



MEMORANDUM

From: Bob Gedert, Department Director, Austin Resource Recovery
Date: June 22, 2015
Subject: Director's Acceptance and Response to CB&I *City-Serviced Residential Waste Characterization Study*

Background

In order to track progress towards its Zero Waste goal and identify needs and opportunities for diversion of particular materials, the *Austin Resource Recovery Master Plan* (December 2011) recommended that a waste characterization study be completed and then updated every five years. Austin Resource Recovery (ARR) hired CB&I to conduct a field sorting study in September and October 2014 to determine the composition of the curbside trash and recyclables collected by ARR. The attached CB&I *City-Serviced Residential Waste Characterization Study* was presented to Zero Waste Advisory Commission in May 2015.

Summary of Report Results

CB&I's waste characterization study determined that a significant portion of the ARR-collected trash stream is potentially recoverable and could be diverted from disposal by residents through the curbside collection programs. The composition of the ARR-collected trash stream by material class is shown in Figure 11 (page 15 of the study). Organics (including food wastes, yard trimmings, wood, and other organic materials) comprise 46% of the disposed waste stream. Traditional recyclable materials (paper, plastics, metals, and glass) comprise an additional 44% of the disposed waste stream.

The CB&I *City-Serviced Residential Waste Characterization Study* offers a stark view of the "waste" discarded into the residential trash carts. Of the residential trash sent to the landfill, 44.8% is recyclables and 46.3% is organics. This study demonstrates that 90% of what is sent to the landfill can be diverted toward recycling and organic composting. CBI offered the following recommendations for action. I have provided the recommendation in black, and my response in italics.

Report Recommendations

CB&I provides a number of recommendations for near-term implementation that may increase diversion cost-effectively:

1. Continue customer education. Ensuring customers are aware of the materials that may be diverted and of proper preparation of recyclable materials is essential to every waste diversion

program. The trash sort indicated that nearly one-third of the disposed waste stream consists of materials that are currently accepted in the curbside collection program (cardboard, newsprint, mixed paper, HDPE and PET plastics, aluminum, ferrous metal, glass bottles/jars, and yard trimmings), supporting the need for continued education.

Director Response: *ARR's I Want to Be Recycled Campaign is designed to address these concerns. The results of this study have been discussed with staff, and a new incentive outreach campaign is being designed and will roll-out in November 2015 on America Recycles Day.*

2. Perform an analysis of diversion rates on a route basis throughout the City. Reviewing diversion and disposal tonnages and assessing the level of participation in curbside programs on an individual route basis can assist in identifying particular areas of the City in which diversion is lowest. This can allow for the development and implementation of targeted outreach and education efforts, beyond the broad-based education provided currently.

Director Response: *ARR staff have reviewed the data from routes, and have summarized the information per Council District. Weak areas have been identified, and targeted outreach is being designed to address the low diversion areas. In addition to targeting certain areas, it should be noted that "diversion" is weak city-wide, and as such, a city-wide approach is also necessary.*

3. Expand access to curbside organics collection services to increase diversion of food waste from disposal. Food waste, as the single largest component of the disposed waste stream, represents an opportunity for a substantial increase in diversion if collection service is provided to more households.

Director Response: *The current budget proposal before City Council includes the five-year roll-out of enhanced residential curbside organics collection. The organics roll-out schedule is from 2016 through 2020.*

4. Review existing contracts with recycling and composting facilities and identify incentives to increase diversion that may be included in the next contract. By incentivizing processing facilities to accept additional types and/or quantities of material, more components of ARR's waste stream may be targeted for diversion.

Director Response: *This study did not observe or recommend new items to add to the recycling blue cart. In fact, the study reconfirmed that the recyclables currently being landfilled are also currently accepted by the two recycling processors. The City and its recycling processors are discussing additional materials to the current processing agreements. However, the largest quantity gains will be from increased use of the recycling blue carts with the current list of recyclables.*

5. Investigate recycling options for bulk items which are currently disposed, such as furniture and mattresses. These items are currently sent to the landfill for disposal. While reuse options for furniture and mattresses that have been set out on the curb for collection are likely not feasible, recycling options may exist within the marketplace to divert them from disposal.

Director Response: *ARR is currently redesigning the previous material recovery facility in southeast Austin into a reuse and recycling collection program for appliances, bulk items and hard to recycle items. The new collection program will launch in the fall of 2015.*

6. Implement a textiles collection program. The 2011 Master Plan recommended conducting a pilot textiles collection program during FY2014, which has not been implemented to date. In

addition to providing an outlet for reuse, contractors serving these programs also have recycling options for textiles that cannot be reused.

Director Response: *Textiles collection is being explored by staff. Although textiles cannot be added to the blue cart, a separate collection network is being explored. ARR staff anticipate a textile collection program to be added in 2017.*

Longer Term Recommendations

In the longer term, the CBI recommends consideration and further evaluation of the following;

1. Implement a ban on yard trimmings in trash. If education efforts do not result in decreased yard trimmings in the disposed waste stream, the City may consider passing an ordinance to ban yard trimmings in trash.

Director Response: *A ban is not being considered at this time; however it is a tool to utilize if necessary. A ban requires city council action to establish enforcement procedures and fines. These actions will not be considered until the city-wide roll-out of the organics program is complete and measured for effectiveness.*

2. Provide recycling collection service every week. With recyclables currently collected every other week, some households may fill their recycling container to capacity before their collection day or forget to place their container at the curb for collection on the proper week. Increasing the frequency of recyclables collection may increase the quantity of material segregated for recycling. ARR will need to evaluate the collection cost increase relative to the economic and environmental benefits of increased diversion of recyclables from the landfill if this recommendation is considered further.

Director Response: *Collecting recyclable weekly is being considered for 2017. The current collected volume of recyclables does not justify weekly frequency; however I agree with the authors of this study that recycling collection will likely increase with a weekly collection cycle.*

3. Provide trash collection every other week. The Texas Commission on Environmental Quality (TCEQ) rules require that waste containing putrescible materials (i.e., organic wastes) to be collected at least once per week. In order to reduce the frequency of trash collection to less than once per week, in accordance with TCEQ rules, putrescible wastes must not be present. If the City implements a ban on organics in trash, and if the ordinance is adequately enforced and households properly manage organic wastes, then a switch to every other week collection of trash may be possible.

Director Response: *This reduction in trash collection is being considered for 2025 or thereafter. The city-wide roll-out of organics collection must be fully implemented, and effectively capturing as much food waste as possible before the City can petition TCEQ for every-other week trash collection.*



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April 14, 2015

Mike Turner
City of Austin
Quality Assurance Division Manager
Austin Resource Recovery
1520 Rutherford Lane
Austin, Texas 78754

Re: Final Report
City-Serviced Residential Waste Characterization Study

Dear Mr. Turner;

CB&I Environmental and Infrastructure, Inc. (CB&I) is pleased to present the Final Report for the City-Serviced Residential Waste Characterization Study for Austin resource Recovery. Four bound copies of the report are included with this letter. Additionally, an electronic version in PDF format is provided.

It has been a pleasure working with you and the other members of the City's Resource Recovery staff on developing this baseline data report on the City's goals Zero Waste. If there is anything else we can do in this regard, please let me know.

Sincerely,
CB&I Environmental and Infrastructure, Inc.

Michael W. Oden, P.E.
Project Manager

Attachments:

- Four copies of Report
- CD with Electronic copy of Report

CC: Mr. Steve Nelson – City of Austin
Ms. Christina Seibert – CB&I
Ms. Shivani Kesar, P.E. – CB&I



City-Serviced Residential Waste Characterization Study



March 2015

Prepared for: Austin Resource Recovery
Prepared by: CB&I Environmental & Infrastructure, Inc.

AUSTIN RESOURCE RECOVERY
CITY-SERVICED RESIDENTIAL
WASTE CHARACTERIZATION STUDY

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ACKNOWLEDGEMENTS

The report authors would like to thank those who provided their time, cooperation, and space to complete the City-Serviced Residential Waste Characterization Study. The completion of this study would not have been possible without the participation of the following:

Austin Resource Recovery Staff

City of Austin's Hornsby Bend Biosolids Management Plant

Organics by Gosh

Texas Disposal Systems Landfill

Texas Disposal Systems Recycling Facility



1.0

Introduction

In 2005, the City of Austin established an aggressive goal to achieve Zero Waste to landfills and incinerators by 2040, defining Zero Waste as diversion of 90% of the City's waste from disposal. Subsequent to establishing this goal, the City developed its Zero Waste Strategic Plan in 2008 and its Austin Resource Recovery Master Plan in 2011 to provide a pathway by which the Zero Waste goal may be met. These plans identify strategies, policies, programs, and infrastructure options to be implemented to increase diversion from landfill disposal. The Master Plan also provided near-term diversion targets as the City pursues its ultimate goal of Zero Waste, with a desire to divert 50% by 2015 and 75% by 2020.

The City's goals have been further reinforced by their incorporation into the City's Imagine Austin Comprehensive Plan, adopted in 2012. Imagine Austin stated more general goals regarding waste diversion, including reducing waste disposal, increasing reuse and recycling, and expanding waste diversion services.

In order to track progress towards its Zero Waste goal and identify needs and opportunities for diversion of particular materials, the Master Plan recommended that a waste characterization study be completed and then updated every five years. CB&I began working with the City in March 2014 to develop a scope of work to complete the first characterization study.

The City currently provides waste and recycling services to residential properties only, with services provided principally by City staff within the Austin Resource Recovery Department (ARR). This City-serviced residential material stream is therefore within the City's direct influence. The City estimates that ARR manages approximately 25% of the material generated within the City. The remaining 75% of material generated in the City is generated by commercial properties, industrial operations, larger multi-family properties (apartment complexes, condominiums), education institutions, and government operations. This larger material stream is managed by private companies through individual contracts with the generators and is not within the City's direct influence.

The City opted to address the City-serviced and privately-serviced streams separately, given the differences in management and control of the two streams. This report details the characterization of the City-serviced residential waste stream (the materials managed directly by ARR). The privately-serviced stream will be separately characterized at a later date. Specifically, the objectives of the City-Serviced Residential Waste Characterization Study are to:

1. Quantify the various material streams managed by ARR and determine the current rate at which waste is diverted from disposal; and
2. Determine the composition of the disposed waste stream and the single-stream recycled material stream in order to identify materials that can be targeted for further diversion and the need or opportunity for additional programs and services to increase diversion.

The remainder of this report includes the following sections:

- Section 2.0 Study Methodology
- Section 3.0 Current Material Management Methods and Quantities
- Section 4.0 Material Composition
- Section 5.0 Recommendations



2.0 Study Methodology

The purpose of the City-serviced residential waste characterization study, as noted in Section 1.0, is twofold: 1) to identify the quantity of materials generated within the City of Austin and managed by ARR; and 2) to determine the composition of disposed waste and recovered single-stream recycling materials. This section summarizes the methodology employed to quantify and characterize the ARR-collected material stream.

2.1. Material Quantities

ARR currently manages materials generated by approximately 193,000 residential households within the City through a number of collection services and programs, including:

- Curbside trash collection (weekly)
- Curbside single-stream recycling collection (bi-weekly)
- Curbside yard trimmings collection (weekly)
- Curbside organics collection (pilot program serving 14,000 households, weekly)
- Curbside bulk item collection (twice per year)
- Curbside large brush collection (twice per year)
- Household Hazardous Waste (HHW) collection (drop-off program, available 3 days per week)
- Resource Recovery Center operation (drop-off program, available 5 days per week)

Collection service through each of these programs is provided by ARR staff using ARR equipment. ARR contracts with a number of facilities to provide management of collected materials:

- Trash disposal, including bulk trash - Texas Disposal Systems Landfill
- Single-stream recyclables processing - Texas Disposal Systems Recycling Facility and Balcones Resources Recycling Facility
- Yard trimmings (without food scrap) and large brush - City of Austin's Hornsby Bend Biosolids Management Plant
- Mixed organics (yard trimmings with food scrap from pilot collection program) - Organics by Gosh
- Recyclable/recoverable bulk materials collected curbside or at the Resource Recovery Center - various contracted recycling facilities
- HHW disposal - licensed hazardous waste hauler/disposal facility

To determine the quantities of material managed through each collection program and disposal or diversion outlet, CB&I reviewed and compiled monthly data provided by ARR for FY2014 (October 2013 through September 2014). This provides a baseline measure of material quantities managed on a monthly and annual basis, enabling future evaluation of seasonal fluctuations and program performance as well as annual review of progress towards diversion goals. CB&I also visited a number of the facilities receiving materials from ARR, including the Hornsby Bend Biosolids Management Plant and Organics by Gosh, and discussed the characteristics of the materials managed. Section 3.0 of this report contains data and analysis of material quantities managed by ARR.



2.2. Material Composition

To determine the composition of the disposed waste stream and single-stream recycling stream, CB&I developed a sorting protocol that included selection of random loads of collected materials, procurement of a 200-300 pound sample from each random load, and sorting of the materials in each sample into a number of material categories. The sampling and sorting methodology is consistent with the method outlined in ASTM Standard D 5231-92: Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste.

CB&I identified random loads of trash and recyclables collected by ARR for sample selection prior to the start of field sorting activities, based on a list of collection routes and collection days provided by ARR. This enabled ARR to coordinate with route drivers and other personnel to ensure a sufficient number of samples would be obtained with minimal impact to ARR operations. For the trash sorting event, CB&I and its field crew coordinated with personnel at the Texas Disposal Systems Landfill to direct route drivers to the sample unloading area instead of the landfill's active face. For the recyclables sorting event, ARR directed route drivers to deliver all loads to the Texas Disposal Systems Recycling Facility, rather than sending a portion to the Balcones Resources Recycling Facility, for sorting.

Sorting activities were performed over a 5 day period (Monday through Friday) for both the trash stream and the recycling stream. A total of 15 collection route vehicles were identified for sampling on each collection day, for a total of 75 potential samples to be obtained and sorted from each stream (trash and recycling). At a minimum, the field crew was to obtain 40 samples from each stream during the sorting event. The actual number of samples collected and sorted during the sorting event was dependent upon the load being properly directed to the sorting location, time of arrival at the facility, and the efficiency of the sorting staff, among other factors.

Materials in each sample were sorted into the material classes and categories determined in consultation with ARR, identified in Table 1.



TABLE 1. MATERIAL STREAM COMPONENTS

Material Class	Material Category	
Paper	Mixed Paper Newsprint Corrugated cardboard	Other paper (e.g., aseptic containers, foil-lined food wrappers, wax-coated paper, photographs)
Plastics	HDPE PET Rigid plastics (e.g., buckets, children's toys, lawn chairs, laundry baskets)	Single-use plastic bags ^A Other plastics (e.g., items containing multiple types of plastic, film, foam, plastics #3-7, pens, disposable razors)
Metals	Ferrous metal Aluminum	Other metals (e.g., non-electronic appliances, items with multiple types of metal)
Glass	Glass bottles and jars	Other glass (e.g., Pyrex, glassware, light bulbs)
Organics	Yard trimmings Food waste Wood (other than yard trimmings or C&D)	Other organics/combustibles (e.g., cork, rope, hair, cigarette butts, diapers, animal wastes)
Other materials	Electronics Textiles Construction and demolition (C&D) material	Household hazardous waste Other inorganics/non-combustibles (e.g., rocks, soil, concrete)
Residuals (unknown material)	(no subcategory)	

^A - The term "single-use plastic bags" refers to bags typically made of low-density polyethylene (LDPE). LDPE bags are used by commercial entities such as grocery stores in a onetime usage capacity to bag groceries and similar items for ease in transportation by consumers. For the purpose of this study, single use bags do not include plastic bag-type materials used in food packaging such as ice or bread.

Field sorting was completed by CB&I's subcontractor, Sky Valley Associates, with oversight provided by CB&I personnel. Each material category was separately weighed following completion of sorting activities for the sample and recorded. Upon completion of the sorting events, data was compiled and analyzed to determine the average composition of the waste stream and the margin of error, based on a 90% confidence level.

The detailed sampling plan approved by ARR is provided in Appendix A of this report. Section 4.0 of this report contains data and analysis of the composition of the trash and recycling streams collected by ARR.



3.0 Current Material Management Methods and Quantities

Based on the data provided by ARR for each of the programs it operates, CB&I compiled monthly and annual summaries of disposal and diversion for FY2014 (October 2013 through September 2014). This section reports the total tonnage generated by ARR’s customers and managed through ARR’s programs, current calculated diversion rate (as a percentage of generation) for ARR-managed materials, and per household generation and disposal rates. This data will provide a baseline against which to evaluate future progress towards the City’s Zero Waste goal.

3.1. Management Methods

Materials that are collected by ARR are generally managed through recycling, composting, or disposal. These terms are defined as follows in the 2011 Master Plan:

Recycling: The series of activities by which materials that are no longer useful to the generator are collected, sorted, processed, and converted into raw materials and used in the production of new products.

Composting: The process of converting difficult to handle organic materials resulting in a mixture of decayed organic matter used for fertilizing and agriculture.

Disposal: Final placement of wastes under proper process and authority with no intention to retrieve or reuse. This includes waste sent to landfills and end-of-life disposition of materials sent to incinerators, waste-to-energy facilities and other disposal facilities.

Table 2 identifies the management methods for each of the material streams collected by ARR.

TABLE 2. ARR MATERIAL MANAGEMENT METHODS	
Management Method	Collection Practice
Recycling	Curbside single-stream recycling Curbside bulk items (recyclable) Household hazardous waste for recycling Resource Recovery Center items (recyclable)
Composting	Curbside yard trimmings Curbside organics (pilot) Curbside large brush
Disposal	Curbside trash Curbside bulk items (non-recyclable) Household hazardous waste disposed Resource Recovery Center items (non-recyclable)



The sum of recycling, composting, reuse, and disposal quantities represents the total generation of materials by ARR-served customers. Together, recycling, composting, and reuse activities are considered diversion¹.

Current generation and diversion quantities and rates are calculated in the next section, based on these management methods for the various collection programs operated by ARR and the quantities of material managed through each program during FY2014.

3.2. Material Quantities

During FY2014, ARR collected and managed 212,680 tons of material generated by its customers. Table 3 provides annual material tonnages by ARR program (refer to Appendix B for monthly detail on materials collected over the same period).

Note that not all materials collected for recycling or composting are ultimately diverted; some wastes are removed as contamination during the process of sorting the materials and are ultimately sent to landfills for disposal. Routine audits are performed at the City's contracted recycling facilities to characterize the materials recovered and estimate contamination. The most recent audits performed indicate that the recycling facilities observe a 16-18% rate of contamination, which results in residue from the recycling process that is sent to a landfill for disposal. This contamination rate has been deducted from the curbside recycling tonnage in Table 3 and Appendix B to provide a more accurate representation of disposal and diversion tonnages managed by ARR.

ARR does not have a measure of contamination removed at other processing facilities managing the City's material streams. To accurately track and report diversion in the future, it is recommended that ARR obtain reports of contamination from its other contracted facilities, including the Hornsby Bend Biosolids Management Plant and Organics by Gosh.

The Hornsby Bend Biosolids Management Plant indicated during the site visit in October 2014 that the material delivered has very little contamination (see Figure 1 for a sample of the material delivered to the facility). This is likely due to the brush collection program being mature and well-established, residents being well-educated in the materials that are acceptable, and route drivers collecting only acceptable materials.

Conversely, Organics by Gosh noted in discussion during the site visit in October 2014 that glass contamination is a significant challenge in managing material collected through the pilot curbside mixed organics program. This is an indication that additional resident education is needed to reinforce the materials that are acceptable and unacceptable for the program. An example of the quality of the material stream delivered to Organics by Gosh is shown in Figure 2.

¹ Note that the 2011 Master Plan defines diversion as "The combination of reusing, reducing, and recycling in order to keep materials from being disposed of in landfills. Diversion includes waste prevention activities and material sent to recyclers, composting systems, reuse facilities and other secondary use options." Because reduction/waste prevention activities cannot be directly quantified and because reuse is not a service provided by ARR, reduction and reuse activities are excluded from the calculation of the City-served residential diversion rate in this report.



TABLE 3. ARR MATERIAL QUANTITIES MANAGED (FY2014)

Management Method	Quantity (tons)
Disposal	
Curbside Trash	114,545
Bulk Trash	8,389
Household Hazardous Waste	404
Recyclables Contamination	8,841
Recycling	
Curbside Recycling, Less Contamination	46,415
Bulk Metal	211
Bulk Tires	174
Household Hazardous Waste	306
Composting	
Curbside Yard Trimmings	23,731
Large Brush	6,302
Curbside Organics Pilot	3,365
Total Generation	212,680
Disposal Subtotal	132,178
Diversion Subtotal	80,502



FIGURE 1. BRUSH AND YARD TRIMMINGS DELIVERED TO HORNSBY BEND





FIGURE 2. MIXED ORGANICS (INCLUDING GLASS AND PLASTIC CONTAMINATION) DELIVERED TO ORGANICS BY GOSH

Total generation by ARR customers is approximately 212,680 tons per year, of which 132,178 tons is disposed in landfills and 80,502 tons is diverted through recycling and composting activities. The 2011 Master Plan projected disposal of 115,000 tons and diversion of 115,000 tons in FY2015. Observed disposal tonnages for FY2014 are approximately 17,000 tons greater than the FY2015 projection, and observed diversion tonnages for FY2014 are approximately 35,000 tons less than the FY2015 projection.

Table 4 presents a historical summary of diversion and disposal tonnages managed by ARR since FY2008. As historically calculated, diversion tonnages increased by more than 30% while disposal tonnages declined by more than 12% between FY2008 and FY2013. Though the calculation of diversion and disposal tonnages has been modified for FY2014 to include residue from curbside recyclables, disposal tonnages continued to show a decline in FY2014 and are the lowest in the past 7 years.



TABLE 4. HISTORICAL ARR-COLLECTED TONNAGES

	Diversions	Disposal	Total Generation
FY2008	66,419	151,941	218,360
FY2009	77,292	136,893	214,185
FY2010	82,611	138,757	221,368
FY2011	84,257	134,168	218,425
FY2012	83,883	137,698	221,581
FY2013	87,380	133,064	220,444
FY2104	80,502	132,178	212,680

Note: FY2008-FY2013 diversion and disposal tonnages do not include an adjustment for contamination removed during the processing of recyclables, and therefore overstates diversion tonnages and understates disposal tonnages compared to the method utilized to calculate FY2014 diversion and disposal tonnages.

In addition to tracking total tonnages of material managed and diversion rates (calculated in Section 3.3), per household generation and disposal rates are important for the City to track going forward. As the waste stream continues to change, (such as through changes in product design/manufacturing, material consumption, source reduction activities, and other conditions which impact the base character of generated material), reductions in the per-household disposal rate can provide an additional method of tracking progress towards the City's Zero Waste goal.

ARR currently serves 192,423 households, and waste is therefore generated at a rate of 42.5 pounds per household per week. Of this, approximately 26.4 pounds per household per week is directed to landfill disposal and 16.1 pounds per household per week are diverted through recycling and composting. Per household generation and disposal rates showed some fluctuation between October 2013 and September 2014, likely due to seasonal variations in consumption; rates were largely unchanged from the beginning to the end of the fiscal year.

3.3. Current ARR Diversion Rate

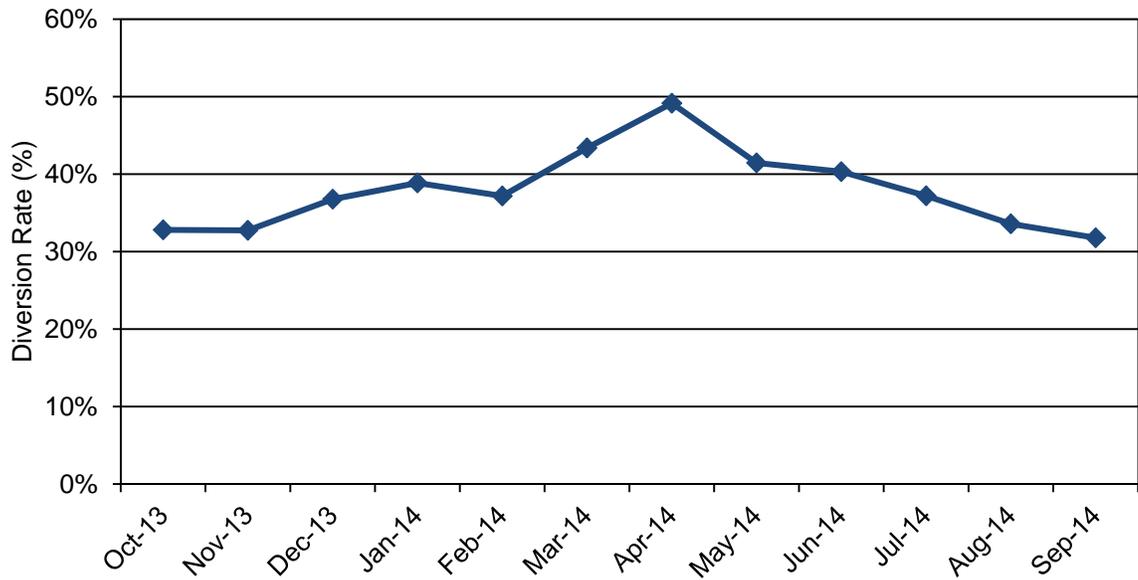
The current diversion rate achieved by ARR's programs and services is calculated by dividing tons diverted by tons generated:

$$\text{Diversion Rate (\%)} = \frac{\text{Tons Recycled} + \text{Tons Composted} + \text{Tons Reused}}{\text{Tons Generated}}$$

As previously noted, reuse was not quantified in this study and was therefore excluded from the above calculation. During FY2014, ARR-collected material was diverted through recycling and composting at an average rate of 38%. A review of monthly material tonnages (see Appendix B) indicates that yard trimmings and large brush are the most variable material in the diverted stream, and these materials contribute significantly to month-to-month variation in diversion Citywide. As shown in Figure 3 below, diversion was at its highest in April 2014, the peak of the spring growing season. While diversion increased steadily between October 2013 and April 2014, it showed a similarly steady decline in the last 5 months of the fiscal year, again consistent with trends in the quantity of yard trimmings and large brush managed by ARR.



FIGURE 3. ARR DIVERSION RATE (FY2014)



Historically, ARR's diversion rates as measured in this study generally increased between FY2008 and FY2013, increasing from 30% to 40% (excluding any adjustment for contamination removed during the processing of curbside recyclables). The calculated diversion rate does not include waste reduction/prevention that may be occurring in the residential sector, as the impact of such activities cannot be measured. It also does not include materials from the residential sector which are sent for reuse, because reuse was not measured in this study.

The 2011 Master Plan has a goal of diverting 50% by FY2015. To achieve this goal, an additional approximately 25,800 tons of waste must be diverted from the disposed waste stream with no change in current generation. Section 5 of this report contains recommendations to increase diversion in the near term and continue working towards this goal.



4.0 Material Composition

While ARR has historically tracked and reported waste and diversion quantities that it manages, there has previously been no evaluation of the specific composition of the City's waste stream². CB&I conducted a field sorting study in September and October of 2014 to determine the composition of the curbside trash and curbside recyclables collected by ARR. The results of the field sorting study are presented in this section.

4.1. Trash Composition

A total of 75 samples of ARR-collected residential trash were targeted for sorting, with a minimum of 40 samples required to meet the desired level of statistical significance. Overall, the field crew collected and sorted 47 samples during the one-week study from October 6-10, 2014. Figures 4, 5, and 6 show the sample selection process for a trash load.

The average sample size was 253 pounds, within the 200-300 pound range established in the ASTM D 5231-92 standard. A total of 11,900 pounds of trash were sorted and characterized during the sorting event. Individual sample data is contained in Appendix C. Images of sorted material are provided in Figures 7, 8, 9, and 10 below.



FIGURE 4. TRASH LOAD FOR SAMPLING



² The 2008 Zero Waste Plan did contain estimates of composition; however, these estimates were based on modeling regional data and data from cities of similar size and characteristics, as noted in that plan.



FIGURE 5. SAMPLE SELECTION FROM TRASH LOAD



FIGURE 6. TRASH SAMPLE SET ASIDE FOR SORTING





FIGURE 7. SORTED PAPER FROM TRASH SAMPLE

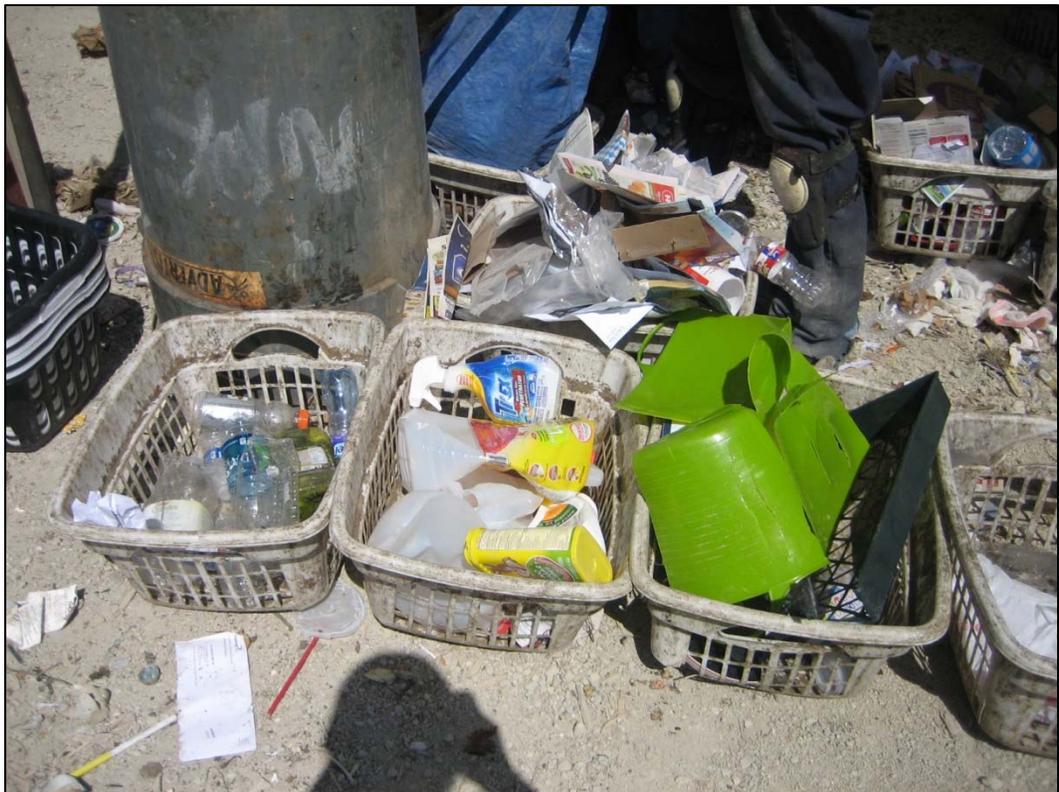


FIGURE 8. SORTED PLASTICS FROM TRASH SAMPLE





FIGURE 9. SORTED GLASS, PLASTIC FILM, AND METALS FROM TRASH SAMPLE



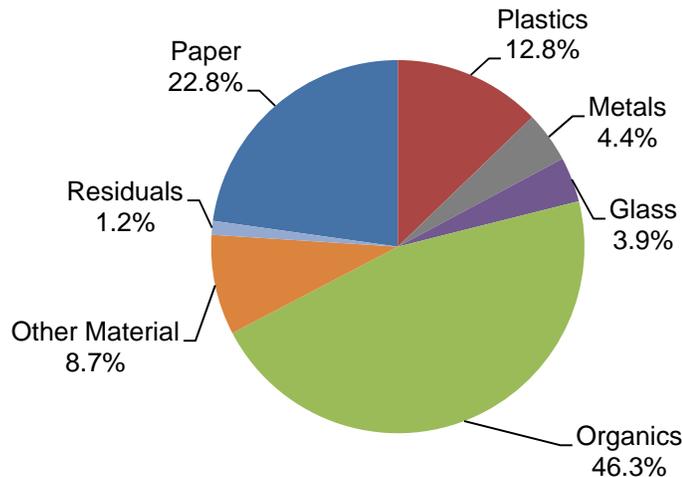
FIGURE 10. RESIDUAL MATERIAL FROM TRASH SAMPLE, BEING WEIGHED



The composition of the ARR-collected trash stream by material class is shown in Figure 11. Organics (including food wastes, yard trimmings, wood, and other organic materials) comprise nearly half of the disposed waste stream. Traditional recyclable materials (paper, plastics, metals, and glass) comprise an additional 44% of the disposed waste stream.

A significant portion of the ARR-collected trash stream is potentially recoverable and could be diverted from disposal by the generator through the curbside recycling program. Materials classified as “other” (e.g., other paper, other plastic) are less likely to be recoverable, unless the processing facilities accept them (e.g., aseptic containers, plastics #3-7 which were not separately characterized in the sorting study).

FIGURE 11. ARR-COLLECTED TRASH STREAM, BY MATERIAL CLASS



Source: CB&I, City-Serviced Residential Waste Characterization Study, 2014.

Detailed results of the sorting study, by material category, are presented in Table 5. The principal materials present in the disposed waste stream are food waste (25.8%), other organics/combustibles (12.3%), mixed paper (9.1%), other paper (8.1%), other plastics (6.8%) and yard trimmings (6.6%). Together, these wastes comprise nearly 70% of the disposed waste stream.

TABLE 5. ARR-COLLECTED TRASH COMPOSITION

	Average	+ / -
Paper	22.8%	1.6%
Mixed Paper	9.1%	0.8%
Newsprint	3.9%	0.7%
Corrugated Cardboard	1.6%	0.4%
Other Paper	8.1%	0.6%
Plastics	12.8%	0.8%
PET	1.5%	0.2%
HDPE	1.0%	0.2%
Single-Use Plastic Bags	0.5%	0.1%
Rigid Plastics	3.0%	0.3%



TABLE 5. ARR-COLLECTED TRASH COMPOSITION

	Average	+ / -
Other Plastics	6.8%	0.6%
Metals	4.4%	0.6%
Aluminum	1.3%	0.2%
Ferrous Metal	2.0%	0.4%
Other Metal	1.0%	0.5%
Glass	3.9%	0.9%
Glass Jars and Bottles	2.9%	0.7%
Other Glass	1.0%	0.4%
Organics	46.3%	2.6%
Food	25.8%	2.1%
Yard Trimmings	6.6%	2.3%
Wood (not Yard Trimmings or C&D)	1.5%	0.5%
Other Organics/Combustibles	12.3%	1.7%
Other Material	8.7%	1.9%
Electronics	0.3%	0.2%
C&D	2.0%	1.5%
Textiles	2.9%	0.6%
HHW	0.3%	0.3%
Other Inorganics/Non-Combustibles	3.2%	1.1%
Residuals	1.2%	1.3%
Unknown or Not Classified	1.2%	1.3%

Source: CB&I, City-Serviced Residential Waste Characterization Study, 2014.

4.2. Single-Stream Recycling Composition

A total of 75 samples of ARR-collected single-stream recyclables were targeted for sorting, with a minimum of 40 samples required to meet the desired level of statistical significance. Overall, the field crew collected and sorted 50 samples during the one-week study from September 29-October 3, 2014. Figures 12, 13, and 14 show the sample selection process for a recycling load.

The average sample size was 231 pounds, within the 200-300 pound range established in the ASTM D 5231-92 standard. A total of 11,550 pounds of trash were sorted and characterized during the sorting event. Individual sample data is contained in Appendix D. Images of sorted material are provided in Figures 15, 16, 17, and 18 below.





FIGURE 12. RECYCLING LOAD FOR SAMPLING



FIGURE 13. SAMPLE SELECTION FROM RECYCLING LOAD



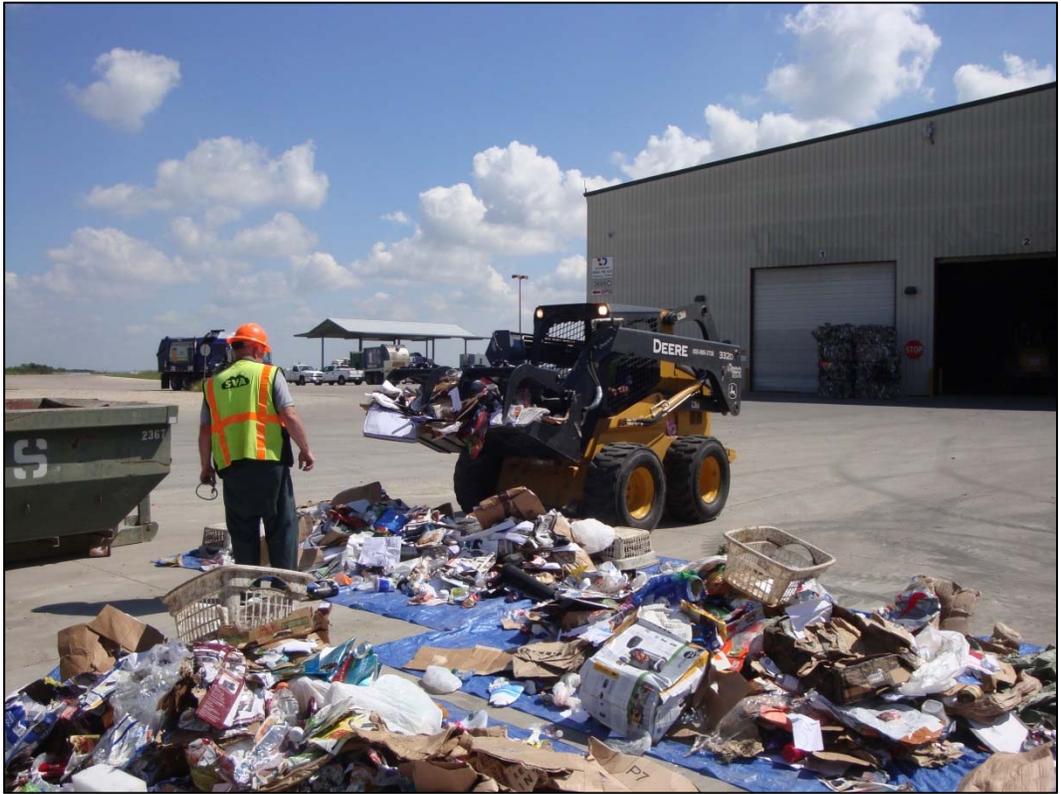


FIGURE 14. RECYCLING SAMPLE AGGREGATION



FIGURE 15. SORTED PLASTICS FROM RECYCLING SAMPLE





FIGURE 16. SORTED ALUMINUM AND PLASTIC FILM FROM RECYCLING SAMPLE

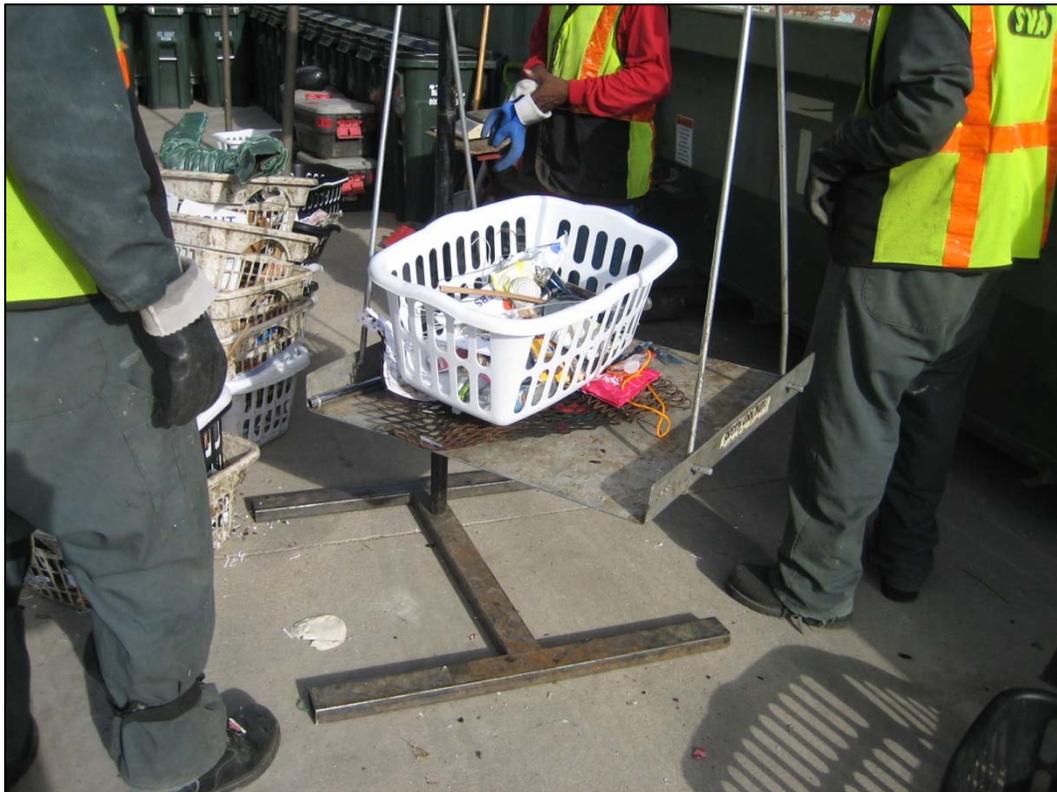
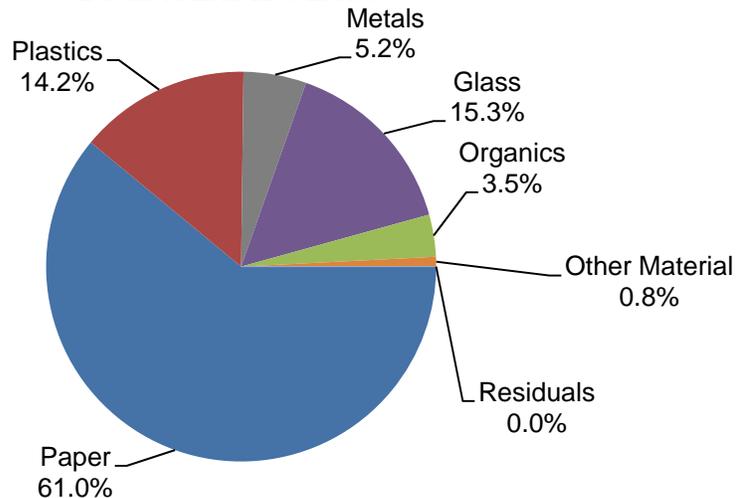


FIGURE 17. WEIGHING OF SORTED METALS FROM RECYCLING SAMPLE



The composition of the ARR-collected recyclables stream by material class is shown in Figure 18. Paper (including newsprint, corrugated cardboard, mixed paper, and other paper) comprises more than 60% of the material collected curbside for recycling. Glass is the second largest contributor to the recycling stream, with approximately 15% of collected recyclables being glass.

FIGURE 18. ARR-COLLECTED RECYCLABLES STREAM, BY MATERIAL CLASS



Source: CB&I, City-Serviced Residential Waste Characterization Study, 2014.

Detailed results of the sorting study, by material category, are presented in Table 6. The principal materials present in the curbside recycling stream are mixed paper (24.6%), glass jars and bottles (13.7%), newsprint (13.4%), corrugated cardboard (12.8%), and other paper (10.3%). Together, these materials comprise nearly 75% of the disposed waste stream.

The recyclables were sorted as collected (i.e., prior to processing by the recycling facility), and therefore a portion of the recyclables may ultimately have not been recovered during processing and been considered contamination. While the sorting data showed no residual materials present, approximately 4% of the recyclables stream was comprised of organics (primarily food wastes) which are not recovered at the recycling facility. Additionally, the categories of other paper (10.3%) and other plastics (3.7%) may include contaminants that would not be recovered during the recycling process but which, with manual sorting, were categorized.



TABLE 6. ARR-COLLECTED RECYCLABLES COMPOSITION

	Average	+ / -
Paper	61.0%	1.7%
Mixed Paper	24.6%	1.1%
Newsprint	13.4%	1.0%
Corrugated Cardboard	12.8%	1.1%
Other Paper	10.3%	1.0%
Plastics	14.2%	0.8%
PET	4.1%	0.3%
HDPE	3.5%	0.3%
Single-Use Plastic Bags	0.4%	0.1%
Rigid Plastics	2.5%	0.3%
Other Plastics	3.7%	0.3%
Metals	5.2%	0.5%
Aluminum	2.2%	0.2%
Ferrous Metal	2.3%	0.2%
Other Metal	0.8%	0.4%
Glass	15.3%	1.7%
Glass Jars and Bottles	13.7%	1.6%
Other Glass	1.6%	0.5%
Organics	3.5%	0.7%
Food	1.4%	0.6%
Yard Trimmings	0.3%	0.2%
Wood (not Yard Trimmings or C&D)	0.4%	0.2%
Other Organics/Combustibles	1.5%	0.5%
Other Material	0.8%	0.3%
Electronics	0.0%	0.0%
C&D	0.1%	0.1%
HHW	0.0%	0.0%
Textiles	0.5%	0.2%
Other Inorganics/Non-Combustibles	0.2%	0.2%
Residuals	0.0%	0.0%
Unknown or Not Classified	0.0%	0.0%

Source: CB&I, City-Serviced Residential Waste Characterization Study, 2014.

4.3. Summary

During FY2014, ARR collected 114,545 tons of trash and 55,256 tons of recyclables curbside from its customers. Based on the composition of these streams, Table 7 shows the quantity of each of the components of the waste stream estimated to have been collected for disposal and collected for recycling during FY2014. Figure 19 shows the total composition of the trash and recyclables streams collected by ARR.



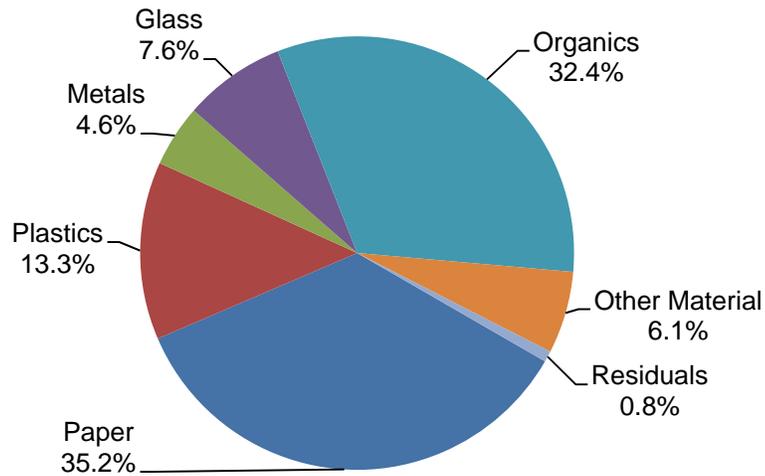
TABLE 7. ARR-COLLECTED TRASH AND RECYCLABLES BY COMPONENT

	Trash (tons)	Recyclables (tons)	Total (tons)
Paper			
Mixed Paper	10,424	13,593	24,017
Newsprint	4,467	7,404	11,871
Corrugated Cardboard	1,833	7,073	8,906
Other Paper	9,278	5,691	14,969
Plastics			
PET	1,718	2,265	3,983
HDPE	1,145	1,934	3,079
Single-Use Plastic Bags	573	221	794
Rigid Plastics	3,436	1,381	4,817
Other Plastics	7,789	2,044	9,833
Metals			
Aluminum	1,489	1,216	2,705
Ferrous Metal	2,291	1,271	3,562
Other Metal	1,145	442	1,587
Glass			
Glass Jars and Bottles	3,322	7,570	10,892
Other Glass	1,145	884	2,029
Organics			
Food	29,553	774	30,327
Yard Trimmings	7,560	166	7,726
Wood (not Yard Trimmings or C&D)	1,718	221	1,939
Other Organics/Combustibles	14,089	829	14,918
Other Material			
Electronics	344	0	344
C&D	2,291	55	2,346
HHW	344	0	344
Textiles	3,322	276	3,598
Other Inorganics/Non-Combustibles	3,665	111	3,776
Residuals			
Unknown or Not Classified	1,375	0	1,375
Total	114,545	55,256	169,801

Source: CB&I, City-Serviced Residential Waste Characterization Study, 2014.



FIGURE 19. ARR-COLLECTED TRASH AND RECYCLABLES, BY MATERIAL CLASS



Source: CB&I, City-Serviced Residential Waste Characterization Study, 2014.

A review of the data in Table 7 indicates that many of the traditional recyclables targeted by ARR's recycling program, including mixed paper, newsprint, corrugated cardboard, PET plastic, HDPE plastic, and glass jars and bottles, are recycled at a greater than 50% rate. However, aluminum and ferrous metals are more prevalent in the disposed waste stream, as are rigid plastics (only recently added to ARR's recycling program).

As identified in Section 4.1, organics are the most significant portion of the disposed waste stream. Food waste, an emerging area that ARR is beginning to serve, is the largest component of the disposed waste stream at more than 29,000 tons per year. Yard trimmings constitute an additional 7,500 tons of the disposed waste stream, despite ARR operating a separate collection program for yard trimmings and brush.



5.0

Recommendations

The composition of the ARR-collected residential waste stream, over which it has direct control, provides guidance for future programs and services that can assist the City to continue making progress towards its Zero Waste goal. ARR currently operates a number of successful collection programs, providing residents access to many diversion opportunities. Building on the existing collection and management infrastructure, before considering new programs and/or new facilities to manage materials, will therefore be the most cost-effective approach to increase diversion, and is also consistent with the recommendations of the 2008 Zero Waste Plan. This section provides a number of recommendations for near-term implementation that may increase diversion cost-effectively.

- 1. Continue customer education.** Ensuring customers are aware of the materials that may be diverted and of proper preparation of recyclable materials is essential to every waste diversion program. The trash sort indicated that nearly one-third of the disposed waste stream consists of materials that are currently accepted in the curbside collection program (cardboard, newsprint, mixed paper, HDPE and PET plastics, aluminum, ferrous metal, glass bottles/jars, and yard trimmings), supporting the need for continued education. Customer education may focus on several key areas, including:
 - Awareness of materials that may be recycled, particularly new materials (e.g., rigid plastics) and materials that are hard to define (e.g., mixed paper);
 - Written and visual representation of recyclable materials, including common materials that ARR has collected for several years such as cardboard, newsprint, mixed paper, HDPE and PET plastics, aluminum, ferrous metal, glass bottles/jars, and yard trimmings due to the continued presence of notable quantities of these materials in the disposed waste stream;
 - Notification of diversion or reuse outlets for materials that are not collected in current curbside programs through a City-produced “Green Guide” which identifies area businesses and at-home management options;
 - Cost reductions that may be realized by residents when reducing the size of their trash cart and maximizing the use of curbside recycling and yard trimmings collections; and
 - Options for at-home management of organics through backyard composting and mulching of grass clippings.
- 2. Perform an analysis of diversion rates on a route basis throughout the City.** Reviewing diversion and disposal tonnages and assessing the level of participation in curbside programs on an individual route basis can assist in identifying particular areas of the City in which diversion is lowest. This can allow for the development and implementation of targeted outreach and education efforts, beyond the broad-based education provided currently.
- 3. Expand access to curbside organics collection services to increase diversion of food waste from disposal.** Food waste, as the single largest component of the disposed waste stream, represents an opportunity for a substantial increase in diversion if collection service is provided to more households. Expansion of curbside organics collection citywide by FY2015 was also recommended in the 2011 Master Plan.

Currently, households with only yard trimmings collection set out an average of 265 pounds per year of yard trimmings. Households participating in the curbside organics pilot, setting out mixed food waste and yard trimmings, place an average of 481 pounds



per year of organics out for collection, indicating that households may set out an average of 216 pounds per year of food waste (481 pounds of mixed organics - 265 pounds of yard trimmings). This equates to an average of 4.2 pounds of food waste per household per week, consistent with organics collection programs that have been tested in other communities (e.g., Highland Park, Illinois with a 4.4 pounds per household per week set-out rate) and lower than the set-out rate observed in communities where food waste collection is an established program (e.g., Seattle, Washington with a 6.5 pounds per household per week set-out rate).

An important consideration for the City in expansion of the curbside organics program is the availability of composting capacity to manage the increased tonnage collected. Capacity data was not reviewed in the preparation of this report, and additional investigation will be needed to assess this consideration. If capacity is available, current contracts allow, and costs are not prohibitive, full implementation of curbside organics collection will provide the greatest diversion increase for the City and reduce customer confusion.

It is also important to note that a significant contaminant noted by the City's contracted mixed organics compost facility is glass. Greater education regarding materials accepted and preparation of materials for set-out will be necessary for both the households currently served in the pilot area as well as those in future expansion areas to continue to produce high quality compost.

- 4. Review existing contracts with recycling and composting facilities and identify incentives to increase diversion that may be included in the next contract.** By incentivizing processing facilities to accept additional types and/or quantities of material, more components of ARR's waste stream may be targeted for diversion. A review of the current service contracts was beyond the scope of this project. Potential incentives could include:
 - Reducing the revenue share due to the City from the processing facilities when contamination detected in periodic sorts of ARR material is below certain thresholds (e.g., below 10%). This may incentivize the processing facilities to maximize recovery of material to retain a greater share of revenues.
 - Providing a purchasing commitment for compost produced from ARR-collected organics.
- 5. Investigate recycling options for bulk items which are currently disposed, such as furniture and mattresses.** These items are currently sent to the landfill for disposal. While reuse options for furniture and mattresses that have been set out on the curb for collection are likely not feasible, recycling options may exist within the marketplace to divert them from disposal. Local companies including Rubbish Works, Junk Guys, and Get it Gone all provide collection services for these materials, and they each provide disassembly and recycling of components to the extent possible.
- 6. Implement a textiles collection program.** The 2011 Master Plan recommended conducting a pilot textiles collection program during FY2014, which has not been implemented to date. In addition to providing an outlet for reuse, contractors serving these programs also have recycling options for textiles that cannot be reused. Textiles collection often results in revenue from the collector, which may offset some or all of the costs associated with the program. Based on the results of the trash sort, an estimated 3,322 tons of textiles may be disposed annually by ARR customers; diversion of this material could result in up to a 1.5% increase in the ARR diversion rate. The impact on



other donation and reuse outlets (e.g., Goodwill, Salvation Army, thrift stores, etc.) should be considered prior to developing such a program.

- 7. Enhance data collection for City-serviced residential waste.** To provide greater detail on progress towards the long-term Zero Waste goal in the City-serviced residential sector, additional data is recommended to be collected. As noted in Section 3.2, ARR does not currently receive data on contamination from its organics processing facilities, Hornsby Bend Biosolids Management Plant and Organics by Gosh. This data should be sought in the future, either under the existing contracts (if possible) or as a condition of future contracts with these or other organics sites. Additionally, the current study did not attempt to quantify reuse activities from the City-serviced residential sector, in part because data is not currently available. ARR will be undertaking a further study of the privately-serviced generators in the City during 2015; through that study, recommendations will be developed to identify data collection methods for reuse activities. It is expected that the resulting recommendations will be implemented prior to the next update of the City-Serviced Residential Waste Characterization Study, anticipated to be completed in 2019.

In the longer term, the City may also consider further evaluation of the following recommendations:

- 1. Implement a ban on yard trimmings in trash.** If education efforts do not result in decreased yard trimmings in the disposed waste stream, the City may consider passing an ordinance to ban yard trimmings in trash. Because ARR already provides collection of yard trimmings as part of its base service at no added cost to residents, costs associated with this option are expected to be related to ordinance enforcement only; however, route adjustments for trash and yard trimmings collection may be necessary to accommodate for reduced trash collection and increased yard trimmings collection quantities. Implementation of a yard trimmings ban will require that adequate compost capacity is available to manage the additional incoming material.
- 2. Provide recycling collection service every week.** With recyclables currently collected every other week, some households may fill their recycling container to capacity before their collection day or forget to place their container at the curb for collection on the proper week. Increasing the frequency of recyclables collection may increase the quantity of material segregated for recycling.

This study did not investigate paired set-outs of trash and recycling from individual households to assess the potential impact such a change may have on diversion rates. A visual observation of a random sampling of set-outs Citywide is recommended to further evaluate the need for more frequent recycling collection.

An additional consideration is the cost associated with an increase in recycling collection frequency. ARR's budget and rate models were not reviewed as part of the scope of this study. ARR will need to evaluate the collection cost increase relative to the economic and environmental benefits of increased diversion of recyclables from the landfill if this recommendation is considered further.

- 3. Provide trash collection every other week.** The Texas Commission on Environmental Quality (TCEQ) rules require that waste containing putrescible materials (i.e., organic wastes) to be collected at least once per week. In order to reduce the frequency of trash collection to less than once per week, in accordance with TCEQ rules putrescible wastes must not be present. If the City implements a ban on organics in trash, and if the



ordinance is adequately enforced and households properly manage organic wastes, then a switch to every other week collection of trash may be possible (further review of TCEQ rules may also be required to confirm that such an option is allowable).

Reducing trash collection to every other week may further encourage residents to maximize the use of recycling and organics collection services, but it is likely to require significant effort to build public and political support for the change. Such a change has been successfully implemented in some larger cities in the Pacific Northwest, including Portland, Oregon and Tacoma, Washington, while others such as Seattle, Washington have chosen to table such considerations. Seattle's hesitation to implement the option cited higher contamination in the recycling and composting streams in pilot areas and decreased customer satisfaction.



APPENDIX A
SAMPLING PLAN



City of Austin – Austin Resource Recovery Internal Waste Composition Study Sampling and Sorting Methodology Garbage and Recyclables

Sample Selection.

Samples will be obtained from City collection vehicles that have been randomly selected by route. The routes that have been selected are included as Attachment A (Garbage) and Attachment B (Recycling).

Once the designated vehicle(s) enter the landfill, the driver will notify the gate attendant that the load is a part of the ARR Internal Waste Composition Study (Study). The gate attendant will instruct the driver to proceed to the unloading location, which will be in proximity to that day's active working face for garbage and on a designated paved area for recyclables. The vehicles selected for sampling will empty their loads in an elongated pile in the designated location. From each pile, the field crew will select one sample using an imaginary 8 cell grid (four sections – one each side of the pile and two layers – 1 through 4 on the top and 5 through 8 on the bottom layer) superimposed over the dumped material. The crew supervisor will use the randomly pre-selected cell, indicated on the Attachments A and B, to be sampled. In the event that the designated cell is not accessible due to site constraints, an alternate cell (typically the cell's mirror-image) will be randomly selected. Then, approximately 300 pounds of garbage or recyclables will be extracted from the designated cell and transported to the sorting location. Care will be taken when sampling from the bottom layer (cells 5 through 8) to avoid collecting any material (dirt and soil typically) from the unloading area.

Bulky items may be encountered in some garbage loads. The use of a grid-selection process to identify whole-sample cells helps ensure that such items are accounted for when encountered. Occasionally, however, bulky items in a sample may result in a sample weight in excess of 300 pounds. Bulky items will be reduced to component parts to the extent possible and be included in the total sample.

Once the sample has been extracted from the pile, it will be transported to the sorting location and deposited on a tarp. The crew supervisor will visually check the approximate weight of the material. If more is needed, it will be obtained from the pile as noted above, or, if too much has been extracted, a vertical slice will be removed and not sorted. The sample will then be sorted as described below.

Once the appropriate amount of material has been delivered to the sorting location, the remainder of the load can be incorporated into the active portion of the landfill or the recyclable's sorting queue, or otherwise removed for disposal.

Sorting Methodology.

Samples will be selected based on the protocol described above. When a sample meets the range of 200-300 pounds, the sample will be photographed and the crew will begin sorting the waste into the appropriate categories listed below. Laundry baskets and plastic tubs will be used to hold materials as the sample is sorted. Bags, boxes, and containers encountered in the sample will be emptied and their contents sorted. Wastes containing materials from multiple categories (e.g., a child's electronic toy comprised of paper, plastic, and electronic components) will be sorted into the category with the most weight, i.e., paper and plastic would go to the "mixed paper and materials" category if the weight of the paper was estimated to be more than

the weight of the plastic. Recyclable materials that contain multiple categories will be designated as residuals.

The field crew will sort samples to the greatest reasonable level of detail, until no more than a small amount of material remains. Many samples, after being sorted down to five pounds or less, contain small residual pieces of material which are difficult to separate. The material will be screened over a 1" square mesh, resulting in two materials: "supermix" (materials too large to pass through the screen) and "fines" (material one-inch and less, often mixed with dirt). Materials contained in the supermix will be further sorted to the degree possible and any remaining supermix categorized as such and described. Fines will be characterized as such and recorded. This is most applicable to the garbage sort, but could be necessary for the recyclables.

Once the sample sorting is complete, baskets will be visually checked for accuracy and the samples weighed. Two scales will be used to weigh samples: a 250-pound hanging digital scale of 0.1-pound accuracy and a digital platform scale with 0.01-pound accuracy, for smaller items. The weight of any individual items weighing more than 250 pounds will be estimated by the crew, usually by having two or more members lift the object and agreeing on the estimated weight. A visual estimate of the composition of any supermix and/or fines will be made and recorded. Any additional observations about the sample, such as the presence of bulky items or unusual wastes, will be recorded. Additional photographs of the sorted materials will be taken for quality assurance purposes.

All weights and observations will be recorded in written form on paper data forms. The paper forms will be organized according to category, and each form will have a designated line for the recording of the weight. Additionally, all forms will prompt for the following basic information to be included: Date; Site Location; Sample ID (route or truck number); Collection Vehicle Type; and Sampling Cell. Space will also be provided for general notations and comments. Once a form is completed, it will be reviewed for completeness and accuracy and compared to the visual observations of the material. Once the form is deemed complete, it will be placed into a folder for recordkeeping.

Once the sample data has been recorded, the sorted material will be placed into a roll-off or similar container provided by the City, or the landfill, for disposal or further processing of recyclables. If the sorted recyclables are to be sent to a processing facility, they can be placed into a separate container if provided.

The following are the sort categories for the material:

- Mixed paper
- Newsprint
- Corrugated paper
- Plastics
 - HDPE
 - PET
 - Single Use Plastic Bags
 - Rigid Plastics
 - Other
- Yard waste
- Food waste
- Wood (other than yard waste or C&D)
- Ferrous metal
- Aluminum
- Glass
- Electronics
- Construction and Demolition (C&D) material
- Household hazardous waste
- Textiles
- Other organics/combustibles
- Other inorganics/non-combustibles
- Residuals (unknown material)

Attachment A
Garbage Route Selection

Sample Number	Garbage Day	Garbage Route	Sample Cell Designation
1	Monday	PAM02	6
2	Monday	PAM62	8
3	Monday	PM22	7
4	Monday	PAM60	5
5	Monday	PM20	4
6	Monday	PAM52	6
7	Monday	PM11	6
8	Monday	PAM53	3
9	Monday	PM12	1
10	Monday	PAM04	1
11	Monday	PM32	3
12	Monday	PAM51	7
13	Monday	PAM70	3
14	Monday	PM41	1
15	Monday	PM21	6

Sample Number	Garbage Day	Garbage Route	Sample Cell Designation
1	Tuesday	PAT72	5
2	Tuesday	PAT52	7
3	Tuesday	PT41	8
4	Tuesday	PT21	3
5	Tuesday	PAT74	8
6	Tuesday	PAT50	7
7	Tuesday	PAT61	8
8	Tuesday	PAT81	8
9	Tuesday	PT42	5
10	Tuesday	PT30	2
11	Tuesday	PAT84	5
12	Tuesday	PAT51	3
13	Tuesday	PAT03	5
14	Tuesday	PT31	2
15	Tuesday	PT20	7

Sample Number	Garbage Day	Garbage Route	Sample Cell Designation
1	Wednesday	PAW82	3
2	Wednesday	PW30	7
3	Wednesday	PAW54	6
4	Wednesday	PAW71	3
5	Wednesday	PW32	5
6	Wednesday	PAW50	4
7	Wednesday	PAW55	7
8	Wednesday	PW20	5
9	Wednesday	PAW81	8
10	Wednesday	PW10	1
11	Wednesday	PW12	4
12	Wednesday	PW11	2
13	Wednesday	PAW62	8
14	Wednesday	PW31	2
15	Wednesday	PAW64	8

Sample Number	Garbage Day	Garbage Route	Sample Cell Designation
1	Thursday	PAH72	3
2	Thursday	PH21	5
3	Thursday	PAH53	3
4	Thursday	PAH06	1
5	Thursday	PAH51	4
6	Thursday	PAH66	8
7	Thursday	PAH64	1
8	Thursday	PAH65	7
9	Thursday	PH41	5
10	Thursday	PAH84	3
11	Thursday	PAH74	6
12	Thursday	PH42	5
13	Thursday	PAH05	5
14	Thursday	PAH61	5
15	Thursday	PAH82	4

Sample Number	Garbage Day	Garbage Route	Sample Cell Designation
1	Friday	PAF70	3
2	Friday	PAF73	7
3	Friday	PAF83	5
4	Friday	PF22	5
5	Friday	PAF63	5
6	Friday	PAF01	1
7	Friday	PF10	8
8	Friday	PAF82	2
9	Friday	PAF03	5
10	Friday	PAF53	1
11	Friday	PAF62	3
12	Friday	PAF50	6
13	Friday	PAF81	5
14	Friday	PAF04	2
15	Friday	PAF54	5

Attachment B
Recycle Route Selection

Sample Number	Recycle Day	Recycle Route	Sample Cell Designation
1	Monday	RMBU11	1
2	Monday	RMBS41	3
3	Monday	RMBU25	6
4	Monday	RMBU15	7
5	Monday	RMBU26	5
6	Monday	RMBU20	1
7	Monday	RMBU24	1
8	Monday	RMBU16	1
9	Monday	RMBU21	4
10	Monday	RMBS34	5
11	Monday	RMBS40	8
12	Monday	RMBU12	5
13	Monday	RMBS43	2
14	Monday	RMBS42	6
15	Monday	RMBU14	3

Sample Number	Recycle Day	Recycle Route	Sample Cell Designation
1	Tuesday	RTBS33	6
2	Tuesday	RTBU26	6
3	Tuesday	RTBS43	8
4	Tuesday	RTBU15	7
5	Tuesday	RTBU16	4
6	Tuesday	RTBS34	4
7	Tuesday	RTBU23	5
8	Tuesday	RTBS40	4
9	Tuesday	RTBU20	2
10	Tuesday	RTBU12	3
11	Tuesday	RTBS35	1
12	Tuesday	RTBU11	2
13	Tuesday	RTBU10	4
14	Tuesday	RTBS41	3
15	Tuesday	RTBU22	2

Sample Number	Recycle Day	Recycle Route	Sample Cell Designation
1	Wednesday	RWBS43	8
2	Wednesday	RWBS35	7
3	Wednesday	RWBU14	1
4	Wednesday	RWBU25	4
5	Wednesday	RWBU10	3
6	Wednesday	RWBS33	2
7	Wednesday	RWBU23	3
8	Wednesday	RWBU11	5
9	Wednesday	RWBS41	7
10	Wednesday	RWBS34	2
11	Wednesday	RWBU21	3
12	Wednesday	RWBU24	5
13	Wednesday	RWBU13	3
14	Wednesday	RWBU16	3
15	Wednesday	RWBU26	4

Sample Number	Recycle Day	Recycle Route	Sample Cell Designation
1	Thursday	RHBS33	7
2	Thursday	RHBU25	8
3	Thursday	RHBU20	3
4	Thursday	RHBU14	7
5	Thursday	RHBU13	8
6	Thursday	RHBU24	6
7	Thursday	RHBU26	2
8	Thursday	RHBU12	4
9	Thursday	RHBS43	3
10	Thursday	RHBU16	6
11	Thursday	RHBS35	6
12	Thursday	RHBS42	5
13	Thursday	RHBU21	6
14	Thursday	RHBU11	7
15	Thursday	RHBU10	2

Sample Number	Recycle Day	Recycle Route	Sample Cell Designation
1	Friday	RFBS35	3
2	Friday	RFBS34	3
3	Friday	RFBU10	8
4	Friday	RFBU25	5
5	Friday	RFBU11	8
6	Friday	RFBU22	2
7	Friday	RFBU24	5
8	Friday	RFBU20	1
9	Friday	RFBU23	3
10	Friday	RFBS33	8
11	Friday	RFBS42	4
12	Friday	RFBS40	4
13	Friday	RFBS41	7
14	Friday	RFBU21	5
15	Friday	RFBU16	2

APPENDIX B

ARR MATERIAL QUANTITIES (AUGUST 2013 - JULY 2014)



APPENDIX B - ARR MATERIAL QUANTITIES (FY2014)

	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Total
Curbside Trash	10,878	10,054	10,976	9,731	8,215	8,593	8,863	8,746	8,609	9,144	10,025	10,711	114,545
Curbside Recycling	4,750	4,341	5,133	5,021	4,208	4,329	4,620	4,743	4,528	4,700	4,654	4,228	55,256
Curbside Yard Trimmings	1,204	1,144	2,290	2,273	1,601	2,682	4,486	2,526	1,927	1,458	1,005	1,135	23,731
Large Brush	743	422	321	320	479	420	625	523	560	583	490	816	6,302
Bulk Metal	6	41	3	25	6	11	13	26	29	22	11	17	211
Bulk Tires	25	12	13	10,97	25	0	7	19	26	11	11	24	174
Bulk Trash (Non-metal)	997	404	496	528	1,022	121	397	1,142	765	991	401	1,124	8,389
Household Hazardous Waste - Recycled	30	21	21	13	17	20	32	27	31	37	30	28	306
Household Hazardous Waste - Disposed	37	41	22	34	23	26	35	48	39	40	40	19	404
Curbside Organics Pilot	134	103	171	153	179	413	586	387	405	352	213	268	3,365
Recycling Contamination (16%)	760	694	821	803	673	693	739	759	724	752	745	676	8,841
Generation (tons)	18,803	16,583	19,445	18,098	15,775	16,616	19,663	18,187	16,920	17,338	16,881	18,371	212,680
Disposal (tons)	12,671	11,193	12,315	11,097	9,933	9,433	10,035	10,695	10,138	10,926	11,211	12,531	132,178
Diversions (tons)	6,132	5,390	7,130	7,001	5,841	7,183	9,628	7,492	6,782	6,412	5,670	5,840	80,502
Diversions (%)	33%	33%	37%	39%	37%	43%	49%	41%	40%	37%	34%	32%	38%
Generation rate (lbs/hh/week)	45.1	39.8	46.6	43.4	37.8	39.9	47.2	43.6	40.6	41.6	40.5	44.1	42.5
Disposal rate (lbs/hh/week)	30.4	26.8	29.5	26.6	23.8	22.6	24.1	25.7	24.3	26.2	26.9	30.1	26.4

All quantities in tons, except where noted.

Households Served =

192,423

Source:

Austin Resource Recovery data.

APPENDIX C
TRASH SAMPLING DATA



APPENDIX D
RECYCLABLES SAMPLING DATA.



APPENDIX D - RECYCLABLES SAMPLING DATA

PERCENT	Route No. Truck No.	Monday - 9/29/2014										Tuesday - 9/30/2014										Wednesday - 10/1/2014										Thursday - 10/2/2014										Friday - 10/3/2014									
		RMBS42 08G826	RMBS40 11G565	RMBU21 08G802	RMBU16 12G580	RMBU25 12G578	RMBU26 10G993	RMBU15 10G988	RMBU14 08G794	RMBU20 08G801	RMBU34 10G992	RMBS43 13G166	RMBU24 08G798	RMBS41 08G797	RMBU11 08G042	RMBU12 13G465	RTBU22 08G801	RTBU12 13G465	RTBU26 10G993	RTBS40 11G565	RTBU16 13G466	RTBU10 10G988	RTBU11 12G580	RTBU23 08G800	RTBU15 10G755	RWB26 08G797	RTBU20 08G798	RWB24 08G798	RWB13 08G792	RWB35 08G799	RWB11 12G580	RWB10 10G755	RWB23 12G578	RWB21 12G579	RTBS33 11G566	RTBS43 13G166	RTBS41 08G826	RWB16 13G466	RWB14 10G988	RHB21 12G579	RHB11 12G580	RHBS42 08G799	RFBU11 12G580	RHBS33 08G802	RHB20 08G801	RHB16 08G796	RFB542 10G755	RFBU16 08G800	RFB16 13G466	RFB25 10G754	RFB533 10G993
PAPER																																																			
Mixed Paper		22.9%	25.4%	27.2%	28.2%	19.4%	31.9%	20.4%	29.3%	26.4%	21.5%	21.1%	26.6%	32.6%	30.2%	30.3%	21.0%	24.8%	15.6%	28.3%	16.8%	34.2%	26.2%	29.2%	12.7%	19.9%	26.1%	30.8%	20.4%	21.4%	25.8%	25.1%	25.3%	24.6%	19.8%	16.0%	23.8%	22.7%	23.0%	22.1%	27.9%	23.4%	22.0%	28.8%	23.7%	22.0%	38.7%	22.1%	25.4%	21.4%	25.3%
Newsprint		20.7%	8.6%	12.4%	11.1%	19.8%	13.7%	14.3%	15.5%	13.7%	11.2%	10.6%	12.1%	9.1%	5.8%	16.3%	13.5%	10.6%	17.4%	7.5%	17.7%	7.7%	10.8%	7.8%	21.3%	16.4%	15.4%	10.9%	22.0%	13.8%	15.7%	19.9%	12.0%	16.6%	13.7%	18.9%	8.6%	14.8%	24.0%	11.9%	9.6%	7.4%	7.0%	6.6%	14.0%	22.1%	9.4%	9.8%	13.2%	11.5%	13.1%
Corrugated Cardboard		5.7%	12.0%	17.3%	11.5%	5.1%	12.2%	10.9%	9.6%	13.9%	13.4%	12.2%	14.3%	15.3%	11.8%	14.0%	20.6%	16.8%	6.0%	12.4%	13.3%	17.7%	16.4%	13.6%	6.2%	13.1%	13.6%	10.1%	13.0%	7.4%	19.9%	12.2%	17.0%	17.4%	11.8%	12.4%	8.5%	13.6%	7.1%	14.1%	9.7%	3.9%	15.2%	14.7%	12.8%	16.6%	7.6%	29.7%	16.2%	12.8%	7.0%
Other Paper		13.3%	11.4%	9.5%	9.8%	7.5%	5.2%	13.1%	15.3%	16.9%	12.5%	12.6%	4.8%	12.7%	4.8%	12.4%	19.3%	13.0%	6.8%	9.9%	13.5%	14.0%	17.0%	6.6%	13.6%	8.3%	5.9%	5.3%	16.5%	11.1%	7.9%	7.6%	18.3%	14.8%	2.8%	16.0%	8.2%	9.9%	5.8%	6.9%	12.3%	14.4%	12.1%	6.0%	15.3%	2.3%	5.6%	5.5%	5.6%	5.4%	8.7%
PLASTICS																																																			
PET		3.0%	5.1%	3.7%	2.5%	4.1%	3.4%	5.9%	5.5%	5.7%	3.1%	5.6%	4.4%	4.0%	7.0%	4.5%	3.7%	4.9%	3.2%	1.7%	3.6%	3.8%	2.3%	2.9%	2.4%	5.6%	5.1%	4.3%	5.6%	3.6%	4.1%	5.7%	4.6%	5.0%	3.8%	2.7%	4.3%	3.0%	6.2%	4.6%	3.3%	4.3%	1.6%	6.8%	3.7%	3.0%	5.5%	4.1%	4.5%	2.6%	3.5%
HDPE		4.0%	6.2%	3.1%	4.1%	3.4%	4.1%	6.6%	3.6%	1.8%	2.5%	4.5%	4.0%	3.8%	3.8%	3.5%	3.6%	2.8%	3.5%	0.8%	3.2%	2.8%	2.7%	4.0%	1.5%	3.2%	3.4%	5.0%	3.4%	3.8%	5.3%	5.2%	3.2%	3.6%	1.9%	3.0%	3.9%	4.3%	3.8%	3.0%	8.5%	3.6%	1.7%	3.6%	3.1%	1.6%	3.0%	1.8%	3.0%	1.4%	1.9%
Single-Use Plastic Bags		0.1%	0.5%	0.2%	0.2%	0.2%	0.4%	1.1%	0.5%	0.3%	0.0%	0.2%	4.4%	0.8%	0.9%	0.9%	0.7%	0.2%	0.0%	0.1%	0.2%	0.0%	0.0%	0.0%	0.1%	0.2%	0.1%	0.5%	0.1%	0.3%	0.1%	0.5%	0.5%	0.4%	0.4%	0.4%	0.1%	0.0%	0.0%	0.0%	0.4%	0.5%	0.3%	0.1%	0.2%	0.2%	0.8%	0.2%	0.2%	0.0%	0.2%
Rigid Plastics		1.6%	1.4%	0.0%	3.8%	1.2%	2.3%	5.1%	1.9%	1.8%	1.2%	1.3%	3.0%	2.4%	2.5%	2.5%	3.1%	2.7%	1.6%	1.3%	1.9%	2.1%	2.7%	2.8%	1.8%	2.9%	3.2%	2.9%	3.0%	1.4%	3.7%	3.2%	3.0%	3.8%	1.3%	0.0%	3.9%	3.4%	5.5%	3.8%	2.5%	3.4%	1.7%	3.2%	2.6%	3.3%	2.9%	1.1%	3.5%	2.1%	2.8%
Other Plastics		2.4%	4.3%	6.1%	0.7%	2.2%	2.4%	3.4%	1.6%	5.8%	6.1%	6.0%	1.7%	5.6%	6.3%	3.0%	1.7%	2.2%	4.0%	1.4%	3.2%	3.1%	1.6%	4.5%	1.5%	2.7%	2.3%	3.4%	4.0%	6.8%	3.1%	2.7%	4.7%	5.2%	3.9%	3.7%	3.6%	3.4%	3.1%	4.3%	0.9%	2.7%	6.4%	4.6%	3.7%	3.2%	5.8%	1.9%	4.6%	3.7%	4.4%
METALS																																																			
Aluminum		2.3%	2.1%	1.9%	2.1%	1.7%	2.0%	2.6%	3.7%	1.5%	2.3%	4.0%	4.1%	2.2%	3.0%	2.6%	2.7%	1.5%	1.6%	1.5%	1.7%	2.1%	1.3%	1.6%	1.9%	4.1%	2.4%	1.6%	2.1%	1.6%	1.2%	1.6%	2.5%	4.9%	2.1%	1.4%	1.9%	1.5%	2.1%	1.8%	0.9%	2.2%	1.9%	2.1%	2.0%	1.1%	1.0%	1.9%	3.2%	3.2%	2.7%
Ferrous Metal		4.3%	0.0%	3.8%	3.0%	3.7%	2.4%	1.8%	2.2%	1.8%	1.1%	4.4%	2.9%	2.9%	3.6%	1.9%	2.1%	0.0%	1.9%	2.0%	1.5%	1.5%	4.7%	2.3%	3.7%	2.8%	2.3%	2.2%	1.5%	2.4%	2.7%	1.8%	0.5%	3.1%	3.5%	1.9%	2.3%	1.2%	1.6%	2.6%	1.9%	2.1%	2.7%	2.9%	1.8%	1.3%	1.5%	3.0%	1.9%	1.8%	1.9%
Other Metal		0.0%	4.3%	0.0%	0.0%	1.0%	4.7%	0.0%	0.0%	2.1%	8.1%	1.9%	1.4%	0.0%	1.4%	0.0%	0.0%	1.3%	0.5%	0.9%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.6%	3.7%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	3.4%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%
GLASS																																																			
Glass Jars and Bottles		14.3%	7.9%	8.3%	9.8%	19.6%	15.3%	14.6%	8.7%	4.9%	6.1%	15.6%	2.9%	7.1%	16.0%	5.9%	7.9%	15.4%	22.4%	20.1%	16.4%	7.9%	10.7%	17.5%	25.4%	13.1%	12.3%	16.2%	5.1%	14.1%	7.9%	7.2%	4.8%	0.0%	22.2%	14.4%	29.3%	9.6%	8.8%	17.4%	12.1%	20.7%	27.2%	16.8%	9.3%	23.4%	13.4%	9.8%	17.4%	32.3%	19.7%
Other Glass		2.5%	0.0%	2.1%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%	0.8%	0.0%	1.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	2.7%	4.3%	2.6%	0.0%	7.6%	0.0%	5.2%	1.4%	0.0%	2.1%	3.7%	0.0%	2.7%	7.1%	6.4%	6.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.7%	0.9%	0.0%	0.0%	2.9%
ORGANICS																																																			
Food		0.0%	0.0%	3.1%	0.0%	11.0%	0.0%	0.0%	2.8%	0.9%	8.2%	0.0%	1.4%	0.0%	0.9%	1.4%	0.0%	0.0%	8.2%	7.5%	1.8%	0.0%	0.0%	3.6%	0.0%	0.0%	0.0%	0.0%	1.0%	2.2%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	0.0%	3.4%
Yard Trimmings		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	2.6%	1.8%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	0.0%	0.0%	0.0%
Wood (not Yard Trimmings or C&D)		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	2.7%	3.4%	0.0%	2.0%	0.0%	0.0%	1.5%	0.6%	0.1%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	1.4%	0.4%	1.6%	0.0%
Other Organics/Combustibles		0.0%	8.7%	0.0%	7.2%	0.0%	0.0%	0.0%	0.0%	2.6%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	1.8%	4.0%	3.6%	3.0%	0.0%	0.0%	0.0%	0.0%	2.9%	3.2%	0.0%	1.4%	0.0%	1.7%	2.2%	0.0%	4.0%	4.3%	0.0%	6.2%	0.0%	0.0%	4.0%	0.0%	0.0%	2.0%	0.0%	0.0%	0.0%	2.8%	0.9%	0.0%	2.2%
OTHER MATERIAL																																																			
Electronics		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
C&D		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Textiles		3.1%	2.2%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	2.1%	0.0%	1.6%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.5%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	1.3%	0.0%	1.4%	0.0%	0.9%	0.0%	1.1%	0.0%	1.4%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
HHW		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other Inorganics/Non-Combustibles		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RESIDUALS																																																			
Unknown or Not Classified		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%