Seattle Public Utilities

2012 Organics Stream Composition Study: Year-end Report

prepared by

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Chapter 1 Overview

Introduction and Background

Seattle Public Utilities (SPU) has conducted composition studies since 1988 to better understand the types and quantities of municipal solid waste (MSW) and recyclable materials collected, to assess Seattle's recycling potential, and to aid in the evaluation of existing programs. These studies have analyzed the residential, commercial, and self-haul waste streams and the residential recycling stream at intervals of about four years.

In 2012, Seattle conducted the first in-depth evaluation of the city's organics stream. The objective of this study was two-fold. The first objective was to evaluate how accurately this sampling methodology can depict the composition of the organics stream over a year, in general and when compared to previous composition estimate techniques. The second objective was to determine the composition of Seattle's combined organics stream that the city's two contracted haulers collect for composting in plastic carts.

In 2005, the city added vegetative *food waste* to the materials acceptable in Seattle's organics collection program. In 2009, the organics collection program expanded to include all *food waste*, to offer weekly organics collection year round, and to make organics collection program participation mandatory for all single family residential accounts. After this program expansion, program participation increased by 35 percent. Until now, SPU has used a statistical regression technique to estimate the portion of organics collected that was *food waste*. This technique uses 16 years of organics program data (including data from when the program was just collecting yard debris), weather patterns, and sign-up data to estimate organics composition.

This composition study will help to evaluate the accuracy of this estimating technique. It will also be used to evaluate how accurately the sampling methodology used for this study can depict organics composition over a year, given the variability in the amount and type of *yard waste* the program collects throughout the year. Haulers, organics processing facilities, city staff, and SPU staff are also increasingly interested in details of the composition of the material placed in the organics containers, including the amount and type of contaminants. The results of this study will provide these composition details.

This study only includes material collected under Seattle's contracts for organics collection services. Private haulers outside of the city's contracts collect a significant amount of material from commercial customers, and this material is not included in this study.

This report presents the results of the 2012 organics composition study in three sections. Chapter 1 briefly introduces the project and the study methodology, and Chapter 2 provides the composition results, detailing composition results by substream. Appendices follow the main body of the report and provide definitions of organics components, the complete sampling methodology, comments on sampling events, organics composition calculations, results by volume, and copies of field forms.

Study Conclusions

The extreme variability in sample results presented and discussed in Chapter 3 provides evidence that the study methodology did not capture the overall composition of the *yard waste* and *food waste*

portions of the contract collected organics stream. Therefore, the results in Chapter 2: Composition Results only include composition by percent, and are not used to project annual tonnage by material class.

SPU will use the results and lessons learned from the 2012 study to modify the design for the next round of studies (likely to be in 2016).

Seattle's Organics

This study presents data on organic materials placed in collection carts by commercial, multifamily residential, and single-family residential customers and collected by the city's contracted haulers in 2012. Organics placed in metal dumpsters at commercial sites were excluded.[1] The contents of the carts included in this study were collected and transported to Cedar Grove (quarters 1 and 2) or to Seattle' north or south transfer stations (quarters 3 and 4) for sampling. As noted above, this study did not sample any organics collected by haulers outside of the City's contracts.

Study Universe

For any specific geographic area, the organics stream is composed of various substreams. A "substream" is determined by the particular generation, collection, or composition characteristics that make it a unique portion of the total organics stream. For this study, the three substreams are defined as follows:

- ***Single-family residential:*** Organic materials that are generated by residential customers with cart collection service for organics. These customers have garbage collected in carts and are typically single-family detached homes, duplexes, triplexes, and four-plex buildings.

- ***Multifamily residential:*** Organic materials that are generated by residential customers with cart collection service for organics and dumpster collection for garbage. These customers are typically apartment buildings with five or more units.

- ***Commercial:*** Organic materials that are generated by businesses and institutions with cart collection service for organics.

[1] There are about 48 commercial customers who receive dumpster service for organics. It was decided to exclude those from sampling due to the sampling challenge they presented. The field methodology involved dumping the container contents onto a tarp and sampling at a central location. These one-cubic-yard and larger dumpsters could not be easily sampled in the field.

These three organics substreams are collected by two contracted haulers, each serving two of four distinct "zones" (Figure 1) in the City of Seattle. One of the contracted haulers handles zones one and four; the other hauler handles zones two and three.

Figure 1. Seattle's Collection Zones

Study Methodology

This organics stream composition study consisted of four distinct steps: develop sampling plan, collect organics samples, sort samples, and analyze data and prepare report. Each of these steps is outlined in detail below.

Step 1: Develop Sampling Plan

Samples were allocated among the three substreams (single-family residential, multifamily residential, and commercial) and four quarters (quarter 1 – February and March; quarter 2 – May; quarter 3 – August and September; quarter 4 – November and December).

For the single-family residential substream:

- Samples were equally distributed among the four collection zones.
- Samples were collected and sorted in each quarter of 2012.[2]

For the multifamily residential and the commercial substreams:

- In quarters 1 and 2, samples were allocated to each zone based on the distribution of customers among zones. In quarters 3 and 4 multifamily samples were equally distributed across zones.
- Commercial samples were only collected and sorted during the first two quarters of 2012.
- Multifamily samples were collected and sorted in each quarter of 2012.

The dates for sampling events for all substreams were randomly selected to assure a representative distribution of the days of the week and weeks of the month.

Refer to Appendix B for the full Sampling Methodology.

[2] Samples were collected at predetermined intervals along selected routes. The specific addresses were not selected or recorded.

Step 2: Collect Organics Samples

Organics samples for the 2012 study were collected using the following methodologies.

For single-family samples:

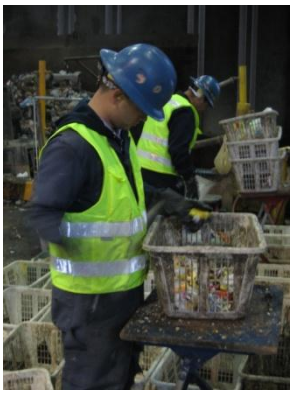
- Vehicle routes for sampling were randomly selected for each sampling day and zone.
- For each selected route, the collection crew:
  1. Collected cart samples over a predetermined interval (e.g., every 17th cart). The interval was chosen such that enough samples could be collected, and cart pickup would be distributed equally along the route.
  2. Emptied the entire contents from selected carts on a tarp, sealed the tarps, and labeled them with sample placards.
  3. Delivered collected samples to the Cedar Grove Marginal Way facility (quarters 1 and 2) or one of Seattle's transfer stations (quarters 3 and 4) for sorting.

For multifamily and commercial samples:

- For the selected zone for a particular sampling day, lists of all of the multifamily and commercial accounts were obtained from the hauler that serviced that zone. The lists of accounts were randomly ordered and the top accounts were selected for sampling until the target for that day, plus contingencies, had been reached.
- The selected accounts were mapped and routed for the sample collection crews.
- Following the route of selected accounts, the collection crew:
  1. Emptied the entire contents from selected carts on a tarp, sealed the tarps, and labeled then with sample placards.
  2. Delivered collected samples to the Cedar Grove Marginal Way facility (quarters 1 and 2) or one of Seattle's transfer stations (quarters 3 and 4) for sorting.

Refer to Appendix B for the full Sampling Methodology and Appendix G for sample Field Forms, and Appendix D for Comments on Sampling Events.

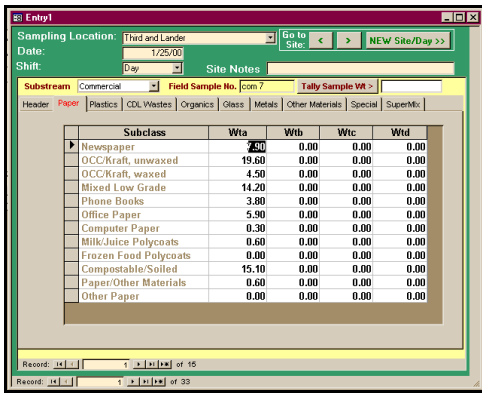
Step 3: Sort Samples

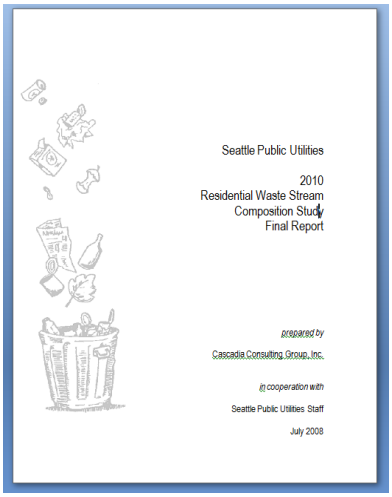


- Following sample collection, field crew members hand-sorted samples at the Cedar Grove Marginal Way facility in quarters 1 and 2, and at Seattle' north and south transfer stations in quarters 3 and 4.
- For this study, 751 samples were sorted into 23 distinct material components. Refer to Appendix A for component definitions.
- Field crew members weighed the sorted components of each sample and recorded the weights. At the conclusion of each sorting day, the field crew manager conducted a quality control review of the recorded data. Refer to Appendix G for sample Data Tracking Sheets.

Step 4: Analyze Data and Prepare Report

- Following each sampling event, all sort data was entered into a customized database.
- Entered data was re-checked against the paper forms to eliminate data entry errors.
- At the conclusion of the study organics composition estimates were calculated. Refer to Appendix E for a description of the calculation methodology.





Chapter 2 Composition Results

This chapter presents composition results in two ways. First, a composition table reflects broad material classes by weight: *organics* (split into the components *yard waste* [*grass/leaves* and *prunings combined*], *food waste,* and *other organics*), *compostable plastic*, *compostable paper*, *contaminants*. And second, a detailed table presents the full composition results of all 23 components by weight. In addition, Appendix F provides volumetric composition estimates for the first two quarters.

Due to rounding, percentages may not add to 100% in tables and figures throughout the report.

Overview

Over the six sampling months of 2012, Cascadia collected and sorted a total of 740 organics samples: 296 from the single-family residential substream, 288 from the multifamily residential substream, and 156 from the commercial substream.[3]

Table 1 summarizes the total pounds of material sampled, the total number of samples used in the analysis, and the average sample weight (in pounds). The average sample weight for the single-family residential and multifamily residential substreams was similar at about 30 pounds and 32 pounds, respectively. The average commercial sample was considerably heavier, at 79 pounds.

Table 1: Sampling Data by Substream[4] – Overall 2012

Subpopulation	Total Sample (lbs)	Sample Count	Average Sample (lbs)	Total Organics (Tons)
Substream				
Single-family	9,026	296	30	80,211
Multifamily	9,225	288	32	3,455
Commercial	12,374	156	79	1,977
Overall	**30,625**	**740**	**41**	**85,643**

[3] SPU elected to exclude eleven of these samples (1 from single family, 6 from multifamily, and 4 from commercial) from analysis and reporting, because they were highly contaminated and the hauler would not have collected them. This was done because SPU wanted the composition results to reflect the composition of the carts that would have been collected. Since the sampling method called for carts to be collected for sampling ahead of the hauler, this was the method that was used to mimic the rejection of contaminated carts by the hauler.

[4] The average weight of the sample is the average weight of the cart sampled, but not necessarily the average weight of the entire amount set out. If there was more than one cart set out for collection, only one was selected for sampling during the first and second quarters of the study. In quarters 3 and 4, the City elected to include all carts that were set out in the sample.

Residential Organics Composition

A total of 584 samples were obtained from residential (single-family and multifamily) carts set out for collection in 2012. The tables below show the results of the single family and multifamily sampling by the month that the samples were collected.

Single-Family Residential Substream

A total of 296 samples were obtained from single-family collection carts during 6 months of sampling in 2012. As shown in Table 2, *yard waste* and *food waste* together accounted for the majority of single-family organics. These two material classes were most prevalent in May, when they represented 97 percent of single-family organics, and least prevalent in March, when they represented 85 percent. In every month except March, *yard waste* was the largest broad material class at between 88.0 percent (9,002 tons) and 62.9 percent (3,342 tons) of organics composition, followed by *food waste* at between 30.0 percent (1,595 tons) to 8.9 percent (912 tons). In March, *food waste* represented a much larger portion of the organics stream than *yard waste*: *food waste* made up about 57 percent (2,735 tons) of single-family organics, while *yard waste* made up about 27 percent (1,315 tons).

Compostable paper was the third most prevalent material class by weight, ranging from around 12 percent in March to almost 2 percent in May. In August, *contaminants* was the third most prevalent material class at over 4 percent of this substream, by weight.

Table 2. Broad Material Classes by Study Month – Single-family[5]

	March		May		August		September		November		December	
Material Class	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons
Yard Waste	27.4%	1,314.6	88.0%	9,001.7	66.9%	4,915.3	62.9%	3,342.4	80.8%	7,212.7	70.9%	3,549.1
Food Waste	57.1%	2,734.8	8.9%	912.0	24.1%	1,774.7	30.0%	1,595.4	15.4%	1,370.8	21.7%	1,086.8
Subtotal	**84.5%**	**4,049.5**	**96.9%**	**9,913.7**	**91.0%**	**6,690.0**	**92.9%**	**4,937.9**	**96.2%**	**8,583.6**	**92.6%**	**4,635.9**
Compostable Paper	11.5%	549.8	1.9%	197.5	4.2%	308.3	6.0%	317.4	2.6%	229.2	3.9%	195.8
Compostable Plastic	1.1%	53.2	0.1%	9.5	0.5%	35.8	0.5%	24.6	0.1%	12.1	0.4%	18.0
Other Organics	0.8%	37.4	0.5%	52.8	0.0%	0.9	0.0%	0.9	0.3%	28.4	0.6%	31.4
Contaminants	2.2%	103.9	0.5%	55.7	4.3%	316.9	0.7%	35.2	0.8%	73.2	2.5%	123.0
Total	**100%**	**4,793.7**	**100%**	**10,229.1**	**100%**	**7,351.8**	**100%**	**5,316.0**	**100%**	**8,926.5**	**100%**	**5,004.1**

[5] Tons in this table represent total tons collected in the program for the single family sector during the sampling month. The composition results for the month sampled are combined with the monthly tonnage collected to estimate the tons collected by material for the month.

Table 3. Composition by Study Month – Single-family

Materials	March				May				August				September				November				December			
	Tons	%	Low	High	Tons	%	Low	High	Tons	%	Low	High	Tons	%	Low	High	Tons	%	Low	High	Tons	%	Low	High
Compostable Paper	**549.8**	**11.5%**			**197.5**	**1.9%**			**308.3**	**4.2%**			**317.4**	**6.0%**			**229.2**	**2.6%**			**195.8**	**3.9%**		
Universal Compostable Paper	494.0	10.3%	6.0%	14.6%	155.5	1.5%	1.0%	2.1%	269.3	3.7%	1.8%	5.5%	278.3	5.2%	3.2%	7.2%	185.9	2.1%	1.2%	3.0%	170.3	3.4%	1.8%	5.0%
Mixed Recyclable Paper	47.3	1.0%	0.5%	1.5%	32.6	0.3%	0.0%	0.7%	34.4	0.5%	0.0%	1.0%	30.4	0.6%	0.2%	0.9%	37.6	0.4%	0.1%	0.7%	19.5	0.4%	0.1%	0.7%
Commercially Compostable Paper	8.4	0.2%	0.0%	0.3%	9.4	0.1%	0.0%	0.2%	4.6	0.1%	0.0%	0.1%	8.7	0.2%	0.1%	0.3%	5.7	0.1%	0.0%	0.1%	6.0	0.1%	0.0%	0.2%
Compostable Plastic	**53.2**	**1.1%**			**9.5**	**0.1%**			**35.8**	**0.5%**			**24.6**	**0.5%**			**12.1**	**0.1%**			**18.0**	**0.4%**		
Universal Compostable Plastic	53.2	1.1%	0.6%	1.6%	9.5	0.1%	0.0%	0.1%	35.8	0.5%	0.2%	0.7%	24.5	0.5%	0.3%	0.7%	12.0	0.1%	0.1%	0.2%	17.7	0.4%	0.2%	0.5%
Commercially Compostable Plastic	0.0	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%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	0.2	0.0%	0.0%	0.0%
Organics	**4,086.9**	**85.3%**			**9,966.5**	**97.4%**			**6,690.8**	**91.0%**			**4,938.8**	**92.9%**			**8,612.0**	**96.5%**			**4,667.3**	**93.3%**		
Food	2,734.8	57.1%	47.4%	66.7%	912.0	8.9%	5.3%	12.5%	1,774.7	24.1%	13.1%	35.1%	1,595.4	30.0%	20.8%	39.2%	1,370.8	15.4%	10.2%	20.5%	1,086.8	21.7%	12.1%	31.3%
Grass/Leaves	1,195.5	24.9%	15.4%	34.5%	8,924.0	87.2%	82.5%	92.0%	4,837.8	65.8%	51.3%	80.3%	3,338.0	62.8%	51.7%	73.9%	7,212.7	80.8%	74.6%	87.0%	3,533.3	70.6%	58.2%	83.0%
Prunings	119.1	2.5%	0.0%	5.7%	77.7	0.8%	0.0%	1.5%	77.5	1.1%	0.0%	2.1%	4.4	0.1%	0.0%	0.2%	0.0	0.0%	0.0%	0.0%	15.8	0.3%	0.0%	0.9%
Other Compostable Organics	37.4	0.8%	0.3%	1.3%	52.8	0.5%	0.0%	1.1%	0.9	0.0%	0.0%	0.0%	0.9	0.0%	0.0%	0.0%	28.4	0.3%	0.0%	0.8%	31.4	0.6%	0.2%	1.1%
Contaminants	**103.9**	**2.2%**			**55.7**	**0.5%**			**316.9**	**4.3%**			**35.2**	**0.7%**			**73.2**	**0.8%**			**123.0**	**2.5%**		
Polycoated paper	27.9	0.6%	0.2%	1.0%	4.7	0.0%	0.0%	0.1%	0.5	0.0%	0.0%	0.0%	8.4	0.2%	0.0%	0.3%	39.9	0.4%	0.1%	0.8%	27.1	0.5%	0.2%	0.9%
Not Approved Paper Packaging	1.2	0.0%	0.0%	0.1%	0.7	0.0%	0.0%	0.0%	10.1	0.1%	0.0%	0.2%	11.4	0.2%	0.1%	0.3%	4.9	0.1%	0.0%	0.1%	5.0	0.1%	0.0%	0.2%
Other Paper	2.2	0.0%	0.0%	0.1%	0.2	0.0%	0.0%	0.0%	13.4	0.2%	0.0%	0.3%	4.3	0.1%	0.0%	0.1%	4.1	0.0%	0.0%	0.1%	1.7	0.0%	0.0%	0.1%
Non-compostable Film	13.6	0.3%	0.1%	0.5%	4.1	0.0%	0.0%	0.1%	22.4	0.3%	0.0%	0.7%	0.9	0.0%	0.0%	0.0%	8.6	0.1%	0.0%	0.2%	3.5	0.1%	0.0%	0.1%
Not Approved Plastic Packaging	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%	0.1	0.0%	0.0%	0.0%
Recyclable Plastic Containers	6.2	0.1%	0.0%	0.3%	1.6	0.0%	0.0%	0.0%	7.7	0.1%	0.0%	0.2%	3.5	0.1%	0.0%	0.1%	3.2	0.0%	0.0%	0.1%	1.9	0.0%	0.0%	0.1%
Other Plastic	4.0	0.1%	0.0%	0.1%	1.4	0.0%	0.0%	0.0%	5.1	0.1%	0.0%	0.1%	2.6	0.0%	0.0%	0.1%	2.0	0.0%	0.0%	0.0%	2.3	0.0%	0.0%	0.1%
Recyclable Glass	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	5.7	0.1%	0.0%	0.2%	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%
Recyclable Metal	6.2	0.1%	0.0%	0.3%	1.1	0.0%	0.0%	0.0%	2.3	0.0%	0.0%	0.1%	3.2	0.1%	0.0%	0.1%	0.2	0.0%	0.0%	0.0%	1.3	0.0%	0.0%	0.1%
Pet Waste	4.0	0.1%	0.0%	0.2%	0.2	0.0%	0.0%	0.0%	242.3	3.3%	0.0%	7.0%	0.0	0.0%	0.0%	0.0%	9.3	0.1%	0.0%	0.3%	69.3	1.4%	0.0%	3.2%
Hazardous	2.6	0.1%	0.0%	0.1%	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	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 Materials	35.9	0.7%	0.0%	1.8%	41.6	0.4%	0.0%	1.1%	6.8	0.1%	0.0%	0.2%	0.9	0.0%	0.0%	0.0%	1.0	0.0%	0.0%	0.0%	10.8	0.2%	0.0%	0.5%
Total	**4,793.7**	**100%**			**10,229.1**	**100%**			**7,351.8**	**100%**			**5,316.0**	**100%**			**8,926.5**	**100%**			**5,004.1**	**100%**		
# of Samples	*57*				*48*				*47*				*48*				*48*				*48*			

Multifamily Substream

A total of 288 samples were obtained from multifamily organics carts during the 5 months of sampling in 2012. Table 4 shows the broad material class composition for the multifamily sampling months. Together, *yard waste* and *food waste* represent between 87.6 percent (September) and 82.3 percent (December) of the multifamily organics substream, by weight. In three of the multifamily sampling months, *food waste* was the most prevalent material class, ranging from around 52 percent (205 tons) in May to 46 percent (97 tons) in February/March. In November and December, *yard waste* was the largest material class at around 53 percent (215 tons) in November and 45 percent (103 tons) in December. *Compostable paper* was the third largest material class by weight each month, and ranged from 10.3 percent in December to 6.9 percent in November.

Table 4. Broad Material Classes by Study Month – Multifamily[6]

	February/March*		May		September		November		December	
Material Class	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons
Yard Waste	39.5%	82.5	34.8%	137.5	40.0%	93.1	53.0%	214.9	45.2%	102.8
Food Waste	46.3%	96.5	51.8%	204.8	47.6%	110.6	34.4%	139.4	37.1%	84.3
Subtotal	**85.8%**	**179.0**	**86.5%**	**342.4**	**87.6%**	**203.7**	**87.4%**	**354.3**	**82.3%**	**187.1**
Compostable Paper	7.2%	14.9	7.3%	28.8	7.3%	17.0	6.9%	28.0	10.3%	23.4
Compostable Plastic	1.7%	3.6	1.6%	6.4	1.8%	4.1	1.8%	7.4	1.0%	2.4
Other Organics	0.9%	1.9	1.4%	5.5	0.0%	0.0	0.8%	3.4	0.5%	1.0
Contaminants	4.5%	9.3	3.2%	12.7	3.3%	7.7	3.0%	12.3	5.9%	13.3
Total	**100%**	**208.7**	**100%**	**395.8**	**100%**	**232.4**	**100%**	**405.4**	**100%**	**227.3**

**For this season samples were taken from the end of Februrary into March. These weights represent the average of Feburary and March tons.*

[6]Tons in this table represent total tons collected in the program for the multi-family sector during the sampling month. The composition results for the month sampled are combined with the monthly tonnage collected to estimate the tons collected by material for the month.

Table 5. Composition by Study Month – Multifamily

Materials	February/March*				May				September				November				December			
	Tons	%	Low	High	Tons	%	Low	High	Tons	%	Low	High	Tons	%	Low	High	Tons	%	Low	High
Compostable Paper	**14.9**	**7.2%**			**28.8**	**7.3%**			**17.0**	**7.3%**			**28.0**	**6.9%**			**23.4**	**10.3%**		
Universal Compostable Paper	12.3	5.9%	3.7%	8.0%	24.5	6.2%	4.6%	7.7%	13.2	5.7%	3.1%	8.3%	15.0	3.7%	2.2%	5.2%	15.7	6.9%	4.3%	9.5%
Mixed Recyclable Paper	2.6	1.2%	0.2%	2.2%	3.8	0.9%	0.5%	1.4%	3.5	1.5%	0.0%	3.6%	12.4	3.1%	1.0%	5.1%	7.6	3.4%	1.3%	5.4%
Commercially Compostable Paper	0.1	0.0%	0.0%	0.1%	0.6	0.1%	0.1%	0.2%	0.3	0.1%	0.0%	0.2%	0.6	0.2%	0.0%	0.3%	0.1	0.0%	0.0%	0.1%
Compostable Plastic	**3.6**	**1.7%**			**6.4**	**1.6%**			**4.1**	**1.8%**			**7.4**	**1.8%**			**2.4**	**1.0%**		
Universal Compostable Plastic	3.5	1.7%	1.1%	2.2%	6.3	1.6%	1.3%	1.9%	4.1	1.7%	1.1%	2.4%	7.4	1.8%	0.7%	2.9%	2.3	1.0%	0.6%	1.4%
Commercially Compostable Plastic	0.1	0.0%	0.0%	0.1%	0.1	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%
Organics	**180.9**	**86.7%**			**347.9**	**87.9%**			**203.7**	**87.6%**			**357.7**	**88.2%**			**188.2**	**82.8%**		
Food	96.5	46.3%	33.6%	58.9%	204.8	51.8%	42.8%	60.7%	110.6	47.6%	31.6%	63.6%	139.4	34.4%	21.6%	47.2%	84.3	37.1%	24.9%	49.3%
Grass/Leaves	79.5	38.1%	22.8%	53.5%	136.5	34.5%	23.9%	45.1%	91.8	39.5%	21.2%	57.8%	214.3	52.9%	38.7%	67.0%	102.2	45.0%	28.1%	61.8%
Prunings	2.9	1.4%	0.0%	3.1%	1.0	0.3%	0.0%	0.6%	1.3	0.5%	0.0%	1.2%	0.6	0.1%	0.0%	0.4%	0.6	0.3%	0.0%	0.7%
Other Compostable Organics	1.9	0.9%	0.4%	1.4%	5.5	1.4%	0.0%	2.9%	0.0	0.0%	0.0%	0.0%	3.4	0.8%	0.3%	1.4%	1.0	0.5%	0.2%	0.7%
Contaminants	**9.3**	**4.5%**			**12.7**	**3.2%**			**7.7**	**3.3%**			**12.3**	**3.0%**			**13.3**	**5.9%**		
Polycoated paper	1.1	0.5%	0.3%	0.7%	2.6	0.7%	0.4%	0.9%	0.6	0.3%	0.1%	0.5%	1.6	0.4%	0.2%	0.6%	1.7	0.8%	0.4%	1.1%
Not Approved Paper Packaging	0.6	0.3%	0.0%	0.6%	0.5	0.1%	0.0%	0.2%	0.4	0.2%	0.1%	0.3%	0.5	0.1%	0.0%	0.2%	0.1	0.1%	0.0%	0.1%
Other Paper	0.1	0.1%	0.0%	0.1%	0.0	0.0%	0.0%	0.0%	0.1	0.1%	0.0%	0.1%	0.8	0.2%	0.1%	0.3%	0.2	0.1%	0.0%	0.2%
Non-compostable Film	2.5	1.2%	0.5%	1.9%	4.3	1.1%	0.7%	1.5%	1.2	0.5%	0.2%	0.8%	2.0	0.5%	0.3%	0.7%	1.7	0.8%	0.4%	1.1%
Not Approved Plastic Packaging	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%
Recyclable Plastic Containers	0.9	0.4%	0.1%	0.7%	2.3	0.6%	0.2%	1.0%	0.5	0.2%	0.0%	0.4%	1.5	0.4%	0.1%	0.6%	2.7	1.2%	0.4%	2.1%
Other Plastic	0.4	0.2%	0.1%	0.4%	0.3	0.1%	0.0%	0.1%	0.3	0.2%	0.0%	0.3%	0.9	0.2%	0.0%	0.5%	0.8	0.4%	0.2%	0.6%
Recyclable Glass	1.1	0.5%	0.0%	1.1%	0.5	0.1%	0.0%	0.2%	3.7	1.6%	0.0%	3.5%	1.2	0.3%	0.1%	0.5%	2.5	1.1%	0.2%	2.0%
Recyclable Metal	0.3	0.1%	0.0%	0.2%	0.3	0.1%	0.0%	0.1%	0.2	0.1%	0.0%	0.1%	0.5	0.1%	0.0%	0.2%	1.6	0.7%	0.1%	1.3%
Pet Waste	0.3	0.2%	0.0%	0.3%	0.3	0.1%	0.0%	0.2%	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	0.2	0.1%	0.0%	0.2%
Hazardous	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%	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 Materials	2.0	1.0%	0.0%	1.9%	1.6	0.4%	0.1%	0.7%	0.7	0.3%	0.0%	0.7%	3.3	0.8%	0.0%	1.8%	1.5	0.7%	0.0%	1.4%
Total	**208.7**	**100%**			**395.8**	**100%**			**232.4**	**100%**			**405.4**	**100%**			**227.3**	**100%**		
# of Samples	*59*				*108*				*37*				*44*				*40*			

**For this season samples were taken from the end of Februrary into March. These weights represent the average of Feburary and March tons.*

Commercial Organics Composition

A total of 156 samples were collected from commercial organics collection carts during two months of sampling in 2012. As shown in Table 6, *yard waste* and *food waste* combined represented the majority of the material in the commercial organics stream by weight, at 83 percent in May and 82 percent in February/March. *Food waste* was the largest material category in both months, at around 77 percent (109 tons) in February/March and 62% (109 tons) in May. *Yard waste* was the second largest material class in May at about 21 percent of the stream (36 tons), and the third largest material class in February/March, at about 6 percent of the stream (8 tons). *Compostable paper* represented the third largest material class in February/March and the second largest in May, at around 12 percent and 13 percent by weight, respectively.

Table 6. Broad Material Classes by Study Month – Commercial

	February/March*		May	
Material Class	%	Tons	%	Tons
Yard Waste	5.8%	8.2	20.8%	36.4
Food Waste	76.6%	109.2	62.0%	108.6
Subtotal	**82.3%**	**117.4**	**82.8%**	**145.0**
Compostable Paper	11.9%	17.0	13.1%	22.9
Compostable Plastic	1.1%	1.5	1.2%	2.0
Other Organics	1.7%	2.4	0.2%	0.4
Contaminants	3.0%	4.3	2.8%	4.8
Total	**18%**	**25.2**	**17%**	**30.2**

**For this season samples were taken from the end of Februrary into March. These weights represent the average of Feburary and March tons.*

Table 7. Composition by Study Month – Commercial

Materials	February/March*				May			
	Tons	%	Low	High	Tons	%	Low	High
Compostable Paper	**17.0**	**11.9%**			**22.9**	**13.1%**		
Universal Compostable Paper	14.3	10.0%	8.0%	12.1%	20.2	11.5%	9.3%	13.7%
Mixed Recyclable Paper	1.8	1.3%	0.4%	2.1%	2.5	1.4%	0.3%	2.5%
Commercially Compostable Paper	0.8	0.6%	0.0%	1.3%	0.3	0.2%	0.0%	0.3%
Compostable Plastic	**1.5**	**1.1%**			**2.0**	**1.2%**		
Universal Compostable Plastic	1.5	1.0%	0.5%	1.6%	1.8	1.0%	0.7%	1.4%
Commercially Compostable Plastic	0.0	0.0%	0.0%	0.1%	0.2	0.1%	0.0%	0.2%
Organics	**119.9**	**84.0%**			**145.5**	**83.0%**		
Food	109.2	76.6%	69.8%	83.3%	108.6	62.0%	54.2%	69.8%
Grass/Leaves	7.9	5.5%	0.0%	11.7%	36.1	20.6%	12.2%	29.0%
Prunings	0.4	0.2%	0.0%	0.7%	0.3	0.2%	0.0%	0.4%
Other Compostable Organics	2.4	1.7%	0.0%	4.2%	0.4	0.2%	0.0%	0.5%
Contaminants	**4.3**	**3.0%**			**4.8**	**2.8%**		
Polycoated paper	1.9	1.3%	0.6%	2.1%	1.8	1.0%	0.7%	1.4%
Not Approved Paper Packaging	0.3	0.2%	0.0%	0.4%	0.6	0.3%	0.0%	0.7%
Other Paper	0.0	0.0%	0.0%	0.1%	0.0	0.0%	0.0%	0.0%
Non-compostable Film	1.0	0.7%	0.4%	1.0%	1.0	0.6%	0.3%	0.8%
Not Approved Plastic Packaging	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%
Recyclable Plastic Containers	0.2	0.2%	0.1%	0.2%	0.5	0.3%	0.1%	0.4%
Other Plastic	0.2	0.1%	0.1%	0.2%	0.2	0.1%	0.0%	0.2%
Recyclable Glass	0.1	0.0%	0.0%	0.1%	0.1	0.1%	0.0%	0.1%
Recyclable Metal	0.1	0.1%	0.0%	0.1%	0.2	0.1%	0.0%	0.2%
Pet Waste	0.0	0.0%	0.0%	0.1%	0.1	0.0%	0.0%	0.1%
Hazardous	0.0	0.0%	0.0%	0.0%	0.0	0.0%	0.0%	0.0%
Other Materials	0.4	0.3%	0.1%	0.5%	0.4	0.2%	0.1%	0.3%
Total	**142.6**	**100%**			**175.2**	**100%**		
# of Samples	*75*				*81*			

**For this season samples were taken from the end of Februrary into March. These weights represent the average of Feburary and March tons.*

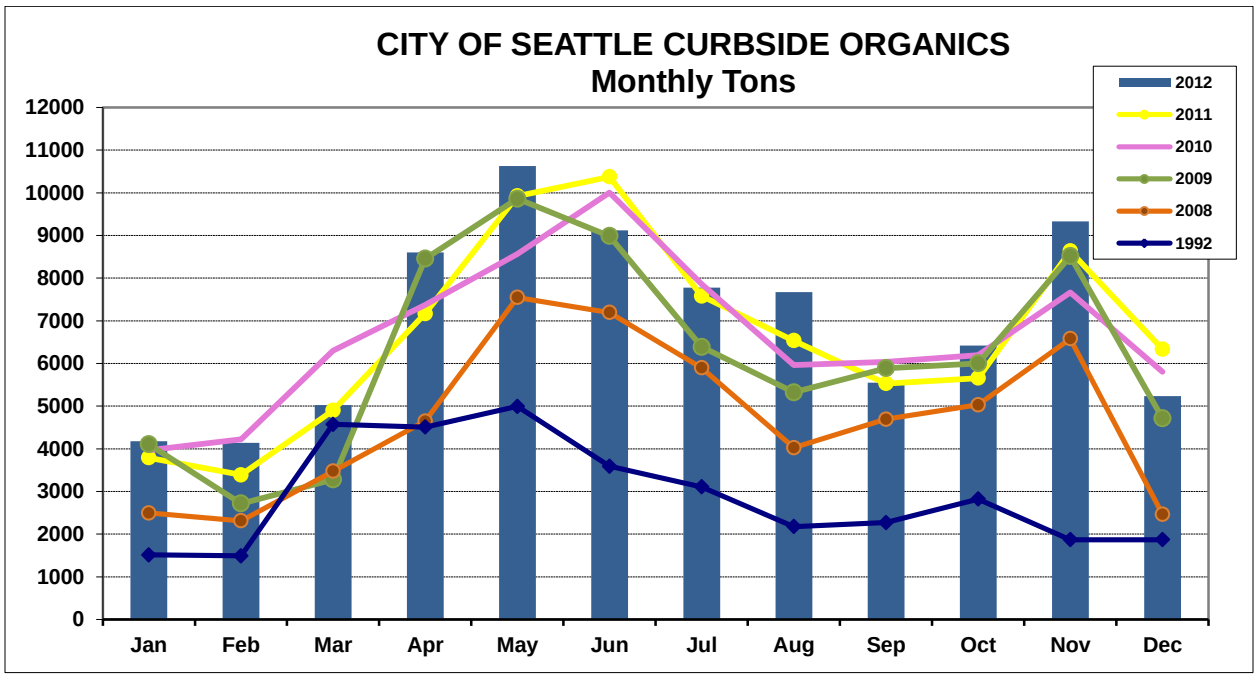
Chapter 3 Analysis of Single-Family Composition Data

This chapter discusses whether the study methodology produced results that represent the composition of a full year's worth of organics collection. Analysis of the results for the single-family substream concluded that they were too inconsistent to be representative of Seattle's single-family organics stream for a full year. This conclusion is discussed below, followed by recommendations for altering the methodology for use in the next organics composition study, expected to occur in 2016.

Variability in Amount of Organics Collected

The amount of residential organics collected at the curb by contracted haulers varies widely throughout the year due primarily to the fluctuation in *yard waste*. Figure 2 shows the tons of single family and multifamily organics collected each month in 2008-2012, and in 1992 (the least amount of organics generated on record due to a drought).

Figure 2. Monthly Residential Organics Collection From 1992 to 2012

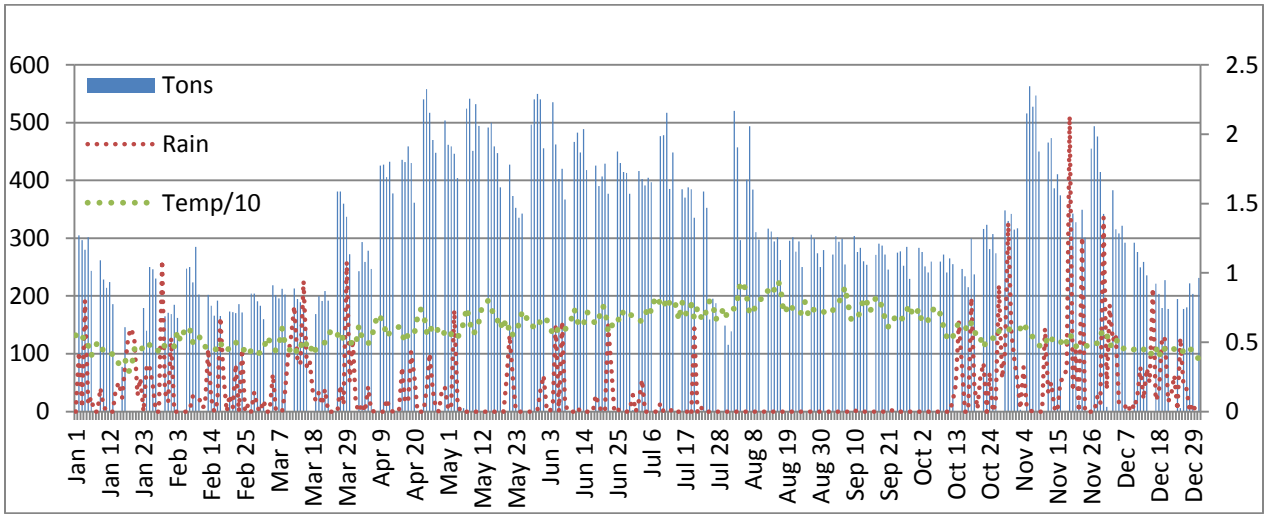


In addition to this monthly variation, tons of organics collected from residents in any given week can vary based on the weather. The amount of organics collected after a dry weekend is typically greater than the amount of organics collected after a wet weekend, because residents are more likely to do yard work and generate *yard waste* during a dry weekend.

Figure 3 below illustrates this phenomenon. The blue bars show tons of organics collected, and collection typically occurs Mondays through Fridays, so the weekends are easy to see on the chart (the gaps between each set of blue bars). During 2012, the last weekend in January had extreme amounts of rainfall on Saturday and Sunday, and low amounts of organics were collected the week of Jan 30th. As another example, March 24 and 25 was a dry weekend, and the weekends before and after were wet.

The organics that contracted haulers collected the week of March 26th was substantially more than the organics collected the week prior or the week after.

Figure 3. Tons of Residential Organics Collected vs Weather in 2012



Variability in Composition

The monthly and weekly variations in the amount of organics collected make it challenging to design a sampling schedule that accurately represents monthly or annual organics collection. The methodology developed for this study included between two and four consecutive sampling days twice each quarter.[7] Based on what we observed about variability in organics collection, this sampling schedule is not sufficiently frequent or evenly distributed throughout the year to capture monthly and quarterly variations.

Table 8. Samples Collected by Substream and Month

Sample Dates	Quarter	Sample Counts			
		Single-family	Multifamily	Commercial	Total
February 27, 28, 29	Winter	0	29	42	71
March 1, 2	Winter	0	30	33	63
March 5, 6	Winter	57	0	0	57
May 10, 11	Spring	48	0	0	48
May 14-18	Spring	0	108	81	189
August 22, 24	Summer	47	0	0	47
September 18, 19	Summer	48	37	0	85
November 14, 15	Fall	48	44	0	92
December 10, 11	Fall	48	40	0	88
	Overall	296	288	156	740

[7] The methodology included selecting a random week to sample, and sampling from all four zones in that week. Samples were collected on consecutive days in order to meet the required number of samples from all 4 collection zones during each selected sampling week.

Compared to *yard waste* collection, which varies highly with the seasons, *food waste* collection is typically constant. However, the single-family samples collected for this study contained highly variable amounts of *food waste*: tons of *food waste* collected varied from a low of 912 tons in May to a high of about 2,735 tons in March. The sampling results from the months of August, September, November, and – to some extent – December, are much more constant.

The observed variance in single-family *food waste* quantities may be due, in part, to two non-sampling factors related to peak periods of *yard waste* generation:

1. When there are large amounts of *yard waste* in the organic carts, moisture and non-solid portions of *food waste* can adhere to *yard waste* in a manner that makes it impossible to physically separate the *food waste* from the *yard waste* during sorting.
2. During peak *yard waste* generation months, and particularly after nice weekends, the organics cart may be too full to accommodate additional *food waste*, and generators may place *food waste* in the garbage cart rather than in the already full organics cart.

Other major material classes were also variable. For example, *compostable paper* varied from 550 tons in March to 196 tons in December. This was due, in part, to one sample that had substantially more compostable paper than normal, which affected the mean value for March.

This variation in composition data paired with the information about weekly and monthly variability in the amount of organics generated leads to the conclusion that the number of sampling days scheduled were not frequent enough nor distributed appropriately throughout the year to capture variability in the composition of the collected organics stream.

Recommendations for Future Sampling

Based on the issues identified above, four recommendations are offered for consideration in the design of future single family organics sampling. The four recommendations include:

1. **Increasing the total number of samples** to provide more precise estimates of food in the organics carts and to better represent differences within and between seasons.
2. **Collecting organics samples on more days each season** to reflect the effects of weather on the amounts and types of materials placed in organics bins each season.
3. **Distributing sampling days evenly throughout each season** to adequately reflect weather impacts within each season.
4. **Weighting sampling by season** to allocate more samples to peak organics generation months, which also appear to exhibit greater variation between weeks due to weather influences.

Table 9 shows a possible annual sampling schedule for single-family residences. The schedule takes into account sampling more consistently throughout the year while focusing heavier sampling during peak organics generation months. The result is more sampling days and more total samples collected for the year.

Table 9. Example Future Single-family Organics Sample Schedule

Sample Dates	Quarter	Days of Sampling	Interval	Sample Count Single-family
January	Winter	1	1 x Month	32
February	Winter	1	1 x Month	32
March	Spring	1	1 x Month	32
April	Spring	2	Every Other Week	64
May	Spring	2	Every Other Week	64
June	Summer	2	Every Other Week	64
July	Summer	2	Every Other Week	64
August	Summer	2	Every Other Week	64
September	Fall	1	1 x Month	32
October	Fall	2	Every Other Week	64
November	Fall	2	Every Other Week	64
December	Winter	1	1 x Month	32
	Overall	19		608

Appendix A **Organics Components**

Organics samples were sorted by hand into 23 material components. The list below is organized by compostable, questionable, and non-compostable materials within the broad categories paper, plastic, organics, and other. The sorting crewmembers utilized this list in-field to guide the sorting process. Materials classified as "potentially compostable paper" and "potentially compostable plastic" were further sorted by sorting crewmembers into the appropriate component categories.

	Class	Component Category	Definition
Paper	Compostable	1 Universal Compostable Paper	Cedar Grove-labeled cups and other clearly compostable paper, such as pizza boxes, paper towels, napkins, egg and berry cartons, shredded paper, uncoated paper plates, uncoated paper bags, coffee filters, drink carriers, coffee sleeves, take-out paper bags.
		2 Mixed Recyclable Paper	Office paper, newspaper, boxboard, and other recyclable papers not listed in other categories.
		3 Compostable Paper Currently Accepted from Commercial Accounts	BPI-labeled paper clamshells, waxed cups, and waxed cardboard. Though approved compostable, SPU does not currently encourage their discard in residential organics service.
	Questionable	4 Potentially Compostable Paper	Bakery boxes, deli sheets, plates, bowls, wax-coated portion cups, non-BPI labeled clamshells, food trays, hot cups, deli containers, paper or bagasse meat trays.
	Non-compostable	5 Polycoated Paper	Milk cartons, juice cartons, and ice cream cartons; Starbucks or other non-compostable hot cups, TetraPak containers.
		6 Not Approved as Compostable Fiber Packaging	Items that are marked compostable or biodegradable, but are not Cedar Grove-approved. Examples include compostable-labeled bagasse or coffee cups that are not Cedar Grove-approved.
		7 Other Non-compostable Paper	Photographs, carbon copy paper, hardcover books, and other predominantly paper items with other attached materials, such as spiral notebooks.
Plastic	Compostable	8 Universal Compostable Plastic	Cedar-Grove-labeled food service ware, tan-colored compostable meat trays, and BPI-labeled kitchen compost bags currently on accepted list.

	Class	Component Category	Definition
		9 Compostable Plastic Currently Accepted from Commercial Accounts	Though approved compostable, SPU does not currently encourage their discard in residential organics service.
	Questionable	10 Potentially Compostable Plastic	Utensils, straws, cups, food-handling gloves, cold cups, deli containers, meat trays.
	Non-compostable	11 Non-compostable Film	Bags not approved by Cedar Grove and other film. Includes all merchandise and take-out bags.
		12 Not Approved as Compostable Plastic Packaging	Items that are marked compostable or biodegradable, but are not Cedar Grove-approved.
		13 Recyclable Plastic Containers	Plastic bottles, jars, tubs, cups, and other rigid containers not marked as compostable or biodegradable. Includes lids 3 inches in diameter or larger.
		14 Other Non-compostable, Non-recyclable Plastic	All other items that are entirely or predominantly composed of plastic.
Organics	Compostable	15 Food	All food, such as vegetable, fruits, breads, meats, pastas, etc. Includes tea bags and soiled coffee filters.
		16 Grass/Leaves	Grass, leaves, evergreen needles, and soil.
		17 Prunings	Prunings that are at least 2 inches in diameter at their largest point.
		18 Other Compostable Organics	Toothpicks, chop sticks, untreated wood (including dimensional lumber), indoor florals.
Other	Non-compostable	19 Recyclable Glass	Glass containers.
		20 Recyclable Metal	Aluminum cans, aluminum foil/containers, steel food cans, other ferrous metal.
		21 Pet Waste	Bagged or unbagged pet waste. Includes kitty litter and animal bedding.
		22 Hazardous	Mercury-containing light bulbs, paint, motor oil, etc.
		23 Other Non-compostable, Non-recyclable Items	All other items not included in above categories, such as mirrors.

Appendix B **Sampling Methodology**

Overview

Seattle Public Utilities (SPU) has conducted composition studies since 1988 to better understand the types and quantities of municipal solid waste (MSW) and recyclable materials collected, to assess the City's recycling potential, and to aid in the evaluation of existing programs. These studies have analyzed the residential, commercial, and self-haul waste streams and the residential recycling stream at intervals of about four years.

In 2012, Seattle conducted the first in-depth evaluation of Seattle's organics stream. The objective of this study was to determine the composition of Seattle's combined organics stream that the City's two contracted haulers collect for composting in plastic carts.

In 2005, the City added vegetative *food waste* to the materials acceptable in Seattle's organics collection program. In 2009, the organics collection program expanded to include all *food waste*. Until now, SPU has used 16 years of organics program data (from before the program included *food waste*) to estimate how much of the current organics stream is food/compostable paper and how much is *yard waste*. This composition study will help to evaluate this estimating technique. It will also be used to evaluate the degree to which this sample design methodology can accurately depict the composition over a year given the extreme volatility in the amount of *yard waste* going into the organics container across the year. There has also been an increased interest in knowing more details about the composition of the material placed in the organics containers including the amount and type of contaminants.

This study only includes material collected under Seattle's contracts for organics collection services. Private haulers outside of the City's contracts, and therefore not included in this study, collect a significant amount of material from commercial customers. [8]

Substream Definitions

For any specific geographic area, the organics stream is composed of various substreams. A "substream" is determined by the particular generation, collection, or composition characteristics that make it a unique portion of the total organics stream. For this study, the three substreams are defined as follows:

- ***Single-family residential:*** Organic materials that are generated by residential customers with cart collection service for organics. These customers have garbage collected in carts and are typically single-family detached homes, duplexes, triplexes, and four-plex buildings.

- ***Multifamily residential:*** Organic materials that are generated by residential customers with cart collection service for organics and dumpster collection for garbage. These customers are typically apartment buildings with five or more units.

[8] Seattle commercial customers can choose organics service through a hauler outside of the City of Seattle's contracts. This is referred to as "non-contract" organics service. In 2011, 68% (82,494 tons) of the total organics collected (120,595 tons) were part of the City contracts. Haulers outside of the City contracts collected 32% (38,101 tons) of the total. Self-haul customers who delivered organic materials directly to the transfer station accounted for 6% (6,794 tons) of the total.
http://www.seattle.gov/util/groups/public/@spu/@garbage/documents/webcontent/01_012982.pdf

- ***Commercial:*** Organic materials that are generated by businesses and institutions with cart collection service for organics.

These three organics substreams are collected by two contracted haulers, each serving two of four distinct "zones" (Figure 4) in the City of Seattle. One of the contracted haulers handles zones one and four, the other hauler handles zones two and three. All organics that are placed in plastic carts, including those placed at curbside and those picked up from on-site locations, were considered as the universe of containers included in this study. Organics placed in metal containers at commercial and multifamily sites were excluded. The organics targeted by this study are typically collected and transported to Cedar Grove for composting. As noted above, this study did not sample any organics collected by private organics composting firms outside of the contract with Seattle Public Utilities.

Figure 4. Seattle's Collection Zones

Sample Allocation

For this study, samples were obtained directly from organics carts that were set out for pick up on a regularly scheduled collection day. Each sample consisted of the entire contents of at least one cart.

In the first two quarters, commercial, single-family, and multifamily organics set out for collection in carts were sampled. In the second two quarters, only single-family and multifamily residences were

sampled, and the number of targets changed. The sample allocation process and resulting allocations for quarters 1 and 2 is described below, and the description of the process and allocations for quarters 3 and 4 follows separately.

QUARTERS 1 AND 2

A total of 96 single-family residential carts were selected for sampling. The single-family samples were evenly distributed across the four collection zones.

A total of 200 commercial and 120 multifamily carts were selected as targets for characterization. These samples were allocated to each of the four collection zones using the following process:

1. Calculated the percent of accounts that are in each zone for multifamily and for commercial, separately.
2. Allocated 120 multifamily and 200 commercial samples to the four zones based on percent of accounts in each zone.
3. Summed multifamily and commercial samples for each zone to get total samples by zone.
4. Based on the assumption that 32 samples is a reasonable daily sampling target, divided total samples per zone by 32 samples to calculate number of sampling days per zone for the study.
5. Rounded days per zone to integers so that no zone had less than one sampling day and total sampling days was equal to ten.
6. Re-calculated target samples per zone based on number of sampling days allocated to each zone and daily sample target.

Final allocations appear below in Table 10.

Table 10. Target Samples by Sector and Zone, Quarters 1 and 2

Zone	Single-family	Multifamily	Commercial
1	24	32	35
2	24	17	32
3	24	53	109
4	24	18	24
Total Target	**96**	**120**	**200**

QUARTERS 3 AND 4

A total of 192 single-family residential carts were selected for sampling. The single-family samples were evenly distributed across the four collection zones.

A total of 120 multifamily samples were selected as targets for characterization. These samples were collected on the same days as the single-family samples, so sampling targets were allocated per day with collection crew capacity in mind. The multifamily samples were also evenly distributed across the four collection zones.

Final allocations appear below in Table 11.

Table 11. Target Samples by Sector and Zone, Quarters 3 and 4

Zone	Single-family	Multifamily	Commercial
1	48	30	0
2	48	30	0
3	48	30	0
4	48	30	0
Total Target	**192**	**120**	**0**

Sampling Calendar

Sampling for single-family and multifamily organics occurred in each quarter of the year, while commercial sampling occurred only in the first two quarters.[9] Sampling dates within each quarter were selected using a random number generator. The sampling dates in each quarter were scheduled contiguously.

In the first two quarters, commercial, single-family, and multifamily organics set out for collection in carts were sampled. In the second two quarters, only single-family and multifamily residents were sampled, and the number of targets changed. The sampling calendar design process and resulting sampling schedule for quarters 1 and 2 is described below, and the description of the process and schedule for quarters 3 and 4 follows separately.

QUARTERS 1 AND 2

Sampling events in quarter 1 and quarter 2 consisted of ten days of commercial/multifamily sampling and four days of single-family sampling.

Scheduling Single-family Sampling

The daily sampling target for single-family organics was 24, so four sampling days (two per quarter for quarters 1 and 2) were assigned to the single-family substream.

Scheduling Commercial and Multifamily Sampling

Since the sample collection crew could collect 32 samples of commercial/multifamily organics per day, ten sampling days were assigned to commercial/multifamily substreams and divided between quarter 1 and 2.

The commercial/multifamily sampling calendar was designed using the following steps.

1. Calculated the number of sampling days required for each zone. Rounded each estimate so that each zone would have at least one day and the total number of sampling days across all zones was 10.

[9] Seattle Public Utilities and Cedar Grove Composting jointly funded quarters 1 and 2 of the study, and Cedar Grove desired to concentrate sampling of the commercial substream in the first two quarters.

Zone	MF	COM	Total Samples	Days	Days, Rounded
1	32	35	66	2.1	**2**
2	17	32	49	1.5	**2**
3	53	109	163	5.1	**5**
4	18	24	42	1.3	**1**

2. Split Zone 1 and 2 sampling days evenly between quarters 1 and 2. Subtracted one day from Zone 3 so that Zone 4 would be represented each quarter.

Zones	Allocation of Sampling Days	Quarter 1	Quarter 2
1	**2**	1	1
2	**2**	1	1
3	**5**	2	2
4	**1**	1	1

3. Randomly reordered the sequence in which the zones would be sampled in quarters 1 and 2.

Quarter 1	Reordered by Random #	Quarter 2	Reordered by Random #
3	0.9263241	4	0.020858164
4	0.8329393	1	0.102534504
1	0.6840518	3	0.169606898
2	0.2312217	3	0.274167704
3	0.1467674	2	0.885848718

4. Calculated daily sampling targets by zone for the commercial and multifamily substreams by evenly distributing targeted samples across the number of sampling days.

Zone	MF Target Samples	COM Target Samples	Sampling Days	Daily MF Samples	Daily COM Samples
1	31	33	2	15	17
2	22	42	2	11	21
3	42	86	4	10	22
4	28	36	2	14	18

5. The schedule for the first sampling event was determined by crew availability and contract start date. For the second sampling event, the week of the month was randomly selected within the crew's window of availability.

Table 12 presents the sampling calendar for the first two quarters.

Table 12. Quarters 1 & 2 Sampling Calendar

Date	Substream	Zone	SF Target	MF Target	COM Target
Mon, 2/27/2012	COM/MF	3	0	10	22
Tue, 2/28/2012	COM/MF	1	0	15	17
Wed, 2/29/2012	COM/MF	4	0	14	18
Thu, 3/1/2012	COM/MF	2	0	11	21
Fri, 3/2/2012	COM/MF	3	0	10	22
Mon, 3/5/2012	SF	1 and 4	24	0	0
Tue, 3/6/2012	SF	2 and 3	24	0	0
Thu, 5/10/2012	SF	1 and 4	24	0	0
Fri, 5/11/2012	SF	2 and 3	24	0	0
Mon, 5/14/2012	COM/MF	4	0	14	18
Tue, 5/15/2012	COM/MF	1	0	15	17
Wed, 5/16/2012	COM/MF	3	0	10	22
Thu, 5/17/2012	COM/MF	3	0	10	22
Fri, 5/18/2012	COM/MF	2	0	11	21

QUARTERS 3 AND 4

Sampling events in quarter 3 and quarter 4 consisted of a total of eight days of single-family/multifamily sampling.

Scheduling Single-family Sampling

The daily sampling target for single-family organics was 24; two sampling days (both in quarter 3) were dedicated solely to single-family sampling, and six days consisted of combined single-family/multifamily sampling.

Scheduling Multifamily Sampling

Six sampling days were assigned to multifamily sampling; two were assigned to quarter 3, and four were assigned to quarter 4.

Table 13 presents the sampling calendar for quarters 3 and 4.

Table 13. Quarters 3 & 4 Sampling Calendar

Date	Substream	Zone	SF Target	MF Target	COM Target
Wed, 8/22/2012	SF	2 and 3	24	0	0
Fri, 8/24/2012	SF	1 and 4	24	0	0
Tue, 9/18/2012	SF/MF	1 and 4	24	20	0
Wed, 9/19/2012	SF/MF	2 and 3	24	20	0
Thu, 11/14/2013	SF/MF	1 and 4	24	20	0
Fri, 11/15/2013	SF/MF	2 and 3	24	20	0
Tue, 12/10/2013	SF/MF	2 and 3	24	20	0
Wed, 12/11/2013	SF/MF	1 and 4	24	20	0

Cedar Grove and Hauler Participation

For the first two quarters of 2012, Cedar Grove collected samples and provided a sorting site at their Marginal Way facility. For the second two quarters of 2012, Cascadia staff collected samples and Seattle's north and south transfer stations provided sorting sites. To assist with the daily sample collection routing, the two contracted haulers were asked to provide daily collection schedules and route maps. These were used to construct collection routes for use by the sample collection personnel. See *Commercial/Multifamily Collection Crew Instruction Sheets* and *Instructions for Collecting Single-family Samples* in Appendix G.

Sample Selection

SINGLE-FAMILY SAMPLE SELECTION

For each single-family sampling day, one route for sampling was randomly selected from one of the four zones. The contracted haulers were asked to provide a starting location, regular driver starting time, and number of single-family accounts for the selected routes. A sampling interval was calculated by multiplying the number of accounts by 50 percent to produce a conservative estimate, allowing, in part, for residents who do not set out their carts. That number was divided by the target sample number for that zone to produce the sampling interval. For example, 50 percent of 400 total accounts equals 200, and 200 divided by 12 samples equals 16.7. In this example, the sample collection driver would count each set-out cart until they reach 17; every 17^{th} cart would be a sample.

Prior to each single-family sampling day, the collection crew was given a route map, a starting point, and a copy of the Instructions for Collecting Single-family Samples. (An example of the instructions is included in Appendix G.)

The collection crew began the collection of samples one hour before the contracted hauler began collection; the crew collected samples from carts in roughly the same order as the hauler did. This ensured that sample collection staff were sufficiently ahead of the hauler to prevent any disruptions to the normal collection operations while allowing customers time to set out their organics containers.

COMMERCIAL AND MULTIFAMILY SAMPLE SELECTION

SPU provided commercial and multifamily account data, including customer name, address, contracted hauler, zone, and collection day(s). Account lists were created for each weekday. Prior to each sampling day, that day's accounts were randomly ordered and the first accounts were selected to equal that day's sampling target plus 50% contingencies. Each day's preliminary sampling list was sent to the appropriate hauler to check collection days and to eliminate any inaccessible (e.g., locked) containers. Following the review by the contracted hauler, the selected account list was used to develop a sample collection route for the collection crew.

In quarters 1 and 2, prior to each commercial/multifamily sampling day, Commercial/Multifamily Collection Crew *Instruction Sheets* were sent to the Cedar Grove project manager. (An example is included in Appendix G.) The Cedar Grove project manager planned and coordinated the collection process, and drivers collected and delivered the samples to the Marginal Way sampling site. In quarters 3 and 4, Cascadia staff received similar instruction before each sampling day, and delivered collected samples to Seattle's north and south transfer stations.

When feasible, the collection crew collected samples prior to normal pick-up time for the contracted hauler. When that was not possible (for instance, if the regular driver started very early in the morning), selected carts were pre-tagged to alert the regular driver to skip the selected carts. In those cases, the collection crew collected the sample after the driver serviced that portion of the route and retrieved the tag. (The *Cart Tag* is presented in Appendix G.)

Sample Collection and Sorting

When a selected cart was identified for sampling, the sample collector emptied the entire contents of the cart on a tarp and sealed it. When more than one cart was set-out, the sample collector collected the contents of one cart. Each sample was labeled with a *Sample Placard*. Examples of commercial/multifamily and single-family *Sample Placards* are included in Appendix G. After the collection staff completed their day's collection, they transported the samples to the Cedar Grove Marginal Way facility (quarters 1 and 2) or one of Seattle's transfer stations (quarters 3 and 4) for sorting.

Cascadia staff hand-sorted samples at these facilities. The sorting procedure included the following four steps.

Step 1: Review methodology and sorting categories with the crew. To provide consistent sorting, Cascadia used highly trained crewmembers throughout the project. Before the sorting began, all crewmembers reviewed the procedures, forms, and material definitions in detail. The material definitions are included in Appendix A.

Step 2: Sort sample. Once the samples were placed on the floor for sorting, the sorting crewmembers sorted each sample by hand into the prescribed material component categories. The crewmembers typically started each sample with three or four sorting baskets for the most commonly found components and set up more as needed. Each sample was sorted to the greatest reasonable level of detail.

Step 3: Weigh the sample. The Field Crew Manager verified the purity of each material as it was weighed using a pre-tared scale, and recorded the data on the *Sample Tally Sheet* (Appendix G).

Sorted materials were aggregated in containers to collect volume measurements of total sample material. The field crew manager used these volumes to calculate density factors for materials to estimate collection volumes in the final report.

Step 4: Review data. At the conclusion of each sorting day, the Field Crew Manager conducted a quality control review of the data recorded.

Target v. Actual v. Reported Samples

Cascadia collected and sorted 751 samples in the 2012 study: 297 from the single-family residential substream, 294 from the multifamily residential substream, and 160 from the commercial substream. SPU elected to exclude eleven of these samples (1 from single-family, 6 from multifamily, and 4 from commercial) due to extreme contamination, based on the assumption that the hauler would not have collected these highly contaminated carts.

Table 14 presents the overall sample targets, actual samples collected and sorted, and samples included in final analysis and reporting.

Table 14. Target v. Actual v. Reported

Substream	Zone/ Area	Overall Target	Overall Actual	Overall Reported
Single-family		**288**	**297**	**296**
	1	72	74	74
	2	72	75	74
	3	72	75	75
	4	72	73	73
Multifamily		**240**	**294**	**288**
	1	62	72	72
	2	47	96	94
	3	83	60	60
	4	48	66	62
Commercial		**200**	**160**	**156**
	1	35	37	37
	2	32	27	26
	3	109	75	74
	4	24	21	19
Totals		**648**	**751**	**740**

Appendix C Comments on Sampling Events

This appendix presents summaries of pertinent details regarding collection and sorting activities for sampling events for this study.[10]

Comments on Quarter 1 Sampling

Sampling took place from February 27 to March 2 for commercial and multifamily organics and on March 5 and 6 for single-family organics. Table 15 presents the number of samples captured compared to the targets for this quarter.

Table 15. Quarter 1 Sample Targets vs. Actual

Substream	Zone/Area	Sampling Targets	Actual Samples	Difference
Single-family		**48**	**57**	**9**
	1	12	14	2
	2	12	15	3
	3	12	15	3
	4	12	13	1
Multifamily		**65**	**63**	**(2)**
	1	18	17	(1)
	2	16	23	7
	3	20	9	(11)
	4	11	14	3
Commercial		**95**	**70**	**(25)**
	1	30	13	(17)
	2	0	15	15
	3	44	33	(11)
	4	21	9	(12)
Totals		**208**	**190**	**(18)**

The overall shortfall of 18 samples was due in part to the use of one truck on the first sampling day rather than two. We anticipate making up this shortfall and meeting the overall sampling targets for each substream following the second quarter.

The results in this memo differ from those that will appear in the final report in two ways:[11]

1. Tables in the final report will include tonnage estimates as well as composition percentages. Tonnage estimates are not provided in this memo because they are not available yet for Quarter 1.

[10] Because the sample targets changed in the middle of the year, the progress report tables are not consistent across all sampling events.

[11] All waste composition results were derived using a 90% confidence level, meaning that there is a 90% certainty that the actual composition is within the calculated range.

2. The final analysis will produce organics composition estimates by aggregating sample data using a *weighted average procedure*. For example, to develop composition estimates for Seattle's multifamily organics stream, sample data from all four zones will be combined, with slightly more importance given to the multifamily zone samples that contribute the majority of total multifamily tons collected. Tables in this memo are *unweighted*, meaning that samples across all four zones had the same relative *weight* in the calculation of composition estimates.

Comments on Quarter 2 Sampling

Sampling took place on May 10th and 11th for single-family organics and from May 14th to May 18th for commercial and multifamily organics. Table 16 presents the number of samples captured compared to the targets for this quarter and for the first two quarters combined.

Table 16. Quarter 2 and Overall Sample Targets vs. Actual

Substream	Zone/ Area	Quarter 2 Target	Quarter 2 Actual	Quarter 2 Difference	Overall Target	Overall Actual	Overall Difference
Single-family		**48**	**48**	**0**	**96**	**105**	**9**
	1	12	12	0	24	26	2
	2	12	12	0	24	27	3
	3	12	12	0	24	27	3
	4	12	12	0	24	25	1
Multifamily		**62**	**110**	**48**	**120**	**170**	**50**
	1	12	26	14	32	40	8
	2	15	43	28	17	66	49
	3	19	21	2	53	30	(23)
	4	16	20	4	18	34	16
Commercial		**98**	**83**	**(15)**	**200**	**160**	**(40)**
	1	20	21	1	35	37	2
	2	17	12	(5)	32	27	(5)
	3	45	42	(3)	109	75	(34)
	4	16	8	(8)	24	21	(3)
Totals		**208**	**241**	**33**	**416**	**435**	**19**

We met the sampling targets for the single-family and multifamily substreams for Quarter 2 and for the overall study, but we fell short of the commercial sampling target for Quarter 2 and overall. While we began each day with ample carts to meet our goals, the collection crew had a lower success rate with commercial carts, which were frequently difficult to locate. We exceeded the target for all substreams for the first two quarters by 19 samples.

The results in this memo differ from those that will appear in the final report in two ways:[12]

[12] All waste composition results were derived using a 90% confidence level, meaning that there is a 90% certainty that the actual composition is within the calculated range.

1. Tables in the final report will include tonnage estimates as well as composition percentages. Tonnage estimates are not provided in this memo because they are not available yet for Quarter 2.
2. The final analysis will produce organics composition estimates by aggregating sample data using a *weighted average procedure*. For example, to develop composition estimates for Seattle's multifamily organics stream, sample data from all four zones will be combined, with slightly more importance given to the multifamily zone samples that contribute the majority of total multifamily tons collected. Tables in this memo are *unweighted*, meaning that samples across all four zones had the same relative *weight* in the calculation of composition estimates.

Comments on Quarter 3 Sampling

Sampling in the third quarter, which took place on August 22nd and 24th and September 18th and 19th, focused on single-family and multifamily organics. Commercial organics were sampled in the first two quarters. Table 17 presents the number of samples captured compared to the targets for this quarter and for the first three quarters combined.

Table 17. Quarter 3 and Overall Sample Targets vs. Actual

Substream	Zone/ Area	Quarter 3 Target	Quarter 3 Actual	Quarter 2 Difference	Overall Target	Overall Actual	Overall Difference
Single-family		**96**	**96**	**0**	**192**	**201**	**9**
	1	24	24	0	48	50	2
	2	24	24	0	48	51	3
	3	24	24	0	48	51	3
	4	24	24	0	48	49	1
Multifamily		**40**	**40**	**0**	**160**	**210**	**50**
	1	10	10	0	42	50	8
	2	10	10	0	27	76	49
	3	10	10	0	63	40	(23)
	4	10	10	0	28	44	16
Commercial		**0**	**0**	**0**	**200**	**160**	**(40)**
	1	0	0	0	35	37	2
	2	0	0	0	32	27	(5)
	3	0	0	0	109	75	(34)
	4	0	0	0	24	21	(3)
Totals		**136**	**136**	**0**	**552**	**571**	**19**

We met the Quarter 3 sampling targets for the single-family and multifamily substreams.
The preliminary composition results and associated error ranges are presented below in a series of tables.[13] The results in this memo differ from those that will appear in the final report in two ways:

[13] All waste composition results were derived using a 90% confidence level, meaning that there is a 90% certainty that the actual composition is within the calculated range.

1. Tables in the final report will include tonnage estimates as well as composition percentages. Tonnage estimates are not provided in this memo because they are not available yet for Quarter 3.
2. The final analysis will produce organics composition estimates by aggregating sample data using a *weighted average procedure*. For example, to develop composition estimates for Seattle's multifamily organics stream, sample data from all four zones will be combined, with slightly more importance given to the multifamily zone samples that contribute the majority of total multifamily tons collected. Tables in this memo are *unweighted*, meaning that samples across all four zones had the same relative *weight* in the calculation of composition estimates.

Comments on Quarter 4 Sampling

Sampling in the fourth quarter, which took place on November 14th and 15th and December 10th and 11th, focused on single-family and multifamily organics. Commercial organics were sampled in the first two quarters. Table 18presents the number of samples captured compared to the targets for this quarter and for the overall study.

Table 18. Quarter 4 and Overall Sample Targets vs. Actual

Substream	Zone/ Area	Quarter 4 Target	Quarter 4 Actual	Quarter 4 Difference	Overall Target	Overall Actual	Overall Difference
Single-family		**96**	**96**	**0**	**288**	**297**	**9**
	1	24	24	0	72	74	2
	2	24	24	0	72	75	3
	3	24	24	0	72	75	3
	4	24	24	0	72	73	1
Multifamily		**0**	**84**	**84**	**160**	**294**	**134**
	1	0	22	22	42	72	30
	2	0	20	20	27	96	69
	3	0	20	20	63	60	(3)
	4	0	22	22	28	66	38
Commercial		**0**	**0**	**0**	**200**	**160**	**(40)**
	1	0	0	0	35	37	2
	2	0	0	0	32	27	(5)
	3	0	0	0	109	75	(34)
	4	0	0	0	24	21	(3)
Totals		**96**	**180**	**84**	**648**	**751**	**103**

We met the Quarter 4 sampling targets for the single-family substream. Though the initial plan did not include sampling multifamily carts in Quarter 4, efficiencies in sample collection allowed for the sampling of 84 multifamily organics carts this quarter.

The preliminary composition results and associated error ranges are presented below in a series of tables.[14] The results in this memo differ from those that will appear in the final report in two ways:

[14] All waste composition results were derived using a 90% confidence level, meaning that there is a 90% certainty that the actual composition is within the calculated range.

1. Tables in the final report will include tonnage estimates as well as composition percentages. Tonnage estimates are not provided in this memo because they are not available yet for Quarter 4.
2. The final analysis will produce organics composition estimates by aggregating sample data using a *weighted average procedure*. For example, to develop composition estimates for Seattle's multifamily organics stream, sample data from all four zones will be combined, with slightly more importance given to the multifamily zone samples that contribute the majority of total multifamily tons collected. Tables in this memo are *unweighted*, meaning that samples across all four zones had the same relative *weight* in the calculation of composition estimates.

Appendix D **Organics Composition Calculations**

Composition Calculations

The composition estimates represent the **ratio of the components' weight to the total sorted weight** for each noted subpopulation. They were derived by summing each component's weight across all of the selected records and dividing by the sum of the total weight of organics sorted, as shown in the following equation:

$$r_j = \frac{\sum_i c_{ij}}{\sum_i w_i}$$

where:

c = weight of particular component

w = sum of all component weights

for i 1 to n

where n = number of selected samples

for j 1 to m

where m = number of components

The confidence interval for this estimate was derived in two steps. First, the variance around the estimate was calculated, accounting for the fact that the ratio includes two random variables (the component and total sample weights). The **variance of the ratio estimator** equation follows:

$$\hat{V}_{r_j} = \left(\frac{1}{n}\right) \cdot \left(\frac{1}{\overline{w}^2}\right) \cdot \left(\frac{\sum_i \left(c_{ij} - r_j w_i\right)^2}{n-1}\right)$$

where:

$$\overline{w} = \frac{\sum_i w_i}{n}$$

Second, **precision levels** at the 90% confidence interval were calculated for a component's mean as follows:

$$r_j \pm \left(t \cdot \sqrt{\hat{V}_{r_j}}\right)$$

where:

t = the value of the t-statistic (1.645) corresponding to a 90% confidence level

For more detail, please refer to Chapter 6 "Ratio, Regression and Difference Estimation" of *Elementary Survey Sampling* by R.L. Scheaffer, W. Mendenhall and L. Ott (PWS Publishers, 1986).

Volumetric Composition Calculations

During quarters 1 and 2, Cedar Grove commissioned a project designed to estimate the volumes of primary materials found in incoming organics carts. In quarters 1 and 2, after each sample was sorted into its component categories and weighed, material was accumulated in seven combined categories: compostable paper, non-compostable paper, compostable plastics, non-compostable plastics, *food waste*, *yard waste*, and other materials. The volume of material in each container was measured. Those volumes were divided by the total weight of material sorted during that time period to calculate density factors. Using the combined material categories, the weight-based composition estimates, in the form of tons collected, were converted to pounds collected and divided by the density factors to calculate volumetric composition estimates.

Total volume (cubic inches) sorted, cubic yards sorted, weight sorted, and resulting densities are presented in the tables below for the three substreams. These density factors were applied to composition data for the first two quarters to determine composition by volume. Compositions by volume for quarter 1 and 2, by substream, are presented in Appendix F.

Table 19. Single-family Density Factors

	Total Volume *Cubic inches*	Total Volume *Cubic yards*	Total Weight *Pounds*	Density *Pounds/ cubic yard*
Compostable paper	24,336	0.5	46	88
Non-compostable paper	5,408	0.1	11	91
Compostable plastics	1,512	0.0	3	82
Non-compostable plastics	6,084	0.1	2	15
Food waste	18,928	0.4	253	624
yard waste	379,227	8.1	2,513	309
Other materials	450	0.0	12	1,234
Total	**435,945**	**9.3**	**2,839**	**304**

Table 20. Multifamily Density Factors

	Total Volume *Cubic inches*	Total Volume *Cubic yards*	Total Weight *Pounds*	Density *Pounds/ cubic yard*
Compostable paper	116,164	2.5	262	105
Non-compostable paper	27,536	0.6	71	121
Compostable plastics	37,192	0.8	64	81
Non-compostable plastics	24,234	0.5	73	141
Food waste	108,745	2.3	2,101	901
yard waste	195,696	4.2	1,467	350
Other materials	15,178	0.3	114	352
Total	**524,745**	**11.2**	**4,154**	**369**

Table 21. Commercial Density Factors

	Total Volume *Cubic inches*	Total Volume *Cubic yards*	Total Weight *Pounds*	Density *Pounds/ cubic yard*
Compostable paper	161,054	3.5	686	199
Non-compostable paper	62,572	1.3	166	124
Compostable plastics	38,909	0.8	68	81
Non-compostable plastics	20,762	0.4	57	129
Food waste	174,636	3.7	3,657	977
yard waste	177,282	3.8	1,195	314
Other materials	4,758	0.1	28	279
Total	**161,054**	**3.5**	**686**	**427**

Appendix E Results by Volume, Quarters 1 and 2

This appendix presents volumetric composition estimates results for single-family, multifamily, and commercial organic substreams. These data only include volumetric estimates for the first two quarters of the study, because they represent a request from Cedar Grove, who contributed funding for these analyses for quarter 1 and quarter 2.

Decide which tables to show.

Table 22. Volumetric Composition, Overall Residential Organics

Material	Weight (tons)	Volume (cy)	Percent by Volume
Compostable Paper	**1,439**	**32,568**	**14.8%**
Compostable Plastic	**125**	**3,057**	**1.4%**
Organics	**30,585**	**174,016**	**79.1%**
Food	*7,108*	*22,373*	*10.2%*
Yard Waste	*23,477*	*151,643*	*68.9%*
Contaminants	**345**	**10,326**	**4.7%**
Non-compostable paper	*72*	*1,531*	*0.7%*
Non-compostable plastics	*72*	*7,594*	*3.5%*
Other materials	*202*	*1,202*	*0.5%*
Total	***32,494***	***219,968***	***100%***

Table 23. Volumetric Composition, Single-family Organics

Material	Weight (tons)	Volume (cy)	Percent by Volume
Compostable Paper	**1,377**	**31,402**	**14.6%**
Compostable Plastic	**111**	**2,718**	**1.3%**
Organics	**29,851**	**171,290**	**79.9%**
Food	*6,688*	*21,442*	*10.0%*
Yard Waste	*23,163*	*149,848*	*69.9%*
Contaminants	**302**	**9,086**	**4.2%**
Non-compostable paper	*65*	*1,416*	*0.7%*
Non-compostable plastics	*57*	*7,377*	*3.4%*
Other materials	*181*	*293*	*0.1%*
Total	***31,641***	***214,495***	***100%***

Table 24. Volumetric Composition, Multifamily Organics

Material	Weight (tons)	Volume (cy)	Percent by Volume
Compostable Paper	**61.4**	**1,167**	**24.9%**
Compostable Plastic	**13.7**	**339**	**7.2%**
Organics	**733.8**	**2,726**	**58.2%**
Food	*419.9*	*932*	*19.9%*
Yard Waste	*314.0*	*1,795*	*38.3%*
Contaminants	**43.5**	**452**	**9.7%**
Non-compostable paper	*6.9*	*115*	*2.4%*
Non-compostable plastics	*15.4*	*217*	*4.6%*
Other materials	*21.2*	*121*	*2.6%*
Total	***852.4***	***4,684***	***100%***

Table 25. Volumetric Composition, Commercial Organics

Material	Weight (tons)	Volume (cy)	Percent by Volume
Compostable Paper	**53.1**	**534**	**29.5%**
Compostable Plastic	**4.6**	**114**	**6.3%**
Organics	**346.2**	**986**	**54.5%**
Food	*282.0*	*577*	*31.9%*
Yard Waste	*64.2*	*409*	*22.6%*
Contaminants	**12.2**	**176**	**9.7%**
Non-compostable paper	*6.0*	*98*	*5.4%*
Non-compostable plastics	*4.1*	*64*	*3.5%*
Other materials	*2.0*	*14*	*0.8%*
Total	***416.1***	***1,810***	***100%***

Appendix F **Field Forms**

- Commercial/Multifamily Collection Crew Instruction Sheet
- Instructions for Collecting Single-family Samples
- Sample Tally Sheet
- Sample Placard: Commercial/Multifamily
- Sample Placard: Single-family
- Cart Tag

Instructions for Collecting Single-family Samples

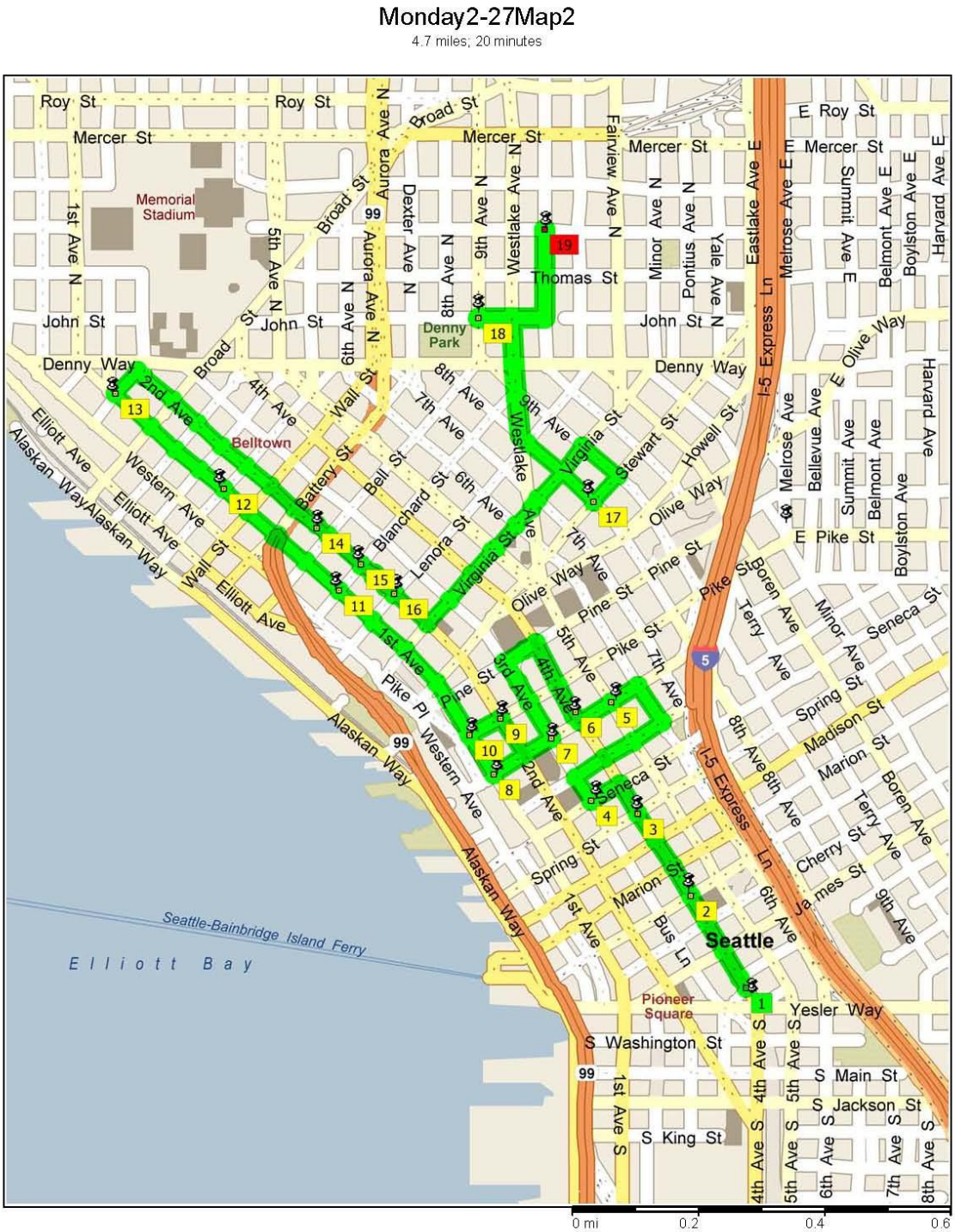
Instructions for Collecting Single-family Samples
Monday, 3/5 and Tuesday, 3/6

We'll use a different method for selecting samples on Monday and Tuesday. Instead of selecting accounts for sampling, Monday and Tuesday's sample collection will be from individual routes.

1. Each driver should take a packet that includes a route map and sample placards.
2. Each route map shows the starting point where the regular driver will begin collection.
3. Leave enough time to arrive at the start of your route by 6:45am.
4. We've identified a sampling interval for each route. It's written on the route map. You're going to use the sampling interval to figure out which houses to pick up samples from.
5. Beginning at the first cart that's set out at the start of your route, go down the street counting set outs.
6. When you get to your sampling interval (e.g., the 8th house that has a cart set out), take that sample. Try to get all the material that's set out. This should be easier than with commercial/multifamily accounts.
7. Write the cross streets on your sample placard.
8. Wrap up the sample as you have been.
9. Move on to the next sample by counting set-outs again until you get to the next interval (e.g., the next 8th set-out). If you can follow the exact route, that's best. If we didn't provide the exact route, than do your best to move across the route area away from the starting point.
10. Keep going until you get 15 samples.

Troubleshooting: If the regular route driver catches up with you, skip ahead and start counting again.

Commercial/Multifamily Collection Crew Instruction Sheet (map)



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Collection Crew Instruction Sheet (driving instructions)

9:00 AM	0.0 mi	1 Depart REYNOLDS W/T RELEASE PRG [410 4TH AVE, seattle, WA] on 4th Ave (North) for 0.2 mi
9:00 AM	0.2 mi	2 At RAINIER CLUB [820 4TH AVE, seattle, WA], stay on 4th Ave (North) for 0.2 mi
9:00 AM	0.4 mi	3 At STARBUCKS COFFEE #20016 [1100 4TH AVE, seattle, WA], stay on 4th Ave (North) for 109 yds
9:00 AM	0.4 mi	*Turn potentially restricted* Turn LEFT (West) onto Seneca St for 109 yds
9:01 AM	0.5 mi	4 At HOTEL SEATTLE [315 SENECA ST, seattle, WA], turn RIGHT (North) onto 3rd Ave, then immediately turn RIGHT (East) onto University St for 0.2 mi
9:02 AM	0.7 mi	Turn LEFT (North) onto 6th Ave, then immediately turn LEFT (West) onto Union St for 0.1 mi
9:03 AM	0.9 mi	5 At BLUE WATER TACO GRILL #12 [515 UNION ST, seattle, WA], stay on Union St (West) for 109 yds
9:03 AM	0.9 mi	Turn RIGHT (North) onto 4th Ave for 32 yds
9:04 AM	1.0 mi	6 At JOSHUA GREEN CORPORATION [1425 4TH AVE, seattle, WA], stay on 4th Ave (North-West) for 0.1 mi
9:04 AM	1.1 mi	Turn LEFT (West) onto Pine St, then immediately turn LEFT (South) onto 3rd Ave for 0.2 mi
9:06 AM	1.3 mi	7 At GVA KM - VANCE BLDG. [1402 3RD AVE #525, seattle, WA], turn RIGHT (West) onto Union St for 0.1 mi
9:06 AM	1.4 mi	8 At CAFFE LADRO [110 UNION ST, seattle, WA], turn RIGHT (North) onto 1st Ave, then immediately turn RIGHT (East) onto Pike St for 0.1 mi
9:07 AM	1.6 mi	9 At Pable Indian Cuisine, turn RIGHT (South) onto 2nd Ave, then immediately turn RIGHT (West) onto Union St for 0.1 mi
9:08 AM	1.7 mi	Turn RIGHT (North) onto 1st Ave for 142 yds
9:08 AM	1.8 mi	10 At SEATTLE COFFEE WORKS [107 PIKE ST, seattle, WA], stay on 1st Ave (North) for 0.4 mi
9:09 AM	2.2 mi	11 At KASOTA APARTMENTS [2212 1ST AVE, seattle, WA], stay on 1st Ave (North-West) for 0.3 mi
9:10 AM	2.4 mi	12 At CJS [2619 1ST AVE, seattle, WA], stay on 1st Ave (North-West) for 0.3 mi
9:11 AM	2.7 mi	13 At DENDREON [3005 1ST AVE, seattle, WA], turn RIGHT (North-East) onto Eagle St, then immediately turn RIGHT (South-East) onto 2nd Ave for 0.5 mi
9:12 AM	3.2 mi	14 At MARRAKESH RESTAURANT [2334 2ND AVE, seattle, WA], stay on 2nd Ave (East) for 174 yds
9:12 AM	3.3 mi	15 At PINTXO [2207 2ND AVE, seattle, WA], stay on 2nd Ave (East) for 142 yds
9:13 AM	3.4 mi	16 At STARBUCKS #3296 [211 LENORA ST, seattle, WA], stay on 2nd Ave (South-East) for 142 yds
9:13 AM	3.4 mi	Turn LEFT (North-East) onto Virginia St for 0.4 mi
9:14 AM	3.9 mi	Turn RIGHT (South-East) onto 9th Ave, then immediately turn RIGHT (South-West) onto Stewart St for 0.1 mi
9:16 AM	4.0 mi	17 At 1918 8TH AVE [1918 8TH AVE, seattle, WA], turn RIGHT (North-West) onto 8th Ave for 0.2 mi
9:16 AM	4.2 mi	Bear RIGHT (North) onto Westlake Ave (N) for 0.2 mi
9:18 AM	4.4 mi	Turn LEFT (West) onto John St for 109 yds
9:18 AM	4.5 mi	18 At BANYA 5 [217 9TH AVE N, seattle, WA], return East on John St for 0.1 mi
9:19 AM	4.6 mi	Turn LEFT (North) onto Terry Ave N for 0.2 mi
9:20 AM	4.7 mi	19 Arrive INSTITUTE FOR SYSTEMS BIOLOGY [401 TERRY AVE N, seattle, WA]

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Sample Tally Sheet

2012 Seattle Organics Composition Study

Sample Tally Sheet

						Subsort Wt.
Paper	Wt.1	Wt.2	Wt.3	Wt.4		
Universal Compostable Paper						
Mixed Recyclable Paper						
Commercially Compostable Paper						
Potentially Compostable Paper					*	
Polycoated paper						
Not Approved Paper Packaging						
Other Paper						
Plastic	Wt.1	Wt.2	Wt.3	Wt.4		
Universal Compostable Plastic						
Commercially Compostable Plastic						
Potentially Compostable Plastic					*	
Non-compostable Film						
Not Approved Plastic Packaging						
Recyclable Plastic Containers						
Other Plastic						
Organics	Wt.1	Wt.2	Wt.3	Wt.4		
Food						
Grass/Leaves						
Prunings						
Other Compostable Organics						
Other	Wt.1	Wt.2	Wt.3	Wt.4		
Recyclable Glass						
Recyclable Metal						
Pet Waste						
Hazardous						
Other Materials						

***SUBSORT SAMPLE** ☐

Sample ID: _____

Day: _____

Hauler: _____

Area: _____

Sampler: _____

Volume _____ in

_____ in

_____ in

Notes

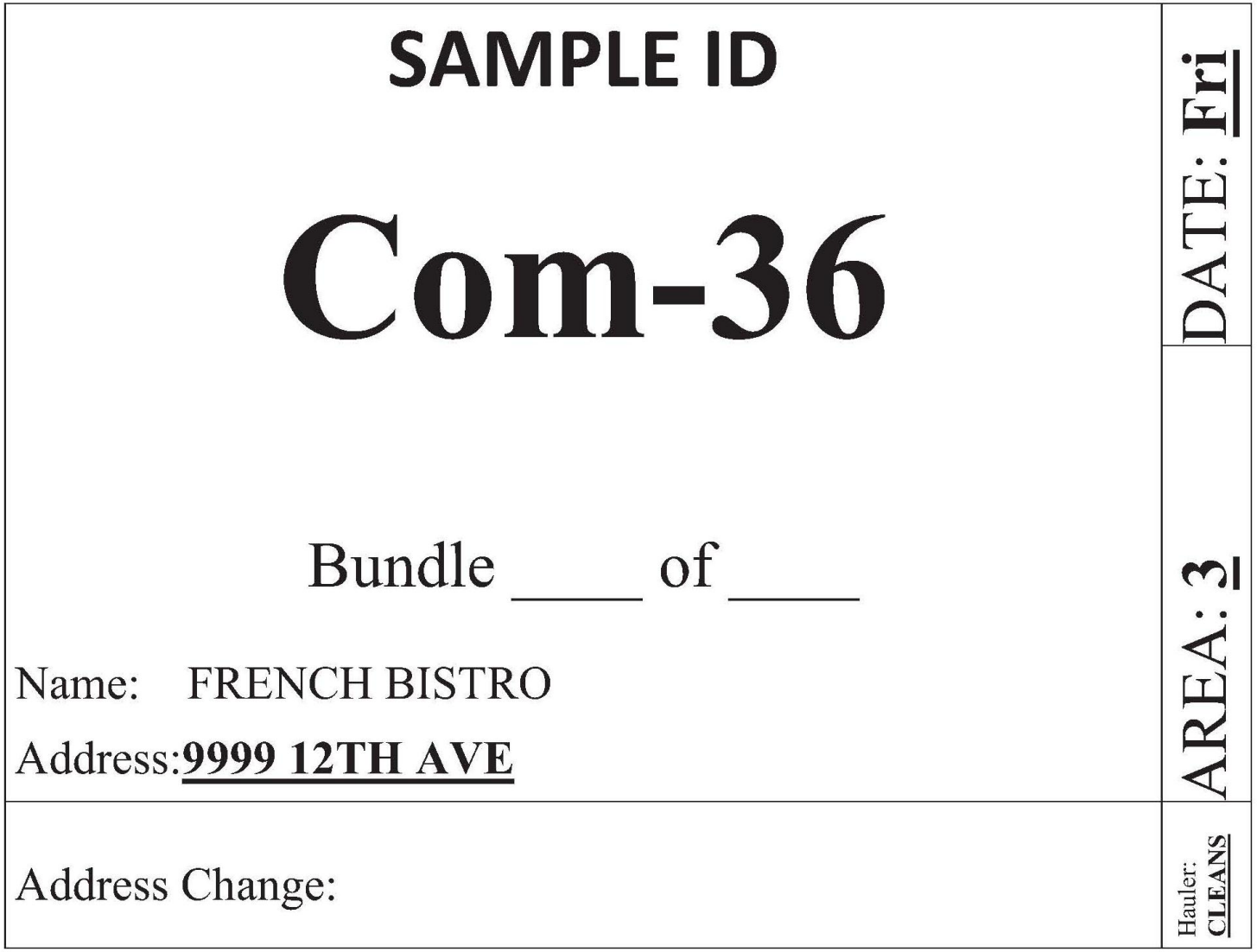
Volume Data Tracking Sheet

Seattle Organics Study Volume Measurement Tally

Date:						
Combined Class	**Volume 1**	**Volume 2**	**Volume 3**	**Volume 4**	**Volume 5**	**Volume 6**
Compostable Paper						
Non-compostable Paper						
Compostable Plastics						
Non-compostable Plastics						
Food waste						
yard waste						

If found, please call 206-449-1121. Reward offered.

Sample Placard: Commercial/Multifamily



Sample Placard: Single-family

SAMPLE ID

SF-8

DATE:

Bundle ____ of ____

AREA: 1

Closest Cross Streets:

Route: 1610

Hauler: **Waste**

Cart Tag

Your cart was NOT missed. Please do not move your cart. A food/ *yard waste* collection driver will return to pick it up by noon.