

Chapter 5 – Selection and Justification of Municipal Waste Management Program

This Chapter summarizes the core elements of the selected waste management program for the City of Philadelphia for the term of this Municipal Waste Management Plan. In support of the selected program, this Chapter presents a waste management hierarchy established by the Streets Department in collaboration with the City's Solid Waste and Recycling Advisory Committee (SWRAC). This Chapter also identifies alternatives that were considered by the City and the SWRAC, including alternative solid waste management practices and policy considerations, and addresses certain issues for management of other waste streams such as C&D waste and electronic waste. As described herein, the City will seek to remain current with the changing nature of waste management services, which may include monitoring, studying, and/or piloting certain initiatives over the ten-year term of the Plan, as appropriate.

The selected program presented in this Plan is consistent with the City's sustainability goals provided in Greenworks Philadelphia (issued in 2009, with subsequent updates and progress reports). Greenworks Philadelphia represents the City's vision and strategy to create a greener and more sustainable City, with an implementation timeline of 2009 – 2015, and with goals that strive to provide benefits to the City and its citizens beyond 2015. As described more fully in the introduction to this Plan, Greenworks Philadelphia addresses sustainability through five areas: energy, environment, equity, economy and engagement. Key goals that are reflected in the selected solid waste management program include diverting more than 70% of solid waste from landfill disposal, and purchasing and generating 20% of the electricity used in Philadelphia from alternative energy sources.

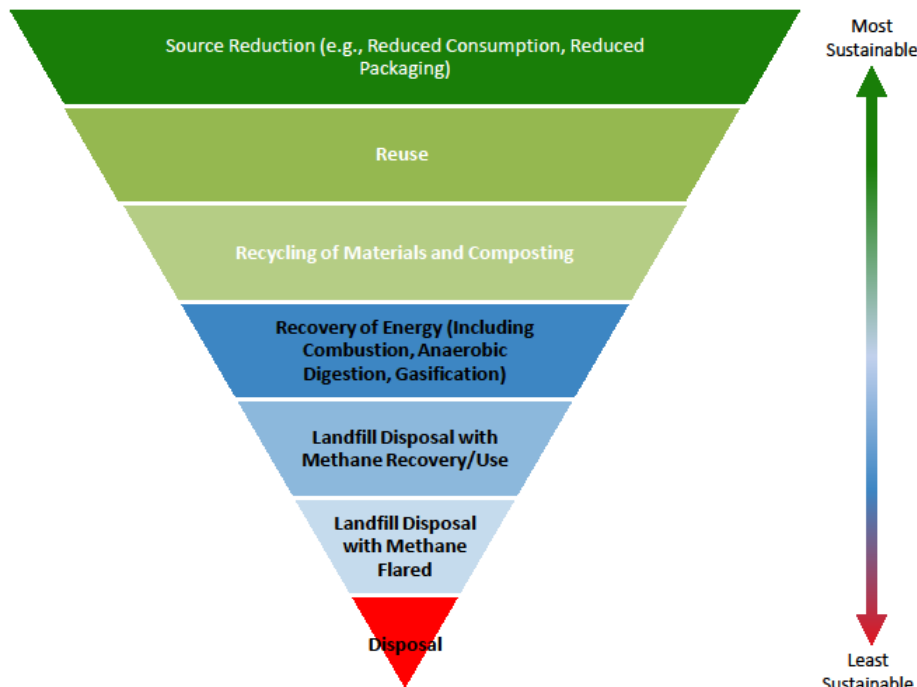
5.1 Waste Management Hierarchy

The Streets Department and the SWRAC have established a waste management hierarchy built around a total materials management approach, which supports the dual goals of minimizing waste disposal and maximizing recovery of recyclable materials. The waste management hierarchy is also consistent with the diversion and energy generation goals of Greenworks Philadelphia.

As shown in Figure 5-1, the highest priority and most preferred management option of the City's hierarchy is to minimize the creation of waste (source reduction). Source reduction includes broad actions at the beginning of product lifecycles, such as packaging redesign to reduce waste and consumer education to promote and encourage reduced consumption. Also at the top of the hierarchy is reuse. The next step in the hierarchy is recycling, which returns discarded materials to use in the form of raw materials for the production of new products. Recycling includes composting when the compost product is put to beneficial use. After recycling of materials to the extent feasible is recovery of energy. The last steps in the waste management hierarchy are disposal, with a priority given to landfill disposal with energy recovery. Disposal is the least preferred management method, because it offers little or no recovery value, but is a necessary part of the hierarchy when considering consumer behavior as well as technical and economic feasibility of recycling options.

During the preparation of this Plan, the City and SWRAC conducted several visioning meetings to identify and discuss existing and new programs that could potentially be integrated into City practices in alignment with the established waste management hierarchy. This included consideration of collection practices, recycling programs, and processing technologies that could contribute to greater diversion of waste from disposal. The key topics that were explored are summarized in this Chapter, along with a discussion of how they fit within this Plan, as applicable.

Figure 5-1. City of Philadelphia Waste Management Hierarchy



5.2 Management of City Collected Recyclables

In the early 1980's, the City established one of the earlier curbside recycling programs in the United States. Since then, the City has continuously invested in improving recycling throughout Philadelphia, modifying the program as needed based on changes in the waste stream, collection and processing technology developments, and economic parameters such as the availability of markets for recycled materials. In 2006, the City began to transition to single stream recycling, and by 2009 single stream recycling was available City-wide on a weekly collection schedule. As described in more detail in Chapter 4, the City's current recycling program is both comprehensive and successful. It provides and facilitates integrated approaches for recycling in residential and commercial establishments, City buildings, schools and public places. The City's single-stream curbside program is supplemented with drop-off convenience centers as well as private recycling services, and is supported by a strong public outreach campaign and broad educational resources. The City intends to continue the

recycling program as outlined in Chapter 4. Some of the key elements of the City's recycling program are briefly summarized below.

5.2.1 Collection

The City's recycling program includes weekly curbside collection of single stream recyclables coincident with weekly trash collection. The City provides 22 gallon recycling bins, available at the City's Sanitation Convenience Centers, and at more than two-dozen community partner distribution sites (i.e. City Council district offices, civic associations, etc.). The City also allows residents to use any household container (up to 32 gallons) with "RECYCLING" written on it. There are no limits to the number of recycling bins that can be set out each week. The City collects the materials manually, in rear-loader packer trucks with capacities ranging from ten cubic yards to twenty-five cubic yards. Currently, the City direct-hauls the collected single stream recyclables to the contracted MRF for processing. In the past, the City has utilized transfer stations to efficiently manage collection operations, and could do so in the future if cost effective or otherwise beneficial to the City.

The materials that are collected for recycling are identified in Chapter 4 of this Plan. Over time, materials have been added to the program, including #3-7 plastics in 2011 and aseptic cartons in 2012. These additions were warranted by the changing nature of the consumer marketplace and the corresponding increase of these materials in the waste stream. The City will continue to monitor the characteristics of waste generation, recycling markets and technology developments and will continue to examine opportunities to add new materials to the recycling program.

In addition to providing residential curbside collection, the City also operates Sanitation Convenience Centers (drop-off centers) for City residents. The Centers accept recyclables as well as rubbish, e-waste, bulk items, yard waste, Christmas trees, automotive tires, mattresses and box springs.

Recycling in City buildings began in 1991, and was expanded in 1996 following the issuance of Executive Order 5-96, which established a recycling policy for municipal buildings and employees. City agencies receive recycling collection from a combination of the Streets Department, private haulers, and in-house collections (e.g., parks, prisons). In 2014, the City updated a recycling guide for City agencies, to assist office managers to comply with the City's recycling ordinance. The guide provides an overview of recycling requirements and offers guidance in establishing and managing an effective office program.

In the recent past, the Streets Department has collected recyclables from a number of schools as part of the City's curbside recycling routes. However, a comprehensive and consistent recycling program has not existed District-wide. Since 2013, the City has been providing guidance and technical assistance to the SDP in order to promote and facilitate a more comprehensive recycling program. In 2014, SDP commissioned a waste composition study, which captured data from three elementary schools, two middle

schools and three high schools. The findings demonstrated waste streams with relatively high recyclables content. In the summer of 2014, SDP convened a multi-agency and stakeholder “Sustainability Roundtable.” As an outcome, recycling was identified as one of the top priorities, and a recycling subcommittee was formed. The Recycling Office of the Streets Department sits on that subcommittee, and has also been meeting with SDP staff to assist in developing recycling strategies and options for implementing recycling in the District.

In 2015, SDP in coordination with its hauler (Republic Services) began a recycling pilot program in eight District buildings, including six schools, the bus garage, and the administration building. Results will be evaluated and considered for purposes of potential program expansion to a larger scale, with the objective of phasing in recycling at all schools for the 2015-16 school year. Recyclebank, Keep Philadelphia Beautiful, and the Recycling Office have offered SDP technical assistance with recycling training and outreach. In addition, the Recycling Office secured a \$7,500 technical assistance grant from PADEP that will be used to perform an analysis of SDP’s solid waste contract service levels. The purpose is to identify and implement, as appropriate, adjustments to garbage service levels to allow SDP to more fully implement recycling and save overall cost.

5.2.2 Selection of Recyclable Processing Facility for City-Collected Recyclables

In July 2014, the City solicited proposals for recyclables processing capacity for City-collected single stream recyclables. The City received proposals from Waste Management of Pennsylvania, Inc. and Blue Mountain Recycling LLC, d/b/a ReCommunity Recycling. The City reviewed the proposals and met with both companies to allow them to present and discuss their proposals.

Following an open and competitive procurement process, the City entered into a recyclables processing contract with ReCommunity Recycling. The contract commenced on October 1, 2014 and is a standard City agreement with an initial one (1) year term plus up to three (3) successive one (1) year additional terms that may be exercised at the City’s sole option. The contract will expire on September 30, 2018. Services under the contract include the receipt of City recyclables at ReCommunity’s Materials Recycling Facility (MRF) near Grays Ferry, followed by appropriate sorting, processing, reuse, recycling and/or marketing. The contract includes recyclable materials collected or caused to be collected by the City from residential, institutional, public, and small commercial properties through the City’s recycling program, including the following targeted materials:

- Residential mixed paper
- Old corrugated cardboard
- Aluminum beverage cans and containers
- Tin, steel and bi-metal containers
- Plastic food and beverage containers and packaging(#1 - #7)
- Aseptic packaging and gable-top cartons, and

- Glass food and beverage containers

The business and financial terms of the City's current recyclables processing contract reflect industry challenges in the economics of recyclables processing. In general, the cost of processing has increased due to the increased complexity of sorting technology and the changing composition of source-separated recyclables. In addition, recycling markets remain highly variable, in large part due to macro-economic events. As discussed in more detail in Chapter 4, market prices have declined substantially since peaking in 2012 and remain low. Another factor impacting the cost of recycling is the limited amount of recyclables processing infrastructure available in the Philadelphia area, and the large amount of capacity needed to process Philadelphia single stream recyclables. As a result of these factors, the City's current recyclables processing contract requires the City to pay a per-ton fee for recyclables processing. This differs from past contracts in which the City's recycling program resulted in net revenues for the City. The current contract provides opportunity for the processing fee to be lowered with increased commodity values, and with the potential for the City to achieve net revenue payments if market prices are sufficiently strong. Additional information about the changes in recyclables processing and market prices, and the impact on the City's recyclables processing contract, are included in Chapter 4 of this Plan.

The City will need to secure new recyclables processing capacity effective October 1, 2018. A competitive procurement process will be used to select this future recyclables processing capacity.

In addition to the City's contract with ReCommunity Recycling to process single stream recyclables, the City has a contract with Newman Paper for shredded paper and OCC.

5.2.3 Recycling Education and Other Programs

The City offers or supports various programs to enhance recycling awareness and public education and to facilitate and promote recycling efforts. Key programs include the following, which are summarized in Chapter 4:

- Recycling Rewards Program
- Leaf and Yard Waste Collection
- Holiday Recycling
- Event Recycling
- Green Schools Program
- Public Space Recycling (BigBelly Program)
- America Recycles Day

Over the past few years, the City has significantly expanded its recycling outreach through the use of social media. The City maintains a comprehensive website, and routinely uses Facebook and Twitter to reach out to residents and businesses. To help increase the distribution of accurate, local recycling information, the City participates in the website "recyclebycity.com". This website provides a curbside recycling guide and

related information specific to participating cities, including Philadelphia. Philadelphia is currently the only city in Pennsylvania that participates in this innovative outreach platform. Other cities include Austin and Houston, Texas, and Los Angeles, Santa Monica and West Hollywood, California.

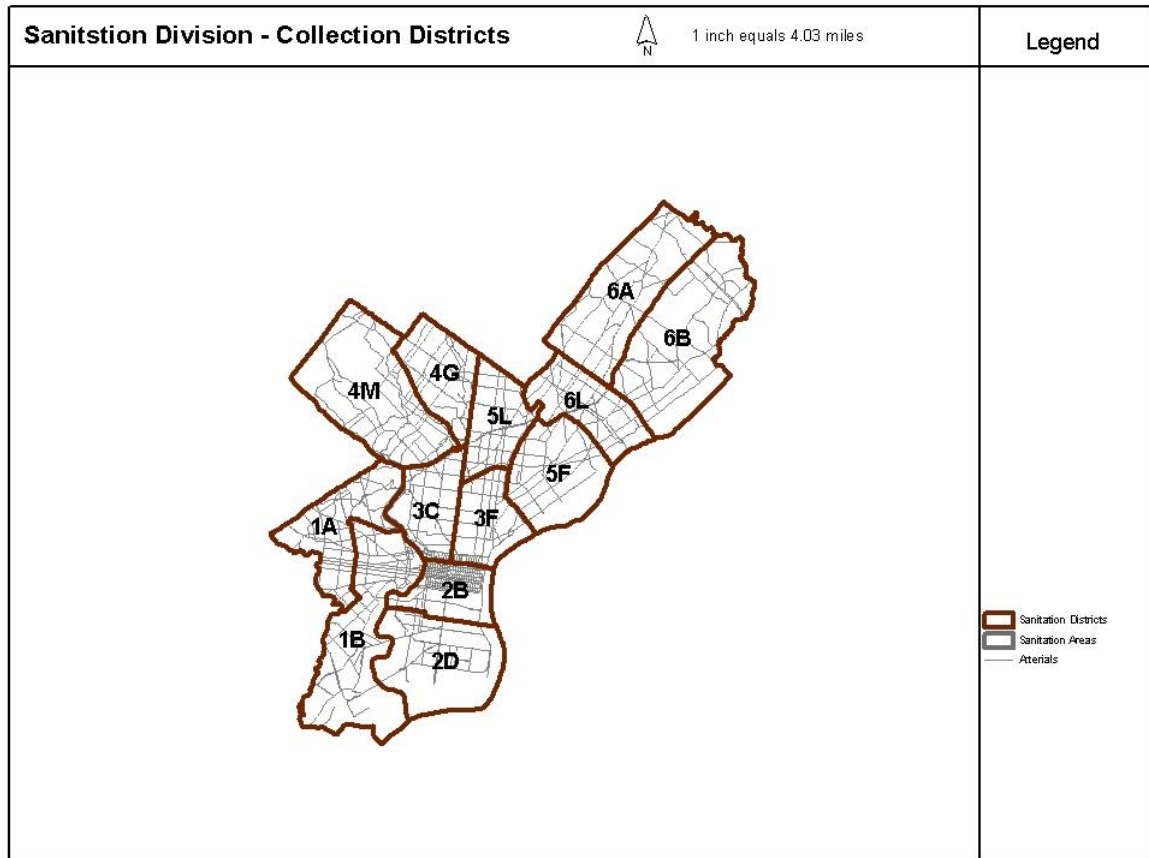
A successful recycling program in the City is the Philadelphia Waste Watchers program, implemented through the City's involvement with the Cities of Service Coalition. Waste Watchers is a volunteer organization that recruits residents to help manage waste at large City events. Volunteers are trained to guide event participants in separating their waste into trash, recycling and compost receptacles. Philadelphia Waste Watchers is a collaborative effort of multiple City entities, including the Office of Civic Engagement and Volunteer Service, the Office of Sustainability, the Office of the City Representative, the Streets Department, Philadelphia Parks and Recreation, and Philadelphia RISE. Through the initiative, more than 1,400 volunteers have been recruited and trained. The initiative has been highly successful. At the 2012 Marathon, Waste Watchers achieved an 87.5% waste diversion rate, earning the Marathon a Gold Certification from the Council for Responsible Sport that has been maintained for two years in a row. Due to its success, the initiative has been implemented at other major events in the City.

5.3 Management of City Collected Waste

5.3.1 Collection

The Streets Department's Sanitation Division provides collection services at about 540,000 residential locations in the City. Collections are performed using rear loading compactor trucks ranging in size: 25 cubic yard high density, 20 cubic yard high density, 20 cubic yard, and 10 cubic yard. Most trash collection crews collect two routes per day collecting a total of 14 to 20 tons per day. The Sanitation Division administers these services through 6 Sanitation Areas and 13 Sanitation Districts. Figure 5-2 shows the Sanitation Areas and Districts.

Figure 5-2. City of Philadelphia Collection Districts



In addition to curbside residential waste collection, the Sanitation Division has historically provided trash and recycling collections for small commercial establishments and residential buildings with up to 6 units. The City assesses a fee for these collection services.

City Council adopted an Ordinance allowing condominiums to have City trash and recycling collections. A subsequent court ruling resulted in a settlement where these services are provided at the frequency of residential trash and recycling collections, which are provided weekly. In 2005, the Sanitation Division began providing weekly collection services for condominium complexes that meet criteria established by the Streets Department for either curbside services or 2 and 4 cubic yard rear loading dumpster services. Condominium associations are required to complete an application and sign a right of entry agreement in order to qualify for trash and recycling collection services. Currently 28 condominium associations with 1,620 dwelling units are provided this service. The Streets Department adopted regulations concerning these services in 2005.

The Sanitation Division provides a range of special collections for larger City facilities and Philadelphia Housing Authority (PHA) properties. Collection services include major Police and Fire Department facilities as well as the School District Administration Building, PHA Administration Building Main Library, Boat House Row, City Hall, Criminal Justice Center, and Municipal Services Building. All Police, Fire and Recreation buildings located along residential collection routes are collected weekly along with residential trash and recycling collection.

The Sanitation Division also provides municipal cleaning services including short dump collections, mechanical street cleaning, and litter basket/BigBelly collections. Annually, the City conducts a spring cleanup program. The first Philly Spring Cleanup was in April 2008. In addition to collecting trash and abandoned tires, recyclable materials are separated for recycling and yard waste is separated for composting as well as planting trees. These programs are further described in Chapter 4 of this Plan. Other City Departments such as the Water Department, Prisons, Airport, and Park and Recreation Department also collect municipal solid waste.

5.3.2 Selection of Processing and Disposal Facilities

In 2011, the Streets Department, with the advice of the SWRAC, developed and issued a Request for Proposals (RFP) for disposal capacity for City-collected municipal solid waste. The City evaluated responses to that RFP from vendors of transfer stations and disposal capacity in consideration of cost, environmental impact, neighborhood impact, and operational efficiency. Based on the evaluation, the City entered into waste transfer and disposal agreements with Waste Management of Pennsylvania, Inc. and Covanta 4 Recovery, L.P. These agreements commenced on July 1, 2012, and are for a period of four (4) years with, at the City's option, three (3) one (1) year renewal periods. This is the maximum term permitted under the City Charter. The seven-year contract terms, inclusive of all renewal options, will expire on June 30, 2019. The City ordinances authorizing the Streets Commissioner to enter into the agreements with Covanta and Waste Management (Bill Nos. 120393 and 120394, respectively) and the corresponding agreements are described in Chapter 9, Ordinances and Resolutions and provided in Appendix __. The competitive procurement process followed by the City to establish disposal capacity is further described below.

The purpose of the disposal capacity RFP was to select one or more contractors to provide transfer stations, transportation and disposal sites to meet the City's requirements. The RFP required that all transfer facilities be located within the City; have the capability of accepting 300 tons per day of City collected municipal solid waste; and be fully permitted by PADEP. The RFP required that all transfer and disposal facilities be designed, constructed and maintained in complete conformance with all applicable Federal, State and local codes and regulations and good engineering practices, and be capable of accepting municipal solid waste from the City on July 1, 2012. Respondents were required to demonstrate operational experience and financial resources to manage the proposed transfer stations and disposal facilities.

In the RFP, the City reserved the right to award a contract at a maximum daily quantity up to the maximum daily capacity proposed. The City also reserved the right to annually adjust the maximum daily quantity to reflect changes in the total quantity of municipal solid waste collected by or on behalf of the City. The City committed to minimum annual deliveries calculated, in part, as a percentage of the maximum daily capacity.

The City considered three alternatives in response to the disposal capacity RFP:

- **Alternative 1** applied to a transfer station(s) provided by a contractor for the purpose of receiving municipal solid waste from the City, and transporting the waste to and disposing of it at a disposal facility(ies) provided by the contractor. The contractor was required to have full control of the transfer station(s) and disposal facility(ies) either through ownership or by contract under terms adequate to cover the proposed quantities and the seven-year contract Term.
- **Alternative 2** applied to acceptance by a contractor of City collected municipal solid waste delivered from the City's Northwest Transfer Station to a disposal facility(ies) provided by a contractor. The proposed disposal facility(ies) was required be located within fifty (50) air miles of the Northwest Transfer Station, which is located at the intersection of Domino Lane and Umbria Street in the Roxborough section of the City of Philadelphia. The contractor was required to have full control of the disposal facility(ies) either through ownership or by lease of a term adequate to cover the proposed quantities and Contract Term.
- **Alternative 3** applied to acceptance of municipal solid waste for disposal using alternative waste disposal technology. The City was interested in technology with an energy production efficiency that is superior to mass burn waste to energy technology, and had goals of reducing air emissions and reducing the amount and toxicity of residual waste generated as compared to mass-burn systems.

The RFP was advertised and publicly posted on eContract Philly on October 18, 2011. The eContract Philly web based system was created in response to City Council Bill No. 040772-AA adopted on June 9, 2005 to make changes to how the Request for Proposal process works for non-bid contracts to make the process of government fair, open, and responsive to the people it serves. All RFP documents and addendum are posted on the eContract Philly website and proposers are required to submit proposals electronically. Additionally, there are eligibility requirements for vendors based on campaign contribution limits. All applicants and contractors are required to provide information about their contributions to make sure they are below those limits and eligible for non-bid contracts.

In response to the RFP, proposals were submitted by Waste Management of Pennsylvania, Republic Services and Covanta 4Recovery. Each proposer submitted

multiple alternatives. The City reviewed the proposals and based its selection on criteria that included, but were not limited to the following:

- Superior ability or capacity to meet particular requirements of contract and needs of City Department and those it serves
- Eligibility under Code provisions relating to campaign contributions
- Superior prior experience of Applicant and staff
- Superior quality, efficiency and fitness of proposed solution for City Department
- Superior skill and reputation, including timeliness and demonstrable results
- Special benefit to continuing services of incumbent, such as operational difficulties with transition or needs of population being served
- Benefit of promoting long-term competitive development and allocation of experience to new or small businesses, including those owned by minority or disabled persons or by women
- Lower cost
- Administrative and operational efficiency, requiring less City oversight and administration
- Anticipated long-term effectiveness
- Meets prequalification requirements

More specifically, the City evaluated proposals in two phases. The first phase was evaluation of the respondent's qualifications. If the respondent satisfied the minimum qualifications criteria, then the respondent's management and cost proposal was evaluated for compliance with the specifications and proposal requirements and for the proposed cost. The following evaluation criteria were used to evaluate which proposals would best satisfy the City's needs:

- Cost – Evaluation of the cost to the City as an aggregate of several factors: the unit price per ton quoted for performing the work specified in the RFP, how that price would change over time, if at all, and the different travel times for refuse collection or transfer vehicles between point of origin and tipping locations proposed.
- Operational Capability – Evaluation of the respondent's transfer station(s), transportation system and disposal facility(ies) to assess their respective capability to efficiently handle the quantities proposed for the potential term of

the contract. Evaluation of operational capability including evaluation of permitted capacity, facility design as it relates to ease of access, reliability of operation and environmental performance, acceptable turn-around times, flexibility to adapt to potential changes in collection technology and the ability to accommodate night-shift, and Saturday and Sunday deliveries.

- Operating Experience – Evaluation of the respondent’s performance history in operating the proposed transfer station(s) and disposal facility(ies) and similar facilities operated by the respondent. This assessment included performance on contract commitments and adherence to environmental regulatory requirements.
- Operations Plan – Evaluation of the respondent’s plan for the reliable, safe, and efficient operation of the transfer station(s) and/or disposal facility(ies) and the anticipated distribution of municipal solid waste received among those facilities. Elements evaluated included traffic management procedures; site safety; solid waste transportation equipment and procedures; type and quantity of mobile equipment; facility staffing; operating hours; procedures for the control of dust, noise, odor, availability of back-up equipment, litter and vermin; and procedures for the inspection and removal of hazardous waste.
- Environmental Impacts – Evaluation of respondent’s proposed efforts to minimize the environmental impacts of the proposed transfer and disposal system infrastructure on the local community and region in general (including but not limited to the emission/discharge of carbon, methane, volatile organic compounds, metals, particulates, as well as limiting traffic and noise associated with the transfer and disposal system).

Proposals were evaluated comprehensively as a system for alternative management approaches, to determine which single or combination of proposals or other options available to the City, represented the best possible system. After evaluating the proposals the City initiated a negotiation process with all three proposers. After completing this process, the City selected a processing and disposal system utilizing facilities offered by Waste Management of Pennsylvania and Covanta 4Recovery for a seven (7) year term July 1, 2012 to June 30, 2019. The designated facilities, tonnage allocation, and pricing for the selected disposal system are summarized in Table 5-1.

Table 5-1. Summary of Selected Transfer and Disposal System for City Collected Municipal Solid Waste

Designated Facility ⁽¹⁾	Maximum Daily Quantity ⁽²⁾	FY 2013 Disposal Rate ⁽³⁾
Waste Management of Pennsylvania, Inc.		
Forge Transfer Station/SpecFUEL™ Facility	1,150 tpd	\$57.95
Philadelphia Transfer Station and Recycling Facility	600 tpd	\$57.95
Tullytown Resource Recovery Facility	--	\$57.95
G.R.O.W.S. North Landfill	--	\$57.95
Wheelabrator Falls Resource Recovery Facility	--	\$57.95
Covanta 4 Recovery, LP		
58 th Street Transfer Station ⁽⁴⁾	300 tpd	\$61.50
Covanta Delaware Valley	250 tpd ⁽⁵⁾	\$54.00
Covanta Plymouth Renewable Energy	250 tpd ⁽⁵⁾	\$58.00
Rolling Hills Landfill	--	
1. See Chapter 2 of this Plan for additional information on Designated Disposal Facilities, including identification of Alternate Designated Disposal Facilities. 2. Subject to adjustment by the City. 3. Subject to escalation by contractual formula. 4. The Girard Point Transfer Station may be used as a backup transfer station. 5. The City has the right to deliver 250 tpd to either the Covanta Delaware Facility or the Covanta Plymouth Renewable Energy Facility.		

The combined approaches summarized in Table 5-1 allow the City to minimize the quantity of waste that is landfilled in accordance with the City’s sustainability goals outlined in the Greenworks Plan.

The City’s selected disposal system includes the Waste Management SpecFUEL™ facility. The facility processes mixed waste using a multi-step process that includes various mechanical and optical sorting equipment. The system is designed to recover recyclable metals, organics, plastic (PVC), and inert materials. The remaining materials (primarily paper and plastic) represent the fuel product.

In 2013, Waste Management received regulatory determination from the USEPA that SpecFUEL may be considered a non-waste fuel under the Non-Hazardous Secondary Material rule under certain conditions including fuel product limitations on moisture and ash, chlorine, and sulfur content. Potential markets for the product include coal-fired electric generating facilities and cement kilns. The long-term marketability of the product remains to be demonstrated, particularly in consideration of abundant supply and pricing for natural gas in the northeast.

When fully operational, the SpecFUEL facility could process between 500 – 1,150 tons per day of City collected waste through this waste processing option. The processing system, previously tested at a pilot facility in San Antonio, Texas, was constructed at the

existing Forge Recycling and Transfer Station in Philadelphia. The Philadelphia facility represents the first commercial SpecFUEL facility in the United States

The City will need to secure new transfer and disposal capacity effective July 1, 2019. The RFP and selection process outlined above will be used to select processing and disposal contracts for another seven year term beginning July 1, 2019. In summary, this process will include:

- Develop RFP; advertise and publicly post RFP on eContract Philly
- Receive and evaluate proposals, based on established criteria
- Initiate negotiations with preferred proposers
- Request final price proposals
- Complete evaluation and select new disposal system
- Prepare draft contracts for consideration by City Council
- Present disposal contracts to SWRAC
- Update Solid Waste Plan

5.3.3 Education, Enforcement and Other Programs

Education and enforcement is conducted through the City's SWEEP program, which is a city-wide program created to educate citizens about their responsibilities under the Sanitation Code. Educational efforts are also conducted in partnership with the Sanitation Division's Philadelphia More Beautiful Committee (PMBC) and the UnLitterUs public service campaign. Other programs such as the annual Philly Spring Cleanup are also used on a city-wide basis to educate citizens while also achieving other purposes. These programs are described in Chapter 4 of this Plan.

5.4 Management of Privately Collected Waste and Recycling

Residential units (i.e., certain multi-family dwellings and condominium units) and businesses that do not receive City collection services have waste and recyclable collection services provided by the private sector. Privately collected waste is processed at private transfer facilities or transported directly to a disposal facility. In 2013, private haulers utilized the transfer and disposal facilities identified in Chapter 2 of this Plan.

The City does not control how the private haulers select transfer and disposal systems. As a part of the Act 101 planning process, disposal facilities have been identified that plan to accept privately collected municipal waste generated in Philadelphia. These facilities are listed in Chapter 6 of this Plan. Private haulers are encouraged to utilize this list of disposal facilities but are not required to use only those facilities listed.

[College and university recycling and waste management programs]

5.5 Innovative and Alternative Technology Assessment and Planning

During the preparation of this Plan, the City and SWRAC conducted several visioning meetings to identify and discuss existing and new programs that could potentially be integrated into City practices in alignment with the established waste management hierarchy and the Greenworks goals. This included consideration of organics management strategies, alternative solid waste management methods, and policy considerations that could contribute to greater diversion of waste from disposal and generation of energy. The City and SWRAC also considered management practices for other waste streams (specifically, C&D and electronic waste present in municipal solid waste). The key topics that were explored are summarized below, along with a discussion of how they fit within this Plan, as applicable.

5.5.1 Organics Management Strategies

Municipal organic waste management strategies primarily address food waste, yard waste and non-recyclable fiber (e.g., food-soiled paper). As a step towards increased diversion of waste from disposal, many communities are identifying and implementing organics management strategies. Nationally, programs range from voluntary or pilot to those that are established on a city-wide scale. Typical organics management strategies include drop-off programs and curbside collection of source-separated organic material. These strategies are described below, along with selected examples of large city initiatives.

Drop-off programs provide an opportunity for residential organics recycling. Under these programs, residents separate organics such as food waste from other household materials that are being recycled or disposed, and deliver these source-separated organics to a drop-off location. A drop-off program is a lower cost option than curbside collection or mixed waste processing. However, drop-off programs require the most effort on the part of participating residents, and would usually be implemented as a voluntary program. Drop-off programs would typically attract the lowest amount of participation; however, residents that voluntarily participate would likely be diligent in source-separation efforts, providing material with the least amount of contamination.

Curbside collection of source-separated organics is a more expansive organics management strategy. Curbside collection programs increase the opportunity for participation by making the program more convenient to residents and by extending the program to non-residential customers (as applicable). However, curbside programs also have higher cost structures, associated with the cost to collect the source-separated organics and to implement extensive public education and outreach efforts. Curbside collection programs can be implemented as a targeted or pilot program, or on a city-wide basis. Similarly, these programs can be voluntary (e.g., a subscription service) or mandatory. Mandatory programs may require legislative or policy actions to implement and enforce.

Examples of large-city initiatives that illustrate the wide range of organics management strategies in use by municipalities in the U.S. include the following:

- The City of Boston has initiated a 24-hour community compost program serving two of Boston's neighborhoods (East Boston and the North End). Known as "Project Oscar", the pilot program provides centrally-located neighborhood collection bins where anyone who lives or works in the neighborhood can drop-off food waste to be composted. Residents must complete a brief, composting educational quiz to be provided with a lock combination for accessing the bins. The bins are available in the spring, summer and fall. The City of Boston is working on a plan for scaling up the program.
- The City of Minneapolis is an example of an initiative to implement an organics drop-off program that is now transitioning to a curbside program. In partnership with the Minneapolis Park and Recreation Board and various neighborhood groups, the City of Minneapolis initially opened numerous residential organic drop-off sites. Following a city-sponsored pilot program, a curbside organics collection program is being initiated in phases beginning in August 2015, with roll-out on a city-wide basis by spring 2016. The drop-off sites will remain in service. Organics that are accepted include food scraps, non-recyclable food-soiled paper, and certified compostable plastics. At this time, yard waste cannot be added to the organics recycling bin. Organics must be contained in a paper bag or certified compostable bag prior to set-out in a city-provided collection cart. Collected organics are mixed with yard waste and composted at a commercial composting facility.
- New York City recently began offering curbside collection of organic waste, including food scraps, food-soiled paper and yard waste, to select schools, residences, and institutions. The pilot program currently serves more than 100,000 households (240,000 residents) in all five boroughs. The pilot program will expand in 2015 to serve an additional 33,000 households (100,000 residents). Currently, materials collected through the city's pilot program are delivered to a city-owned composting facility at the former Fresh Kills Landfill or to compost facilities in upstate New York and Connecticut. The pilot program to divert organic materials from disposal was initiated in response to a local law. The legislation required the City to test a collection system for organic waste and to evaluate the program. Set-out containers, contamination of organic waste (i.e. polystyrene foam) and route optimization are among the factors under evaluation. Use of liners, attraction of vectors such as rodents, collection kits, and integration with yard waste collection are also under evaluation. Legislation has also been adopted by the City requiring certain large-scale commercial food waste generators to separate organic waste and divert the material from landfills for composting or anaerobic digestion. By enacting mandatory source-separation for large generators, the City may encourage the construction of processing capacity by the private sector which may ultimately benefit a residential curbside program, if adopted citywide.

The City of Philadelphia has an established history of organics recycling. Since approximately 1950, New Jersey pig farmers collected residential food waste under a

program overseen by the Streets Department. Under the program, farmers bid on collection routes and those offered contracts were paid by the City to collect food waste set out by residents. The program was discontinued at the end of 1995 due to low participation by residents and the high cost of the program. At that time, the City had 26 contracts with 18 pig farmers. Beginning in 2009, local universities and businesses had the opportunity to recycle organic waste through the Wilmington, Delaware composting facility. However, in 2014, the state of Delaware ordered the closure of the facility due to uncontrollable odors and other non-compliance conditions. The closure of the facility left many local and regional entities without viable options for organic waste composting.

At present, the City of Philadelphia offers programs and has undertaken a number of initiatives or pilot projects to increase recovery of organics. Year-round, yard waste is accepted at all of the City's Sanitation Convenience Centers. Yard waste is also collected City-wide as a part of the annual Philly Spring Clean up events. In addition to yard waste, the City has an established fall leaf collection program. Yard waste and leaves collected by the City are composted at the Fairmont Park Organics Recycling Center. Previous efforts conducted by the Department included a pilot project with the InSinkErator company in the West Oak Lane and Point Breeze Neighborhoods for food waste diversion. In addition to these initiatives, the City of Philadelphia Water Department (PWD) has anaerobic digestion facilities at its Northeast and Southwest Water Pollution Control Plants for digestion of sludge. Biogas produced by the Northeast Plant is used to generate electricity, meeting 85% of the plant's electrical demand. Biogas produced at the Southwest Plant is used for thermal drying and pelletizing at the biofuels facility discussed in Chapter 1. PWD may have capacity to co-digest food waste with sludge, but does not have area to receive and pre-process the food waste.

In addition to these City programs, there are some private and institutional organic management initiatives within the City, including the following:

- Philadelphia's prisons have an active composting program. Organic materials from the prisons and from other institutional, commercial and industrial sources are composted using aerated static piles. The prison is prohibited from competing with private industry, so the compost product cannot be sold; however, it is provided to prison staff members with plans to use the product on prison grounds.
- The Dirt Factory is a private composting facility located in Philadelphia. The Dirt Factory is a community composting facility for University City, serving the residential sector. Grass clippings, leaves, and certain food waste materials (e.g. coffee grounds, egg shells) are accepted for drop-off. The materials are composted using earth tubs.
- In 2011 the Division of Aviation and six restaurants at Philadelphia International Airport participated in an organic waste pilot program to determine the feasibility

of implementing an airport-wide composting program, which was partially funded with a grant from USEPA.

- The New Kensington Community Development Corporation (NKCDC) is a nonprofit organization dedicated to revitalizing the Kensington, Fishtown and Port Richmond neighborhoods in Philadelphia. Its mission is to strengthen the physical, social, and economic fabric of the community by being a catalyst for sustainable development and community building. NKCDC sustainability efforts are neighborhood-based initiatives. Successes are documented through the organization's Green Actions mapping tool, which tracks sustainable efforts of individuals, households and the community. NKCDC efforts have resulted in more than 7,300 pounds of organics being removed from landfills and composted, along with numerous other green actions.

On June 19, 2014, the Philadelphia City Council adopted Resolution No. 140626 authorizing the Joint Committees of Streets and Services and the Environment to hold hearings on the feasibility and benefits to the City of residential food waste recycling including its impact on environmental quality, hunger prevention, economic savings and job creation (see Appendix ___ for a copy of the resolution). In November 2014, the Philadelphia City Council held hearings on the subject. Representatives of the Streets Department and SWRAC presented testimony at the hearings.

As highlighted in the testimony, the ability of the City to recover additional organics would depend on changes to commercial waste and recycling initiatives as well as increasing options for residential waste diversion. Further consideration of organics waste diversion in Philadelphia would need to include collection, processing, and product marketing elements. In February 2015, City Council passed Bill No. 140903, which provides a mechanism and an incentive for restaurants to use a separate dumpster for food waste. Previously, the City required that all grindable garbage be disposed of using a garbage disposal. The Mayor signed the bill in March 2015 (see Appendix ___ for a copy).

Collection services are currently available from several private entities, which are listed in the City's Commercial Recycling Toolkit (see Appendix ___). Implementation of a City-wide curbside collection program in Philadelphia could require consideration of more than 500,000 homes requiring collection services, consisting of single-family and single-family attached households and properties with between two and six dwelling units. The City has estimated that an up-front cost of \$30 million may be required for single-family and single-family attached households. The implementation costs would include vehicle purchases, increased staffing levels, and containers.

Should the City determine it is feasible to pursue organics recycling, the material could be composted or managed with anaerobic digestion technology. These technologies are briefly summarized below:

- Composting is a process performed in the presence of oxygen that can be controlled through monitoring of feedstock composition and environmental conditions including moisture content, temperature, pH, and oxygen levels. Three main processes are available to support compost processing including use of aerated static piles, windrows, and enclosed systems. Composting produces a biologically stable product that may find application as a soil amendment. As previously described, yard waste and leaves collected by the City are currently composted at the Fairmont Park Organics Recycling Center.
- Anaerobic digestion is performed in the absence of oxygen in enclosed reactors or chambers known as digesters. Similar to composting, anaerobic digestion can be controlled through monitoring of feedstock composition and environmental conditions including moisture content, temperature, and pH. Anaerobic digestion results in the generation of biogas and digestate. Biogas is composed primarily of methane and carbon dioxide. It has a heating value equivalent to about one-half that of natural gas, and can be combusted to generate renewable electricity or upgraded under certain conditions to serve as a replacement for natural gas in pipelines, among other potential uses. The remaining digestate may be composted as described above and may find application as a soil amendment.

As further described in Chapter 1 of this Plan, the City performed a residential waste characterization study in 2009-2010. For planning purposes, the City's data is a reasonable representation of the composition of residential waste. The data shows that approximately 22% of City-collected municipal waste is food waste and yard trimmings that would be potential feedstock for composting or anaerobic digestion. In addition, the data shows approximately 15% of City-collected municipal waste is non-recycled paper, which if not otherwise recycled could also be feedstock for composting or anaerobic digestion (e.g., wet and food-soiled paper).

For planning purposes, USEPA waste characterization data can be used as a representation of waste collected from commercial and institutional generators. As described in Chapter 1, there are certain limitations to using USEPA waste characterization data; specifically, USEPA data excludes C&D waste, which is included by the City. Nevertheless, USEPA data shows the potential for approximately 30% of commercial waste to consist of food waste and yard trimmings. In addition, approximately 15% may be non-recycled paper. These components are potential feedstock for composting or anaerobic digestion.

Table 5-2 summarizes the potential organic fraction of municipal waste generated in Philadelphia (excluding C&D waste). As shown in the table, based on the total quantity of municipal waste disposed in 2013 from Philadelphia, it is estimated that more than 550,000 tons per year of organic waste may be generated in Philadelphia, including more than 350,000 tons per year of food waste and yard trimmings (with the balance equal to non-recycled paper).

Table 5-2. Estimate of the Organic Fraction of Municipal Waste (2013)

	Residential Municipal Waste	Commercial Municipal Waste ⁽¹⁾	Total Waste Disposal
Waste Disposed from Philadelphia (tons)(2013)	498,024	818,167	1,316,191
Estimated Organic Fraction (%) ⁽²⁾			
Food Waste	10.8%	21.3%	
Yard Trimmings	<u>11.4%</u>	<u>8.8%</u>	
Subtotal	22.2%	30.1%	
Non-Recycled Paper	14.7%	14.8%	
Total	36.9%	44.9%	
Estimated Organic Fraction (tons) ⁽²⁾			
Food Waste	53,787	174,270	228,057
Yard Trimmings	<u>56,775</u>	<u>71,999</u>	<u>128,774</u>
Subtotal	<u>110,562</u>	<u>246,269</u>	<u>356,831</u>
Non-Recycled Paper	73,210	121,089	<u>194,299</u>
Total	183,772	367,358	551,130
1. Excludes C&D waste. 2. Based on City's Residential Waste and Recyclables Characterization Study, 2009-2010, for residential waste and USEPA MSW Characterization Report (2011) for commercial waste.			

Considering the quantity of waste disposed and the estimated fraction of that waste that is organic (see Table 5-2), there is potential for implementing a separate organics management strategy for the City. Based on recycling data summarized in Chapter 1, the capture rate for curbside recyclables ranges from a low of approximately 23% (for aseptic containers) to a high of approximately 75% (for glass bottles and jars). The average capture rate is estimated at between 60 to 65%. Assuming an overall capture rate of approximately 50% for organic waste, an organics management system implemented for the City could divert about 55,000 tpy of food waste and yard trimmings (residential sources only) to about 178,000 tpy of food waste and yard trimmings (combined residential and commercial sources). With the addition of non-recycled paper to the organic fraction, those quantities could increase to more than 90,000 tpy (residential) and more than 275,000 tpy (combined residential and commercial).

Limited organics management capacity currently exists in the Philadelphia region, including the Fairmont Park Organics Recycling Center (composting of yard waste and leaves) and biosolids digestion at the Philadelphia Water Department. Further evaluation is needed to determine the extent to which these existing systems could accept additional organic waste.

Based on the large amount of organic waste that is potentially available in the City, coupled with uncertainty regarding the availability of processing capacity and cost associated with curbside collection of organic waste and solicitation of proposals, the Streets Department advocates for funding to perform a feasibility study to determine the efficacy of diversion of organic waste as part of this Plan. The scope and timing of the feasibility study would depend on City Council approval and the availability of grant funding and/or other sources of funding to conduct the study. Depending on the outcome of that potential feasibility study, the City could issue an RFP for organics processing capacity. Such an RFP could include responsibility for marketing the products resulting from the processing of organic waste.

5.5.2 Alternative Solid Waste Management Methods

In addition to organics management strategies, alternative solid waste management methods that were considered by the City and SWRAC include mixed waste processing, anaerobic digestion, gasification, alternative collection practices, and other policy considerations. These alternative practices are described below.

Mixed Waste Processing

Mixed waste processing (MWP) can be used to supplement or replace conventional source-separated recycling programs. MWP recovers recyclable material from mixed waste, and prepares the recovered materials for sale to secondary materials markets. A MWP facility is sometimes called a “dirty” MRF, advanced MRF (AMRF) or mixed waste MRF (MWMRF). MWP projects were more common in the 1990s, but the approach has experienced a resurgence during the past few years, in large part because of the advances in single-stream sorting technologies.

MWP typically consists of a highly integrated system that combines mechanical processing with manual labor. Often there is a manual pre-sort to remove oversized materials, followed by mechanical operations to open bags, reduce material size, and meter materials into the sorting process. The sorting process separates materials by size, density and type, using manual sorting labor as well as screens, magnets, optical sorting, and other specialized equipment. Following the primary sorting process, MWP may include manual labor and additional mechanical processing to clean and consolidate recovered recyclables to prepare them for sale to markets (e.g., glass clean-up systems, balers, manual quality control). In addition to recovering recyclables, MWP facilities can be designed to separate an organic fraction for subsequent processing or used to produce an engineered fuel. The Waste Management SpecFUEL™ facility, which is currently one of several Designated Disposal Facilities for City-collected municipal solid waste, is an example of MWP.

The SpecFUEL facility does not yet have a sufficiently long operating history to demonstrate sustained performance for Philadelphia. MWP can recover valuable recyclables that would otherwise be disposed, including fiber, plastic, glass, metal and other materials. However, the recyclable materials that are recovered from MWP are

generally of lower quality than recyclable materials collected from source separation programs. Quality issues can impact marketability and value of recyclables, and is believed to be a factor in the sustained drop in market conditions over the past several years. There is a higher risk that materials recovered from MWP would not be used for their highest and best use, but rather for low-end uses due to the presence of contaminants such as glass, food, and liquids. Therefore, MWP may have a more positive impact if used to supplement, not replace, source-separated recycling programs.

In addition to the SpecFUEL facility in Philadelphia, examples of representative MWP plants that are in operation or in the design and permitting phase include the following:

- The GreenWaste Material Recovery Facility located in the City of San Jose, CA is designed to accept up to 2,000 tons per day of residential and commercial trash, yard trimmings, curbside recyclables, food waste, and construction and demolition debris. The facility has two side-by-side processing lines that initially handle municipal solid waste separately from single-stream recyclables, merging clean product from both lines.
- The City of Montgomery, AL discontinued an existing curbside recycling program and currently sends trash (un-separated) to a mixed waste processing facility. The facility has capacity to process up to 225,000 tons per year of MSW, and designers state it will be able to achieve up to an 85% recovery rate. Phase Two of the project, which is currently in the design phase, involves possible installation of an anaerobic digestion system to process the organic fraction of the waste.
- The Covanta Advanced Recycling Center in Indianapolis, IN will be built adjacent to the Covanta Indianapolis Energy from Waste facility. The recycling center is designed to recover recyclables from mixed MSW. The mixed waste processing system may enhance operation of the existing municipal waste combustion system. The facility has an expected commercial operation date in 2016.

The City of Philadelphia may include mixed waste processing as part of the future competitive procurement for waste processing and disposal capacity for a term beginning July 1, 2019.

Anaerobic Digestion

Anaerobic digestion is a biological process that uses bacteria to decompose biodegradable organic materials (such as food waste, yard waste, and non-recyclable paper) in the absence of oxygen. The process results in biogas consisting primarily of methane and carbon dioxide. The biogas can be used to generate electricity, or it can be upgraded to pipeline-quality gas (biomethane) or other types of fuel (such as

compressed natural gas). The remaining material that is not converted to biogas is called digestate. The digestate can be marketed as a fertilizer or soil amendment, typically after composting and curing. If there is not a market for the digestate, it can be gasified to extract the remaining energy value or be landfilled. Anaerobic digestion can result in residue requiring landfill disposal, both from pre-processing of the feedstock and post-processing of the digestate. The viability of an individual anaerobic digestion project will typically depend on the quantity and characteristics of organic feedstock, the ability to enter into a long-term fuel or power purchase agreement under favorable economic terms, the strength and stability of the market for beneficial use of digestate, and the avoided cost of disposal.

There are many variations of anaerobic digestion technology including: wet and dry systems; continuous and batch processing; single stage or multi-stage processing; differing temperature profiles that support different types of bacteria, and various options for mixing (or not mixing) the feedstock before and during the digestion process. In all cases, anaerobic digestion operates within an enclosed tank, vessel or bunker, under controlled conditions and without the addition of air or oxygen. The variations offer differing advantages and disadvantages relating to retention times to complete the process, biogas yields, space requirements, energy needs, and other infrastructure needs. Almost all anaerobic digestion technologies use some type of pre-processing to prepare the feedstock for digestion, including facilities that accept source separated organics for processing. Pre-processing may consist of opening and removing bags, removing contaminants (e.g., removing silverware and plastic from food waste), size reduction, moisture control, and blending.

Anaerobic digestion facilities are highly suitable for processing source-separated food waste or source-separated food and yard waste. When yard waste is processed, the woody components may be removed and used as a bulking agent in a post-digestion composting process, rather than being used as feedstock to the digester, since these materials are slow to digest and yield low levels of biogas. Management of source separated organic waste requires infrastructure to collect this waste separately from other municipal waste. Anaerobic digestion facilities can also process mixed waste but would usually be paired with a mixed waste processing facility (integrated or as part of a separate operation) to recover recyclables, remove non-biodegradable materials, and digest an organic-rich fraction separated from the mixed waste. Without such pre-processing, the digesters would need to be substantially oversized to handle waste constituents with little or no biogas generation potential, and the resulting digestate would have significantly reduced potential for beneficial use.

Outside of the United States, there are many commercially operational anaerobic digestion facilities processing mixed waste and source separated organics (sometimes in combination with other types of organic feedstock). Many of these facilities have operated for five to 10 years, and some facilities have operating histories that approach 20 years. These facilities are widespread across Europe, including large numbers in Germany, Spain, France, Italy, and Portugal, and they are also located in numerous other countries. While the total installed capacity for anaerobic digestion is quite large

in aggregate, most of the individual anaerobic digestion facilities have a relatively small digestion capacity (generally less than 50,000 tons per year, with a small number of facilities with larger digestion capacity). There are a handful of facilities in Europe that process more than 100,000 tons per year of mixed waste. However, for these facilities, the digestion capacity is typically much smaller than the overall facility capacity.

In the United States, anaerobic digestion has been commercially established for many years for feedstock from farms (e.g., manure), biosolids, and process streams from the food and beverage industry (e.g., brewery waste). Recently, there has been progress on development of anaerobic digestion projects in the United States for source-separated organic waste (predominantly food waste and also yard waste from residential and commercial sources), and for the organic fraction separated from mixed waste. While some of the focus has been on site-specific feasibility studies and procurement activities, several projects are at advanced development stages, particularly in California where there are legislated mandates for increased waste diversion. This includes a facility in San Jose that began operations in 2013, designed to process 90,000 tons per year of commercial organic waste and produce electricity (Zero Waste Energy/Kompoferm). It also includes the CR&R/Eisenmann facility in Perris, California, that has completed permitting and initiated construction. This facility will process approximately 80,000 tons per year of source separated yard waste and food waste from residential and commercial sources and will produce compressed natural gas from the biogas. In addition, Harvest Power, in partnership with Entec Biogas, operates a facility in Lake Buena Vista Florida that processes biosolids; fats, oil and grease (FOG); and food waste from industrial, commercial and institutional sources. That facility began operation in 2014 and is designed to process 120,000 tons per year of organic waste at full capacity.

The City of Philadelphia may include anaerobic digestion as part of the future competitive procurement for waste processing and disposal capacity for a term beginning July 1, 2019.

Gasification

Gasification is a process that converts the carbon-bearing materials in municipal solid waste (such as paper, plastic, wood, rubber, and other organics) into a synthesis gas. The synthesis gas consists primarily of hydrogen and carbon monoxide. The synthesis gas can be combusted to generate electricity, or it can be converted to fuels (e.g. ethanol) or chemicals (e.g. naphtha), which provides flexibility for optimizing project economics.

The remaining inert materials (including glass, sand, and metals) that are not converted to synthesis gas can potentially be recovered for recycling or beneficial use, particularly if the process converts the inert material to a vitrified slag or aggregate material. Gasification can result in residue requiring landfill disposal, both from pre-processing of the feedstock as well as from residual inert material remaining after gasification and not otherwise vitrified (commonly called ash). The viability of an individual gasification

project will typically depend on the quantity and characteristics of the feedstock, the ability to enter into a long-term fuel or power purchase agreement under favorable economic terms, the strength and stability of the market for beneficial use of residue, and the avoided cost of disposal.

There are many variations of gasification technology including: pyrolysis (gasification in the absence of oxygen); gasification at differing temperature profiles, and plasma gasification. The variations offer differing advantages and disadvantages relating to synthesis gas yields, space requirements, energy needs, and other infrastructure needs. Many gasification technologies use some type of pre-processing to prepare the feedstock, including size reduction and recovery of recyclable materials. Gasification facilities also offer potential for application of systems to cost-effectively clean the synthesis gas prior to use, are amenable to application of certain highly efficient technologies for air pollution control (e.g. selective catalytic reduction for control of nitrogen oxides), and may incorporate highly efficient power generation technology (e.g. gas turbine/steam turbine combined cycle configurations).

Gasification of mixed waste is established outside of the United States with numerous commercial applications in Europe and Japan. In Canada, the City of Edmonton's waste management program includes the Enerkem Biofuels Facility, which is designed to convert 110,000 tons per year of processed waste into methanol and/or ethanol. In the United States, gasification has been demonstrated or commercially established for certain feedstocks (e.g. lignite, biomass, wood from forestry applications, and biosolids from wastewater treatment). Recently, there has been progress on development of gasification projects in the United States for municipal solid waste. Examples of gasification projects in the United States include:

- AlterNRG/Westinghouse Plasma operates a pilot plasma gasification facility in Madison, PA, that has gasified a range of feedstocks including MSW, refuse-derived fuel, construction and demolition waste, biosolids, tires, auto shredder residue, and incinerator ash. This plasma gasification technology is in the final stages of construction for a large-scale (1,000 tons per day) commercial facility in Tees Valley, UK.
- Covanta Energy has completed demonstration testing of the Covanta Low Emission Energy Recovery Gasification (CLEERGAS) technology to process MSW on a demonstration basis at a resource recovery facility in Tulsa, Oklahoma. Covanta represents that a standard 300 ton per day plant will produce 6 to 8 megawatts of electricity.
- IneosBio operates a facility in Vero Beach, Florida that began production of commercial scale ethanol in 2013. The Indian River BioEnergy Center has recently installed equipment to remove impurities from the process stream that had been affecting operations. The Center has reportedly processed vegetative waste and yard waste and is permitted to process municipal solid waste.

- Fulcrum BIOEnergy is developing a facility near Reno, Nevada to process municipal solid waste with operations anticipated in 2017. The Sierra BioFuels Plant will produce more than 10 million gallons of oil that will be further refined and upgraded into jet fuel. The plant will process approximately 200,000 tons per year of prepared feedstock from a processing facility designed to extract recyclables and inorganic matter not suitable for gasification. Waste service partners have entered into 20-year service agreements to supply municipal solid waste to the plant.

The City of Philadelphia may include gasification as part of the future competitive procurement for waste processing and disposal capacity for a term beginning July 1, 2019.

Pay-as-you-throw Collection Programs

Pay-as-you-throw (PAYT) programs charge for waste collection based on the amount of material thrown away. These programs are also known as unit-pricing or variable-rate pricing programs, in which customers are typically charged a fee for each bag or container of waste generated. PAYT programs are usually paired with a recycling program that has no charge to the customer or a reduced charge compared to waste disposal. PAYT programs have been shown to decrease the amount of waste, by providing a direct economic incentive to reduce, reuse and recycle. They are also considered by some to be an equitable approach to waste management, charging customers for what they throw away. For these reasons, the USEPA supports PAYT programs and has developed a tool kit and other informational resources to assist communities implement PAYT. PADEP also provides information regarding implementing PAYT programs. PADEP reports that more than 200 municipalities in Pennsylvania have implemented PAYT and showcases certain boroughs and townships on their website.

PAYT programs have more often been implemented in municipalities that are smaller than Philadelphia. PAYT programs have also been implemented in larger cities, but such programs can have additional challenges. These challenges and concerns include logistical issues, political concerns, the ability of low-income residents to pay for waste collection services, the potential for increased illegal dumping, challenges with multi-family buildings, and enforcement issues. A handful of large cities have implemented PAYT programs. Notable examples include San Jose, CA; San Francisco, CA; Portland, OR; Seattle, WA; Austin, TX, and Worcester, MA.

Implementing a PAYT program in Philadelphia would require significant funding, including for a detailed analysis of program options and ultimately for public education, collection staff training, and enforcement. It would require City-wide collaboration and discussion regarding the advantages and disadvantages of a program and the practicality of implementation in the City. While not proposed to be implemented at this

time, a PAYT program will be further considered in the future, consistent with the goal of this plan and the City to increase diversion from disposal.

Separate Glass Recycling

The City's single-stream curbside recycling program includes mixed glass, consisting of household glass containers, bottles and jars (amber, flint and green). Glass currently makes up approximately 32% of the City's single-stream recyclables, as collected.

In an effort to maximize the value of recovered glass, some municipalities (e.g., Santa Fe, New Mexico) have started to collect glass separately from other recyclables. The intent is to allow the glass cullet to remain relatively free of contaminants when compared to the glass product from a single-stream sorting line, in order that it can meet specifications for remanufacture into new glass bottles. Conversely, in recognition of the low price and limited market for glass, some municipalities (e.g., Salt Lake City, Utah) provide glass collection on an optional, subscription service basis and others (e.g., Harrisburg, Pennsylvania) have discontinued glass collection as part of their recycling programs.

The City will continue to monitor the value of glass in the regional marketplace, to determine if future changes to current collection practices are warranted.

Policy Considerations

A key policy objective for this Plan is to incorporate the City's sustainability goals provided in Greenworks Philadelphia (issued in 2009, with annual progress updates). Greenworks Philadelphia represents the City's vision and strategy to create a greener and more sustainable City. Greenworks Philadelphia considers sustainability through goals that address energy, the environment, equity, the economy and engagement. Integrated into this Plan are policy positions that are consistent with Greenworks Philadelphia, specifically including policies that increase diversion of waste from landfill disposal with engagement by well-informed and empowered citizens.

As part of consideration of alternative solid waste management practices, the City and the SWRAC discussed the following policy options as potential opportunities to facilitate greater diversion of waste from disposal:

- **City Procurement Process.** Executive Order 13-93, included in Appendix ___, establishes as a goal the maximum feasible purchase of recycled content products and reusable or recyclable products, along with other related measures to encourage recycling and reuse through procurement policies. This executive order remains in effect, and under this Plan the City proposes to revisit and reinforce the procurement policies that favor the purchase of recycled and recyclable goods for use by City agencies.
- **Recycling Education.** The City has established and maintains a comprehensive and successful recycling program backed by a strong public

outreach campaign. The City has developed many resources, initiatives and incentives to support its recycling program, including a residential recycling rewards program, a commercial recycling toolkit, public space recycling (BigBelly), and a comprehensive anti-litter campaign. In addition, the City has employed integrated media approaches using transit advertising, television commercials, local media print advertising, and direct mail. Under this Plan, the City proposes to sustain its strong commitment to recycling education and outreach. The Streets Department has recently engaged in rebranding the program with the theme “recycle right” to promote smarter and more successful recycling efforts City-wide. Ongoing recycling education programs will seek to engage a broad range of stakeholders through clear, accurate and comprehensive messaging.

- **Public/Private Partnerships.** The City will continue to engage with private entities that generate waste and that provide waste management and recycling services, to ensure City-wide collaboration and progress on achieving increased diversion of waste from landfill disposal. A key accomplishment is the City’s commercial recycling toolkit, which was updated and reissued in July 2014. The toolkit outlines the recycling requirements for the commercial sector and provides best practices and case studies for successful recycling programs. The toolkit provides information on assessment tools to facilitate waste management and recycling activities, including information on conducting waste composition surveys and completing waste process mapping. As part of this Plan, the Recycling Office of the Streets Department will explore ways in which it can further assist businesses in utilizing the toolkit, perhaps by assisting with business and institutional waste audits, sharing data and other information and expertise, and/or providing other guidance to help businesses comply with the City’s recycling requirements. Also, consistent with the City’s policy position on continuing a sustained focus on education and outreach, these education efforts will include messaging to the commercial sector, including companies and manufacturers that are generators and service providers within the City’s waste management and recycling program.
- **Educational Institutions.** A component of the City’s recycling program is the Green Schools Program, offered in partnership with RecycleBank under the Recycling Rewards Program. As further described in Chapter 4 of this Plan, the program helps fund recycling and composting programs at participating schools. Under this Plan, there is interest in exploring opportunities for further collaboration between the Streets Department and the SDP to increase recycling from school buildings and expand recycling education. Specific programs and initiatives will be developed as appropriate, and subject to the availability of staff resources and budget, and may include efforts such as increasing student involvement in City initiatives and/or developing grade-appropriate waste management and recycling curriculum.

5.6 Management of Other Waste Streams

The focus of this Plan is the management of municipal waste and the diversion of municipal waste from disposal. Two specific components of municipal waste that present potential opportunity for increased diversion are construction and demolition (C&D) waste and electronic waste. These components of municipal waste are briefly discussed below.

- **C&D Waste.** C&D waste is solid waste resulting from the construction, reconstruction, renovation, and demolition of buildings and other structures, including, but not limited to, wood, plaster, metals, asphaltic substances, bricks, block and unsegregated concrete. Private haulers operating in Philadelphia collect the majority of C&D waste, of which more than 94% is recycled (see Chapter 1). Under City regulations, waste materials from construction, demolition, or remodeling may be collected curbside by the City subject to certain restrictions imposed on the types and sizes of receptacles and quantities. Construction materials are not accepted at the Sanitation Convenience Centers. During the planning period, the City will consider opportunities to increase C&D recycling in the residential sector. Concepts to be investigated include: establish collection sites; implement additional policies; conduct increased education and enforcement; and seek partnership opportunities, such as through pilot programs and with partnerships with big box retailers and other City Departments.
- **Electronic Waste.** The Covered Device Recycling Act (Act 108 of 2010) requires manufacturers to provide recycling programs for certain electronics sold to consumers in Pennsylvania, including computers and televisions. It also prohibits disposal of certain electronics with municipal waste. As described in Chapter 1, the City began accepting computers and televisions at household hazardous waste events in 2004 and at its Sanitation Convenience Centers in 2008. However, some amount of electronic waste may be present in municipal waste collected by the City. During the planning period, the City will consider opportunities to increase electronic waste recycling.