped off at various convenience centers located within the county.


Source: https://www.charlestoncounty.org/departments/environmental-management/files/2019-Map-Calendar-Countywide.pdf?r=960

## Charlotte, North Carolina

Residential waste management services in Charlotte are provided by the Solid Waste Services for single-family residences, multi-family communities with fewer than 12 units, and business with less than 512 gallons of trash per week. Larger multi-family buildings and businesses with more trash must contract with a private hauler.

Residential curbside services in Charlotte include pick-up for garbage, single-stream recycling, and yard trimmings. Garbage and yard trimmings are collected once a week while recycling is collected every other week. Information on services and programs is provided in the Wipe Out Waste Guide produced by Mecklenburg County.

### Trash

City-issued bins are offered in a 95-gallon size. There is a limit of two trash bins per household and a one-time $40 charge to receive the second bin.

### Recycling

Charlotte's single-stream recycling service includes collection of aerosol cans, aluminum containers, bottle caps and lids, cardboard, glass bottles and jars, juice boxes, milk and juice cartons, paper, pizza boxes, plastics, spiral paper cans, as well as steel and tin cans. Recycled cardboard must be cut rather than folded to fit into the recycling cart. City-issued recycling bins are offered in a 95-gallon size. There is a limit of two recycling bins per household and a one-time $40 charge to receive the second bin.

### Bulky Items

All bulk items that do not fit in the city-issued garbage carts must be scheduled in advance for pick-up by the city. No recycling program for bulky items is currently provided by the city.

### Yard Waste and Organics

Yard trimmings that can be collected curbside include brush and limbs no longer than 5 feet in length and no larger than 4 inches in diameter as well as grass clippings and leaves that have been placed in untied plastic or paper bags. Separate curbside collection of food waste for composting is not offered.

### Hazardous Household Waste

HHW is not eligible for curbside collection but can be dropped off for free at various full-service centers located throughout the county.

### Electronics

Electronics are not eligible for curbside collection but can be dropped off for free at various full-service centers located throughout the county.

## Portland, Oregon

Residential waste management services in Portland are provided by franchised garbage and recycling companies that are overseen by the Bureau of Planning and Sustainability within Metro, the governmental body of the Portland metropolitan region. Commercial services are also provided by privately contracted haulers. Residential waste management services are partly financed through a tiered service fee (TSF) program.

The residential curbside services in Portland include pick-up for garbage, dual-stream recycling, and yard trimmings and food scraps. Trash is picked up every-other week while the recycling and combined yard trimmings and food scraps are picked up weekly.

### Trash

City-issued trash bins are offered in 20-, 32-, 35-, 60-, and 90-gallon sizes. Residents may pay for up to four trash bins, but all bins must be the same size.

### Recycling

Portland's dual-stream recycling service includes one bin for the collection of mixed recyclables and a second bin for the separate collection of glass. Mixed recyclables include:

- Paper and cardboard (newspapers, magazines, catalogs, phone books, scrap paper, junk mail, cartons, paper-bagged shredded paper, and flattened cardboard boxes).
- Plastic (bottles, tubs, plant pots, and buckets).
- Metals (aluminum, tin and steel food cans, empty metal paint cans, aerosol cans, aluminum foil, and scrap metal).

Motor oil can also be collected with the curbside recycling service if it is transferred into a clear plastic bottle with a screw-on lid and set adjacent to the recycling carts or bins.

The standard city-issued recycling bin size is 60-gallons, although 35-gallon bins are available upon request. Residents can request as many recycling bins as they want for a one-time charge of $5.85 per bin.

## Yard Waste and Organics

Portland offers a comprehensive program to residents for curbside collection of yard trimmings and food waste for composting.

The standard city-issued composting bin size is 60-gallons, though 35-gallon bins are available upon request. Residents can request as many composting bins as they want for a one-time charge of $12.45 per bin.

## Bulk Items

Bulk items that do not fit in the garbage cart must be scheduled for pick up at an extra cost.

## Hazardous Household Waste

HHW can be dropped off year-round at Metro's two transfer stations for a small fee as well as at various free household hazardous waste collection events held throughout the year.

## Electronics

Electronic waste is not allowed in the curbside garbage or recycling stream but can be dropped off for free at the Oregon E-Cycles facility.


**YES! Food scraps include:** Meat, poultry, fish, shellfish, bones, eggs and eggshells, cheese, dairy products, bread, baked goods, pasta, rice, beans, nuts, seeds, vegetables and fruit, table scraps, plate scrapings, leftovers, spoiled food, and the like. ***Other:**** *Put only these types of food-soiled paper in curbside compost roll carts: coffee filters, tea bags, paper napkins, paper towels and pizza delivery boxes (remove any plastic or wax paper).*

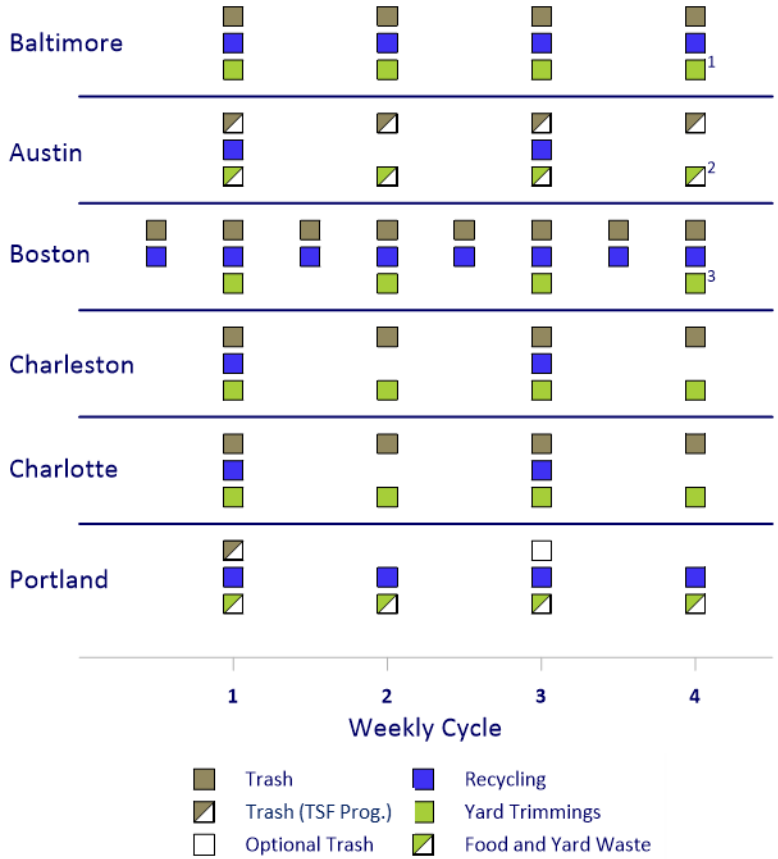
**NO! Things to leave out:**
"Compostable" containers, non-approved compostable plastic bags, pet waste, animal bedding (including straw and chicken manure), animal carcasses from hunting and fishing waste, fireplace ashes, metal and glass, textiles, clothing, linens, shoes, household garbage, fast food wrappers, packaging, takeout containers and waxed paper, facial tissue.


**YES! Yard debris includes:**
Weeds, leaves, vines, grass, small branches, flowers, house plants, plant clippings, fallen tree fruit, pumpkins.

**NO! Things to leave out:**
Dirt, rocks, sod, lumber, treated wood, sawdust, stumps, large branches (more than 4 in thick or 36 in long).

Source: https://www.portlandoregon.gov/bps/article/402972

## Frequency of Residential Curbside Services




Notes:
1. Baltimore collects trash and yard trimmings together without separation to allow for composting of yard trimmings.
2. Austin's combined yard trimmings and food waste program is currently being rolled out to all residents, but at this time services approximately half of the residential customers.
3. Boston's curbside collection of yard trimmings is seasonal

## Food Composting Programs

| | Baltimore | Austin | Boston | Charleston | Charlotte | Portland |
|---|---|---|---|---|---|---|
| Subsidized Home Food Composting | | ✓ | ✓ | | | |
| Community Drop-Off Bins | | | ✓ | | | |
| School District Food Composting | | ✓ | | ✓ | | |
| Required Composting for Food-Related Businesses | | ✓ | ✓ | | | |
| Residential Curbside Compost Pick-Up[1] | | ✓ | | | | ✓ |

Notes:
1. Residential curbside pick-up service is for combined yard trimmings and food waste

## Summary of Residential Waste, Recycling, and Composting Services

| Bin Sizes for Residential Curbside Service | Baltimore | | | Austin | | | Boston | | | Charleston | | | Charlotte | | | Portland | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | T[1] | R[1] | C[1] | T | R | C | T | R | C | T | R | C | T | R | C | T | R | C |
| 18-, 20-, 24-, or 25-gallon | | ✓[2] | | ✓ | | | City does not provide bins. Residents can use any size. | | | | | | | | | ✓ | | |
| 32- or 35-gallon | | | | ✓ | | ✓ | | | | ✓[3] | ✓[3] | | | | | ✓ | ✓[4] | ✓[4] |
| 60-, 64-, or 65-gallon | ✓ | | | ✓ | | | | ✓ | | ✓[3] | ✓[3] | | | | | ✓ | ✓ | ✓ |
| 90-, 95- or 96-gallon | | | | ✓ | ✓ | | | | | ✓ | ✓ | | ✓ | ✓ | | ✓ | | |
| Maximum number of bins | No[5] | No | N/A | No | No | No | No | No | N/A | 3 | No | N/A | 2 | 2 | N/A | 4 | N/A | N/A |
| Allowed to use non-city issued bins | Yes | | | No | | | Yes | | | No | | | No | | | No | | |
| Allowed to place overflow bags/containers curbside | Yes[6] | | | Yes[7] | | | Yes | | | Yes | | | No | | | No | | |

Notes:

1. T = Trash bins, R = Recycling bins, C = Combined yard and food waste bins
2. Baltimore sells (at nominal cost) two recycling bin sizes: 18-gallons and 25-gallons
3. Sizes smaller than 95-gallons are available only upon request
4. Sizes smaller than 60-gallons are available only upon request
5. Baltimore does not limit the number of trash bins, but it limits the quantity of trash to 96-gallons per week
6. Only for recycling and yard waste
7. Austin charges $4.00 per bag with an "Extra Trash Sticker" and $9.60 per bag without the sticker

**Comparison of Bin Sizes for Curbside Trash, Recycling, and Composting Services**

# 3. WASTE MANAGEMENT INFRASTRUCTURE AND FACILITIES

## Methodology and Data Sources

The solid waste management systems in each benchmarked jurisdiction are served by a combination of public and private facilities that include transfers stations, material recovery facilities (MRFs), composting and other organics management facilities, landfills, and WTE plants. In this benchmarking review, facilities are divided into those within a jurisdiction's "sphere of control" and those within its "sphere of influence." Facilities within the sphere of control are those directly owned and/or operated by the jurisdiction in question. However, most jurisdictions also rely on facilities that are privately owned or are owned by neighboring counties or cities. Although the jurisdiction in question does not have direct control over the operations of facilities owned by private companies or other jurisdictions, these facilities are influenced by their priorities, policies, and regulations.

Identification of the facilities serving each benchmarked jurisdiction was conducted using publicly available documents such as annual solid waste management reports, operating permits and licenses, and facility annual reports. However, different types of private and public facilities are subject to different permitting and reporting requirements, which means that most jurisdictions have difficulty precisely tracking the flow of solid waste through their system and there is often some uncertainty as to the final disposal destination of materials that are fully handled by the private sector. As a result, while every effort was made to identify all facilities comprising a jurisdiction's solid waste management system in both the public and private sectors, there are likely to be a number of privately-owned facilities – in particular, transfer stations, MRFs, and organics management facilities – that were not captured in this analysis because they are not subjected to certain reporting requirements. Another limitation in this analysis is accurately capturing material flows to facilities in other jurisdictions such as landfills that only receive waste periodically over the years as needed to meet demand from a benchmarked jurisdiction. These facilities, however, are likely to be processing much smaller volumes of solid waste than the facilities that have been identified.

In the remainder of this section, a discussion of each jurisdiction's system for processing and/or disposal of materials within their wasteshed is presented. A quantitative comparison between jurisdictions, including Baltimore, is provided at the end of the section.

## Austin, Texas

The waste management system that serves the city of Austin includes a combination of privately- and publicly owned facilities. The system includes reuse centers, MRFs, resource recovery centers, composting facilities, construction and demolition (C&D) debris facilities, and MSW landfills. These facilities are located primarily within Travis County, the county in which the City of Austin is situated.

### Waste/Recycling Acceptance and Handling Facilities

While the city no longer operates its own transfer station, there are several privately operating transfer stations in Austin. The city operates the Recycle and Reuse Drop-Off Center, which receives household hazardous waste, electronics and appliances, clothing and housewares,

recyclables, tires, and brush and yard trimmings. The center formerly operated as a transfer station but was recently transformed under the city's Zero Waste initiative to divert reusable materials and bulky objects such as appliances and furniture from landfills. Dropped-off items that remain in usable condition can be picked up for free by residents from the center's ReUse Store. The center is actively expanding its ability to divert non-functioning appliances/electronics, discarded clothing, and other unwanted items from disposal; for example, but hosting or promoting fix-it clinics. However, the majority of materials delivered to the center are currently landfilled.


**Austin's Recycle and Reuse Drop-Off Center and ReUse Store**
https://austineconetwork.com/location/austin-resource-recovery-drop-off/

## Organics Management Facilities

Austin has primarily contracted with a local, privately-owned composting facility called Organics by Gosh to process the combined yard and food waste that is picked up from the residential curbside program. There are also other facilities within the city that are permitted to compost food scraps, and businesses with large amounts of food waste are able to either compost their food waste on-site or contract with a private service provider of their choice to collect organics. The city relies on the city-owned Hornsby Bend Biosolids Management Plant to co-compost yard trimmings with digested biosolids. The city is considering expanding the capabilities of this facility to allow processing of food waste.

## Landfills and Waste-to-Energy Plants

Austin does not utilize WTE plants for disposal of solid waste. There are three MSW landfills and one C&D debris landfill that receive waste from the greater Austin area. One of the MSW landfills is a county-owned facility in adjacent Williamson County. The other two MSW landfills are privately owned. One is located within the Austin city limits and the other is 15 miles south of the city in Travis County.

The C&D debris landfill originally operated as a city-owned MSW landfill until 1999 when relocation of the Austin-Bergstrom International Airport to this vicinity prevented its continued use in that capacity. The landfill has continued to accept C&D debris since 1999 and is currently privately operated. It has also been identified as a potential future site for an eco-industrial park to help the city achieve its zero waste goals.

## Boston, Massachusetts

The waste management system that serves the City of Boston includes a combination of privately- and publicly owned facilities. The system includes transfer stations, MRFs, composting facilities, and WTE incinerators. These facilities are located within the city limits as well as in surrounding counties in Massachusetts.

### Waste/Recycling Acceptance and Handling Facilities

Boston contracts with a private company to run the city's residential curbside recycling program. All recyclables collected in this program are processed at a MRF owned by the same company.

There are two privately-owned transfer facilities located in Boston. One is a C&D debris management facility and the other is an MSW transfer facility.

### Organics Management Facilities

Boston has two registered composting sites, one of which is privately owned. The other, the Boston Compost Site, is owned by the city but operated by under a public-private partnership. All yard waste collected curbside in the city is composted at the Boston Compost Site.

### Landfills and Waste-to-Energy Plants

Boston does not have any active landfills within the city limits or surrounding counties that accept solid waste. While Boston does not have an incinerator within its city limits, almost 100% of the city's waste that is not recycled or composted is sent to one of two WTE plants: Wheelabrator Saugus and Covanta SEMASS Resource Recovery. The Wheelabrator Saugus facility opened in 1975, has a waste processing capacity of 1,500 tons per day, and can generate up to 54 MW of energy. The Covanta SEMASS Resource Recovery facility was opened in 1988 and was expanded in 1993. The facility can process up to 3,000 tons per day and can generate up to 84 MW of energy. The small quantity of waste not incinerated, as well as WTE ash generated, is landfilled at out-of-region facilities.

## Charleston, South Carolina

The waste management system that serves the city of Charleston includes a combination of privately- and publicly owned facilities. The system includes transfer stations, material recovery facilities, composting facilities, and landfills. These facilities are located within Charleston County as well as in adjacent counties.

### Waste/Recycling Acceptance and Handling Facilities

There is one privately-owned transfer station in North Charleston that receives MSW, C&D debris, and mixed recyclables. There is a second transfer facility in Charleston County that is only permitted to receive C&D debris.

A large, state-of-the-art regional recycling center is planned for North Charleston that would service adjacent counties Dorchester and Berkeley in addition to Charleston County, but progress on this project has been delayed repeatedly since its ground breaking in the spring of 2017 partly because of repeated changes to the scope of the project. Following the closure of the county's main recycling center due to increasing costs, the city and county currently have no infrastructure for processing

recyclables until the new recycling facility opens.[1] As a result, some towns within Charleston County have suspended their curbside recycling programs and the City of Charleston is transferring their curbside recyclables to a facility several counties away.

## Organics Management Facilities

Charleston County composts all of the yard and food waste that it collects or receives at the county-owned Bee's Ferry Compost Facility, a large facility which accounts for approximately 50% of all organics composted in Charleston County. Food waste composting was introduced in 2010 and today the facility receives food waste from local restaurants and schools in the Charleston County School District.

In addition to the Bee's Ferry Compost Facility, there are five, privately-owned composting and wood-grinding facilities permitted to operate in Charleston County; however, these primarily process yard waste and brush with little/no other organics.

## Landfills and Waste-to-Energy Plants

The Charleston Resource Recovery Facility was a WTE incinerator located in North Charleston that operated from 1989 to 2009. While in use, approximately 65% of Charleston's waste was sent to the WTE incinerator. The facility was capable of processing 600 tons per day but shut down after the city declined to renew its contract with the facility. One of the main motivations for shutting down the facility was public concerns over air pollution emissions. Since closure of the facility, Charleston's previously incinerated waste has been sent to regional landfills.

Seven MSW landfills in South Carolina receive waste from Charleston County, three of which are publicly owned and four are privately owned. Approximately 65% of the waste is sent to two out-of-county landfills, with most of the remaining waste sent to the publicly owned Bee's Ferry Landfill. Two landfills in Charleston County accept C&D debris, one of which is the Bee's Ferry Landfill.

**Bee's Ferry Compost Facility, Charleston**
Image: BioCycle July 2012, Vol. 53, No. 7, p. 10

[1] https://www.postandcourier.com/news/charleston-area-still-waiting-for-recycling-center-years-afterromney/article_d12c8b3e-ba9d-11e8-b83e-4f9787364718.html

## Charlotte, North Carolina

The waste management facilities that serve the City of Charlotte include facilities that are owned and operated by Mecklenburg County, as well as a variety of privately-operated facilities. The system includes transfer stations, a MRF, composting facilities, and landfills, some of which are in adjacent counties and states.

### Waste/Recycling Acceptance and Handling Facilities

Mecklenburg County owns a MRF, the Metrolina Recycling Center, that is operated by a private company. This facility receives and sorts the single-stream recyclable material that is collected from curbside programs, schools, and drop-off centers throughout the county, including in Charlotte.

Mecklenburg County operates four recycling centers, three of which are in Charlotte, that serve as drop-off sites for residents. These centers accept household trash, bulky items, C&D debris, yard waste, household hazardous waste, and electronic waste. Received items are sorted based on condition and material composition, and then redirected either for recycling or landfilling.

There are an additional eight private transfer stations that receive waste and recyclables from Mecklenburg County, two of which are in Charlotte. Three of the transfer stations are located in adjacent counties, two are located in other parts of North Carolina, and one is located in South Carolina.

### Organics Management Facilities

Mecklenburg County's four recycling centers are also set up to receive yard trimmings. Three of the facilities have mulching equipment to process yard trimmings that are dropped off by residents and private haulers. The county's Compost Central and Recycling Center, however, processes the majority of the county's yard trimmings with mulching and composting equipment and receives yard trimmings from the residential curbside program in addition to resident and private hauler drop offs.

### Landfills and Waste-to-Energy Plants

Charlotte does not utilize WTE plants for disposal of solid waste. Mecklenburg County owns and operates one MSW landfill that is also the site for one of its full-service recycling centers. The county also sends waste to nine other MSW landfills, seven of which are in North Carolina and two of which are in South Carolina. However, most MSW generated in Mecklenburg County is sent to one of three MSW landfills. Approximately 50% goes to an out-of-county landfill 15 miles north of Charlotte while about 30% goes to an out-of-county landfill 50 miles east of Charlotte. Only about 15% of waste goes to the Mecklenburg County Landfill. C&D debris in Mecklenburg County is received at five C&D debris landfills located within the state of North Carolina, one of which is a privately-owned facility located within Mecklenburg County but outside of Charlotte. Almost 60% of the C&D debris generated within Mecklenburg County is landfilled within the county.

## Portland, Oregon

The waste management system for the City of Portland is overseen and licensed by Metro, the governmental body of the greater Portland metropolitan region. The overall system includes two public transfer facilities, 11 private transfer facilities, 17 source-separated and mixed waste material recovery sites, 22 yard and food composting and digestion facilities, nine landfills, and one WTE incinerator, some of which are located in adjacent counties and states.

### Waste/Recycling Acceptance and Handling Facilities

The two public transfer stations servicing the city of Portland are the Metro Central Transfer Station and the Metro South Transfer Station. Both transfer stations are open for residents to drop off trash, recycling, household hazardous waste, and food scraps. Both transfer stations also receive hauled residential and commercial waste and recycling for processing. The Metro South Transfer Station also accepts commercial organics. These two transfer stations receive 40% of the total solid waste generated within the Metro region. An additional 11 privately-owned and operated transfer stations within the Metro system receive the remaining 60% of the residential and commercial waste that is generated in the Portland metropolitan region. Five of these transfer stations are located within the metropolitan region and operate as franchised facilities. The other six transfer stations are located outside of the region and operate on non-system licenses from Metro. Most of these facilities are also open for residents to drop off trash, recycling, household hazardous waste, and food scraps.

The Portland metropolitan region includes 17 MRFs that are not owned or operated by Metro. Six of these facilities are designated as source-separated material recovery sites and 11 are designated as mixed waste material recovery sites.

### Landfills and Waste-to-Energy Plants

Nine landfills serve the Portland metropolitan area. Under a contract with Waste Management (WM), however, up to 90% of all the MSW generated in the Metro region through 2019 is required to go to WM's Columbia Ridge Landfill, which accounts for almost 400,000 tons annually. By court order, however, after 2019 the contract can only restrict the destination of waste for the 40% of waste that flows through Metro's two public transfer stations, allowing the 11 other transfer stations and private haulers to select the destination for the remaining 60% of waste that flows through their facilities.

The Covanta Marion WTE incinerator receives a small amount waste from the Portland metropolitan region on the order of 5,000 tons annually, or approximately 1% of the total MSW generated in the Metro region. This 13-MW facility was opened in 1987 and has a waste processing capacity of 550 tons per day, but the majority of its received waste comes from jurisdictions other than Metro. Much of the waste this facility receives from the Portland metropolitan area comes directly from businesses or includes special waste such as confidential records of customers from within the Metro boundary.

### Organics Management Facilities

With the expansion of the residential food composting program in Portland, many new privately-owned composting and anaerobic digestion (biogas) facilities have recently opened to meet demand. There are currently at least 22 such facilities serving Portland. The city has one

composting facility that processes leaves that the city collects from the streets, but it does not accept yard trimmings or food waste.

**Food scraps collected in Portland's commercial (top) and residential (bottom) compost programs go to different processing facilities, including the Willamette Valley biogas plant**

https://www.portlandoregon.gov/sustainabilityatwork/article/536026

| Facility Type | Baltimore | | | Austin | | | Boston | | | Charleston | | | Charlotte | | | Portland | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Public | Private[1] | Proposed | Public | Private[1] | Proposed | Public | Private[1] | Proposed | Public | Private[1] | Proposed | Public | Private[1] | Proposed | Public | Private[1] | Proposed |
| | Total | | | Total | | | Total | | | Total | | | Total | | | Total | | |
| Transfer Stations | 1 | 1 | 1[2] | 0 | 1+[3] | | 0 | 2 | | 0 | 2 | | 4 | 8 | | 2 | 11 | |
| | 2 | | | 1+ | | | 2 | | | 2 | | | 12 | | | 13 | | |
| Material Recovery Facilities | 0 | 6 | | 0 | 1+ | | 0 | 1 | | 0 | 1 | 1 | 1 | 0 | | 0 | 17 | |
| | 6 | | | 1+ | | | 1 | | | 1 | | | 1 | | | 17 | | |
| Organics Management Facilities | 1 | 2[4] | | 1 | 1+ | | 1 | 1 | | 1 | 5 | | 1 | 0 | | 1 | 22 | |
| | 2 | | | 2+ | | | 2 | | | 6 | | | 1 | | | 22 | | |
| Landfills | 1 | 3 | | 1 | 3 | | 0 | 0 | | 1 | 8 | 1[5] | 1 | 9 | | 0 | 9 | |
| | 4 | | | 4 | | | 0 | | | 9 | | | 10 | | | 9 | | |
| Waste-to-Energy Incinerators | 0 | 1 | | 0 | 0 | | 0 | 2 | | 0 | 0 | | 0 | 0 | | 0 | 1 | |
| | 1 | | | 0 | | | 2 | | | 0 | | | 0 | | | 1 | | |
| Other | | | | | | 1[6] | | | | | | | | | 1[7] | | | |

Notes:

1. Facilities that are privately-owned or operated, or publicly-owned by a different jurisdiction
2. Expansion of a current transfer station
3. '+' symbol indicates that several facilities are known to exist but the exact numbers servicing the jurisdiction are unknown
4. These facilities compost sludge from the waste water treatment process
5. Construction of a new landfill cell
6. Construction of an eco-industrial park
7. Renovation of a city-owned warehouse into a community space to support zero waste initiatives and businesses

**Summary of Facilities Comprising the Solid Waste Management System in each Jurisdiction**

**(Facilities in Baltimore are shown for comparison, based on information in the Task 3 Report prepared for the LWBB Plan)**

# 4. WASTE MANAGEMENT FINANCIALS

## Methodology and Data Sources

Funding for solid waste management within the five benchmarked jurisdictions comes from a variety of sources such as fees assessed through property taxes, usage-pricing models (e.g., tiered service fees or pay-as-you-throw programs), tipping fees, sales of recyclables and mulch, franchising fees, and permit fees. Additional resources are also frequently available through a local jurisdiction's general fund, which can help cover the cost of large capital expenditures or bridge the gap between a solid waste department's revenue and expenditures each year. **It is important to note that because each jurisdiction offers different levels of solid waste management services and owns different numbers and types of solid waste facilities, direct comparisons of revenue and budgets across jurisdictions are difficult. Per capita costs were thus estimated from the reported data and used as the key metrics for comparison in the tables and figures at the end of Section 4.**

In the remainder of this section, a discussion of each jurisdiction's financial system for provision of solid waste management services is presented. The information in this section was sourced primarily from city annual budgets, the websites of the municipal solid waste departments, and city planning documents, supplemented where possible with information obtained directly from local or state government employees. Graphical summaries and quantitative comparisons of certain services between different jurisdictions, including Baltimore, are provided at the end of the section.

## Austin, Texas

### Main Revenue Sources

The solid waste services provided by Austin's Resource Recovery Department are primarily funded through direct charges for services and goods provided. This includes fees associated with the residential tiered service fee program (which covers the recycling, composting and disposal costs of the program), commercial services, extra trash fees, and a Clean Community Fee, which is $8.95 per month for residential customers and is $20.75 per month for commercial customers.

### Tiered Service Fee Program

Austin offers a straightforward approach to its program for residential curbside services. Monthly costs for various service levels range from $17.90 for a 24-gallon cart to $42.85 for a 96-gallon cart. Residents can decrease the size of their cart for free but are charged a $15 one-time exchange fee if they increase the size of their cart. Residents also must already be using a 96-gallon cart before requesting additional trash carts for added capacity at their household. For households with multiple bins, the price per bin is constant and there is no limit to the number of bins a household can have. Additional recycling and composting bins can be requested for free and there is also no limit to the number of these bins per household. At all levels of service, trash and composting are collected weekly and recycling every other week.

### Annual Budget

The approved 2018-2019 budget for Austin's Resource Recovery Department anticipates nearly $94 million in revenue and about $97

million in expenditures for its operating budget[2], and about $18.5 million in its capital budget. The main capital expenditures are related to a new landfill office, a new North East Service Center, preparation to officially close a landfill, and the acquisition of support vehicles and equipment.

| Austin Resource Recovery 2018-2019 Operations Budget – Expenditures | |
|---|---|
| **Program** | **Expenditures** |
| **Collection Services** | |
| Bulk Collection | $2,922,438 |
| Organics Collection and Processing | $9,205,340 |
| Recycling Collection | $12,006,532 |
| Trash Collection | $15,439,848 |
| **Subtotal** | **$39,574,158** |
| **Litter Abatement** | $6,281,062 |
| **Operations Support** | $5,814,629 |
| **Remediation** | $1,648,959 |
| **Departmental Support Services** | $11,073,029 |
| **Transfers, Debt Service, Other Requirements** | |
| Transfers | $24,707,075 |
| Other Requirements | $2,423,774 |
| **Subtotal** | **$27,130,849** |
| Waste Diversion | |
| Diversion Facilities | $3,087,284 |
| Strategic Initiatives | $2,483,167 |
| **Subtotal** | **$5,570,451** |
| **TOTAL OPERATIONS BUDGET** | **$97,093,137** |

| Austin Resource Recovery 2018-2019 Operations Budget – Revenue | |
|---|---|
| **Source** | **Revenue** |
| Charges to Residential and Commercial Clients | $90,469,020 |
| Intergovernmental | $110,000 |
| Other Revenue | $888,678 |
| Transfers In | $0 |
| Use of Money & Property | $2,409,669 |
| **TOTAL REVENUE** | **$93,877,367** |

| Austin Resource Recovery 2018-2019 Capital Budget – Revenue | |
|---|---|
| **Source** | **Revenue** |
| Current Revenue | $2,191,007 |
| Multiple Funding Groups | $10,643,674 |
| Non-Voter Approved General Obligation Debt | $5,760,000 |
| **TOTAL CAPITAL REVENUE** | **$18,594,681** |

| Austin Resource Recovery 2018-2019 Capital Budget – Expenditures | |
|---|---|
| **Category** | **Expenditures** |
| Buildings and Improvement | $428,416 |
| Landfills | $730,000 |
| Vehicles and Equipment | $17,436,265 |
| **TOTAL CAPITAL BUDGET** | **$18,594,681** |

[2] It is not reported how the gap between revenues and expenditures is funded.

## Boston, Massachusetts

### Main Revenue Sources

The City of Boston Public Works Department (DPW) is funded primarily by tax revenue, for which specific details were not available. Similar to Baltimore City, solid waste and recycling services appear to be funded through the city's general fund and are not direct-billed or listed as a separate fee on residents' property tax bills.

### Annual Budget

The approved 2018-2019 budget for the Waste Reduction Division within DPW anticipates operating expenditures of over $39 million. The budget is split between four categories of waste removal: collection, disposal, recycling, and other services. The other services category is for household hazardous waste collection days. The budget does not include any significant capital budget expenditures related to the Waste Reduction Division for the upcoming year.

| Boston Department of Public Works Waste Reduction Division 2018-2019 Budget | |
|---|---|
| **Category** | **Budget** |
| Waste Removal Collection | $24,169,808 |
| Waste Removal Disposal | $14,427,087 |
| Waste Removal Recycling | $487,790 |
| Waste Removal Other Services | $110,000 |
| **TOTAL BUDGET** | **$39,194,685** |

## Charlotte, North Carolina

### Main Revenue Sources

The city's Solid Waste Services Department (SWSD) is funded primarily through a solid waste fee that is assessed in the property tax bill. The annual solid waste fee of $73.56 is split, with $46.06 going to the City of Charlotte and $27.50 going to Mecklenburg County.

### Annual Budget

The fiscal year 2019 budget for SWSD anticipates about $16 million in total revenues and nearly $60 million in total expenditure. It is not reported how the gap between revenues and expenditure is funded. Beyond the approved annual budget for SWSD, the City of Charlotte has also allocated an additional $2 million in 2019 funding sourced from municipal debt for the renovation of a city-owned warehouse into a community space aimed at fostering public-private partnerships in waste reduction, reuse, and recycling. This capital investment is intended to help the city achieve the goals of its circular economy initiative.

| City of Charlotte Department of Solid Waste Services FY 2019 Budget | |
|---|---|
| **Department Services** | **Expenditures** |
| Curbside Recycling Collection and Processing* (Residential Units Only) | $8,991,627 |
| Dumpster/Compactor Collection and Disposal** | $9,346,849 |
| Residential Garbage Collection and Disposal | $20,478,536 |
| Residential Yard Waste Collection and Disposal | $10,271,488 |
| Curbside Bulky Collection and Disposal | $3,073,625 |
| Special Services+ | $7,513,151 |
| **TOTAL BUDGET** | **$59,675,276** |

* Residential units only.

** Multi-family residential units and public facilities only.

+ Special services include small business garbage collection and disposal, special event cleanup and support, dead animal collection and disposal; police barricade delivery and retrieval, public receptacle collection and disposal, sidewalk scrubbing, holiday decorations, plaque and statue cleaning, graffiti removal, street sweeping, right-of-way cleaning, and litter picking.

## Charleston, South Carolina

As described previously, there are two different public authorities offering solid waste services in the Charleston area. The City of Charleston's Environmental Services Division provides trash services while Charleston County's Department of Environmental Management provides recycling and disposal services.

### Main Revenue Sources

Charleston County's main source of funding is the Solid Waste User Fee that is included in the annual Real Property Tax Bill for residents and in a separate bill for commercial customers. The annual fee costs $99 for single-family residences, $70 for multi-family units, and $172 per cubic yard of garbage for commercial customers.

### Annual Budget – City of Charleston

The City of Charleston's fiscal year 2019 draft budget for the Environmental Services Division anticipates over $8 million in expenditure on administration, trash and yard waste collection, and street sweeping. No information on revenues was available.

| City of Charleston Division of Environmental Services FY 2019 Operating Budget | |
|---|---|
| **Division** | **Expenditures** |
| Environmental Services Admin | $792,524 |
| Trash Collection | $4,401,766 |
| Yard Waste Collection | $1,774,099 |
| Street Sweeping | $1,160,888 |
| **TOTAL BUDGET** | **$8,129,277** |

### Annual Budget – Charleston County

The approved fiscal year 2019 budget for Charleston County's Department of Environmental Management (DEM) anticipates over $39 million in expenditure for its ten divisions that include administration as well as various facilities and collections operations.

Following the closure of Charleston County's Resource Recovery Facility in 2015, DEM's revenue decreased from approximately $1.4 million to $200,000 from loss of tipping fees and sale of recyclable materials and its expenditures increased from approximately $200,000 to over $3 million, which includes a contract for Horry County to receive its recyclables as well as the increased hauling costs. Until the county's new MRF opens, DEM will continue to export recyclables at significant net cost.

| Charleston County Department of Environmental Management FY 2019 Budget | | |
|---|---|---|
| **Division** | **Revenues** | **Expenditures** |
| Administration | $30,410,000 | $4,672,949 |
| Bees Ferry Landfill Convenience Center | $25,500 | $798,445 |
| Commercial Collections | $0 | $753,003 |
| Compost & Mulch Operations | $245,000 | $2,434,035 |
| Convenience Centers | $0 | $2,251,788 |
| Curbside Collections | $0 | $4,873,633 |
| Landfill Operations | $420,000 | $4,697,038 |
| Litter Control | $0 | $152,195 |
| Material Recovery Facility | $130,000 | $2,763,876 |
| Transfer Station Contracts | $0 | $7,400,000 |
| Interfund Transfers* | | $8,350,000 |
| **TOTAL BUDGET**** | **$31,230,500** | **$39,146,962** |

* Interfund transfers in 2019 include: (1) $350,000 to the Environmental Management Capital Projects Fund for renovations to a residents' convenience center; (2) $6 million transfer to Environmental Management Projects Fund for the construction of a new landfill cell; and (3) $2 million of additional funding for a new MRF.

** Details on how the gap between revenues and expenditures is funded are not provided.

## Portland, Oregon

Solid waste services in Portland are provided by both the City of Portland and Portland Metro. Because the region relies on private haulers that are franchised through Metro, neither the city nor Metro have direct expenses related to hauling solid waste, but they do have revenue through the franchise and license fees.

### Main Revenue Sources

Funding for the City of Portland's Solid Waste Management Fund primarily comes from fees associated with residential franchises, commercial tonnage, and permits. Metro's solid waste system is funded primarily through the Regional System Free, the Metro Tip Fee, and transaction fees.

### Tiered Service Fee Program

Portland's program provides residents with "a la carte" pricing structure offering a wide variety of choices for curbside services. For residential curbside services that include the full range of trash, recycling, and compost pickup, the monthly cost in 2018 ranged from $24.25 for one 32-gallon can picked up once a month to $78.15 for four 90-gallon carts picked up every other week (the exact breakdown of costs between trash, recycling, and composting within this pricing structure is not reported). For curbside service with multiple trash bins, the per-bin price decreases; however, all bins must be the same size and there is a limit of four bins per household. Residents receive their first 60-gallon recycling and composting bins for free but can obtain additional bins for an additional cost of $5.85/month per recycling bin and $12.45/month per

composting bin. Recycling and compost are picked up weekly for all levels of service.

As an alternative to standard curbside pickup of trash, recycling, and compost service, residents also have the option of receiving special services such as only recycling pickup ($11.05/month), only recycling and compost pickup ($20.85/month), on call trash pickup ($9.75/event), and on call yard debris pickup ($7.45/event). As of December 2018, only one third of Portland households utilized standard curbside services with the majority opting for "al a carte" services in some form.

## Annual Budget

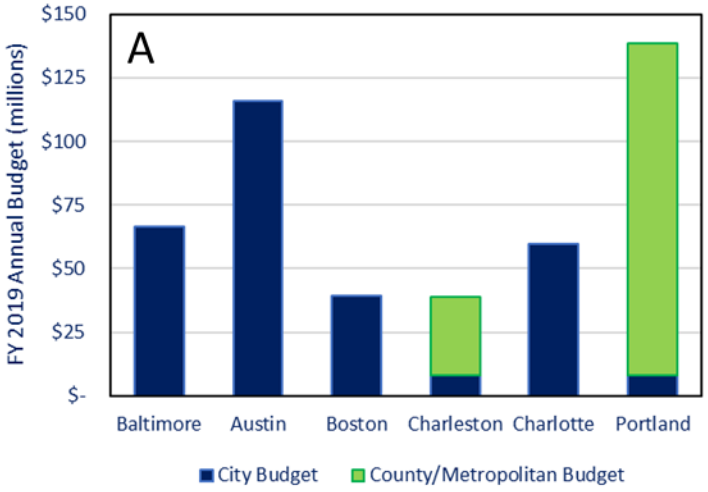
The 2018-2019 budget for Portland's Solid Waste Management Fund anticipates about $7.5 million in total revenue and $7.9 million in total expenditures (details not available).

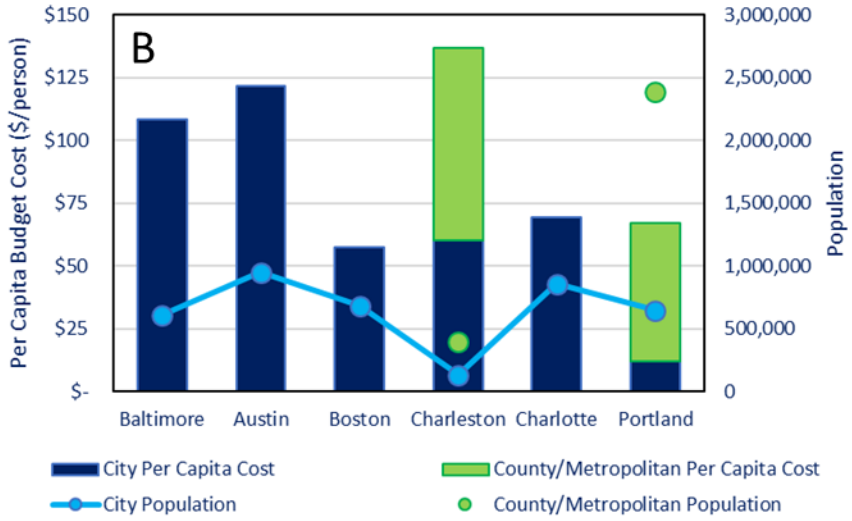
| City of Portland Solid Waste Management Fund 2018-2019 – Revenue | |
|---|---|
| **External Source** | **Revenue** |
| Licenses & Permits | $3,110,704 |
| Charges for Services | $4,372,595 |
| Intergovernmental | $0 |
| Miscellaneous | $108,624 |
| **Total Revenue** | **$7,591,923** |

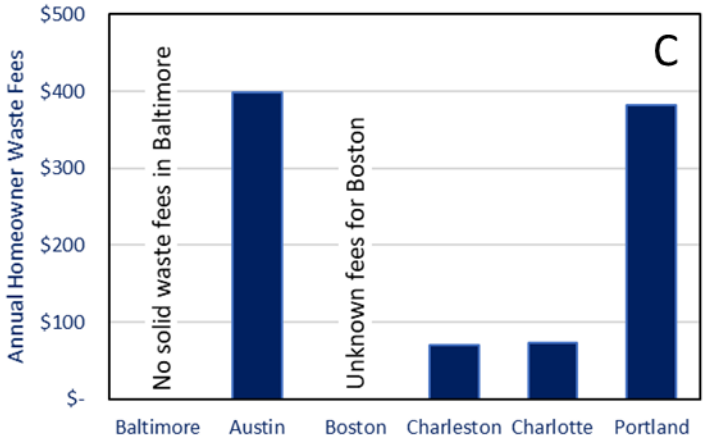
The 2018-2019 budget for Portland Metro's Solid Waste Revenue Fund anticipates about $72.5 million in total revenue and over $130 million in total expenditures. It is not reported how the gap between revenue and expenditure is funded. There are no reported large, upcoming capital expenditures for the Portland Metro region.

| Portland Metro 2018-2019 Solid Waste Revenue Fund – Revenue | |
|---|---|
| **Source** | **Revenue** |
| Interest Earnings | $391,600 |
| Grants | $0 |
| Contributions from Governments | $40,000 |
| Charges for Services | $71,240,610 |
| Miscellaneous Revenue | $17,000 |
| Other Financing Sources | $0 |
| Internal Service Transfers | $16,435 |
| Interfund Loads | $692,900 |
| Fund Equity Transfers | $185,570 |
| **Total Revenue** | **$72,584,115** |

| Portland Metro 2018-2019 Solid Waste Revenue Fund – Expenditures | |
|---|---|
| **Accounts** | **Expenditures** |
| Personnel Services | $16,684,056 |
| Materials and Services | $49,432,034 |
| Capital Outlay | $9,757,300 |
| Internal Service Transfers | $933,668 |
| Interfund Reimbursements | $5,280,811 |
| Fund Equity Transfers | $255,220 |
| Interfund Loads | $0 |
| Contingency | $17,879,527 |
| Unappropriated Fund Balance | $30,605,063 |
| **Total Budget** | **$130,827,679** |

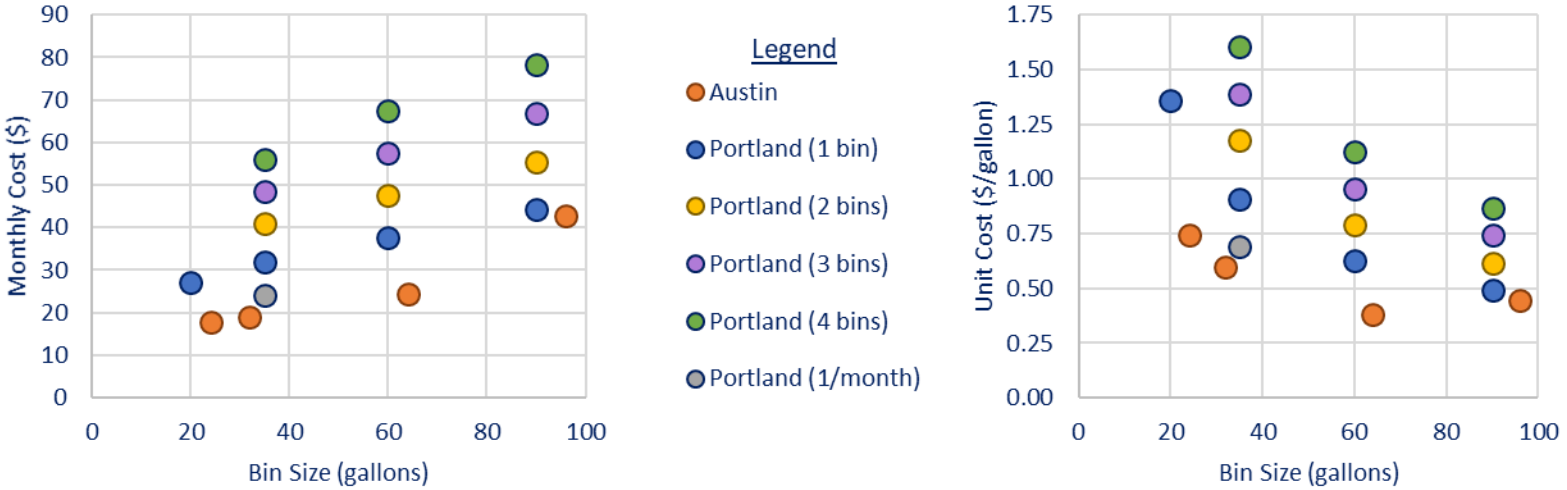



Notes:
A: Annual budget: Values shown are summation of all expenditures listed for each jurisdiction in Section 4. Where solid waste services are shared by larger county/metropolitan region (Charleston and Portland), the total budget for both the city and county/metropolitan region are added (i.e., blue and green bars are additive to show total budget).
B: Per capita costs: Values shown are total budget in (A) divided by city population. Where solid waste services are shared (Charleston and Portland), the total budget for services provided by larger county/metropolitan region is pro-rated by the relative population of the city to reflect the city's share of costs. Again, blue and green bars are additive.
C: Annual fees: Values shown are direct fees assessed for solid waste management. Baltimore and Boston do not directly assess fees.

**Total Annual and Per-Capita Budgets and Annual Fees Assessed for Waste Collection per Household (where applicable)**




Austin

- Austin's TSF program allows residents to select from four trash bin sizes: 24-, 32-, 64-, or 96-gallons.
- There is no limit to the number of trash bins a resident can request, though the city requires that residents have the 96-gallon bin before adding another bin.
- There is no multiple-bin discount on the price-per-bin cost for households with multiple trash bins.
- Residents can request as many recycling and composting bins as they want for free.
- Curbside pick up of trash and composting is offered weekly.
- Curbside pick up of recycling is offered every-other-week.
- Tiered service fees are in addition to annual homeowner waste fees.

Portland

- Portland's TSF program allows residents to select from four trash bin sizes: 20-, 32/35-, 60-, or 90-gallons. The 20- and 32-gallon sizes are cans and the 35-, 60-, and 90-gallons sizes are roll carts. The 32- and 35-gallons containers have the same pricing except in the case of multiple trash containers per household.
- There is a limit of 4 trash bins per household and specific pricing for households with multiple trash bins.
- Residents can request additional recycling and composting bins at an additional cost of $5.85/month/bin for recycling and $12.45/month/bin for composting.
- Curbside pick up of trash is offered every-other-week in the standard service, or once a month for reduced service with a 32- or 35-gallon bin. Curbside pick up of recycling and compost is offered weekly.
- Tiered service fees are in addition to annual homeowner waste fees.

**Comparison of Costs for Tiered Service Fee (TSF) Programs in Austin and Portland**

# 5. QUANTITIES OF WASTE MANAGED

## Methodology and Data Sources

Assessing the quantities and types of waste that move through a jurisdiction's solid waste system is helpful for evaluating the needs of the system and setting waste reduction goals. However, metrics such as total waste tonnage and per capita waste generation rates can be difficult to accurately define and use for comparisons because reporting requirements are not standardized across jurisdictions. Further, as discussed previously, waste tracking and reporting requirements tend to differ between a jurisdiction's spheres of control and influence. Private haulers operating within the sphere of influence often do not need to separately report waste collected from residential and commercial sources. Additional discrepancies exist because some jurisdictions only provide services to single family homes while others extend services to multifamily homes and small businesses. Services are also provided on a per-household basis rather than a per-person basis. Jurisdictions that reported combined residential and commercial waste streams will have higher estimated per-capita waste generation rates as a result. In summary, many metrics may be best used by a single jurisdiction to measure its progress over time rather than in comparison to other jurisdictions. Nevertheless, they are presented in a comparative analysis in this section.

Waste tonnage data for each jurisdiction was sourced from publicly available documents such as annual solid waste management reports and solid waste composition studies, and where possible, only data regarding the residential waste stream was used to provide a quasi-equal comparison of waste generation within the sphere of control of each jurisdiction. In the cases of Charleston and Portland, however, residential-only data was not available; therefore, the evaluations include combined residential and commercial waste streams. Graphical summaries and quantitative comparisons of waste generation in the different jurisdictions, including Baltimore, are provided at the end of this section.

It is important to note that total tonnages are broken down into disposal, recycling, and composting percentages in this section based on nominal calculation of material flows. However, these numbers do not necessarily corelate with reported waste diversion and recycling rates in each jurisdiction as actual rates are subject to jurisdiction-specific rules as to what may or may not be counted within each category. Comparative recycling rates are discussed in more detail in Section 6.

## Austin, Texas

The solid waste stream in Austin was estimated using a daily waste collection report generated by the city that covered a one-year period from September 2016 to August 2017. The data included information such as the load date, load type, load weight, drop-off site, route type, and route number. The waste stream in the daily report included waste from all residential and municipal routes in the city, but not from commercial customers. It is noted that Austin's curbside composting program only started in 2018, so the analysis here presents a snapshot of Austin's waste stream immediately prior to the start of that program. It is likely that this will change significantly in coming years as the curbside composting program matures and a greater number of households become regular, active participants.

| City of Austin, Texas<br>Waste Generation Rate, 2016-2017 | | | | |
|---|---|---|---|---|
| **Tonnage** | **Disposal** | **Recycle** | **Compost** | **Total** |
| tons | 148,351 | 59,086 | 42,955 | **250,392** |
| percentage | 59.2% | 23.6% | 17.2% | **100%** |
| lbs./person/day | 0.86 | 0.34 | 0.25 | **1.44** |

## Boston, Massachusetts

The solid waste stream in Boston was assessed using results from a 2017 MassDEP Municipal Solid Waste and Recycling Survey. The survey included information such as descriptions of municipal programs and services, trash disposal and recycling tonnage, annual collection frequency of other recyclable materials, and hazardous products collection. The city's waste stream includes trash and recycling from residential customers and recycling only from municipal buildings and schools. Waste stream statistics do not include commercial waste.

| City of Boston, Massachusetts<br>Waste Generation Rate, 2017 | | | | |
|---|---|---|---|---|
| **Tonnage** | **Disposal** | **Recycle** | **Compost** | **Total** |
| tons | 193,000 | 40,929 | 8,638 | **242,567** |
| percentage | 79.6% | 16.9% | 3.6% | **100%** |
| lbs./person/day | 1.54 | 0.33 | 0.07 | **1.94** |

## Charleston, South Carolina

Comprehensive waste generation data from the City of Charleston was not available; therefore, the solid waste stream in Charleston was estimated using the Charleston County MSW summary from the 2018 South Carolina Solid Waste Management Annual Report. The summary provides information regarding the breakdown of recyclable materials from residential, commercial, and industrial waste producers in 2017, but only total disposal tonnages for combined residential and commercial sources. Because the data is for countywide tonnages, the county population of 401,438 was used to calculate the per capita rate.

| Charleston County, South Carolina<br>Waste Generation Rate, 2017 | | | | |
|---|---|---|---|---|
| **Tonnage** | **Disposal** | **Recycle** | **Compost** | **Total** |
| tons | 330,428 | 66,695 | 89,539 | **486,662** |
| percentage | 67.9% | 13.7% | 18.4% | **100%** |
| lbs./person/day | 4.07 | 0.84 | 1.13 | **6.05** |

## Charlotte, North Carolina

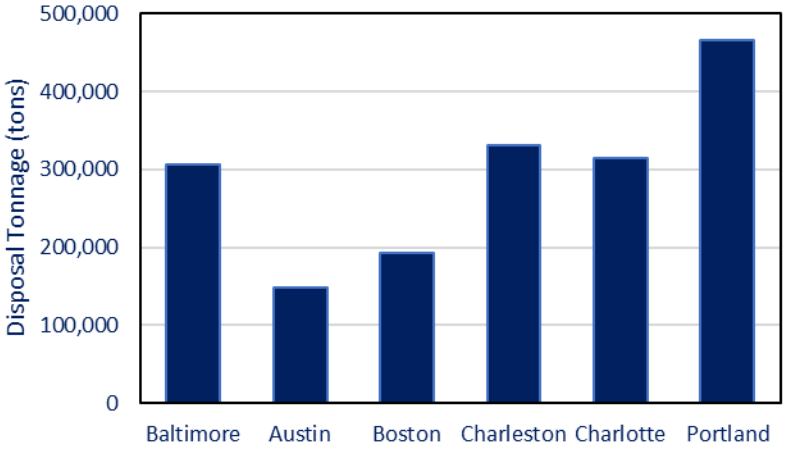
The solid waste stream in Charlotte was assessed using 2017 data submitted by the city to the North Carolina Department of Environmental Quality through the 2018 Local Government Report Form. The document describes the solid waste services available in the city and reports waste tonnages from city programs. The data only includes the residential waste stream because the city does not offer services to non-residential customers.

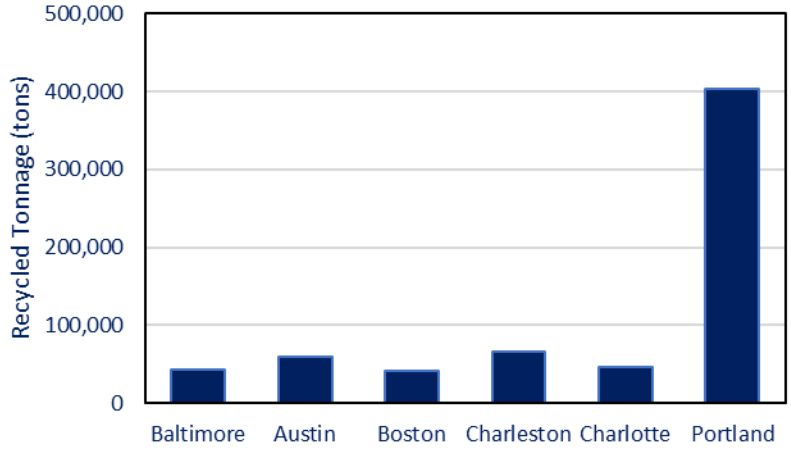
| City of Charlotte, North Carolina<br>Waste Generation Rate, 2017 | | | | |
|---|---|---|---|---|
| **Tonnage** | **Disposal** | **Recycle** | **Compost** | **Total** |
| tons | 314,053 | 45,688 | 56,490 | **416,231** |
| percentage | 75.5% | 11.0% | 13.6% | **100%** |
| lbs./person/day | 2.00 | 0.29 | 0.36 | **2.65** |

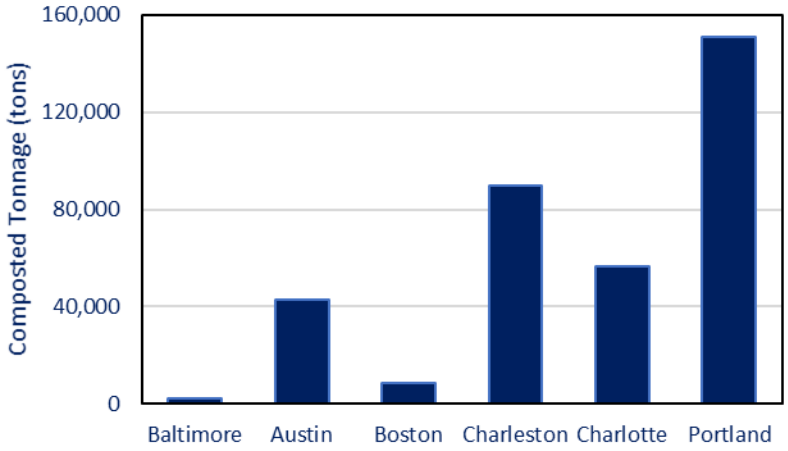
## Portland, Oregon

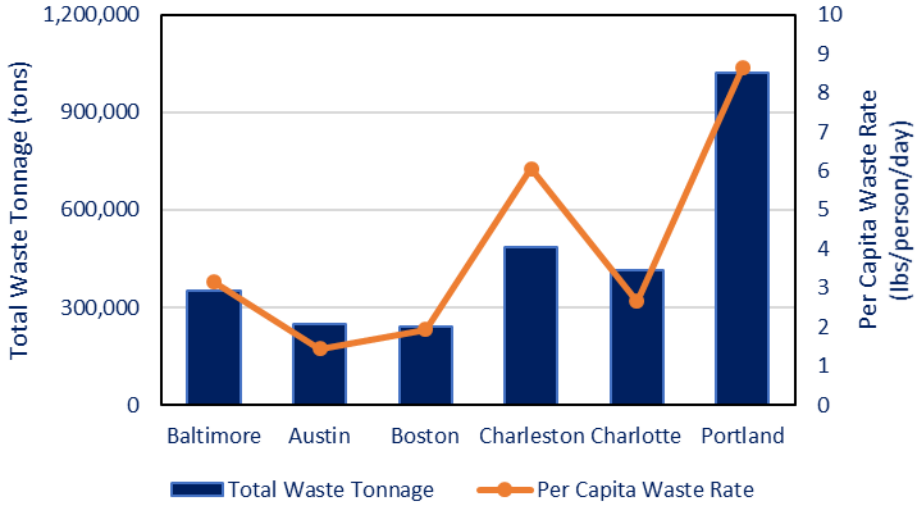
The solid waste stream in Portland was assessed using data from the city's 2017 Recycling Program Summary published by the Bureau of Planning and Sustainability. The summary includes a general description of its waste stream, residential and commercial services, and a list of materials that count toward the recycling rate in Portland. The reported waste tonnages are for the combined residential and commercial waste streams in the city of Portland.

| Portland, Oregon<br>Waste Generation Rate, 2017 | | | | |
|---|---|---|---|---|
| **Tonnage** | **Disposal** | **Recycle** | **Compost** | **Total** |
| tons | 466,600 | 403,000 | 151,100 | **1,020,700** |
| percentage | 45.7% | 39.5% | 14.8% | **100%** |
| lbs./person/day | 3.95 | 3.41 | 1.28 | **8.63** |




**Nominal Waste Generation, Recycling, and Composting Data across Different Jurisdictions**

**(Data for Charleston and Portland includes residential and commercial waste; other jurisdictions include residential waste only)**

# 6. RECYCLING RATES

## Methodology and Data Sources

Reported recycling rates are significantly affected by calculation methodologies, which in turn are influenced by what classes of materials are considered "recyclables" and what programs and systems for diverting materials from disposal are eligible for inclusion. To provide fair comparison across each jurisdiction in this section, self-reported recycling rates are ignored and the recycling rate for each jurisdiction recalculated using the Maryland Recycling Act (MRA) methodology. The methodology splits materials into MRA and non-MRA categories, and then calculates a recycling rate based on the fate of MRA materials only. Composting of most organics is included as recycling under the MRA. A fuller discussion of the rationale and basis for calculating recycling rates under the MRA was provided in Geosyntec's previous Task 3 Report for the LWBB Master Plan.

In calculating "MRA-equivalent" recycling rates, however, it was observed that most jurisdictions had broadly similar definitions for recyclable materials, with the most consistent discrepancy being inclusion of non-MRA recyclables such as antifreeze, used motor oil, scrap metal, and C&D debris. These non-MRA recyclables, generally have a negligible contribution to the overall system's waste stream and thus mean that the MRA-equivalent recycling rates do not differ significantly from nominal recycling rates.

Consistent with Section 5, to the fullest extent possible only data regarding the residential waste stream was used in these calculations, thereby focusing the comparison of recycling on materials handled within a jurisdiction's sphere of control rather than their broader sphere of influence. However, the data for Charleston and Portland include both residential and commercial waste streams, because it was not possible to accurately separate reported tonnages into different sectors for these two jurisdictions.

The information analyzed in this section was sourced from publicly available documents such as annual solid waste management reports and solid waste composition studies as reported in Section 5. As is evident in the remainder of this section, the granularity of data varied significantly between jurisdictions. A graphical summary comparing MRA-equivalent recycling rates and self-reported recycling rates across the different jurisdictions, including Baltimore, is provided at the end of this section.

## Austin, Texas

Austin's current residential diversion stream includes single-stream recycling and combined yard and food waste composting, although the publicly available data for the city from 2016-2017 predates the combined yard and food waste composting program and only includes compost from yard trimmings.

The majority of MRA recyclables are also counted towards recycling in Austin and include bulky items such as tires and mattresses. MRA recyclables that are not recycled in Austin include dead animals, which are primarily landfilled rather than sent to an organic processing facility, and bulk items, which are primarily landfilled rather than processed or reused.

| City of Austin, Texas<br>Breakdown of Materials for Calculation of MRA-Equivalent Recycling Rate (2016-2017) | |
|---|---|
| **Waste Type** | **Total Tonnage** |
| **DISPOSED** | **148,356** |
| **RECYCLED** | **59,086** |
| Recycling – Single Stream | 58,927 |
| Tires | 159 |
| **COMPOSTED** | **42,955** |
| Brush | 7,720 |
| Mulch | 1,472 |
| Yard Trimming | 33,741 |
| Yard Trimming – Christmas Trees | 22 |
| **TOTAL** | **250,397** |

## Boston, Massachusetts

Boston's residential diversion stream includes single-stream recycling and yard trimmings composting. There is not much publicly available information regarding the current composition of the Boston's recyclable materials, but it appears that the city's definitions of recyclables closely mirror those of the MRA, based on the lists of items that are approved for recycling in the curbside services and for drop off.

| City of Boston, Massachusetts<br>Breakdown of Materials for Calculation of MRA-Equivalent Recycling Rate (2017) | |
|---|---|
| **Waste Type** | **Total Tonnage** |
| **DISPOSED** | **193,000** |
| **RECYCLED** | **40,929** |
| Comingled Recyclables | 37,700 |
| Bulky Rigid Plastic | 3,225 |
| Textiles/Used Clothing | 4 |
| **COMPOSTED** | **8,638** |
| Yard Waste | 8,638 |
| **TOTAL** | **242,567** |

## Charleston, South Carolina

As with waste generation, city-specific recycling data were not available; therefore, recycling was estimated using data from Charleston County. The county's diversion stream predominantly consists of single-stream recycling and yard trimmings for composting. Although this data includes residential, commercial, and industrial waste sources, residential recyclables make up more than 80% of the combined recyclables, indicating that the waste stream is likely characterized predominantly by residential waste.

Most of Charleston's recyclables are also counted as MRA recyclables with a few exceptions of non-MRA materials such as used motor oil, antifreeze, and scrap metal. These non-MRA materials are not a large component of the total solid waste stream and represent only about 1% of all recycled materials and less than 0.5% of the total waste stream.

It should be noted that tonnages in the table below include residential and commercial waste rather than just residential waste.

**Charleston County, South Carolina**
**Breakdown of Materials for Calculation of MRA-Equivalent Recycling Rate (2017)**

| Waste Type | Total Tonnage* |
|---|---|
| **DISPOSED** | **330,428** |
| **RECYCLED** | **66,695** |
| Mixed Recyclables | 37,744 |
| Glass | 1 |
| Scrap Metal (non-MRA) | 1,787 |
| Paper | 15,028 |
| Plastics | 421 |
| Appliances | 1,119 |
| Electronics | 447 |
| Lead-Acid Batteries | 404 |
| Tires | 971 |
| Used Motor Oil, Antifreeze (non-MRA) | 13 |
| Carpet and Carpet Padding | 93 |
| Cooking Oil/Grease | 137 |
| Fluorescent Bulbs | 14 |
| Mattresses and Box Springs | 6 |
| Paint | 61 |
| Rechargeable Batteries | 5 |
| Textiles | 60 |
| Used Oil Filters | 14 |
| Wood Packaging | 8,634 |
| Other | 1,506 |
| **COMPOSTED** | **89,539** |
| **TOTAL** | **486,662** |

* Tonnages include residential and commercial waste.

## Charlotte, North Carolina

Charlotte's reported residential diversion stream consists primarily of single-stream recyclables and yard trimmings for composting. Appliances that are picked up curbside through bulky waste collection are delivered to Mecklenburg County for recycling and disposal, but the total quantity of such materials processed annually is not known. The city does not directly collect MRA recyclables such as batteries, fluorescent bulbs, used oil filters, so these materials are not included in their own recycling rate.

| City of Charlotte, North Carolina<br>Breakdown of Materials for Calculation of MRA-Equivalent Recycling Rate (2017) | |
|---|---|
| **Waste Type** | **Total Tonnage** |
| DISPOSED | 314,053 |
| RECYCLED | 45,688 |
| COMPOSTED | 56,490 |
| TOTAL | 416,231 |

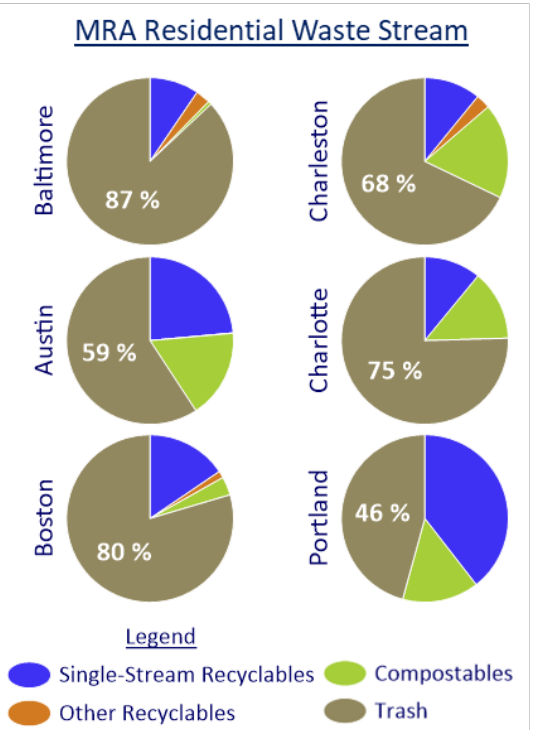
## Portland, Oregon

Portland's waste diversion stream consists of single-stream recyclables, combined yard and food waste, self-hauled materials, and an estimate of bottle bill recycling. The available data included waste from both residential and commercial customers without distinction between the sources. Portland includes a few non-MRA recyclables in its list of recyclable materials such as antifreeze, motor oil, and scrap metal, but the quantities of these materials typically have a negligible contribution to the waste stream tonnage.

| City of Portland, Oregon<br>Breakdown of Materials for Calculation of MRA-Equivalent Recycling Rate (2017) | |
|---|---|
| **Waste Type** | **Total Tonnage*** |
| DISPOSED | 466,600 |
| RECYCLED | 403,000 |
| COMPOSTED | 151,100 |
| TOTAL | 1,020,700 |

* Tonnages include residential and commercial waste.

| Material | | Baltimore[1] | Austin[2] | Boston[3] | Charleston[4] | Charlotte[5] | Portland[6] |
|---|---|---|---|---|---|---|---|
| MRA Materials Recycled | Single Stream Recyclables | 33,609 | 58,927 | 37,700 | 53,194 | 45,688 | 403,000 |
| | Appliances | -[8] | - | - | 1,119 | - | - |
| | Electronics | 65 | - | - | 477 | - | - |
| | Tires | 318 | 159 | - | 971 | - | - |
| | Miscellaneous Recyclables[7] | 9,570 | - | 3,229 | 10,934 | - | - |
| | Compostables | 2,328 | 42,955 | 8,638 | 89,539 | 56,490 | 151,100 |
| Total MRA Materials Recycled/Diverted | | 45,890 | 102,041 | 49,567 | 156,292 | 102,178 | 554,100 |
| Total Materials Disposed | | 306,510 | 148,356 | 193,000 | 330,428 | 314,053 | 466,600 |
| MRA-Equivalent Recycling Rate | | 13 % | 41 % | 20 % | 32 % | 25 % | 54 % |
| Self-Reported Recycling Rate | | 19 % | 41 % | 25 % | 33 % | 12 % | 54 % |




Notes:

1. Baltimore's waste stream as shown includes waste from single-family households, city government buildings, small businesses, and public schools.
2. Austin's waste stream as shown includes waste from residential and city sources. The waste stream data immediately predates the rollout of its residential curbside compost program for combined food and yard waste.
3. Boston's waste stream as shown includes waste from residential and city sources.
4. Charleston's waste stream as shown includes waste from residential, commercial, and industrial sources and is reported for Charleston County rather than the City of Charleston.
5. Charlotte's waste stream as shown includes waste from residential sources only.
6. Portland's waste stream as shown includes waste from residential and commercial sources and is reported for the City of Portland rather than the greater Metro area.
7. Miscellaneous materials include items such as textiles, electronics, batteries, and wood materials.
8. Appliances are recycled in Baltimore but are counted as scrap metal, which is not tracked as an MRA recyclable.

**Jurisdictional Waste Stream Composition and MRA-Equivalent Recycling Rates**

# 7. WASTE-RELATED REGULATIONS

## Overview

This section provides an overview of the various regulatory mechanisms and ordinances used by the five benchmarked jurisdictions to achieve their existing waste management and recycling goals, or that have been proposed as part of a drive to increase waste diversion and recycling.

The information regarding solid waste regulations and proposed waste diversion initiatives in this section was sourced from publicly available city websites, government ordinances, and solid waste management planning documents. A full listing of references is provided in Section 9.

## Austin, Texas

### Notable Solid Waste Regulations and Ordinances

#### Universal Recycling Ordinance (URO)

The URO was approved in 2010 and amended in 2013 to support Austin's zero waste goals. The ordinance is directly primarily at commercial and multifamily properties and it is related to recycling and food composting programs. By 2017, all businesses and multifamily properties were required to meet the following requirements:

1. Provide recycling for plastics, paper, cardboard, glass, and aluminum;
2. Provide sufficient collection-container capacity;
3. Provide information signs in English and Spanish;
4. Provide regular tenant and employee education; and
5. Submit an annual recycling plan.

In addition to recyclable materials, the URO also regulates food waste. By 2018, all businesses with food service permits were required to divert food scraps and provide their employees with convenient access to organics diversion or composting services.

#### Construction and Demolition Recycling Ordinance

As of 2019, all construction projects in Austin must do one of the following:

1. Divert at least 50% of the construction material from disposal at a landfill; and/or
2. Dispose no more than 2.5 pounds of materials per square foot of floor area at a landfill.

#### Single-Use Bag Ban

Austin approved a single-use bag ban in 2012 but stopped enforcing it in 2018 after the Supreme Court of Texas overturned the bag ban in another Texas city.

### Zero Waste Master Plan

The 2011 Austin Resource Recovery Master Plan outlines the city's goals for becoming a zero waste community by 2050. Currently underway, the city aims to divert 75% of solid waste from landfills by 2020, 85% by 2025, 90% by 2030, >95% by 2040, and 100% by 2050.

To achieve its zero waste goals, the city is investing in new infrastructure to support the reuse and recycling of materials currently found in its waste stream. Three reuse centers will be built throughout the city to

supplement the one existing reuse center that was recently repurposed from a former city-owned transfer station. The facilities serve as drop-off centers for residents where they can bring material to be reused, recycled, or composted. Materials that are in usable condition can be picked up by other residents for free.

To further the city's zero waste goals, an eco-industrial park known as the Austin [re]Manufacturing Hub is planned for the site of the city's recently closed landfill. The objective of the hub is to attract companies that can use the materials that are diverted from landfills, helping close the loop of the zero waste initiative.

In addition to new infrastructure, the city intends to increase the ease of diverting material from the waste stream with policies such as increasing curbside recycling pick up to once a week (current frequency is every other week) and increasing the number of times that bulk items can be scheduled for curbside pickup (current frequency is twice per year). The city is also rolling out a new residential curbside collection program for combined yard and food waste.

# Boston, Massachusetts

## Notable Solid Waste Regulations and Ordinances

### MassDEP Waste Disposal Bans

In 1990, the Massachusetts Department of Environmental Protection (MassDEP) started regulating certain materials generated within the Commonwealth by banning their disposal, incineration, or transfer for disposal at a solid waste disposal facility. The ban includes, among other items, the disposal of recyclables (glass, metal, plastic containers, and paper/cardboard), yard trimmings, food material from larger facilities that dispose of one ton or more per week, and C&D debris. In practice, C&D material simply has to be processed to remove recyclables prior to being landfilled.

### Plastic Bag Reduction Ordinance

As of 2018, retailers and restaurants in Boston can only provide customers with reusable bags, recyclable paper bags, or compostable bags, and the bags must be sold for a minimum of 5 cents each.

## Zero Waste Initiative

Boston has recently announced a zero waste initiative to decrease the amount of waste it sends to landfills and incinerators. The city realizes that it is not likely to fully achieve the zero waste vision but hopes to increase its diversion rate from 25% to 80% by 2035 and to 90% by 2050. To achieve its goals, the city is focusing on encouraging reduction and reuse of materials, greater recycling, increased composting, and generation of innovative ideas.

Boston has already had recent success in increasing its residential recycling rate from 12% to 21% over the time period of 2008 to 2016. An additional 39% of the existing waste stream is considered to be recyclable material that could reasonably be captured with existing and upgraded infrastructure.

While food composting is not yet a widespread part of the waste management system, Boston is piloting a program where residents can drop off their food waste at five locations around the city. Boston's neighbor Cambridge is also aggressively rolling out a mandatory residential composting program that could positively influence Boston's eventual adoption of a widespread food composting program. It is

estimated that 36% of the Boston waste stream is compostable material that could be captured in a broad food composting program.

## Charleston, South Carolina

### Notable Solid Waste Regulations and Ordinances

#### South Carolina Waste Disposal Bans

The State of South Carolina has banned appliances, electronics, lead-acid batteries, used motor oil, and whole waste tires from entering the disposal waste stream.

#### Single-Use Plastics Ban

In late 2018, Charleston voted to ban single-use plastic bags, straws, and foam containers. Enforcement of the ban will go into effect in December 2019 for restaurants and grocery stores.

### Future Solid Waste Management Goals

With the closure of its WTE incinerator in 2009 and main recycling center in 2015, Charleston County has been adjusting to significant changes in its solid waste management system. As a result of the recent closure of the recycling center, some towns have stopped offering curbside recycling programs and Charleston County is paying another county in the state to accept its recyclables. The county is currently awaiting the completion of a new regional recycling facility that will restore full recycling services and increase the diversion rate from landfills.

The new recycling facility will be a key piece of infrastructure for achieving zero waste if the city chooses to move in that direction. The Charleston Green Plan published in 2010 outlined key steps and initiatives the city can pursue to start moving toward zero waste. To achieve a zero waste society, the plan identified four areas on which the city should focus their efforts: committing to zero waste principles, expanding recycling and composting programs, exploring energy recovery technologies, and encouraging public support. Some of the specific recommended action items include implementing a pay-as-you-throw (PAYT) program, improving bulk trash collection, improving solid waste stream data collection, facilitating composting of organic waste, and improving recycling of hazardous, electronic, and construction waste. At this time, however, the city has not adopted or passed any resolutions pushing the city towards establishing a zero waste goal.

## Charlotte, North Carolina

### Notable Solid Waste Regulations and Ordinances

#### North Carolina Waste Disposal Bans

The State of North Carolina bans certain materials from being disposed in landfills. These items include used oil, yard waste, appliances, antifreeze, aluminum cans, tires, lead-acid batteries, beverage containers, motor vehicle oil filters, rigid plastic containers, wooden pallets, oyster shells, computer equipment, televisions, and lights or thermostats containing mercury.

### Circular Economy Initiative

Charlotte has committed to adopting a circular economy that achieves a zero waste goal by 2040. The city hopes that no waste will be landfilled, and all currently active landfills will be closed. To broadly achieve this goal, the city would have to significantly increase its current recycling and

composting rates, as well as identify means of eliminating the remaining waste stream that cannot be recycled or composted.

While Charlotte does not yet have the infrastructure to achieve its zero waste goals, the city is considering advanced thermal technologies in addition to investing in cutting-edge scanning and sorting technologies for sorting recyclables. The city has allocated $2 million in 2019 to renovating a city-owned warehouse into a community space (incubator) where ideas for public-private partnerships can be started to achieve the city circular economy goals. Charlotte is also considering financial means of increasing participation in the circular economy goal through programs such as PAYT or an "un-tax" system, where people are financially rewarded for high recycling rates. However, nothing has yet been formally planned.

# Portland, Oregon

## Notable Solid Waste Regulations and Ordinances

### Oregon Landfill Ban

The State of Oregon bans certain materials from being disposed in landfills. These items include vehicles, home or industrial appliances, used oil, tires, lead-acid batteries, computers, and televisions.

### Oregon's Bottle Bill

Oregon passed a Bottle Bill in 1971 allowing residents to receive 10 cents for every bottle returned. The program is still active and was expanded in 2011 to include additional beverage containers. Beverage containers that can be redeemed for the 10-cent refund include those for water, soda, beer, coffee, tea, kombucha, juice, hard cider, and sports drinks. Beverage containers for milk, non-dairy drinks, wine, and spirits are not currently eligible for the refund, but they can still be recycled in standard curbside recycling programs.

### Prohibitions and Restrictions on Single-Use Plastic

In 2018, Metro passed an ordinance banning and restricting the use of single-use plastics that will go into effect in July 2019. This ordinance repeals and replaces the existing 1990 ban on polystyrene foam containers and the 2011 ban on single-use plastic bags for retailers while also expanding the coverage of materials that fall under the regulation. The expanded portion of the regulation is intended to restrict the use of additional single-use plastic materials and mandates that single-use plastic serviceware (i.e., plastic straws, stirrers, utensils, and condiment packaging) can only be provided to customers upon request.

## Future Solid Waste Management Goals

### Business Food Waste Reduction

Metro is working on an ordinance that will require businesses that process, cook, serve, or sell food to source separate their food waste and send it to a facility authorized by Metro. The currently proposed timeline would phase in the ban over five years from 2020 to 2025, starting first with the businesses generating the largest tonnages of food waste.

### Metro 2030 Regional Waste Plan

Metro's 2030 Regional Waste Plan, which is currently under review, outlines 19 goals for its solid waste management system over the next decade. The plan broadly addresses not only environmental impacts but also economic and social impacts to the community. While not explicitly

targeting a zero waste goal, achieving the plan's goals would help increase Portland's already high waste diversion rates. Some of these goals include the following:

1. Reduce product environmental impacts and waste through educational and behavioral practices related to prevention and better purchasing choices;
2. Reduce product environmental impacts and waste through policies that support prevention practices and better purchasing choices;
3. Increase the reuse, repair, and donation of materials and consumer products;
4. Increase knowledge among community members about garbage, recycling, and reuse services;
5. Provide regionally consistent services for garbage, recyclables, and other priority materials that meet the needs of all users;
6. Adopt rates for all services that are reasonable, responsive to user economic needs, regionally consistent and well understood;
7. Improve the systems for recovering recyclables, food scraps, and yard debris to make them resilient to changing markets and evolving community needs; and
8. Maintain a system of facilities, from unmanned smaller recycling drop-off depots to larger, fully staffed stations, to ensure equitable distribution of and access to services.

### Oregon DEQ 2050 Vision

In 2012, Oregon's Department of Environmental Quality (DEQ) released a report titled "Materials Management in Oregon: 2050 Vision and Framework for Action." The report presents a forward-looking vision for conserving resources and protecting the environment through sustainable materials management that the state hopes to broadly achieve by 2050. Proposed actions include the following:

1. Perform research to identify highest and best use at end-of-life for discards;
2. Develop and enforce management standards for extended producer responsibility (take-back) programs;
3. Develop a strategy to increase recovery of food, yard waste, and metals and limit them from entering the disposal stream;
4. Evaluate potential bans at a state and local level;
5. Evaluate legislation, other authority, or other program approaches to direct materials to their highest and best use;
6. Increase recycling collection opportunities in Oregon;
7. Set ambitious yet achievable recovery goals;
8. Provide incentives for or mandate post-collection sorting for dry waste loads in large-volume markets;
9. Support efforts to revise national standards for product compostability and clarify product labeling for compostability and biodegradability;
10. Investigate methods and technologies to better sort and preserve value of recovered materials;
11. Support efforts to set standards for finished compost quality;
12. Embed sustainable consumption concepts into existing public education programs;
13. Develop consistent statewide messaging on the benefits of reuse, repair, composting, recycling, and disposal; and
14. Work with partners to deliver messages related to sustainable end-of-life materials management.

| | | Baltimore | Austin | Boston | Charleston | Charlotte | Portland |
|---|---|---|---|---|---|---|---|
| Materials with Disposal or Usage Regulations[1] | Single-Use Bags | ✓ | ✓[2] | ✓ | ✓ | | ✓ |
| | Single-Use Polystyrene (Expanded Foam; Styrofoam) | ✓ | | | | | ✓ |
| | Other Single-Use Plastics | | | | ✓ | | ✓ |
| | Construction and Demolition Debris | ✓ | ✓ | ✓ | | | |
| | Food Waste (Depending on Size/Type of Generator) | | ✓ | ✓ | | | ✓[3] |
| | Yard Waste | ✓ | | ✓ | | ✓ | |
| | General Recyclables – plastics, paper, cardboard, glass, metal | ✓ | ✓ | ✓ | | ✓ | |
| | Appliances, Electronics, Batteries, Other Special Waste | | | | ✓ | ✓ | ✓ |
| | Bottle Redemption Program | | | | | | ✓ |
| Zero Waste | Zero Waste/Circular Economy Initiatives | ✓[4] | ✓ | ✓ | | ✓ | |
| | Target Year | 2040 | 2050 | 2050 | | 2040 | |

Notes:
1. Includes regulations from cities and states.
2. A single-use bag ban was implemented in 2012 but enforcement was stopped in 2018 after the Supreme Court of Texas overturned the bag ban of another city.
3. A regulation related to food waste is currently under development and is expected to take effect in 2020.
4. Zero waste initiatives are included in the City's Sustainability Plan, Food Waste and Recovery Strategy, Food Matters Work Group, and Waste to Wealth Initiative.

**Summary of Waste-Related Regulations, Ordinances, and Zero Waste Goals**

# 8. SUMMARY

## Lessons Learned

Five jurisdictions were selected as aspirational or cautionary benchmarks for Baltimore in a comparison of solid waste management systems. Baltimore's current modest recycling rate and high per capita costs in comparison to the other jurisdictions highlight some discrepancies between the surveyed systems and their implementation of effective programs and policies in comparison to Baltimore. These jurisdictions offer a variety of lessons learned and best practices that Baltimore can reference when setting goals and planning for the future of its solid waste management system.

### Demographics

Section 1 reviewed the demographic data for the five benchmarking jurisdictions in comparison to Baltimore. Notably, Baltimore has a lower median income and higher poverty rate than other jurisdictions, which needs to be borne in mind when assessing potential improvements to existing systems and services. In comparison to the other cities, Baltimore has the second lowest foreign-born rate, which suggests that difficulties in conducting effective outreach and education programs should not be significantly hampered by linguistic challenges.

### Residential Collection Services

Section 2 reviewed the residential curbside services that are provided by each city. The frequency of collection for trash, recycling, and organics ranged broadly from twice a week to once a month across jurisdictions. It has historically been more common for jurisdictions to offer trash collection more frequently than recycling, but communities are now offering or are considering offering recycling services as frequently or more frequently than trash services to encourage recycling and minimize waste generation. Baltimore currently offers trash and recycling pick up at the same weekly frequency, and it is the only jurisdiction that does not offer a separate dedicated yard trimmings pickup service for composting.

Food waste diversion is another initiative that is gaining interest across the country because food is a significant component of the unrecovered waste stream and it has residual economic and environmental value that can be captured at organic processing facilities. While Baltimore recently published a food waste reduction strategy, the city does not provide separate food waste collection or sponsor any food waste diversion programs. In comparison, all five benchmarked cities either already offer various food diversion programs or are considering them. Common initiatives include school district food composting programs, residential curbside organics collection for combined yard and food waste, and composting requirements for restaurant and other food businesses.

### Waste Management Facilities

As discussed in Section 3, the infrastructure that makes up the solid waste management system in each jurisdiction is frequently a combination of public and private facilities. These facilities broadly include transfer stations, MRFs, organics management facilities, landfills, and WTE plants. In comparison to the other jurisdictions, Baltimore is fairly unique in that it relies on both incineration and landfilling to dispose of its trash. Overall the benchmarked jurisdictions rely primarily on either landfilling or incineration, but not both technologies. Charleston, however, used to have a disposal situation that was similar to Baltimore's until its

incinerator was closed in 2010 due in large part to public pressure. Interestingly, Charlotte is considering incineration as a future method to meet its circular economy goals. Several of the benchmarked jurisdictions are also in the process of adding publicly owned, state-of-the-art facilities to their solid waste system as an investment in meeting future waste reduction and recycling goals.

Most of the jurisdictions rely on one main organics composting facility that is typically owned and operated by the jurisdiction itself. Unique in this regard is Portland, which has experienced a large increase in the number of privately-owned organics processing facilities following implementation of its residential curbside organics collection program and voluntary food diversion by restaurants and food businesses. Increases in the number of organic processing facilities is likely to be seen in other jurisdictions as food composting programs are expanded as well.

## Financials

Funding for each jurisdiction's solid waste management systems comes from a variety of sources including property taxes, tiered service fee programs, tipping fees, sales of recyclables and mulch, franchising fees, and permit fees. These were summarized in Section 4. The two jurisdictions that use tiered service fee programs net approximately $400 per household in annual fees for a standard level of service in comparison to less than $100 for the jurisdictions that only collect fees from residents through property and/or income taxes. Baltimore fits the latter model as it does not receive fees directly from its residents for solid waste services but instead receives funding for its operating budget directly from the city's general fund.

Baltimore's annual operating budget and per capita cost for solid waste management are the third highest among all jurisdictions, although it is hard to directly compare these numbers without considering the levels and types of service provided by each jurisdiction. For example, Baltimore has a similar overall per capita cost to Austin, but Austin also offers organics curbside pickup, has a tiered service fee program, and has a much higher diversion rate than Baltimore. For its part, the frequent need for largescale cleanups of illegal dumping in Baltimore consumes a large part of the City's annual waste management budget. This suggests that scope of operations affects how much funding is available and distributed. Baltimore and Austin represent two jurisdictions with varying solid waste challenges and the associated expenditures to maintain critical services. What is clear, however, is that if Baltimore were to implement a new large-scale program such as curbside composting, it would likely need to increase funding through existing measures or a direct billing mechanism.

## Waste Generation

Estimates of waste tonnage and per capita waste generation were presented in Section 5. These offer a quantitative, if imperfect, evaluation of each jurisdiction's overall waste stream. Based on comparisons to benchmarked data, Baltimore generates a rather large amount of trash, an average amount of recyclables, a very low rates of composting. This discrepancy most likely reflects Baltimore's practice of collecting and disposing of residential trash and yard trimmings together rather than separating the yard trimmings for composting. Of the cities that reported waste tonnage for residential customers separately from other waste streams, Baltimore has the largest per capita waste generation rate.

## Recycling Rates

In Section 6, recycling rates across the five benchmarked jurisdictions were calculated using the MRA methodology. Most of the benchmarked jurisdictions calculate their recycling rates using classifications for recyclable materials that are similar to the classifications under MRA; as a result, MRA-equivalent rates did not differ significantly from reported recycling rates. The non-MRA recyclable materials that were most frequently considered recyclables by other jurisdictions included antifreeze, used motor oil, and scrap metal. These materials, however, typically have a negligible contribution to the overall waste stream and only a minor impact on the recycling rate.

The analysis showed that Baltimore has a low recycling rate compared to the other jurisdictions, which is exacerbated by the practice of collecting and disposing of residential trash and yard trimmings together rather than separating the yard trimmings for compost. The jurisdictions with the highest recycling rates (Austin and Portland) are also the two jurisdictions with tiered service fee programs and curbside collection of combined yard and food waste.

## Regulations and Future Waste Reduction Goals

Review of waste-related regulations and ordinances in Section 7 showed that states and cities have been actively regulating the use and disposal of certain materials to achieve higher environmental and waste diversion objectives for decades. Maryland and Baltimore City have this in common with other jurisdictions. Usage bans for items such as single-use plastic bags or food diversion requirements typically originate from a local jurisdiction while landfill disposal bans for materials such as recyclables, yard waste, and construction and demolition debris typically originate from the state. While each of the five benchmarking jurisdictions had multiple regulations aimed at restricting material disposal or usage, only Baltimore has a ban on single-use polystyrene food service ware (there is a State ban on polystyrene that is slightly more restrictive than the City's, which will go into effect October 2020). This suggests there is plenty of scope for enacting additional regulations.

Three of the jurisdictions have formally adopted initiatives to reduce and eventually all but eliminate waste disposal, generally with target dates of 2040. Austin and Boston have adopted zero waste goals. Austin has already planned for and is investing in state-of-the-art facilities to support its zero waste objectives while Boston is already working toward residential services for the collection of food waste, although Boston is still in the very early stages of its initiative. Charlotte has enacted a circular economy initiative but is currently at the very beginning of its journey towards achieving its goals. The city is considering adopting a PAYT or similarly incentivized program for reducing residential waste generation and has already set aside funding for a community space as an incubator for ideas to support waste reduction.

Although Portland has not officially adopted a zero waste initiative, both the city and the state of Oregon have been national leaders in promoting sustainable practices that effectively decrease the disposal of solid waste. The long-term solid waste management plans for both the Portland Metropolitan area and the State of Oregon continue to be strongly focused on reducing consumption and decreasing disposal.

# Best Practices

A selection of best practices from each of the five jurisdictions were categorized into four general categories for consideration by Baltimore:

physical infrastructure, programmatic, policy/regulatory, and economic. Many of these practices are beginning to be adopted across the country as states and cities alike look to increase the diversion of waste materials for both economic and environmental gain.

## Physical Infrastructure

Best practices in effect or planned in benchmarked jurisdictions include:

1. Reuse Centers where residents can buy or freely pick up used electronics, appliances, furniture, and homewares (Austin).
2. Repair Centers and fix-it clinics where residents can have help repairing electronics, appliances, furniture, homewares, and clothing instead of throwing them away (Austin).
3. Community spaces where businesses can partner with the City of Baltimore to use processed waste materials in new manufacturing processes (Austin and Charlotte).
4. Invest in advanced technologies for sorting recyclables (Charleston).
5. Develop new organics collection and transfer capacity and encourage development of privately-owned composting and anaerobic digestion (AD) facilities to meet demand from expansion of residential food waste collection program (Portland).

## Policy and Regulatory

Best practices in effect or planned in benchmarked jurisdictions that could be considered in Baltimore include:

1. Consider banning certain materials from disposal in landfills or incineration, or at least requiring that they are processed for diversion prior to being disposed. Materials could include the following:
    - Construction and demolition debris (Boston)
    - Food waste (Austin, Boston, and Portland)
    - Recyclables (Austin, Boston, and Charlotte)
2. Ban or restrict the use of single-use plastic such as plastic bags, straws, and service ware (Austin, Boston, Charleston, and Portland).
3. Increase reporting requirements for waste haulers and facilities to more accurately track the flow of solid waste and calculate diversion rates (Portland and Austin).

It is recognized that passing disposal bans cannot be expected to be successful without also ensuring that suitable systems and locations for the materials to be recycled are developed. Final recommendations should thus also include strategies for establishing recycling facilities.

## Programmatic

Best practices in effect or planned in benchmarked jurisdictions include:

1. Provide recycling bins with at least the same amount of capacity as trash bins (Austin).
2. Offer pick up for curbside recycling more often than trash (Portland).
3. Offer combined yard and food waste pick up to residential curbsides services (Austin and Portland).
4. Offer free pick up of bulky items such as furniture and appliances, office equipment, and building supplies that can be repurposed through a reuse program (Austin).

It is recognized that making programmatic changes to collection systems cannot be expected to be successful without also ensuring that suitable systems and locations for the materials to be recycled are developed. For example, separate collection of yard and food waste needs to be implemented in tandem with development of organics processing capacity (i.e., composting and AD facilities), while offering bulky waste collection services may necessitate a resource recovery park or recycling center. Final recommendations should thus also consider strategies for establishing these facilities.

## Economic

Best practices in effect or planned in benchmarked jurisdictions include:

1. Implement a tiered service fee program to charge for trash pickup but provide free recycling and organics pick up (Austin and Portland).
2. Implement an "un-tax" program to provide refunds or credits to incentivize recycling behavior, an alternative to a tiered service fee or PAYT program (Charlotte).
3. Charge for overflow trash bags that do not fit in the trash bin (Austin).
4. Use stickers to charge for overflow trash bags points (Austin).

If changes are made to the way that solid waste services are charged for in Baltimore City, an issue for consideration will be how to change the way that funds are raised and distributed. Currently, DPW's solid waste services are paid out of the general fund and are not direct-billed or listed as a separate fee on residents' property tax bills. Therefore, charging directly for solid waste services by DPW would have to be accompanied by the establishment of a utility fund or other mechanism to dedicate these revenues to the appropriate division. Alternatively, some/all solid waste services could be privatized; however, that would also raise issues with regard to ensuring residents' access to services, cost controls, and accountability. Either way, any changes to the way that services are charged for would require the City Council's regulatory authority.

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