Seattle Public Utilities

2010

Residential Recycling Stream Composition Study FINAL Report

prepared by

Cascadia Consulting Group

August 2011

Previous reports on Seattle's residential waste and recycling streams are available on the Seattle Public Utilities website.

Waste Composition Reports[1]

2006 Residential Waste Stream Composition Study

2002 Residential Waste Stream Composition Study

1998-1999 Residential Waste Stream Composition Study

1994-1995 Residential Waste Stream Composition Study

Recycling Composition Reports[2]

2005 Residential Recycling Composition Study

2000-01 Residential Recycling Composition Study

[1] The residential waste composition reports are available online at the following website (link active as of June 2011).
http://www.seattle.gov/util/About_SPU/Garbage_System/Reports/Waste_Composition_Reports/index.asp

[2] The residential recycling composition reports are available online at the following website (link active as of June 2011).
http://www.seattle.gov/util/About_SPU/Recycling_System/Reports/Recycling_Composition_Study/index.asp

Table of Contents

1 OVERVIEW 1

1.1 Sampling Populations 1

1.2 Study Methodology 2

2 SUMMARY OF SAMPLING RESULTS 5

2.1 Overall Recycling Composition 5

2.2 Residential Recycling by Subpopulation 8

3 TRENDS IN RESIDENTIAL RECYCLING: 2000/01 TO 2010 11

3.1 Trends in Tons Recycled Since 2000/01 11

3.2 Changes in Composition Percentages 12

3.2.1 Changes in Composition Percentages: 2000/01 to 2010 12

3.2.2 Changes in Composition Percentages: 2005 to 2010 13

4 COMPOSITION RESULTS, BY SUBPOPULATION 14

4.1 By Residence Type 15

4.1.1 Single-family Composition 16

4.1.2 Multifamily Composition 16

4.1.3 Comparison of Residence Types 17

4.2 By Collection Zone 20

4.2.1 Zone 1 21

4.2.2 Zone 2 21

4.2.3 Zone 3 22

4.2.4 Zone 4 22

4.2.5 Comparison of Zones 23

4.3 By Residence Type and Collection Zone 28

4.3.1 Single-family Zone 1 30

4.3.2 Single-family Zone 2 30

4.3.3 Single-family Zone 3 31

4.3.4 Single-family Zone 4 31

4.3.5 Comparison of Single-family Zones 1 Through 4 32

4.3.6 Multifamily Zone 1 33

4.3.7 Multifamily Zone 2 33

4.3.8 Multifamily Zone 3 34

4.3.9 Multifamily Zone 4 34

4.3.10 Comparison of Multifamily Zones 1 Through 4 35

4.4 By Demographics 44

4.4.1 By Household Income 44

4.4.2 By Household Size 49

Appendix A Recycling Component Categories
Appendix B Sampling Methodology
Appendix C Comments on Monthly Sampling Events
Appendix D Recycling Composition Calculations
Appendix E Year to Year Comparison Calculations
Appendix F Field Forms

Table of Tables

Table 2-1. Top Ten Components: Overall 6
Table 2-2. Composition by Weight: Overall 7
Table 2-3: Largest Recycling Components, by Subpopulation 9
Table 3-1. Changes in Changes in Composition Percentages: 2000/01 to 2010 12
Table 3-2. Changes in Recycling: 2005 to 2010 13
Table 4-1. Description of Samples for Each Subpopulation 14
Table 4-2. Top Ten Components: Single-family 16
Table 4-3. Top Ten Components: Multifamily 16
Table 4-4. Composition by Weight: Single-family 18
Table 4-5. Composition by Weight: Multifamily 19
Table 4-6. Top Ten Components: Zone 1 21
Table 4-7. Top Ten Components: Zone 2 21
Table 4-8. Top Ten Components: Zone 3 22
Table 4-9. Top Ten Components: Zone 4 22
Table 4-10. Composition by Weight: Zone 1 24
Table 4-11. Composition by Weight: Zone 2 25
Table 4-12. Composition by Weight: Zone 3 26
Table 4-13. Composition by Weight: Zone 4 27
Table 4-14. Top Ten Components: Single-family Zone 1 30
Table 4-15. Top Ten Components: Single-family Zone 2 30
Table 4-16. Top Ten Components: Single-family Zone 3 31
Table 4-17. Top Ten Components: Single-family Zone 4 31
Table 4-18. Top Ten Components: Multifamily Zone 1 33
Table 4-19. Top Ten Components: Multifamily Zone 2 33
Table 4-20. Top Ten Components: Multifamily Zone 3 34
Table 4-21. Top Ten Components: Multifamily Zone 4 34
Table 4-22. Composition by Weight: Single-family Zone 1 36
Table 4-23. Composition by Weight: Single-family Zone 2 37
Table 4-24. Composition by Weight: Single-family Zone 3 38
Table 4-25. Composition by Weight: Single-family Zone 4 39
Table 4-26. Composition by Weight: Multifamily Zone 1 40
Table 4-27. Composition by Weight: Multifamily Zone 2 41
Table 4-28. Composition by Weight: Multifamily Zone 3 42
Table 4-29. Composition by Weight: Multifamily Zone 4 43

Table 4-30: Top Ten Components – High-income Households 45
Table 4-31: Top Ten Components – Low-income Households 46
Table 4-32: Composition by Weight – High-income Households 47
Table 4-33: Composition by Weight – Low-income Households 48
Table 4-34: Top Ten Components – Small Households 50
Table 4-35: Top Ten Components – Large Households 50
Table 4-36: Composition by Weight – Small Households 51
Table 4-37: Composition by Weight – Large Households 52

Table of Figures

Figure 1-1: Seattle's Collection Zones 2
Figure 1-2: Residential Recycling Subpopulations, by Residence Type and Collection Zone 2
Figure 2-1: Overview of Composition Estimates: Overall 5
Figure 3-1. Changes in Residential Recycling Tons, 2000/01 to 2010 12
Figure 4-1. Overview of Composition Estimates, by Residence Type 15
Figure 4-2. Overview of Composition Estimates, by Collection Zone 20
Figure 4-3. Overview of Composition Estimates: Single-family 28
Figure 4-4. Overview of Composition Estimates: Multifamily 29
Figure 4-5: Composition Summary, by Household Income 45
Figure 4-6: Composition Summary, by Household Size 49

1 OVERVIEW

In 1988, Seattle Public Utilities launched a series of waste and recycling composition studies. A material composition study provides information about quantities and composition of materials, informing solid waste management planning and evaluation. As part of these ongoing studies, the City of Seattle conducted recycling composition studies in 1993, 1998/99, 2000/01, and 2005 to better understand the types and quantities of materials set out by Seattle residents in recycling containers provided by contracted haulers. Recycling composition estimates obtained from these studies are also used to help determine a portion of the payment amounts from the city to the private company that processes Seattle's residential recycling.[3]

Composition estimates are made by sorting and weighing samples of recycling from randomly selected loads brought to Allied Waste's 3rd & Lander facility. This report summarizes estimates from samples taken between January and December 2010. Cascadia Consulting Group served as the primary contractor for this research; Sky Valley Associates sorted the recyclables[4].

This report is organized into four sections. Section 1 briefly summarizes the project, including a description of the sampling populations. Section 2 presents an overview of the results. Section 3 compares results from the current study with those from previous studies. Section 4 provides the complete composition results for samples taken during the 2010 study, presented by collection zone, residence type, and by residence type for each collection zone. Detailed appendices follow the main body of the report.

1.1 Sampling Populations

This study examined recycling set out by two types of residences: single-family and multifamily. In Seattle, the single-family and multifamily recycling streams are defined as follows:

- **Single-family:** Primarily detached single-family, duplex, triplex, and four-plex homes. Recycling is collected from carts.
- **Multifamily:** Primarily apartments and condominiums with five or more units. Recycling is collected from dumpsters.[5]

The contracted haulers deliver both single-family and multifamily residential recycling to the 3rd & Lander recycling facility. Recyclable materials that are either self-hauled to the city's two transfer stations or collected from Seattle's commercial sector were excluded from this study.

Contract haulers collect Seattle's residential recycling from four collection zones (Zones 1, 2, 3, and 4) shown in Figure 1-1 below.

[3] These payments depend on the amount of each material collected as well as on current market prices and other factors.
[4] A waste composition study was also conducted in 2010. The full citation can be found on the inner side of the title page.
[5] Through the Clear Alleys Program, multifamily recycling from approximately 100 downtown buildings is collected in bags. This material was excluded from the study due to the difficulty of segregating and obtaining representative samples.

Figure 1-1: Seattle's Collection Zones

Figure 1-2 depicts each of the eight residential recycling subpopulations, according to residence type and collection zone.

Figure 1-2: Residential Recycling Subpopulations, by Residence Type and Collection Zone

		Residence Type *(Single-family)*	Residence Type *(Multifamily)*
Recycling Collection Zones	*One*	Single-family Zone One	Multifamily Zone One
	Two	Single-family Zone Two	Multifamily Zone Two
	Three	Single-family Zone Three	Multifamily Zone Three
	Four	Single-family Zone Four	Multifamily Zone Four

1.2 Study Methodology

The following section provides an overview of four major steps of the 2010 study methodology. Appendix B contains a detailed description of the methodology.

Step 1: Develop Sampling Plan

- Samples were allocated across residential sampling groups: about two-thirds to single-family residential recycling and about one-third to multifamily residential recycling. Both single-family and multifamily samples were evenly split among the four service zones.
- A sampling schedule was constructed for the 2010 calendar year, consisting of either one or two sampling days each month. Sampling days were randomly selected to assure a representative distribution across the days of the week and weeks of the month.
- A complete list of Seattle's residential recycling routes was obtained from the city's contracted recycling haulers.

Step 2: Schedule and Collect Recycling Samples

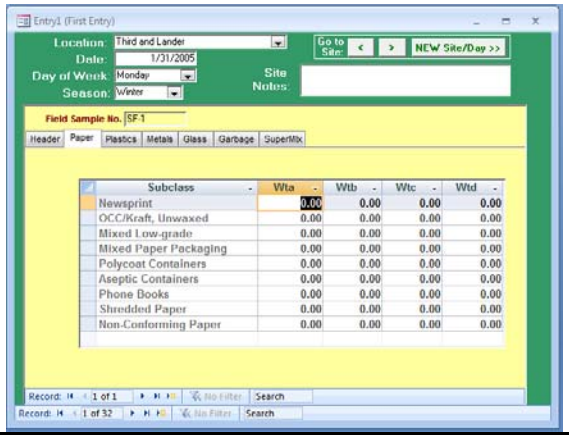
- Prior to each month's sampling, recycling routes were randomly selected from each zone and both residential types.
- The contracted haulers were sent a list of the routes chosen for each day of sampling.
- Recycling from the selected routes was delivered to the 3rd and Lander recycling facility for sampling.

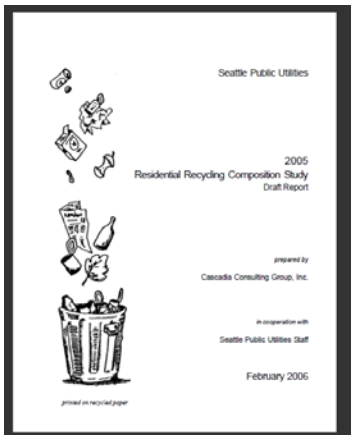
Step 3: Capture and Sort Samples

- As each selected route truck entered the facility, a sampling crew member verified that the vehicle was carrying recycling from the expected route and zone. The driver was then instructed to tip (unload material) as usual. Once the sample vehicle vacated the tipping area, a front-loader operator scooped a sample of approximately 250 pounds and placed it into a steel container. The container was then carried via forklift to the sorting location where it was transferred to a tarpaulin.
- For this study, a total of 270 samples were sorted into 32 distinct component categories, such as *newsprint* or *aluminum cans*. Refer to Appendix A for component definitions and a detailed description of the changes made to the component categories since the 2005 study.

Step 4: Analyze Data and Prepare Report

- Each month sorting data were double-entered into a customized database to eliminate data-entry errors.
- At the conclusion of the study, recycling composition estimates were calculated by aggregating sampling data using a weighted average procedure. SPU provided annual recycling tonnages to perform these calculations. Appendix D describes the calculation methodology.
- This report was prepared based on this data analysis.





2 SUMMARY OF SAMPLING RESULTS

Composition estimates are presented in the following order in this report. First, a pie chart depicts the composition percentages of the five broad material categories: **paper**, **metal**, **plastic**, **glass**, and **contaminants**. Next, a table presents the top ten components. Finally, a table lists the full composition results of all 32 components.[6] Please refer to Appendix A for a list and definitions of the 32 components.

2.1 Overall Recycling Composition

A total of 270 samples were obtained from single-family (180 samples) and multifamily (90 samples) loads between January and December 2010. Recycling samples were sorted by hand into 32 component categories.

The overall composition results are illustrated in Figure 2-1. At approximately 70%, **paper** made up the largest portion of residential recycling from January to December 2010. **Glass** was also prominent, composing about 18% of the total.

Figure 2-1: Overview of Composition Estimates: Overall
(January 2010 – December 2010)

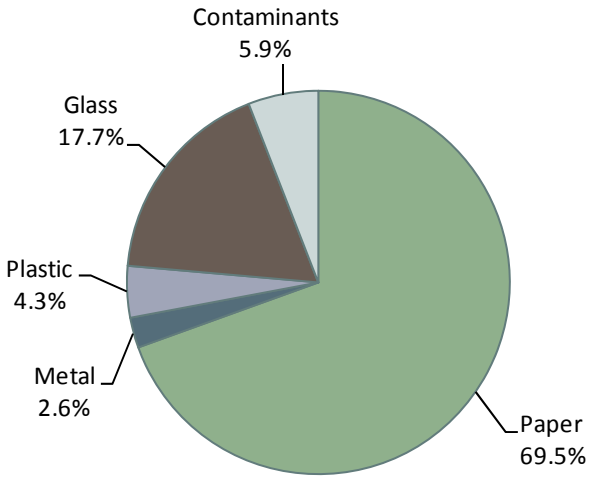


Table 2-1 lists the mean percent, cumulative percent, and tons of the top ten components found in residential recycling samples from January to December 2010. *Mixed low-grade paper* (29.7%) was the largest single component, followed by *newsprint* (19.5%) and *unwaxed OCC/Kraft paper* (17.8%)[7]. Table 2-2 presents complete composition results for the overall residential recycling stream. Definitions for all material components are presented in Appendix A.

[6] In recycling composition tables and figures, estimated tonnages are rounded to the nearest ton, and estimated percentages are rounded to the nearest tenth of a percent. As a result, estimates may not sum to the subtotals or totals shown. Appendix E presents more detail regarding the calculations.
[7] *OCC/Kraft paper* means unwaxed/uncoated old corrugated container boxes and Kraft paper, and brown paper bags.

Table 2-1. Top Ten Components: Overall
(January 2010 – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	29.7%	29.7%	24,305
Newsprint	19.5%	49.2%	15,980
Unwaxed OCC/Kraft Paper	17.8%	67.0%	14,602
Mixed Glass Cullet[8]	5.6%	72.6%	4,585
Green Glass Bottles	4.8%	77.3%	3,900
Brown Glass Bottles	3.4%	80.7%	2,797
Clear Glass Bottles	2.6%	83.4%	2,159
Phone Books	1.8%	85.1%	1,458
Other Non-recyclables	1.5%	86.7%	1,247
Non-Conforming Plastic	1.5%	88.1%	1,201
Total	**88.1%**		**72,233**

[8] *Mixed glass cullet* means glass bottles and containers that are broken into pieces less than one square inch and of multiple colors.

Table 2-2. Composition by Weight: Overall
(January 2010 – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**56,958**	**69.5%**		
Newsprint	15,980	19.5%	18.6%	20.4%
Unwaxed OCC/Kraft Paper	14,602	17.8%	16.8%	18.8%
Phone Books	1,458	1.8%	1.5%	2.1%
Mixed Low-grade Paper	24,305	29.7%	28.9%	30.4%
Polycoat Containers	503	0.6%	0.6%	0.6%
Shredded Paper	55	0.1%	0.0%	0.1%
Aseptic Containers	54	0.1%	0.1%	0.1%
Metal	**2,098**	**2.6%**		
Aluminum Cans	615	0.7%	0.7%	0.8%
Aluminum Foil/Containers	131	0.2%	0.1%	0.2%
Tin Food Cans	999	1.2%	1.1%	1.3%
Other Ferrous Metal	353	0.4%	0.3%	0.6%
Plastic	**3,555**	**4.3%**		
Small PET Bottles (24 oz or smaller)	616	0.8%	0.7%	0.8%
Large PET Bottles (greater than 24 oz)	708	0.9%	0.8%	0.9%
PET Jars, Tubs, and Other Containers	338	0.4%	0.4%	0.4%
HDPE Bottles	816	1.0%	0.9%	1.1%
HDPE Jars, Tubs, and Other Containers	79	0.1%	0.1%	0.1%
Other Plastic Bottles (#3-7)	81	0.1%	0.1%	0.1%
Other Jars, Tubs, and Containers (#3-7)	435	0.5%	0.5%	0.6%
Plastic Bags and Packaging	483	0.6%	0.5%	0.6%
Glass	**14,493**	**17.7%**		
Clear Glass Bottles	2,159	2.6%	2.4%	2.8%
Green Glass Bottles	3,900	4.8%	4.5%	5.1%
Brown Glass Bottles	2,797	3.4%	3.1%	3.7%
Clear Container Glass	841	1.0%	0.9%	1.1%
Other Glass Containers and Bottles	212	0.3%	0.2%	0.3%
Mixed Glass Cullet	4,585	5.6%	5.1%	6.1%
Contaminants	**4,857**	**5.9%**		
Non-Conforming Paper	583	0.7%	0.6%	0.8%
Non-Conforming Metal	340	0.4%	0.3%	0.5%
Non-Conforming Plastic	1,201	1.5%	1.3%	1.7%
Non-Conforming Glass	234	0.3%	0.2%	0.2%
Food, Green Waste, and Wood	504	0.6%	0.5%	1.1%
Textiles and Clothing	747	0.9%	0.8%	1.1%
Other Non-recyclables	1,247	1.5%	1.3%	1.8%
Total Tons	**81,961**			
Sample Count	**270**			

Confidence intervals calculated at the 90% confidence level.

2.2 Residential Recycling by Subpopulation

In addition to overall residential recycling, composition estimates were calculated for the following recycling subpopulations:

- **Residence type**: single-family and multifamily
- **Collection zone**: Zones 1, 2, 3, and 4
- **Residence type and collection zone**: single-family Zone 1, single-family Zone 2, single-family Zone 3, single-family Zone 4, multifamily Zone 1, multifamily Zone 2, multifamily Zone 3, and multifamily Zone 4
- **Season**: spring, summer, fall, and winter
- **Household income**: low and high
- **Household size**: small and large

As with the overall estimates, a weighted average procedure was used to calculate composition estimates for each subpopulation (see Appendix D for more detail on weighted averages). Components accounting for more than 5% are shown in Table 2-3 for each subpopulation. Several additional steps were needed to calculate composition by household income and household size (see the Demographic Calculations section in Appendix D for more detail).

1. Sampled routes were mapped in GIS software.
2. Census blocks were associated with routes.
3. Using 2010 Census and 2005-2009 American Community Survey data, all routes were assigned to household income and size groupings.
4. Composition results were calculated for the top and bottom quartiles.

The largest components for each subpopulation are shown in Table 2-3 (each accounting for more than 5%).

Table 2-3: Largest Recycling Components, by Subpopulation (January – December 2010)

Subpopulation	Paper			Glass	
	Newsprint	Mixed Low-grade	Unwaxed OCC/Kraft	Green Bottles	Mixed Cullet
Residence Type					
Single-family	20.3%	30.9%	15.2%	5.1%	
Multifamily	17.0%	26.0%	25.3%		7.4%
Collection Zone					
Zone 1	19.2%	29.5%	19.0%		7.6%
Zone 2	19.3%	30.0%	16.1%	5.8%	
Zone 3	18.4%	29.5%	19.3%	5.9%	5.1%
Zone 4	21.2%	29.7%	16.2%		
Residence Type and Zone					
Single-family Zone 1	19.9%	31.4%	16.4%		6.8%
Single-family Zone 2	20.1%	31.0%	14.3%	6.3%	
Single-family Zone 3	19.7%	31.1%	14.5%	7.1%	
Single-family Zone 4	21.3%	30.4%	15.5%		
Multifamily Zone 1	16.7%	23.7%	27.2%		10.2%
Multifamily Zone 2	15.4%	26.0%	24.2%		7.1%
Multifamily Zone 3	16.6%	27.2%	26.3%		6.8%
Multifamily Zone 4	20.2%	25.7%	20.4%		5.8%
Season					
Spring	19.7%	29.5%	15.7%	5.2%	7.3%
Summer	16.0%	27.5%	19.6%		6.0%
Fall	21.1%	31.1%	19.4%		
Winter	21.1%	30.6%	16.5%	5.1%	5.8%
Demographics					
Low-income Households	21.2%	30.4%	17.0%		
High-income Households	19.9%	32.6%	13.5%	5.5%	5.0%
Small Households	20.0%	32.0%	14.8%	5.1%	6.3%
Large Households	18.9%	30.0%	16.5%		
Overall Residential	19.5%	29.7%	17.8%	4.8%	5.6%

The following conclusions can be drawn from the recycling composition estimates of the overall residential substream and for each subpopulation.

- *Newsprint*, *mixed low-grade paper*, and *unwaxed OCC/Kraft paper* were large components in all groups. For several subpopulations, *green glass bottles* and *mixed cullet* were also large components.

- The material components that are present in greatest amounts were similar among subpopulations; however, the main differences are presented below by subpopulation type:[9]
    - **Residence type**: Single-family residents recycled a greater percentage of *newsprint*, *mixed low-grade paper*, and *green bottles* than did multifamily residents. Conversely, multifamily residents recycled a greater portion of *unwaxed OCC/Kraft paper*.
    - **Collection zone**: *Mixed low-grade paper* accounted for the highest percentage of recycled materials in all four collection zones. *Newsprint* was the second largest component for Zones 1, 2, and 4, and *unwaxed OCC/Kraft* was the second largest component for Zone 3.
    - **Residence type and collection zone**: *Mixed low-grade paper* was the largest component for all single-family and multifamily collection zones, except multifamily Zone 1 where *unwaxed OCC/Kraft paper* made up the largest percentage. *Mixed cullet* was a large component in single-family Zone 1 and in all multifamily zones. *Green bottles* were a large component only in single-family Zones 2 and 3.
    - **Season**: *Mixed low-grade paper* accounted for at least 27% of recycling in all four seasons. *Newsprint* made up a lower percentage of recycling in summer than in the other three seasons. *Unwaxed OCC/Kraft paper* was greater than 19% in summer and fall compared to about 16% in spring and winter. *Mixed cullet* made up more than 5% of the total in all seasons other than fall.
    - **Demographics**: *Mixed low-grade paper* accounted for at least 30% of recycling for all four demographic subpopulations. *Unwaxed OCC/Kraft paper* accounted for slightly lower portions of recycling for high-income household than low-income households and for small households compared to large households. *Green bottles* and *mixed cullet* represented at least 5% of the total in high-income households and small households.

[9] No statistical tests were performed to identify differences among subpopulations. Therefore, the comparisons may not be statistically significant.

3 TRENDS IN RESIDENTIAL RECYCLING: 2000/01 TO 2010

In this section, results of the 2010 study are compared to those from the 2000/01 and 2005 studies, which followed the same basic methodology.[10] Changes in the amounts and composition percentages of material recycled in each broad material category were analyzed to compare findings between study periods.[11] Section 3.1 provides an overview of the changes in tons recycled since the 2000/01 study. Section 3.2 compares 2010 composition percentages with earlier studies. See Appendix E for details about year-to-year comparison calculations.

3.1 Trends in Tons Recycled Since 2000/01

Figure 3-1 illustrates the changes in residential recycling tons since the 2000/01 study.[12] Overall, the quantity of residential recyclables has increased from about 74,000 tons in 2000/01 to approximately 82,000 tons in 2010. Between 2005 and 2010, however, the quantity of recyclables decreased from about 83,000 tons to slightly less than 82,000 tons, primarily due to a decrease in the broad material category **paper**. The amount of **paper** recycled increased between 2000/01 and 2005, and then decreased between 2005 and 2010. **Glass**, **plastic**, and **metal** recycling increased steadily between 2000/01 and 2010. The amount of **contaminants** also increased over time, and consistently exceeded **plastic** and **metal**.[13]

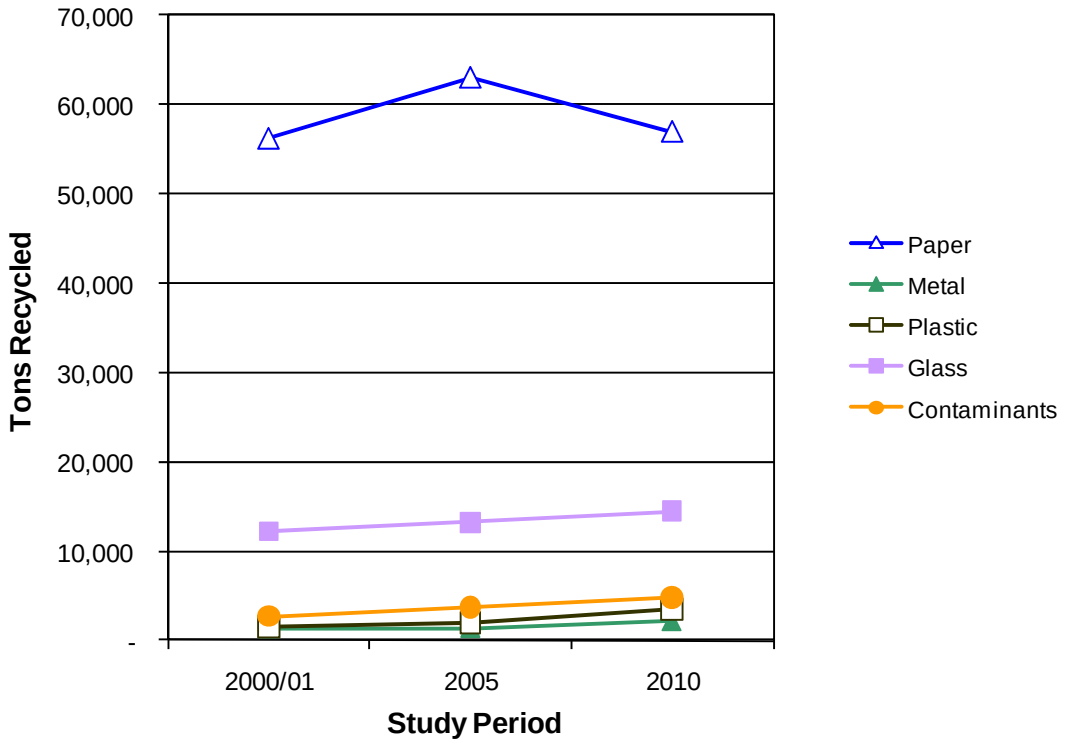
[10] Changes in methods for obtaining samples make results of recent recycling studies not comparable to the 1993 and 1998/99.

[11] The composition percentages used to analyze the differences in recycled tonnage and to perform statistical tests were calculated using unweighted averages. For this reason, and because number reported in this section are based on a uniform material list that is consistent with prior study years, numbers reported in this section differ slightly from those in other parts of the study. Appendix D provides more detail.

[12] Sampling for the 2000/01 study took place between November 2000 and October 2001.

[13] For the purposes of comparisons with the previous study, material components in this section are organized into five broad material categories: **paper**, **metal**, **plastic**, **glass**, and **contaminants**. Because of changes in the category definitions since 2000/01, the numbers reported in this section differ slightly from those in other parts of this report. Appendix A shows the history of how materials have changed since the initial study.

Figure 3-1. Changes in Residential Recycling Tons, 2000/01 to 2010



3.2 Changes in Composition Percentages

This section first compares composition percentages between the current study and the 2000/01 study and then compares the current study to the most recent study in 2005.

3.2.1 Changes in Composition Percentages: 2000/01 to 2010

In Table 3-1, all five broad material categories are bolded because they all changed significantly between the 2000/01 and 2010 study periods. **Paper** decreased the most by 6.5 percentage points from 76.0% to 69.5% of all recyclables. **Contaminants** and **plastic** increased by 2.3 percentage points each.

Table 3-1. Changes in Changes in Composition Percentages: 2000/01 to 2010

	Percent		Change in	Disposed Tons	
	2000/01	2010	Composition %	2000/01	2010
Paper	**76.0%**	**69.5%**	**-6.5%** ↓	**56,180**	**56,958**
Metal	**1.8%**	**2.6%**	**0.8%** ↑	**1,303**	**2,098**
Plastic	**2.0%**	**4.3%**	**2.3%** ↑	**1,493**	**3,555**
Glass	**16.6%**	**17.7%**	**1.1%** ↑	**12,239**	**14,493**
Contaminants	**3.7%**	**5.9%**	**2.3%** ↑	**2,710**	**4,857**
Total	**100%**	**100%**		**73,926**	**81,961**

Note: Bold type indicates statistically significant changes.

3.2.2 Changes in Composition Percentages: 2005 to 2010

In Table 3-2, all five broad material categories are bolded because they all changed significantly between the 2005 and 2010 study periods. **Paper** decreased 6.2 percentage points and **plastic** increased by 2.0 percentage points.

Table 3-2. Changes in Recycling: 2005 to 2010

	Percent		Change in	Disposed Tons	
	2005	2010	Composition %	2005	2010
Paper	**75.7%**	**69.5%**	**-6.2%** ↓	**63,005**	**56,958**
Metal	**1.6%**	**2.6%**	**0.9%** ↑	**1,342**	**2,098**
Plastic	**2.4%**	**4.3%**	**2.0%** ↑	**1,957**	**3,555**
Glass	**15.9%**	**17.7%**	**1.8%** ↑	**13,216**	**14,493**
Contaminants	**4.4%**	**5.9%**	**1.5%** ↑	**3,678**	**4,857**
Total	**100%**	**100%**		**83,197**	**81,961**

Note: Bold type indicates statistically significant changes.

4 COMPOSITION RESULTS, BY SUBPOPULATION

This section presents composition results by subpopulation. Results are presented in three subsections: first by residence types, then by collection zones, and finally by residence type and collection zone. Each subsection is organized so that pie charts appear first for all subpopulations, followed by top ten component tables for each subpopulation. Detailed composition tables are presented at the end of each results subsection.

A total of 270 loads from the residential recycling were sampled from January to December 2010. Table 4-1 summarizes the sample information for each subpopulation as well as the associated tons recycled and number of households. Approximately 83,800 pounds (or about 42 tons) of recycling were sampled in this study, for an average sample weight of about 310 pounds. During the sampling period, nearly 82,000 tons were recycled by Seattle residents.

Table 4-1. Description of Samples for Each Subpopulation
(January 2010 – December 2010)

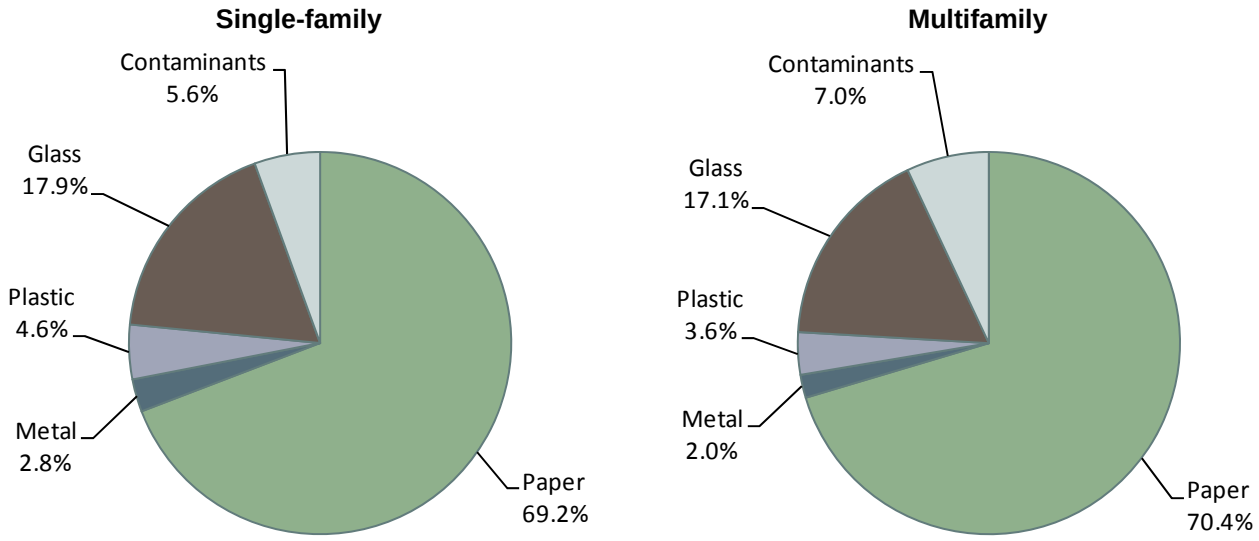
Subpopulation	Total Sampling Weight (lbs)	Sample Count	Total Recycling (Tons)	Number of Households
Residence Type				
Single-family	55,395	180	60,962	153,710
Multi-family	28,371	90	20,999	118,940
Collection Zone				
Zone 1	21,221	68	20,195	63,405
Zone 2	20,520	67	15,061	48,101
Zone 3	21,790	68	24,305	91,819
Zone 4	20,235	67	22,400	69,325
Residence Type and Zone				
Single-family Zone 1	13,806	45	15,384	41,728
Single-family Zone 2	13,955	45	12,213	29,758
Single-family Zone 3	14,315	45	14,306	30,743
Single-family Zone 4	13,319	45	19,059	51,481
Multifamily Zone 1	7,416	23	4,810	21,677
Multifamily Zone 2	6,565	22	2,848	18,343
Multifamily Zone 3	7,475	23	10,000	61,076
Multifamily Zone 4	6,916	22	3,341	17,844
Overall Residential	**83,766**	**270**	**81,961**	**272,650**

Section 4.1 presents detailed composition estimates for single-family and multifamily residence type, and Section 4.1 provides estimates for Zones 1 through 4. Finally, Section 4.3 gives composition by residence type for each of the four collection zones.

4.1 By Residence Type

Composition estimates for single-family and multifamily recycling are summarized in Figure 4-1. As depicted, **paper** accounted for approximately 70% of recycling from both residence types. **Glass** made up between 17% and 18%, and **contaminants** made up between 5% and 7% of recycling from single-family and multifamily residences. **Plastic** and **metal** each made up less than 5% of the total for each residence type.

Figure 4-1. Overview of Composition Estimates, by Residence Type
(January 2010 – December 2010)



4.1.1 Single-family Composition

A total of 180 single-family recycling loads were sampled between January and December 2010. Seattle's single-family residents recycled approximately 60,962 tons in 2010. Table 4-2 lists the top ten components, by weight, of single-family recycling. *Mixed low-grade paper* was the largest single component at about 31%, followed by *newsprint* (20.3%) and *unwaxed OCC/Kraft paper* (15.2%). *Green glass bottles* made up 5% of this recycling. Table 4-4 lists the detailed composition results for the single-family recycling.

Table 4-2. Top Ten Components: Single-family
(January 2010 – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	30.9%	30.9%	18,851
Newsprint	20.3%	51.3%	12,405
Unwaxed OCC/Kraft Paper	15.2%	66.5%	9,293
Green Glass Bottles	5.1%	71.6%	3,104
Mixed Glass Cullet	5.0%	76.6%	3,021
Brown Glass Bottles	3.6%	80.1%	2,180
Clear Glass Bottles	2.8%	83.0%	1,717
Phone Books	1.9%	84.9%	1,158
Non-Conforming Plastic	1.5%	86.4%	941
Tin Food Cans	1.3%	87.7%	803
Total	**87.7%**		**53,474**

4.1.2 Multifamily Composition

A total of 90 samples were captured and sorted from multifamily recycling loads for this study. Seattle's multifamily residents recycled approximately 20,999 tons in 2010. As shown in Table 4-3, *mixed low-grade paper* and *unwaxed OCC/Kraft paper* led the top ten components, each composing between 25% and 26% of the total, by weight. *Newsprint* followed with an estimated 17% of the total. *Mixed glass cullet* accounted for about 7% of the total for this residence type. Table 4-5 lists the full composition results for multifamily recycling.

Table 4-3. Top Ten Components: Multifamily
(January 2010 – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	26.0%	26.0%	5,454
Unwaxed OCC/Kraft Paper	25.3%	51.3%	5,309
Newsprint	17.0%	68.3%	3,575
Mixed Glass Cullet	7.4%	75.7%	1,564
Green Glass Bottles	3.8%	79.5%	796
Brown Glass Bottles	2.9%	82.5%	617
Other Non-recyclables	2.2%	84.6%	460
Clear Glass Bottles	2.1%	86.7%	441
Phone Books	1.4%	88.2%	300
Non-Conforming Plastic	1.2%	89.4%	260
Total	**89.4%**		**18,775**

4.1.3 Comparison of Residence Types

Eight out of ten of the top ten components were the same for single-family and multifamily recycling: *mixed low-grade paper*, *newsprint*, *unwaxed OCC/Kraft paper*, *mixed glass cullet*, *green glass bottles*, *brown glass bottles*, *clear glass bottles*, and *non-conforming plastic*. Although common to both lists, these components varied in composition ratio and order within the lists.

Phone books and *tin food cans* were present as top ten components in single-family loads only. *Other non-recyclables* and *textiles and clothing* were present as top ten components in multifamily loads only.

Table 4-4. Composition by Weight: Single-family
(January 2010 – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**42,178**	**69.2%**		
Newsprint	12,405	20.3%	19.3%	21.4%
Unwaxed OCC/Kraft Paper	9,293	15.2%	14.4%	16.1%
Phone Books	1,158	1.9%	1.6%	2.2%
Mixed Low-grade Paper	18,851	30.9%	30.1%	31.7%
Polycoat Containers	409	0.7%	0.6%	0.7%
Shredded Paper	15	0.0%	0.0%	0.0%
Aseptic Containers	47	0.1%	0.1%	0.1%
Metal	**1,687**	**2.8%**		
Aluminum Cans	480	0.8%	0.7%	0.8%
Aluminum Foil/Containers	110	0.2%	0.2%	0.2%
Tin Food Cans	803	1.3%	1.2%	1.5%
Other Ferrous Metal	294	0.5%	0.3%	0.7%
Plastic	**2,804**	**4.6%**		
Small PET Bottles (24 oz or smaller)	473	0.8%	0.7%	0.8%
Large PET Bottles (greater than 24 oz)	554	0.9%	0.9%	1.0%
PET Jars, Tubs, and Other Containers	282	0.5%	0.4%	0.5%
HDPE Bottles	627	1.0%	1.0%	1.1%
HDPE Jars, Tubs, and Other Containers	62	0.1%	0.1%	0.1%
Other Plastic Bottles (#3-7)	70	0.1%	0.1%	0.1%
Other Jars, Tubs, and Containers (#3-7)	356	0.6%	0.5%	0.6%
Plastic Bags and Packaging	379	0.6%	0.5%	0.7%
Glass	**10,903**	**17.9%**		
Clear Glass Bottles	1,717	2.8%	2.6%	3.1%
Green Glass Bottles	3,104	5.1%	4.7%	5.4%
Brown Glass Bottles	2,180	3.6%	3.3%	3.9%
Clear Container Glass	718	1.2%	1.1%	1.3%
Other Glass Containers and Bottles	163	0.3%	0.2%	0.3%
Mixed Glass Cullet	3,021	5.0%	4.3%	5.6%
Contaminants	**3,390**	**5.6%**		
Non-Conforming Paper	455	0.7%	0.7%	0.8%
Non-Conforming Metal	234	0.4%	0.3%	0.5%
Non-Conforming Plastic	941	1.5%	1.3%	1.8%
Non-Conforming Glass	162	0.3%	0.1%	0.2%
Food, Green Waste, and Wood	311	0.5%	0.4%	1.0%
Textiles and Clothing	500	0.8%	0.6%	1.0%
Other Non-recyclables	787	1.3%	1.0%	1.6%
Total Tons	**60,962**			
Sample Count	**180**			

Confidence intervals calculated at the 90% confidence level.

Table 4-5. Composition by Weight: Multifamily
(January 2010 – December 2010)

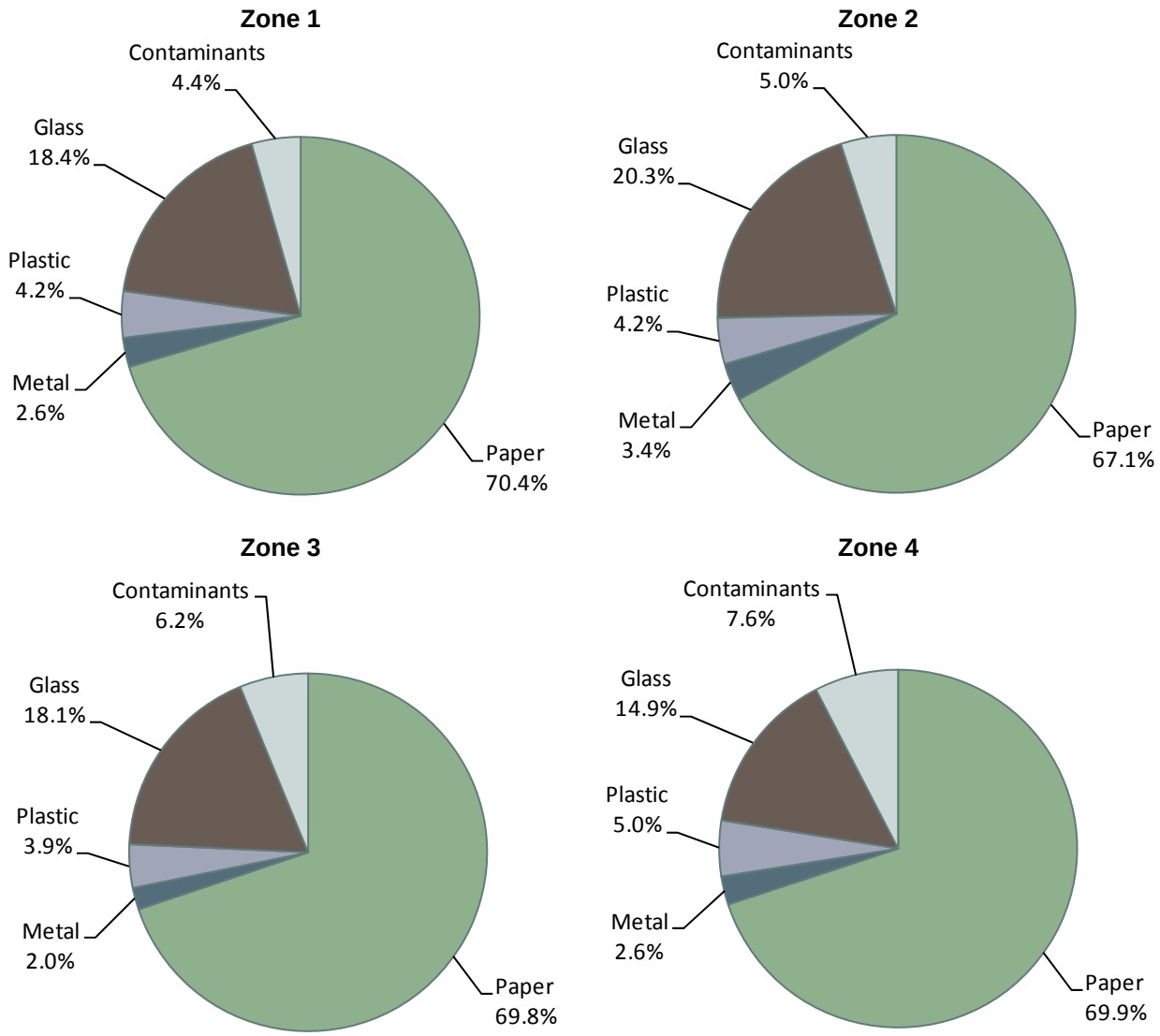
Material	Est. Tons	Est. Percent	Low	High
Paper	**14,780**	**70.4%**		
Newsprint	3,575	17.0%	15.2%	18.9%
Unwaxed OCC/Kraft Paper	5,309	25.3%	22.3%	28.3%
Phone Books	300	1.4%	0.9%	1.9%
Mixed Low-grade Paper	5,454	26.0%	24.2%	27.8%
Polycoat Containers	95	0.5%	0.4%	0.5%
Shredded Paper	40	0.2%	0.0%	0.5%
Aseptic Containers	7	0.0%	0.0%	0.0%
Metal	**411**	**2.0%**		
Aluminum Cans	135	0.6%	0.6%	0.7%
Aluminum Foil/Containers	21	0.1%	0.1%	0.1%
Tin Food Cans	196	0.9%	0.8%	1.0%
Other Ferrous Metal	59	0.3%	0.1%	0.4%
Plastic	**752**	**3.6%**		
Small PET Bottles (24 oz or smaller)	143	0.7%	0.6%	0.7%
Large PET Bottles (greater than 24 oz)	154	0.7%	0.7%	0.8%
PET Jars, Tubs, and Other Containers	55	0.3%	0.2%	0.3%
HDPE Bottles	189	0.9%	0.8%	1.0%
HDPE Jars, Tubs, and Other Containers	17	0.1%	0.1%	0.1%
Other Plastic Bottles (#3-7)	11	0.1%	0.0%	0.1%
Other Jars, Tubs, and Containers (#3-7)	79	0.4%	0.3%	0.4%
Plastic Bags and Packaging	104	0.5%	0.4%	0.6%
Glass	**3,589**	**17.1%**		
Clear Glass Bottles	441	2.1%	1.8%	2.4%
Green Glass Bottles	796	3.8%	3.3%	4.3%
Brown Glass Bottles	617	2.9%	2.4%	3.4%
Clear Container Glass	123	0.6%	0.5%	0.7%
Other Glass Containers and Bottles	49	0.2%	0.1%	0.3%
Mixed Glass Cullet	1,564	7.4%	6.3%	8.6%
Contaminants	**1,467**	**7.0%**		
Non-Conforming Paper	128	0.6%	0.5%	0.7%
Non-Conforming Metal	106	0.5%	0.3%	0.7%
Non-Conforming Plastic	260	1.2%	1.1%	1.4%
Non-Conforming Glass	72	0.3%	0.1%	0.1%
Food, Green Waste, and Wood	193	0.9%	0.7%	1.5%
Textiles and Clothing	247	1.2%	0.9%	1.5%
Other Non-recyclables	460	2.2%	1.7%	2.7%
Total Tons	**20,999**			
Sample Count	**90**			

Confidence intervals calculated at the 90% confidence level.

4.2 By Collection Zone

Figure 4-2 depicts the composition results of residential recycling collected from Zones 1 through 4. For all four collection zones, **paper** made up about 70% of the total. **Glass** was the second largest broad material category in all four collection zones, ranging from about 15% in Zone 4 to 20% in Zone 2.

Figure 4-2. Overview of Composition Estimates, by Collection Zone
(January 2010 – December 2010)



4.2.1 Zone 1

A total of 68 loads of recyclables were sampled from Zone 1 between January and December 2010. Seattle's Zone 1 residents set out approximately 20,195 tons for recycling in 2010. Table 4-6 presents the top ten components for this subpopulation. As shown, *mixed low-grade paper* accounted for approximately 30%, while *newsprint* and *unwaxed OCC/Kraft paper* each made up about 19%. Table 4-10 lists detailed composition results for Zone 1.

Table 4-6. Top Ten Components: Zone 1
(January 2010 – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	29.5%	29.5%	5,965
Newsprint	19.2%	48.7%	3,869
Unwaxed OCC/Kraft Paper	19.0%	67.7%	3,836
Mixed Glass Cullet	7.6%	75.3%	1,537
Green Glass Bottles	3.9%	79.2%	783
Brown Glass Bottles	3.4%	82.6%	682
Clear Glass Bottles	2.3%	84.9%	468
Phone Books	2.1%	86.9%	416
Other Non-recyclables	1.1%	88.1%	226
Tin Food Cans	1.1%	89.1%	218
Total	**89.1%**		**18,000**

4.2.2 Zone 2

For this study, 67 recycling loads from Zone 2 were sampled. Seattle's Zone 2 residents set out approximately 15,061 tons for recycling in 2010. As shown in Table 4-7, *mixed low-grade paper* (30.0%) was the largest component. *Newsprint* (19.3%) and *unwaxed OCC/Kraft paper* (16.1%) were the second and third largest components. Table 4-11 presents complete results for recycling set-outs collected from Zone 2.

Table 4-7. Top Ten Components: Zone 2
(January 2010 – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	30.0%	30.0%	4,521
Newsprint	19.3%	49.3%	2,900
Unwaxed OCC/Kraft Paper	16.1%	65.4%	2,429
Green Glass Bottles	5.8%	71.2%	872
Brown Glass Bottles	4.9%	76.0%	731
Mixed Glass Cullet	4.5%	80.6%	682
Clear Glass Bottles	3.5%	84.1%	533
Tin Food Cans	1.8%	85.9%	273
Clear Container Glass	1.3%	87.3%	203
Other Non-recyclables	1.3%	88.6%	200
Total	**88.6%**		**13,342**

4.2.3 Zone 3

For this study, 68 recycling loads from the Zone 3 were sampled. Seattle's Zone 3 residents set out approximately 24,305 tons for recycling in 2010. As shown in Table 4-8, *mixed low-grade paper* was the largest single component at about 30%, followed by *unwaxed OCC/Kraft paper* (19.3%) and *newsprint* (18.4%). Table 4-12 presents complete composition results for recycling set-outs collected from Zone 3.

Table 4-8. Top Ten Components: Zone 3
(January 2010 – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	29.5%	29.5%	7,172
Unwaxed OCC/Kraft Paper	19.3%	48.8%	4,700
Newsprint	18.4%	67.2%	4,471
Green Glass Bottles	5.9%	73.2%	1,437
Mixed Glass Cullet	5.1%	78.3%	1,249
Brown Glass Bottles	3.1%	81.4%	753
Clear Glass Bottles	2.7%	84.1%	650
Phone Books	1.8%	85.8%	429
Other Non-recyclables	1.5%	87.3%	366
Non-Conforming Plastic	1.4%	88.7%	338
Total	**88.7%**		**21,566**

4.2.4 Zone 4

A total of 67 recycling loads from Zone 4 were sampled. Seattle's Zone 4 residents set out approximately 22,400 tons for recycling in 2010. As shown in Table 4-9, *mixed low-grade paper* (29.7%) was the largest single component, followed by *newsprint* (21.2%) and *unwaxed OCC/Kraft paper* (16.2%). Table 4-13 presents the complete results for recycling set-outs collected from Zone 4.

Table 4-9. Top Ten Components: Zone 4
(January 2010 – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	29.7%	29.7%	6,647
Newsprint	21.2%	50.8%	4,741
Unwaxed OCC/Kraft Paper	16.2%	67.1%	3,636
Mixed Glass Cullet	5.0%	72.1%	1,116
Green Glass Bottles	3.6%	75.7%	808
Brown Glass Bottles	2.8%	78.5%	631
Clear Glass Bottles	2.3%	80.7%	508
Phone Books	2.1%	82.8%	469
Non-Conforming Plastic	2.1%	84.9%	467
Other Non-recyclables	2.0%	87.0%	456
Total	**87%**		**19,480**

4.2.5 Comparison of Zones

The largest single component in all four collection zones, *mixed low-grade paper* composed about 30% of recycling for each. Also consistent across all four zones, *newsprint* and *unwaxed OCC/Kraft* were the second or third largest components. Eight components were common to the top ten lists for recycling loads from all four zones: *mixed low-grade paper, newsprint, unwaxed OCC/Kraft paper, green glass bottles, brown glass bottles, mixed glass cullet, clear glass bottles,* and *other non-recyclables*.

Phone books was common to the top ten lists in Zone 1, 3, and 4; *tin food cans* was a top ten component in Zone 1 and 2; and *non-conforming plastic* was unique to the top ten lists in Zone 3 and 4.

Table 4-10. Composition by Weight: Zone 1
(January 2010 – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**14,216**	**70.4%**		
Newsprint	3,869	19.2%	17.5%	20.8%
Unwaxed OCC/Kraft Paper	3,836	19.0%	16.8%	21.2%
Phone Books	416	2.1%	1.3%	2.8%
Mixed Low-grade Paper	5,965	29.5%	28.1%	31.0%
Shredded Paper	5	0.0%	0.0%	0.0%
Polycoat Containers	111	0.5%	0.5%	0.6%
Aseptic Containers	14	0.1%	0.0%	0.1%
Metal	**533**	**2.6%**		
Aluminum Cans	143	0.7%	0.6%	0.8%
Aluminum Foil/Containers	34	0.2%	0.1%	0.2%
Tin Food Cans	218	1.1%	1.0%	1.2%
Other Ferrous Metal	138	0.7%	0.2%	1.2%
Plastic	**845**	**4.2%**		
Small PET Bottles (24 oz or smaller)	135	0.7%	0.6%	0.7%
Large PET Bottles (greater than 24 oz)	171	0.8%	0.8%	0.9%
PET Jars, Tubs, and Other Containers	85	0.4%	0.4%	0.5%
HDPE Bottles	210	1.0%	0.9%	1.2%
HDPE Jars, Tubs, and Other Containers	23	0.1%	0.0%	0.2%
Other Plastic Bottles (#3-7)	19	0.1%	0.1%	0.1%
Other Jars, Tubs, and Containers (#3-7)	106	0.5%	0.5%	0.6%
Plastic Bags and Packaging	97	0.5%	0.4%	0.6%
Glass	**3,707**	**18.4%**		
Clear Glass Bottles	468	2.3%	1.9%	2.7%
Green Glass Bottles	783	3.9%	3.3%	4.5%
Brown Glass Bottles	682	3.4%	2.8%	4.0%
Clear Container Glass	186	0.9%	0.7%	1.1%
Other Glass Containers and Bottles	51	0.3%	0.1%	0.4%
Mixed Glass Cullet	1,537	7.6%	6.1%	9.2%
Contaminants	**894**	**4.4%**		
Non-Conforming Paper	151	0.7%	0.6%	0.9%
Non-Conforming Metal	58	0.3%	0.2%	0.4%
Non-Conforming Plastic	214	1.1%	0.9%	1.2%
Non-Conforming Glass	39	0.2%	0.1%	0.2%
Food, Green Waste, and Wood	80	0.4%	0.3%	0.9%
Textiles and Clothing	126	0.6%	0.4%	0.9%
Other Non-recyclables	226	1.1%	0.7%	1.5%
Total Tons	**20,195**			
Sample Count	**68**			

Confidence intervals calculated at the 90% confidence level.

Table 4-11. Composition by Weight: Zone 2
(January 2010 – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**10,103**	**67.1%**		
Newsprint	2,900	19.3%	17.8%	20.7%
Unwaxed OCC/Kraft Paper	2,429	16.1%	14.6%	17.6%
Phone Books	144	1.0%	0.6%	1.3%
Mixed Low-grade Paper	4,521	30.0%	28.7%	31.3%
Shredded Paper	2	0.0%	0.0%	0.0%
Polycoat Containers	101	0.7%	0.6%	0.7%
Aseptic Containers	6	0.0%	0.0%	0.1%
Metal	**511**	**3.4%**		
Aluminum Cans	140	0.9%	0.8%	1.1%
Aluminum Foil/Containers	26	0.2%	0.1%	0.2%
Tin Food Cans	273	1.8%	1.2%	2.4%
Other Ferrous Metal	72	0.5%	0.3%	0.7%
Plastic	**629**	**4.2%**		
Small PET Bottles (24 oz or smaller)	115	0.8%	0.7%	0.8%
Large PET Bottles (greater than 24 oz)	133	0.9%	0.8%	1.0%
PET Jars, Tubs, and Other Containers	60	0.4%	0.4%	0.4%
HDPE Bottles	142	0.9%	0.8%	1.0%
HDPE Jars, Tubs, and Other Containers	12	0.1%	0.0%	0.1%
Other Plastic Bottles (#3-7)	15	0.1%	0.1%	0.1%
Other Jars, Tubs, and Containers (#3-7)	82	0.5%	0.5%	0.6%
Plastic Bags and Packaging	72	0.5%	0.4%	0.5%
Glass	**3,060**	**20.3%**		
Clear Glass Bottles	533	3.5%	3.1%	4.0%
Green Glass Bottles	872	5.8%	5.2%	6.4%
Brown Glass Bottles	731	4.9%	4.2%	5.5%
Clear Container Glass	203	1.3%	1.2%	1.5%
Other Glass Containers and Bottles	39	0.3%	0.2%	0.4%
Mixed Glass Cullet	682	4.5%	3.6%	5.5%
Contaminants	**758**	**5.0%**		
Non-Conforming Paper	97	0.6%	0.5%	0.8%
Non-Conforming Metal	51	0.3%	0.2%	0.5%
Non-Conforming Plastic	182	1.2%	1.0%	1.4%
Non-Conforming Glass	58	0.4%	0.1%	0.2%
Food, Green Waste, and Wood	65	0.4%	0.3%	1.0%
Textiles and Clothing	105	0.7%	0.4%	1.0%
Other Non-recyclables	200	1.3%	1.0%	1.7%
Total Tons	**15,061**			
Sample Count	**67**			

Confidence intervals calculated at the 90% confidence level.

Table 4-12. Composition by Weight: Zone 3
(January 2010 – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**16,972**	**69.8%**		
Newsprint	4,471	18.4%	16.6%	20.2%
Unwaxed OCC/Kraft Paper	4,700	19.3%	17.1%	21.6%
Phone Books	429	1.8%	1.3%	2.2%
Mixed Low-grade Paper	7,172	29.5%	27.9%	31.1%
Shredded Paper	41	0.2%	0.0%	0.4%
Polycoat Containers	144	0.6%	0.5%	0.7%
Aseptic Containers	15	0.1%	0.0%	0.1%
Metal	**480**	**2.0%**		
Aluminum Cans	154	0.6%	0.6%	0.7%
Aluminum Foil/Containers	34	0.1%	0.1%	0.2%
Tin Food Cans	237	1.0%	0.9%	1.1%
Other Ferrous Metal	56	0.2%	0.1%	0.4%
Plastic	**953**	**3.9%**		
Small PET Bottles (24 oz or smaller)	169	0.7%	0.6%	0.8%
Large PET Bottles (greater than 24 oz)	183	0.8%	0.7%	0.8%
PET Jars, Tubs, and Other Containers	96	0.4%	0.4%	0.4%
HDPE Bottles	201	0.8%	0.7%	0.9%
HDPE Jars, Tubs, and Other Containers	22	0.1%	0.1%	0.1%
Other Plastic Bottles (#3-7)	18	0.1%	0.0%	0.1%
Other Jars, Tubs, and Containers (#3-7)	120	0.5%	0.4%	0.5%
Plastic Bags and Packaging	144	0.6%	0.5%	0.7%
Glass	**4,394**	**18.1%**		
Clear Glass Bottles	650	2.7%	2.4%	3.0%
Green Glass Bottles	1,437	5.9%	5.3%	6.5%
Brown Glass Bottles	753	3.1%	2.7%	3.5%
Clear Container Glass	241	1.0%	0.8%	1.1%
Other Glass Containers and Bottles	64	0.3%	0.2%	0.4%
Mixed Glass Cullet	1,249	5.1%	4.3%	6.0%
Contaminants	**1,506**	**6.2%**		
Non-Conforming Paper	132	0.5%	0.4%	0.6%
Non-Conforming Metal	115	0.5%	0.3%	0.7%
Non-Conforming Plastic	338	1.4%	0.9%	1.8%
Non-Conforming Glass	115	0.5%	0.2%	0.2%
Food, Green Waste, and Wood	178	0.7%	0.5%	1.4%
Textiles and Clothing	262	1.1%	0.7%	1.4%
Other Non-recyclables	366	1.5%	1.0%	2.0%
Total Tons	**24,305**			
Sample Count	**68**			

Confidence intervals calculated at the 90% confidence level.

Table 4-13. Composition by Weight: Zone 4
(January 2010 – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**15,666**	**69.9%**		
Newsprint	4,741	21.2%	19.3%	23.0%
Unwaxed OCC/Kraft Paper	3,636	16.2%	14.7%	17.7%
Phone Books	469	2.1%	1.5%	2.7%
Mixed Low-grade Paper	6,647	29.7%	28.2%	31.2%
Shredded Paper	7	0.0%	0.0%	0.1%
Polycoat Containers	147	0.7%	0.6%	0.7%
Aseptic Containers	19	0.1%	0.1%	0.1%
Metal	**574**	**2.6%**		
Aluminum Cans	178	0.8%	0.7%	0.9%
Aluminum Foil/Containers	37	0.2%	0.1%	0.2%
Tin Food Cans	272	1.2%	1.1%	1.4%
Other Ferrous Metal	87	0.4%	0.2%	0.5%
Plastic	**1,128**	**5.0%**		
Small PET Bottles (24 oz or smaller)	197	0.9%	0.8%	1.0%
Large PET Bottles (greater than 24 oz)	221	1.0%	0.9%	1.1%
PET Jars, Tubs, and Other Containers	98	0.4%	0.4%	0.5%
HDPE Bottles	262	1.2%	1.0%	1.3%
HDPE Jars, Tubs, and Other Containers	22	0.1%	0.1%	0.1%
Other Plastic Bottles (#3-7)	29	0.1%	0.1%	0.2%
Other Jars, Tubs, and Containers (#3-7)	128	0.6%	0.5%	0.6%
Plastic Bags and Packaging	171	0.8%	0.6%	0.9%
Glass	**3,332**	**14.9%**		
Clear Glass Bottles	508	2.3%	1.8%	2.8%
Green Glass Bottles	808	3.6%	3.1%	4.1%
Brown Glass Bottles	631	2.8%	2.2%	3.4%
Clear Container Glass	212	0.9%	0.8%	1.1%
Other Glass Containers and Bottles	57	0.3%	0.2%	0.3%
Mixed Glass Cullet	1,116	5.0%	4.1%	5.8%
Contaminants	**1,699**	**7.6%**		
Non-Conforming Paper	203	0.9%	0.8%	1.0%
Non-Conforming Metal	117	0.5%	0.3%	0.7%
Non-Conforming Plastic	467	2.1%	1.6%	2.6%
Non-Conforming Glass	23	0.1%	0.0%	0.2%
Food, Green Waste, and Wood	181	0.8%	0.5%	1.4%
Textiles and Clothing	253	1.1%	0.9%	1.4%
Other Non-recyclables	456	2.0%	1.5%	2.6%
Total Tons	**22,400**			
Sample Count	**67**			

Confidence intervals calculated at the 90% confidence level.

4.3 By Residence Type and Collection Zone

Broad material categories were compared across single-family Zones 1 through 4, as shown in Figure 4-3. **Paper** accounted for between 67% and 71% of recycling set out by each of these subpopulations. **Glass** composed between 15% and 21% of loads in each zone. The three remaining broad material categories, **contaminants**, **plastic**, and **metal**, each accounted for 7% or less of the total for all four zones.

Figure 4-3. Overview of Composition Estimates: Single-family
(January 2010 – December 2010)

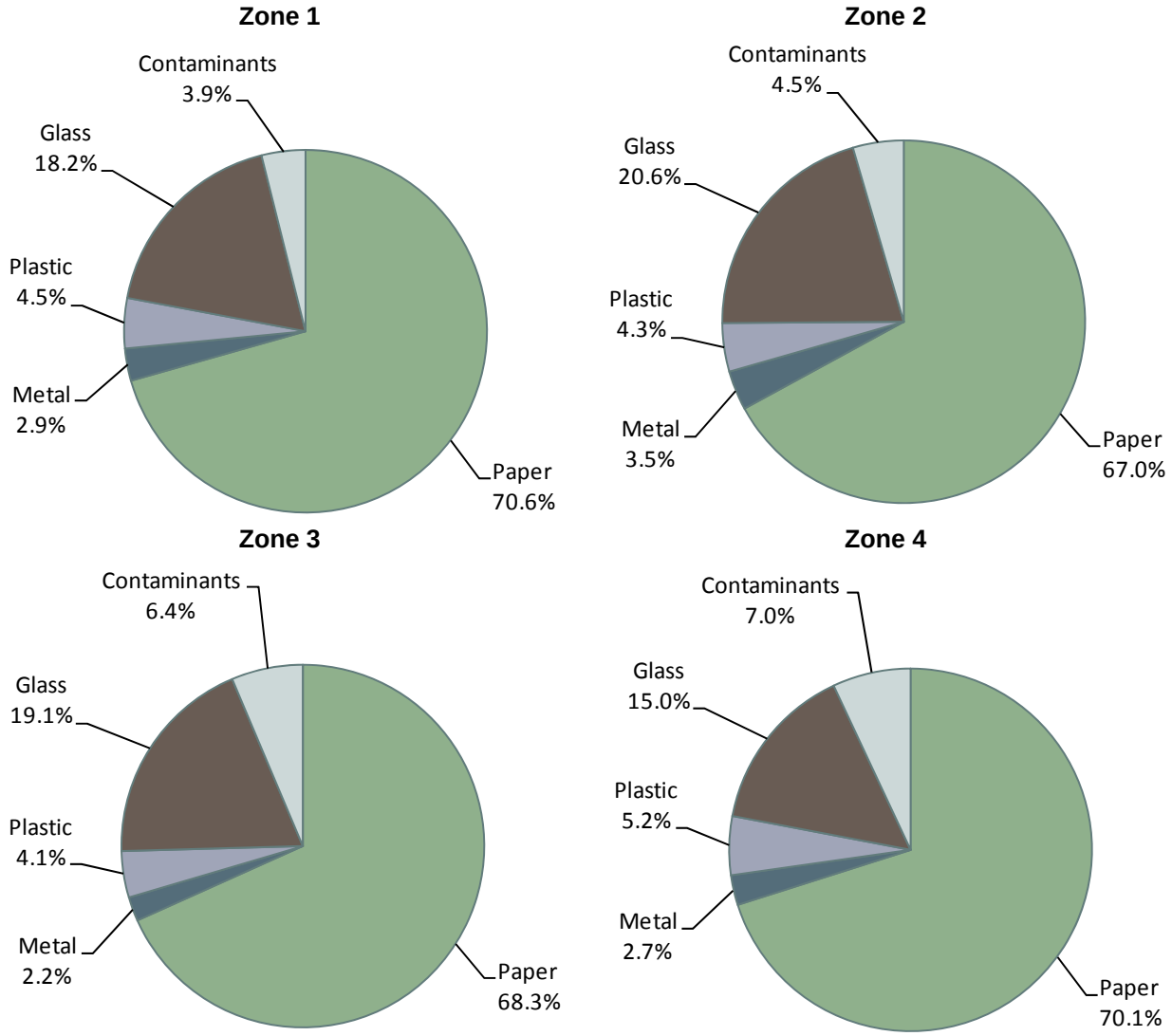
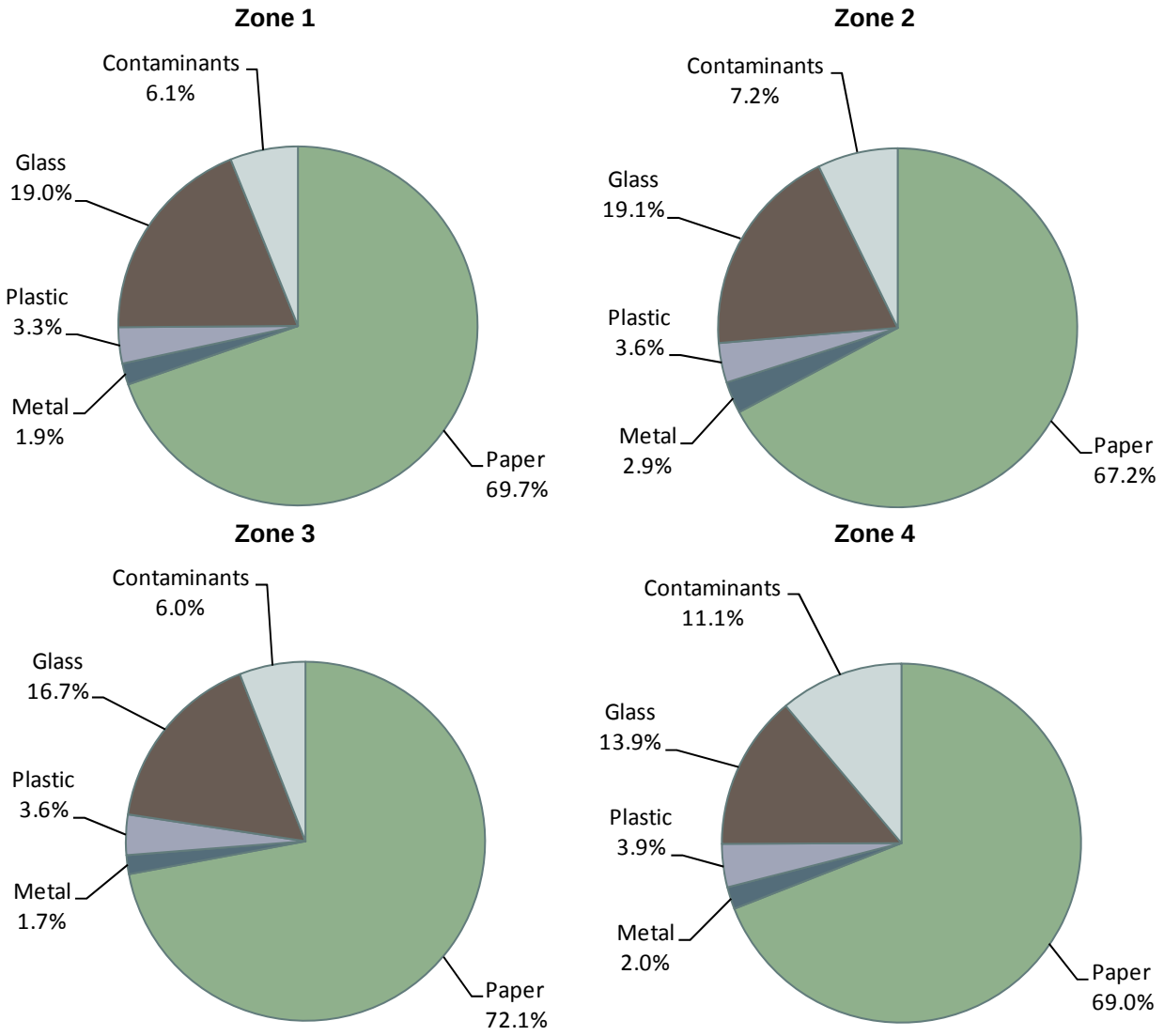


Figure 4-4 summarizes the composition of multifamily recyclables by zone. **Paper** accounted for about 67% to 72% of recycling set out by each of these subpopulations. **Glass** made up a smaller portion of recycling in Zone 4 (13.9%) than in other zones (16.7% to 19.1%). **Contaminants** ranged from about 6% to 11% of recycling set out in each zone. The two remaining broad material categories, **plastic** and **metal**, each accounted for less than 4% of the total for all four subpopulations.

Figure 4-4. Overview of Composition Estimates: Multifamily (January – December 2010)



4.3.1 Single-family Zone 1

A total of 45 samples were captured and sorted from single-family Zone 1 recycling loads between January and December 2010. Seattle's single-family Zone 1 residents set out approximately 15,384 tons for recycling in 2010. As illustrated in Table 4-14, *mixed low-grade paper* (31.4%) was the single largest component, followed by *newsprint* (19.9%) and *unwaxed OCC/Kraft paper* (16.4%). Table 4-22 presents full composition results for single-family Zone 1 recycling.

Table 4-14. Top Ten Components: Single-family Zone 1
(January – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	31.4%	31.4%	4,826
Newsprint	19.9%	51.3%	3,063
Unwaxed OCC/Kraft Paper	16.4%	67.7%	2,527
Mixed Glass Cullet	6.8%	74.5%	1,048
Green Glass Bottles	4.1%	78.6%	628
Brown Glass Bottles	3.5%	82.1%	532
Clear Glass Bottles	2.5%	84.5%	382
Phone Books	2.2%	86.7%	340
Tin Food Cans	1.1%	87.9%	175
HDPE Bottles	1.1%	89.0%	170
Total	**89.0%**		**13,691**

4.3.2 Single-family Zone 2

A total of 45 loads were sampled from the single-family Zone 2. Seattle's single-family Zone 2 residents set out approximately 12,213 tons for recycling in 2010. Table 4-15 lists the top ten components, by weight, for these materials. *Mixed low-grade paper* was the largest component (31.0%), followed by *newsprint* (20.1%) and *unwaxed OCC/Kraft paper* (14.3%). Table 4-23 presents the full composition results for single-family Zone 2 recycling.

Table 4-15. Top Ten Components: Single-family Zone 2
(January – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	31.0%	31.0%	3,781
Newsprint	20.1%	51.1%	2,460
Unwaxed OCC/Kraft Paper	14.3%	65.4%	1,741
Green Glass Bottles	6.3%	71.7%	773
Brown Glass Bottles	4.9%	76.6%	600
Mixed Glass Cullet	3.9%	80.5%	481
Clear Glass Bottles	3.6%	84.2%	443
Tin Food Cans	2.0%	86.1%	240
Clear Container Glass	1.5%	87.6%	182
Non-Conforming Plastic	1.2%	88.8%	141
Total	**88.8%**		**10,842**

4.3.3 Single-family Zone 3

A total of 45 samples were captured and sorted from single-family Zone 3 recycling loads. Seattle's single-family Zone 3 residents set out approximately 14,306 tons for recycling in 2010. As shown in Table 4-16, *mixed low-grade paper* was the largest single component, composing about 31% of the total. *Newsprint* made up almost 20%, followed by *unwaxed OCC/Kraft paper* at approximately 15%. Table 4-24 lists the full composition results for single-family Zone 3 recycling.

Table 4-16. Top Ten Components: Single-family Zone 3
(January – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	31.1%	31.1%	4,454
Newsprint	19.7%	50.8%	2,815
Unwaxed OCC/Kraft Paper	14.5%	65.3%	2,071
Green Glass Bottles	7.1%	72.4%	1,011
Mixed Glass Cullet	4.0%	76.3%	569
Brown Glass Bottles	3.4%	79.7%	487
Clear Glass Bottles	3.1%	82.9%	446
Phone Books	2.2%	85.0%	312
Non-Conforming Plastic	1.6%	86.7%	230
Other Non-recyclables	1.5%	88.1%	209
Total	**88.1%**		**12,605**

4.3.4 Single-family Zone 4

A total of 45 samples were captured from single-family Zone 4 loads during the 2010 study. Seattle's single-family Zone 4 residents set out approximately 19,059 tons for recycling in 2010. As presented in Table 4-17, *mixed low-grade paper* (30.4%) was the largest component. *Newsprint* (21.3%) and *unwaxed OCC/Kraft paper* (15.5%) were the next two largest components. Table 4-25 lists the detailed composition results for single-family Zone 4.

Table 4-17. Top Ten Components: Single-family Zone 4
(January – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	30.4%	30.4%	5,790
Newsprint	21.3%	51.7%	4,066
Unwaxed OCC/Kraft Paper	15.5%	67.2%	2,954
Mixed Glass Cullet	4.8%	72.1%	924
Green Glass Bottles	3.6%	75.7%	692
Brown Glass Bottles	2.9%	78.6%	560
Clear Glass Bottles	2.3%	81.0%	446
Non-Conforming Plastic	2.2%	83.1%	414
Phone Books	2.1%	85.2%	392
Other Non-recyclables	1.6%	86.8%	298
Total	**86.8%**		**16,536**

4.3.5 Comparison of Single-family Zones 1 Through 4

Many of the same components can be found in the top ten tables for single-family recycling in all four zones. *Mixed low-grade paper* was the largest component for each subpopulation. The next two most prevalent components were *newsprint* and *unwaxed OCC/Kraft paper*, in that order, for all four zones. Four additional components were common to the top ten lists for all four zones: *mixed glass cullet*, *green glass bottles*, *brown glass bottles*, and *clear glass bottles*. Other materials on several top ten lists were *phone books* (Zones 1, 3, and 4) and *non-conforming plastic* (Zones 2, 3, and 4).

Two materials were common to two top ten lists: *tin food cans* (Zones 1 and 2) and *other non-recyclables* (Zones 3 and 4). In contrast, *HDPE bottles* was unique to the Zone 1 top ten list, and *clear container glass* was unique to the Zone 2 top ten list.

4.3.6 Multifamily Zone 1

A total of 23 samples were captured and sorted from multifamily Zone 1 recycling loads between January and December 2010. Seattle's multifamily Zone 1 residents set out approximately 4,810 tons in 2010. As shown in Table 4-18, the two largest components, *unwaxed OCC/Kraft paper* and *mixed low-grade paper* together composed slightly more than 50% of the total recycling for this subpopulation. *Newsprint* (16.7%) was the third largest component. Please see Table 4-26 for full composition results for multifamily Zone 1 recycling.

Table 4-18. Top Ten Components: Multifamily Zone 1
(January – December 2010)

Component	Est. Percent	Cum. %	Tons
Unwaxed OCC/Kraft Paper	27.2%	27.2%	1,309
Mixed Low-grade Paper	23.7%	50.9%	1,138
Newsprint	16.7%	67.6%	805
Mixed Glass Cullet	10.2%	77.8%	490
Green Glass Bottles	3.2%	81.0%	155
Brown Glass Bottles	3.1%	84.1%	150
Clear Glass Bottles	1.8%	85.9%	86
Phone Books	1.6%	87.5%	76
Other Non-recyclables	1.5%	89.0%	71
Textiles and Clothing	1.3%	90.3%	64
Total	**90.3%**		**4,345**

4.3.7 Multifamily Zone 2

A total of 22 loads were sampled from the multifamily Zone 2. Table 4-19 lists the top ten components for this subpopulation. Seattle's multifamily Zone 2 residents set out approximately 2,848 tons in 2010. *Mixed low-grade paper* and *unwaxed OCC/Kraft paper*, together, made up slightly more than 50% of the total. *Newsprint* (15.4%) was the third largest component. Table 4-27 presents the full composition results for multifamily Zone 2 recycling.

Table 4-19. Top Ten Components: Multifamily Zone 2
(January – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	26.0%	26.0%	740
Unwaxed OCC/Kraft Paper	24.2%	50.1%	688
Newsprint	15.4%	65.6%	440
Mixed Glass Cullet	7.1%	72.6%	201
Brown Glass Bottles	4.6%	77.2%	131
Green Glass Bottles	3.5%	80.7%	99
Clear Glass Bottles	3.1%	83.8%	89
Other Non-recyclables	2.6%	86.5%	75
Non-Conforming Plastic	1.5%	87.9%	42
Tin Food Cans	1.2%	89.1%	33
Total	**89.1%**		**2,537**

4.3.8 Multifamily Zone 3

A total of 23 samples were captured and sorted from multifamily Zone 3 recycling loads. Seattle's multifamily Zone 3 residents set out approximately 10,000 tons for recycling in 2010. As shown in

Table 4-20, *mixed low-grade paper* was the largest single component (27.2%), followed closely by *unwaxed OCC/Kraft paper* (26.3%). The third largest component, *newsprint*, made up almost 17% of the total. Table 4-28 lists the full composition results for multifamily Zone 3 recycling.

Table 4-20. Top Ten Components: Multifamily Zone 3
(January – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	27.2%	27.2%	2,718
Unwaxed OCC/Kraft Paper	26.3%	53.5%	2,629
Newsprint	16.6%	70.0%	1,655
Mixed Glass Cullet	6.8%	76.8%	680
Green Glass Bottles	4.3%	81.1%	426
Brown Glass Bottles	2.7%	83.7%	266
Clear Glass Bottles	2.0%	85.8%	204
Other Non-recyclables	1.6%	87.4%	157
Phone Books	1.2%	88.5%	117
Non-Conforming Plastic	1.1%	89.6%	108
Total	**89.6%**		**8,960**

4.3.9 Multifamily Zone 4

A total of 22 samples were captured from multifamily Zone 4 loads during the 2010 study. Seattle's multifamily Zone 4 residents set out approximately 3,341 tons of recycling in 2010. As shown in

Table 4-21, *mixed low-grade paper* composed almost 26% of the total. The next two largest components, *unwaxed OCC/Kraft paper* and *newsprint*, each made up about 20% of recycling for this subpopulation. The detailed composition results for multifamily Zone 4 are listed in Table 4-29.

Table 4-21. Top Ten Components: Multifamily Zone 4
(January – December 2010)

Component	Est. Percent	Cum. %	Tons
Mixed Low-grade Paper	25.7%	25.7%	858
Unwaxed OCC/Kraft Paper	20.4%	46.1%	683
Newsprint	20.2%	66.3%	675
Mixed Glass Cullet	5.8%	72.1%	192
Other Non-recyclables	4.7%	76.8%	157
Green Glass Bottles	3.5%	80.3%	116
Phone Books	2.3%	82.6%	77
Brown Glass Bottles	2.1%	84.7%	70
Textiles and Clothing	2.1%	86.7%	69
Clear Glass Bottles	1.9%	88.6%	62
Total	**88.6%**		**2,960**

4.3.10 Comparison of Multifamily Zones 1 Through 4

Many of the same components can be found in the top ten tables for multifamily recycling across all zones. *Mixed low-grade paper*, *unwaxed OCC/ Kraft paper*, and *newsprint* were among the top three largest components across all zones. Five additional materials were common to all top ten lists: *mixed glass cullet*, *green glass bottles*, *brown glass bottles*, *clear glass bottles*, and *other non-recyclables*. *Phone books* appeared in three top ten lists: Zones 1, 3, and 4.

Non-conforming plastic was present as a top ten component in loads from Zones 2 and Zone 3 only. A contaminant, *textiles/clothing*, appeared in the top ten lists for Zones 1 and 4. *Tin food cans* were unique to a top ten list for Zone 2 only.

Table 4-22. Composition by Weight: Single-family Zone 1
(January – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**10,863**	**70.6%**		
Newsprint	3,063	19.9%	18.0%	21.8%
Unwaxed OCC/Kraft Paper	2,527	16.4%	14.6%	18.3%
Phone Books	340	2.2%	1.3%	3.1%
Mixed Low-grade Paper	4,826	31.4%	30.0%	32.8%
Shredded Paper	2	0.0%	0.0%	0.0%
Polycoat Containers	92	0.6%	0.5%	0.7%
Aseptic Containers	12	0.1%	0.1%	0.1%
Metal	**441**	**2.9%**		
Aluminum Cans	116	0.8%	0.7%	0.8%
Aluminum Foil/Containers	29	0.2%	0.1%	0.2%
Tin Food Cans	175	1.1%	1.0%	1.3%
Other Ferrous Metal	120	0.8%	0.1%	1.4%
Plastic	**688**	**4.5%**		
Small PET Bottles (24 oz or smaller)	105	0.7%	0.6%	0.8%
Large PET Bottles (greater than 24 oz)	140	0.9%	0.8%	1.0%
PET Jars, Tubs, and Other Containers	72	0.5%	0.4%	0.5%
HDPE Bottles	170	1.1%	1.0%	1.2%
HDPE Jars, Tubs, and Other Containers	19	0.1%	0.0%	0.2%
Other Plastic Bottles (#3-7)	17	0.1%	0.1%	0.2%
Other Jars, Tubs, and Containers (#3-7)	87	0.6%	0.5%	0.6%
Plastic Bags and Packaging	78	0.5%	0.4%	0.6%
Glass	**2,792**	**18.2%**		
Clear Glass Bottles	382	2.5%	2.0%	2.9%
Green Glass Bottles	628	4.1%	3.3%	4.8%
Brown Glass Bottles	532	3.5%	2.7%	4.2%
Clear Container Glass	162	1.1%	0.8%	1.3%
Other Glass Containers and Bottles	41	0.3%	0.1%	0.4%
Mixed Glass Cullet	1,048	6.8%	5.1%	8.5%
Contaminants	**600**	**3.9%**		
Non-Conforming Paper	115	0.7%	0.5%	1.0%
Non-Conforming Metal	37	0.2%	0.1%	0.4%
Non-Conforming Plastic	156	1.0%	0.9%	1.2%
Non-Conforming Glass	29	0.2%	0.1%	0.2%
Food, Green Waste, and Wood	46	0.3%	0.2%	0.7%
Textiles and Clothing	62	0.4%	0.1%	0.7%
Other Non-recyclables	155	1.0%	0.5%	1.5%
Total Tons	**15,384**			
Sample Count	**45**			

Confidence intervals calculated at the 90% confidence level.

Table 4-23. Composition by Weight: Single-family Zone 2
(January – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**8,189**	**67.0%**		
Newsprint	2,460	20.1%	18.4%	21.9%
Unwaxed OCC/Kraft Paper	1,741	14.3%	12.8%	15.7%
Phone Books	114	0.9%	0.6%	1.3%
Mixed Low-grade Paper	3,781	31.0%	29.5%	32.4%
Shredded Paper	0	0.0%	0.0%	0.0%
Polycoat Containers	87	0.7%	0.6%	0.8%
Aseptic Containers	6	0.0%	0.0%	0.1%
Metal	**430**	**3.5%**		
Aluminum Cans	114	0.9%	0.8%	1.1%
Aluminum Foil/Containers	24	0.2%	0.1%	0.2%
Tin Food Cans	240	2.0%	1.2%	2.7%
Other Ferrous Metal	52	0.4%	0.3%	0.6%
Plastic	**528**	**4.3%**		
Small PET Bottles (24 oz or smaller)	95	0.8%	0.7%	0.9%
Large PET Bottles (greater than 24 oz)	112	0.9%	0.8%	1.0%
PET Jars, Tubs, and Other Containers	51	0.4%	0.4%	0.5%
HDPE Bottles	116	0.9%	0.8%	1.1%
HDPE Jars, Tubs, and Other Containers	9	0.1%	0.0%	0.1%
Other Plastic Bottles (#3-7)	13	0.1%	0.1%	0.1%
Other Jars, Tubs, and Containers (#3-7)	71	0.6%	0.5%	0.6%
Plastic Bags and Packaging	59	0.5%	0.4%	0.6%
Glass	**2,515**	**20.6%**		
Clear Glass Bottles	443	3.6%	3.1%	4.1%
Green Glass Bottles	773	6.3%	5.6%	7.1%
Brown Glass Bottles	600	4.9%	4.2%	5.6%
Clear Container Glass	182	1.5%	1.3%	1.7%
Other Glass Containers and Bottles	35	0.3%	0.2%	0.4%
Mixed Glass Cullet	481	3.9%	2.9%	5.0%
Contaminants	**552**	**4.5%**		
Non-Conforming Paper	81	0.7%	0.5%	0.8%
Non-Conforming Metal	37	0.3%	0.2%	0.4%
Non-Conforming Plastic	141	1.2%	0.9%	1.4%
Non-Conforming Glass	52	0.4%	0.0%	0.2%
Food, Green Waste, and Wood	44	0.4%	0.2%	0.9%
Textiles and Clothing	73	0.6%	0.3%	0.9%
Other Non-recyclables	125	1.0%	0.7%	1.3%
Total Tons	**12,213**			
Sample Count	**45**			

Confidence intervals calculated at the 90% confidence level.

Table 4-24. Composition by Weight: Single-family Zone 3
(January – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**9,767**	**68.3%**		
Newsprint	2,815	19.7%	17.4%	22.0%
Unwaxed OCC/Kraft Paper	2,071	14.5%	12.9%	16.0%
Phone Books	312	2.2%	1.6%	2.8%
Mixed Low-grade Paper	4,454	31.1%	29.4%	32.9%
Shredded Paper	6	0.0%	0.0%	0.1%
Polycoat Containers	96	0.7%	0.6%	0.7%
Aseptic Containers	12	0.1%	0.0%	0.1%
Metal	**309**	**2.2%**		
Aluminum Cans	95	0.7%	0.6%	0.7%
Aluminum Foil/Containers	23	0.2%	0.1%	0.2%
Tin Food Cans	147	1.0%	0.9%	1.1%
Other Ferrous Metal	45	0.3%	0.1%	0.5%
Plastic	**590**	**4.1%**		
Small PET Bottles (24 oz or smaller)	103	0.7%	0.6%	0.8%
Large PET Bottles (greater than 24 oz)	107	0.8%	0.7%	0.8%
PET Jars, Tubs, and Other Containers	70	0.5%	0.4%	0.5%
HDPE Bottles	117	0.8%	0.7%	0.9%
HDPE Jars, Tubs, and Other Containers	12	0.1%	0.0%	0.1%
Other Plastic Bottles (#3-7)	13	0.1%	0.1%	0.1%
Other Jars, Tubs, and Containers (#3-7)	81	0.6%	0.5%	0.7%
Plastic Bags and Packaging	87	0.6%	0.5%	0.7%
Glass	**2,729**	**19.1%**		
Clear Glass Bottles	446	3.1%	2.7%	3.5%
Green Glass Bottles	1,011	7.1%	6.3%	7.9%
Brown Glass Bottles	487	3.4%	3.0%	3.8%
Clear Container Glass	179	1.3%	1.0%	1.5%
Other Glass Containers and Bottles	36	0.3%	0.2%	0.4%
Mixed Glass Cullet	569	4.0%	3.0%	4.9%
Contaminants	**911**	**6.4%**		
Non-Conforming Paper	82	0.6%	0.4%	0.7%
Non-Conforming Metal	61	0.4%	0.2%	0.6%
Non-Conforming Plastic	230	1.6%	0.9%	2.4%
Non-Conforming Glass	64	0.4%	0.1%	0.2%
Food, Green Waste, and Wood	84	0.6%	0.3%	1.7%
Textiles and Clothing	181	1.3%	0.8%	1.7%
Other Non-recyclables	209	1.5%	0.7%	2.3%
Total Tons	**14,306**			
Sample Count	**45**			

Confidence intervals calculated at the 90% confidence level.

Table 4-25. Composition by Weight: Single-family Zone 4
(January – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**13,360**	**70.1%**		
Newsprint	4,066	21.3%	19.4%	23.3%
Unwaxed OCC/Kraft Paper	2,954	15.5%	13.9%	17.1%
Phone Books	392	2.1%	1.4%	2.7%
Mixed Low-grade Paper	5,790	30.4%	28.7%	32.1%
Shredded Paper	7	0.0%	0.0%	0.1%
Polycoat Containers	134	0.7%	0.6%	0.8%
Aseptic Containers	17	0.1%	0.1%	0.1%
Metal	**507**	**2.7%**		
Aluminum Cans	155	0.8%	0.7%	0.9%
Aluminum Foil/Containers	34	0.2%	0.1%	0.2%
Tin Food Cans	241	1.3%	1.1%	1.4%
Other Ferrous Metal	77	0.4%	0.2%	0.6%
Plastic	**997**	**5.2%**		
Small PET Bottles (24 oz or smaller)	170	0.9%	0.8%	1.0%
Large PET Bottles (greater than 24 oz)	194	1.0%	0.9%	1.1%
PET Jars, Tubs, and Other Containers	89	0.5%	0.4%	0.5%
HDPE Bottles	224	1.2%	1.0%	1.3%
HDPE Jars, Tubs, and Other Containers	21	0.1%	0.1%	0.1%
Other Plastic Bottles (#3-7)	27	0.1%	0.1%	0.2%
Other Jars, Tubs, and Containers (#3-7)	117	0.6%	0.5%	0.7%
Plastic Bags and Packaging	155	0.8%	0.6%	1.0%
Glass	**2,867**	**15.0%**		
Clear Glass Bottles	446	2.3%	1.8%	2.9%
Green Glass Bottles	692	3.6%	3.1%	4.1%
Brown Glass Bottles	560	2.9%	2.3%	3.6%
Clear Container Glass	194	1.0%	0.8%	1.2%
Other Glass Containers and Bottles	51	0.3%	0.2%	0.4%
Mixed Glass Cullet	924	4.8%	3.9%	5.8%
Contaminants	**1,327**	**7.0%**		
Non-Conforming Paper	178	0.9%	0.8%	1.1%
Non-Conforming Metal	99	0.5%	0.3%	0.8%
Non-Conforming Plastic	414	2.2%	1.6%	2.8%
Non-Conforming Glass	18	0.1%	0.0%	0.2%
Food, Green Waste, and Wood	136	0.7%	0.3%	1.2%
Textiles and Clothing	184	1.0%	0.7%	1.2%
Other Non-recyclables	298	1.6%	1.0%	2.1%
Total Tons	**19,059**			
Sample Count	**45**			

Confidence intervals calculated at the 90% confidence level.

Table 4-26. Composition by Weight: Multifamily Zone 1
(January – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**3,353**	**69.7%**		
Newsprint	805	16.7%	13.1%	20.4%
Unwaxed OCC/Kraft Paper	1,309	27.2%	20.0%	34.4%
Phone Books	76	1.6%	0.5%	2.7%
Mixed Low-grade Paper	1,138	23.7%	19.3%	28.0%
Shredded Paper	3	0.1%	0.0%	0.1%
Polycoat Containers	19	0.4%	0.3%	0.5%
Aseptic Containers	2	0.0%	0.0%	0.1%
Metal	**93**	**1.9%**		
Aluminum Cans	27	0.6%	0.4%	0.7%
Aluminum Foil/Containers	5	0.1%	0.1%	0.1%
Tin Food Cans	43	0.9%	0.7%	1.1%
Other Ferrous Metal	18	0.4%	0.1%	0.7%
Plastic	**156**	**3.3%**		
Small PET Bottles (24 oz or smaller)	30	0.6%	0.5%	0.8%
Large PET Bottles (greater than 24 oz)	30	0.6%	0.5%	0.8%
PET Jars, Tubs, and Other Containers	13	0.3%	0.2%	0.3%
HDPE Bottles	40	0.8%	0.7%	1.0%
HDPE Jars, Tubs, and Other Containers	3	0.1%	0.0%	0.1%
Other Plastic Bottles (#3-7)	2	0.0%	0.0%	0.1%
Other Jars, Tubs, and Containers (#3-7)	19	0.4%	0.3%	0.5%
Plastic Bags and Packaging	19	0.4%	0.3%	0.5%
Glass	**914**	**19.0%**		
Clear Glass Bottles	86	1.8%	1.4%	2.2%
Green Glass Bottles	155	3.2%	2.5%	4.0%
Brown Glass Bottles	150	3.1%	1.9%	4.3%
Clear Container Glass	23	0.5%	0.3%	0.6%
Other Glass Containers and Bottles	10	0.2%	0.0%	0.5%
Mixed Glass Cullet	490	10.2%	6.8%	13.6%
Contaminants	**294**	**6.1%**		
Non-Conforming Paper	37	0.8%	0.5%	1.1%
Non-Conforming Metal	21	0.4%	0.0%	0.8%
Non-Conforming Plastic	57	1.2%	0.8%	1.6%
Non-Conforming Glass	10	0.2%	0.1%	0.1%
Food, Green Waste, and Wood	33	0.7%	0.4%	2.0%
Textiles and Clothing	64	1.3%	0.7%	2.0%
Other Non-recyclables	71	1.5%	0.8%	2.2%
Total Tons	**4,810**			
Sample Count	**23**			

Confidence intervals calculated at the 90% confidence level.

Table 4-27. Composition by Weight: Multifamily Zone 2
(January – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**1,914**	**67.2%**		
Newsprint	440	15.4%	13.1%	17.8%
Unwaxed OCC/Kraft Paper	688	24.2%	18.9%	29.4%
Phone Books	29	1.0%	0.4%	1.7%
Mixed Low-grade Paper	740	26.0%	23.2%	28.7%
Shredded Paper	2	0.1%	0.0%	0.1%
Polycoat Containers	14	0.5%	0.4%	0.6%
Aseptic Containers	1	0.0%	0.0%	0.0%
Metal	**82**	**2.9%**		
Aluminum Cans	26	0.9%	0.6%	1.2%
Aluminum Foil/Containers	2	0.1%	0.0%	0.1%
Tin Food Cans	33	1.2%	0.9%	1.4%
Other Ferrous Metal	20	0.7%	0.0%	1.6%
Plastic	**102**	**3.6%**		
Small PET Bottles (24 oz or smaller)	20	0.7%	0.6%	0.8%
Large PET Bottles (greater than 24 oz)	21	0.7%	0.6%	0.9%
PET Jars, Tubs, and Other Containers	8	0.3%	0.2%	0.3%
HDPE Bottles	26	0.9%	0.8%	1.1%
HDPE Jars, Tubs, and Other Containers	2	0.1%	0.0%	0.1%
Other Plastic Bottles (#3-7)	2	0.1%	0.0%	0.1%
Other Jars, Tubs, and Containers (#3-7)	10	0.4%	0.3%	0.4%
Plastic Bags and Packaging	12	0.4%	0.3%	0.5%
Glass	**545**	**19.1%**		
Clear Glass Bottles	89	3.1%	2.0%	4.3%
Green Glass Bottles	99	3.5%	2.6%	4.3%
Brown Glass Bottles	131	4.6%	2.8%	6.4%
Clear Container Glass	21	0.7%	0.5%	1.0%
Other Glass Containers and Bottles	4	0.2%	0.0%	0.3%
Mixed Glass Cullet	201	7.1%	5.4%	8.8%
Contaminants	**206**	**7.2%**		
Non-Conforming Paper	16	0.6%	0.5%	0.7%
Non-Conforming Metal	14	0.5%	0.0%	1.0%
Non-Conforming Plastic	42	1.5%	1.0%	1.9%
Non-Conforming Glass	6	0.2%	0.0%	0.1%
Food, Green Waste, and Wood	21	0.7%	0.4%	1.8%
Textiles and Clothing	32	1.1%	0.5%	1.8%
Other Non-recyclables	75	2.6%	1.5%	3.8%
Total Tons	**2,848**			
Sample Count	**22**			

Confidence intervals calculated at the 90% confidence level.

Table 4-28. Composition by Weight: Multifamily Zone 3
(January – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**7,205**	**72.1%**		
Newsprint	1,655	16.6%	13.5%	19.6%
Unwaxed OCC/Kraft Paper	2,629	26.3%	21.4%	31.2%
Phone Books	117	1.2%	0.4%	2.0%
Mixed Low-grade Paper	2,718	27.2%	24.2%	30.1%
Shredded Paper	35	0.3%	0.0%	0.9%
Polycoat Containers	48	0.5%	0.4%	0.6%
Aseptic Containers	3	0.0%	0.0%	0.1%
Metal	**171**	**1.7%**		
Aluminum Cans	59	0.6%	0.5%	0.7%
Aluminum Foil/Containers	11	0.1%	0.1%	0.2%
Tin Food Cans	90	0.9%	0.7%	1.1%
Other Ferrous Metal	11	0.1%	0.0%	0.2%
Plastic	**363**	**3.6%**		
Small PET Bottles (24 oz or smaller)	66	0.7%	0.6%	0.8%
Large PET Bottles (greater than 24 oz)	76	0.8%	0.7%	0.9%
PET Jars, Tubs, and Other Containers	26	0.3%	0.2%	0.3%
HDPE Bottles	85	0.8%	0.7%	1.0%
HDPE Jars, Tubs, and Other Containers	10	0.1%	0.0%	0.2%
Other Plastic Bottles (#3-7)	5	0.1%	0.0%	0.1%
Other Jars, Tubs, and Containers (#3-7)	39	0.4%	0.3%	0.4%
Plastic Bags and Packaging	57	0.6%	0.4%	0.7%
Glass	**1,665**	**16.7%**		
Clear Glass Bottles	204	2.0%	1.5%	2.5%
Green Glass Bottles	426	4.3%	3.3%	5.2%
Brown Glass Bottles	266	2.7%	2.0%	3.3%
Clear Container Glass	61	0.6%	0.4%	0.8%
Other Glass Containers and Bottles	28	0.3%	0.1%	0.5%
Mixed Glass Cullet	680	6.8%	5.2%	8.4%
Contaminants	**595**	**6.0%**		
Non-Conforming Paper	50	0.5%	0.4%	0.6%
Non-Conforming Metal	54	0.5%	0.2%	0.9%
Non-Conforming Plastic	108	1.1%	0.8%	1.3%
Non-Conforming Glass	51	0.5%	0.1%	0.2%
Food, Green Waste, and Wood	94	0.9%	0.6%	1.3%
Textiles and Clothing	81	0.8%	0.3%	1.3%
Other Non-recyclables	157	1.6%	1.0%	2.2%
Total Tons	**10,000**			
Sample Count	**23**			

Confidence intervals calculated at the 90% confidence level.

Table 4-29. Composition by Weight: Multifamily Zone 4
(January – December 2010)

Material	Est. Tons	Est. Percent	Low	High
Paper	**2,307**	**69.0%**		
Newsprint	675	20.2%	15.6%	24.8%
Unwaxed OCC/Kraft Paper	683	20.4%	16.7%	24.1%
Phone Books	77	2.3%	1.4%	3.2%
Mixed Low-grade Paper	858	25.7%	23.1%	28.2%
Shredded Paper	0	0.0%	0.0%	0.0%
Polycoat Containers	13	0.4%	0.3%	0.5%
Aseptic Containers	1	0.0%	0.0%	0.1%
Metal	**67**	**2.0%**		
Aluminum Cans	23	0.7%	0.5%	0.8%
Aluminum Foil/Containers	3	0.1%	0.1%	0.1%
Tin Food Cans	30	0.9%	0.7%	1.1%
Other Ferrous Metal	11	0.3%	0.0%	0.6%
Plastic	**130**	**3.9%**		
Small PET Bottles (24 oz or smaller)	27	0.8%	0.6%	1.0%
Large PET Bottles (greater than 24 oz)	27	0.8%	0.6%	1.0%
PET Jars, Tubs, and Other Containers	8	0.2%	0.2%	0.3%
HDPE Bottles	38	1.1%	0.9%	1.4%
HDPE Jars, Tubs, and Other Containers	2	0.1%	0.0%	0.1%
Other Plastic Bottles (#3-7)	2	0.1%	0.0%	0.1%
Other Jars, Tubs, and Containers (#3-7)	12	0.3%	0.3%	0.4%
Plastic Bags and Packaging	15	0.5%	0.3%	0.6%
Glass	**465**	**13.9%**		
Clear Glass Bottles	62	1.9%	1.2%	2.5%
Green Glass Bottles	116	3.5%	2.4%	4.6%
Brown Glass Bottles	70	2.1%	1.4%	2.9%
Clear Container Glass	18	0.5%	0.4%	0.7%
Other Glass Containers and Bottles	6	0.2%	0.1%	0.3%
Mixed Glass Cullet	192	5.8%	4.2%	7.3%
Contaminants	**372**	**11.1%**		
Non-Conforming Paper	25	0.8%	0.5%	1.0%
Non-Conforming Metal	18	0.5%	0.2%	0.9%
Non-Conforming Plastic	53	1.6%	1.2%	2.0%
Non-Conforming Glass	5	0.1%	0.0%	0.1%
Food, Green Waste, and Wood	45	1.3%	0.7%	3.0%
Textiles and Clothing	69	2.1%	1.2%	3.0%
Other Non-recyclables	157	4.7%	2.3%	7.1%
Total Tons	**3,341**			
Sample Count	**22**			

Confidence intervals calculated at the 90% confidence level.

4.4 By Demographics

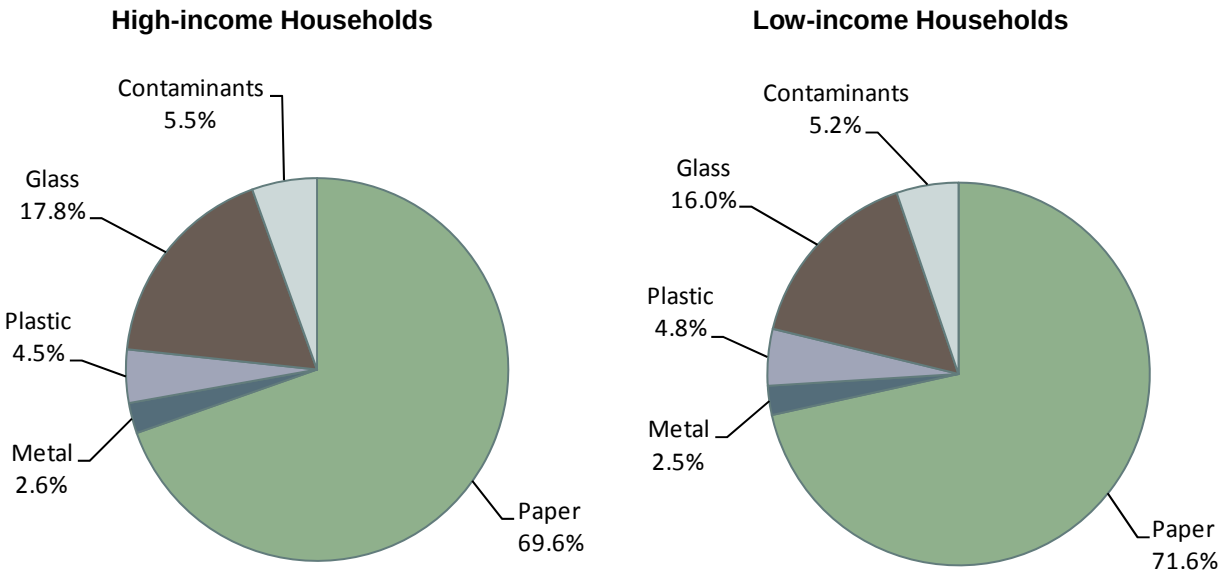
Recycling composition estimates for various demographic groups were calculated by considering the median household income and mean household size of each sampled recycling route. Median household income for each route was calculated based on information from the 2005-2009 American Community Survey 5-year estimates, at the Census Block Group level of geography.[14] The total population and number of households for each route were calculated using information from the 2010 Census, at the Census Block level of geography. Sampled routes were divided into quartiles based on the median income and mean household size of each garbage route. Recycling samples from the first (0 - 25%) quartile of routes were used to calculate recycling compositions for low-income and small households (separately). Samples from the top quartile (75% - 100%) were used to calculate composition profiles for high-income and large households. See Appendix D for more details on demographic calculations.

4.4.1 By Household Income

Figure 4-5 summarizes the composition by broad material category for each household income type. **Paper** accounted for approximately 70% of high-income recycling and nearly 72% of low-income recycling. The second largest broad material category in both recycling streams, **glass**, contributed a slightly higher percentage to high-income household recycling (17.8%) than to low-income household recycling (16.0%).

[14] A Census Block is generally equivalent to a city block. A Block Group is a collection of Blocks. For reference, a Tract is a collection of Block Groups. There are approximately 9,200 blocks; 570 block groups; and 126 tracts in Seattle.

Figure 4-5: Composition Summary, by Household Income
(January – December 2010)



4.4.1.1 High-income Households

A total of 37 samples were collected and sorted from recycling routes with high-income households during 2010. Table 4-30 lists the top ten components, which sum to approximately 88% of the total. The largest component, *mixed low-grade paper*, accounted for approximately 33% of the recycling stream, followed by *newsprint* (19.9%) and *unwaxed OCC/Kraft paper* (13.5%). The detailed composition results for high-income households are listed in Table 4-32.

Table 4-30: Top Ten Components – High-income Households
(January – December 2010)

Component	Est. Percent	Cumulative Percent
Mixed Low-grade Paper	32.6%	32.6%
Newsprint	19.9%	52.5%
Unwaxed OCC/Kraft Paper	13.5%	66.0%
Green Glass Bottles	5.5%	71.5%
Mixed Glass Cullet	5.0%	76.5%
Brown Glass Bottles	3.2%	79.7%
Phone Books	2.9%	82.5%
Clear Glass Bottles	2.6%	85.1%
Non-Conforming Plastic	1.9%	87.0%
Tin Food Cans	1.3%	88.3%
Total	**88.3%**	

4.4.1.2 Low-income Households

A total of 32 samples were collected sorted from recycling routes with low-income households during 2010. The top ten components of these samples are listed in Table 4-31. *Mixed low-grade paper* made up about 30% of the total recycling, followed by *newsprint* (21.2%) and

unwaxed OCC/Kraft paper (17.0%). The top ten components amounted to approximately 88% of this recycling. Table 4-33 details the recycling composition results for low-income routes.

Table 4-31: Top Ten Components – Low-income Households
(January – December 2010)

Component	Est. Percent	Cumulative Percent
Mixed Low-grade Paper	30.4%	30.4%
Newsprint	21.2%	51.6%
Unwaxed OCC/Kraft Paper	17.0%	68.6%
Mixed Glass Cullet	4.7%	73.3%
Green Glass Bottles	3.6%	76.9%
Brown Glass Bottles	3.5%	80.4%
Clear Glass Bottles	3.0%	83.4%
Phone Books	2.3%	85.7%
Non-Conforming Plastic	1.7%	87.3%
HDPE Bottles	1.1%	88.5%
Total	**88.5%**	

4.4.1.3 Comparisons between High- and Low-income Households

Mixed low-grade paper, newsprint and *unwaxed OCC/Kraft paper* were the first through third largest component categories for both income types. *Green glass bottles, mixed glass cullet, brown glass bottles, phone books*, *clear glass bottles*, and *non-conforming plastic* were among the remaining top nine components for both high- and low-income households although rankings were not identical. The unique components, ranked tenth for both types of household, were *tin food cans* (high-income) and *HDPE bottles* (low-income).

Table 4-32: Composition by Weight – High-income Households
(January – December 2010)

Material	Est. Percent	Low	High
Paper	**69.6%**		
Newsprint	19.9%	17.9%	21.8%
Unwaxed OCC/Kraft Paper	13.5%	11.8%	15.2%
Phone Books	2.9%	2.0%	3.8%
Mixed Low-grade Paper	32.6%	30.9%	34.4%
Polycoat Containers	0.7%	0.6%	0.8%
Shredded Paper	0.0%	0.0%	0.0%
Aseptic Containers	0.1%	0.0%	0.2%
Metal	**2.6%**		
Aluminum Cans	0.7%	0.6%	0.8%
Aluminum Foil/Containers	0.2%	0.1%	0.2%
Tin Food Cans	1.3%	1.0%	1.6%
Other Ferrous Metal	0.4%	0.2%	0.6%
Plastic	**4.5%**		
Small PET Bottles (24 oz or smaller)	0.8%	0.7%	0.9%
Large PET Bottles (greater than 24 oz)	0.8%	0.7%	0.9%
PET Jars, Tubs, and Other Containers	0.5%	0.5%	0.6%
HDPE Bottles	0.9%	0.8%	1.1%
HDPE Jars, Tubs, and Other Containers	0.1%	0.0%	0.1%
Other Plastic Bottles (#3-7)	0.1%	0.1%	0.2%
Other Jars, Tubs, and Containers (#3-7)	0.6%	0.5%	0.7%
Plastic Bags and Packaging	0.6%	0.5%	0.7%
Glass	**17.8%**		
Clear Glass Bottles	2.6%	2.0%	3.2%
Green Glass Bottles	5.5%	4.8%	6.2%
Brown Glass Bottles	3.2%	2.6%	3.8%
Clear Container Glass	1.2%	0.9%	1.5%
Other Glass Containers and Bottles	0.3%	0.2%	0.4%
Mixed Glass Cullet	5.0%	3.8%	6.2%
Contaminants	**5.5%**		
Non-Conforming Paper	0.7%	0.5%	1.0%
Non-Conforming Metal	0.5%	0.2%	0.9%
Non-Conforming Plastic	1.9%	1.0%	2.8%
Non-Conforming Glass	0.4%	0.0%	0.2%
Food, Green Waste, and Wood	0.4%	0.1%	0.8%
Textiles and Clothing	0.5%	0.3%	0.8%
Other Non-recyclables	1.0%	0.1%	2.0%
Total	100.0%		
Sample Count	**37**		

Confidence intervals calculated at the 90% confidence level.

Table 4-33: Composition by Weight – Low-income Households
(January – December 2010)

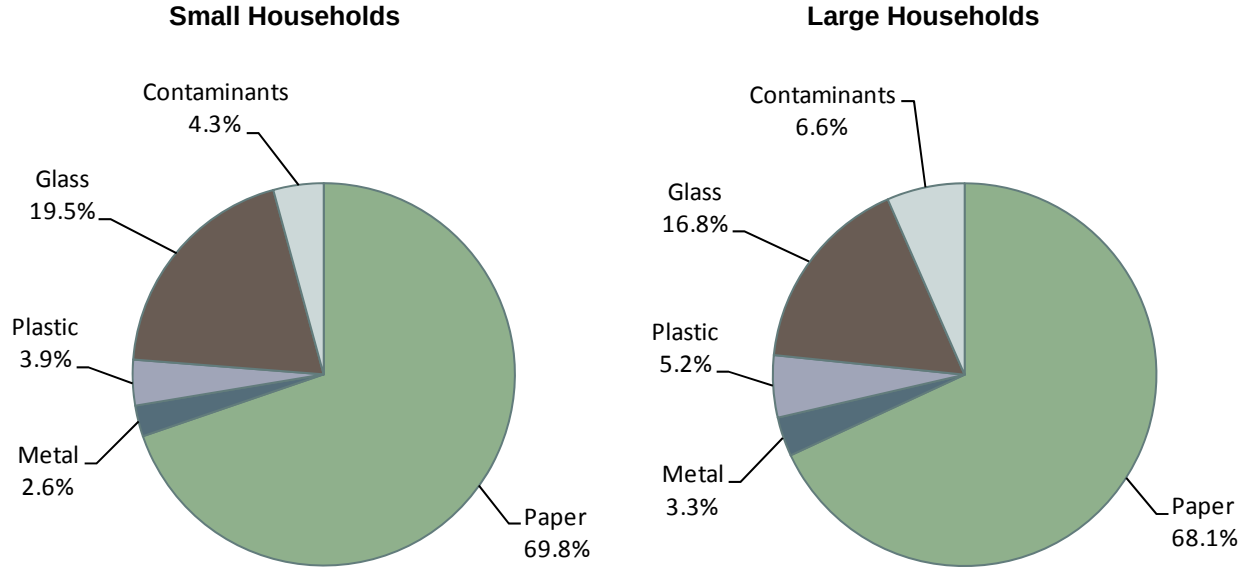
Material	Est. Percent	Low	High
Paper	**71.6%**		
Newsprint	21.2%	18.9%	23.4%
Unwaxed OCC/Kraft Paper	17.0%	15.0%	18.9%
Phone Books	2.3%	0.9%	3.6%
Mixed Low-grade Paper	30.4%	28.5%	32.4%
Polycoat Containers	0.6%	0.5%	0.6%
Shredded Paper	0.0%	0.0%	0.1%
Aseptic Containers	0.1%	0.0%	0.1%
Metal	**2.5%**		
Aluminum Cans	0.7%	0.6%	0.8%
Aluminum Foil/Containers	0.2%	0.1%	0.2%
Tin Food Cans	1.1%	1.0%	1.3%
Other Ferrous Metal	0.4%	0.2%	0.6%
Plastic	**4.8%**		
Small PET Bottles (24 oz or smaller)	0.8%	0.7%	1.0%
Large PET Bottles (greater than 24 oz)	1.0%	0.8%	1.1%
PET Jars, Tubs, and Other Containers	0.4%	0.4%	0.5%
HDPE Bottles	1.1%	1.0%	1.3%
HDPE Jars, Tubs, and Other Containers	0.1%	0.1%	0.2%
Other Plastic Bottles (#3-7)	0.1%	0.1%	0.1%
Other Jars, Tubs, and Containers (#3-7)	0.5%	0.5%	0.6%
Plastic Bags and Packaging	0.6%	0.4%	0.9%
Glass	**16.0%**		
Clear Glass Bottles	3.0%	2.3%	3.7%
Green Glass Bottles	3.6%	3.0%	4.2%
Brown Glass Bottles	3.5%	2.7%	4.3%
Clear Container Glass	1.0%	0.8%	1.3%
Other Glass Containers and Bottles	0.1%	0.1%	0.2%
Mixed Glass Cullet	4.7%	3.1%	6.4%
Contaminants	**5.2%**		
Non-Conforming Paper	1.0%	0.9%	1.2%
Non-Conforming Metal	0.3%	0.2%	0.3%
Non-Conforming Plastic	1.7%	1.2%	2.1%
Non-Conforming Glass	0.1%	0.0%	0.2%
Food, Green Waste, and Wood	0.3%	0.2%	1.4%
Textiles and Clothing	0.9%	0.5%	1.4%
Other Non-recyclables	0.9%	0.5%	1.3%
Total Tons	100.0%		
Sample Count	**32**		

Confidence intervals calculated at the 90% confidence level.

4.4.2 By Household Size

Figure 4-6 presents the recycling composition summary by broad material category for recycling disposed by small and large households. For both residence types, **paper** made up almost 70% of the total. Recycling percentages by broad material categories are very similar for both household types. **Glass** accounted for a slightly larger percentage from small households (19.5%) than from large households (16.8%) and large households (6.6%) had a slightly higher percentage of **contaminants** than small households (4.3%).

Figure 4-6: Composition Summary, by Household Size
(January – December 2010)



4.4.2.1 Small Households

A total of 47 samples were collected and sorted from small household routes. Table 4-34 lists the top ten components for small households. The most prevalent component, *mixed low-grade paper* (32%) combined with the second most prevalent material, *newsprint* (20%), accounted for roughly half of the total recycling. *Unwaxed OCC/Kraft paper* was the third largest component, making up almost 15%. The top ten components, together, represented approximately 89% of the total recycling. The full composition results for this recycling are listed in The first three components in both top ten lists for recycling collected from small and large households are the same: *mixed low-grade paper, newsprint,* and *unwaxed OCC/Kraft paper*. Additionally, six of the other components are common to both lists, though they are ranked differently: *green glass bottles, mixed glass cullet*, *brown glass bottles*, *clear glass bottles*, *phone books*, and *non-conforming plastic*. *Clear container glass* was unique to the small household list and *tin food cans* was unique to large households.
Table 4-36.

Table 4-34: Top Ten Components – Small Households
(January – December 2010)

Component	Est. Percent	Cumulative Percent
Mixed Low-grade Paper	32.0%	32.0%
Newsprint	20.0%	52.0%
Unwaxed OCC/Kraft Paper	14.8%	66.8%
Mixed Glass Cullet	6.3%	73.1%
Green Glass Bottles	5.1%	78.2%
Brown Glass Bottles	3.8%	82.0%
Clear Glass Bottles	3.0%	85.0%
Phone Books	2.2%	87.2%
Clear Container Glass	1.2%	88.4%
Non-Conforming Plastic	1.1%	89.5%
Total	**89.5%**	

4.4.2.2 Large Households

A total of 42 samples were collected and sorted from large household routes. As shown in Table 4-35, *mixed low-grade paper*, the largest component, accounted for 30% of the total. *Newsprint* (18.9%) and *unwaxed OCC/Kraft paper* (16.5%) were the second and third largest components. The top ten components, together, accounted for 87% of recycling for this group. Table 4-37 lists the detailed composition results for recycling from large households.

Table 4-35: Top Ten Components – Large Households
(January – December 2010)

Component	Est. Percent	Cumulative Percent
Mixed Low-grade Paper	30.0%	30.0%
Newsprint	18.9%	48.9%
Unwaxed OCC/Kraft Paper	16.5%	65.4%
Green Glass Bottles	4.9%	70.3%
Mixed Glass Cullet	4.6%	74.9%
Brown Glass Bottles	3.2%	78.0%
Clear Glass Bottles	2.9%	80.9%
Non-Conforming Plastic	2.3%	83.2%
Phone Books	2.0%	85.2%
Tin Food Cans	1.8%	87.0%
Total	**87.0%**	

4.4.2.3 Comparisons between Small and Large Households

The first three components in both top ten lists for recycling collected from small and large households are the same: *mixed low-grade paper, newsprint,* and *unwaxed OCC/Kraft paper*. Additionally, six of the other components are common to both lists, though they are ranked differently: *green glass bottles, mixed glass cullet*, *brown glass bottles*, *clear glass bottles*, *phone books*, and *non-conforming plastic*. *Clear container glass* was unique to the small household list and *tin food cans* was unique to large households.

Table 4-36: Composition by Weight – Small Households
(January – December 2010)

Material	Est. Percent	Low	High
Paper	**69.8%**		
Newsprint	20.0%	18.1%	22.0%
Unwaxed OCC/Kraft Paper	14.8%	13.0%	16.6%
Phone Books	2.2%	1.3%	3.2%
Mixed Low-grade Paper	32.0%	30.5%	33.5%
Polycoat Containers	0.6%	0.5%	0.7%
Shredded Paper	0.0%	0.0%	0.1%
Aseptic Containers	0.1%	0.0%	0.1%
Metal	**2.6%**		
Aluminum Cans	0.7%	0.6%	0.8%
Tin Food Cans	0.2%	0.1%	0.2%
Other Ferrous Metal	1.1%	1.0%	1.2%
Small PET Bottles (24 oz or smaller)	0.6%	0.0%	1.3%
Plastic	**3.9%**		
Small PET Bottles (24 oz or smaller)	0.6%	0.6%	0.7%
Large PET Bottles (greater than 24 oz)	0.8%	0.7%	0.9%
PET Jars, Tubs, and Other Containers	0.4%	0.4%	0.5%
HDPE Bottles	0.8%	0.7%	0.9%
HDPE Jars, Tubs, and Other Containers	0.1%	0.1%	0.2%
Other Plastic Bottles (#3-7)	0.1%	0.1%	0.1%
Other Jars, Tubs, and Containers (#3-7)	0.5%	0.4%	0.6%
Plastic Bags and Packaging	0.4%	0.4%	0.5%
Glass	**19.5%**		
Clear Glass Bottles	3.0%	2.4%	3.6%
Green Glass Bottles	5.1%	4.3%	5.9%
Brown Glass Bottles	3.8%	3.1%	4.5%
Clear Container Glass	1.2%	0.9%	1.4%
Other Glass Containers and Bottles	0.2%	0.1%	0.2%
Mixed Glass Cullet	6.3%	4.9%	7.7%
Contaminants	**4.3%**		
Non-Conforming Paper	0.6%	0.5%	0.8%
Non-Conforming Metal	0.3%	0.2%	0.4%
Aluminum Foil/Containers	1.1%	0.9%	1.3%
Non-Conforming Plastic	0.2%	0.1%	0.2%
Non-Conforming Glass	0.3%	0.2%	1.0%
Textiles and Clothing	0.7%	0.3%	1.0%
Food, Green Waste, and Wood	0.9%	0.6%	1.3%
Total Tons	100.0%		
Sample Count	**47**		

Confidence intervals calculated at the 90% confidence level.

Table 4-37: Composition by Weight – Large Households
(January – December 2010)

Material	Est. Percent	Low	High
Paper	**68.1%**		
Newsprint	18.9%	17.3%	20.5%
Unwaxed OCC/Kraft Paper	16.5%	14.9%	18.1%
Phone Books	2.0%	1.3%	2.7%
Mixed Low-grade Paper	30.0%	28.4%	31.6%
Polycoat Containers	0.6%	0.6%	0.7%
Shredded Paper	0.0%	0.0%	0.1%
Aseptic Containers	0.1%	0.0%	0.1%
Metal	**3.3%**		
Aluminum Cans	0.9%	0.7%	1.0%
Aluminum Foil/Containers	0.1%	0.1%	0.2%
Tin Food Cans	1.8%	1.0%	2.7%
Other Ferrous Metal	0.5%	0.3%	0.7%
Plastic	**5.2%**		
Small PET Bottles (24 oz or smaller)	0.9%	0.8%	1.0%
Large PET Bottles (greater than 24 oz)	1.0%	0.9%	1.1%
PET Jars, Tubs, and Other Containers	0.4%	0.4%	0.5%
HDPE Bottles	1.2%	1.1%	1.4%
HDPE Jars, Tubs, and Other Containers	0.1%	0.1%	0.1%
Other Plastic Bottles (#3-7)	0.1%	0.1%	0.1%
Other Jars, Tubs, and Containers (#3-7)	0.7%	0.6%	0.7%
Plastic Bags and Packaging	0.8%	0.6%	1.0%
Glass	**16.8%**		
Clear Glass Bottles	2.9%	2.5%	3.2%
Green Glass Bottles	4.9%	4.3%	5.6%
Brown Glass Bottles	3.2%	2.6%	3.7%
Clear Container Glass	0.9%	0.7%	1.2%
Other Glass Containers and Bottles	0.4%	0.2%	0.5%
Mixed Glass Cullet	4.6%	3.3%	5.8%
Contaminants	**6.6%**		
Non-Conforming Paper	0.9%	0.7%	1.1%
Non-Conforming Metal	0.5%	0.2%	0.7%
Non-Conforming Plastic	2.3%	1.5%	3.1%
Non-Conforming Glass	0.3%	0.0%	0.2%
Food, Green Waste, and Wood	0.6%	0.2%	1.3%
Textiles and Clothing	0.9%	0.6%	1.3%
Other Non-recyclables	1.1%	0.7%	1.5%
Total Tons	100.0%		
Sample Count	**42**		

Confidence intervals calculated at the 90% confidence level.

Appendix A. RECYCLING COMPONENTS

Recycling samples were sorted by hand into 32 component categories for the 2010 study. Detailed definitions of all component categories for the 2010 study are listed below and are followed by component changes between the 2005 and 2010 studies.[1]

PAPER

1. NEWSPRINT: Printed newsprint. (Advertising "slicks" (glossy paper) were included in this category if found mixed with newspaper; otherwise, ad slicks are included with mixed low grade paper.)

2. OCC/KRAFT, UNWAXED: Unwaxed/uncoated old corrugated container boxes and Kraft paper, and brown paper bags. Clean bags and boxes only; soiled are "non-conforming."

3. PHONE BOOKS: Telephone directories.

4. MIXED LOW GRADE: Mixed recyclable papers, including junk mail, magazines, colored papers, bleached Kraft, boxboard, mailing tubes, and paperback books. May also contain white or lightly colored sulfite/sulfate bond, copy papers, computer printouts, hard-back books, and envelopes. Includes paper packaging made primarily of paper but with a non-paper attachment. Examples include laundry detergent with plastic handle, paper bag with plastic handle, salt containers with plastic or metal spout, and aluminum foil packaging with metal serrated edge.[2]

[1] For the 2005 study, a sample generally consisted of two parts, corresponding to two separate collection compartments within a truck: one for *glass* recyclables, and the other for *all other recyclables* (e.g. mixed paper, aluminum cans, and plastic bottles)[1]. Seattle's recycling is now collected as a single-stream; therefore, for the 2010 study, glass no longer needed to be sampled and analyzed separately.

[2] Seattle Public Utilities elected to refine material categories following the spring sampling events. Several materials were sorted into contaminant categories at the start of the study and sorted separately after the spring sort:

- Mixed paper packaging
- Non-takeout PET disposable cups
- Non-takeout #3-7 disposable cups and single-use and semi-durable food containers
- Bubble wrap and clean product or packaging overwraps (e.g, toilet paper overwrap)

During the analysis, weights for these materials were subtracted from contaminant categories for the early seasons and added to the appropriate recyclable component categories. after the spring sorts:

- Mixed paper packaging weights were added to *mixed low-grade paper*.
- Non-takeout PET disposable cups weights were added to *PET jars, tubs, cups, and other containers*.
- Non-takeout #3-7 disposable cups and single-use and semi-durable food containers weights were added to *other jars, tubs, cups, and other rigid food containers (#3-7)*:
- Bubble wrap and clean product or packaging overwraps (e.g, toilet paper overwrap) weights were added to *plastic bags and packaging*.

The below materials were also sorted into contaminant categories at the start of the study. They were sorted separately after the spring season and reported as new component categories within the contaminant broad material class. Weights from the beginning of the study were subtracted from the category *other non-recyclables*.

- *Non-recyclables: food/green waste/wood*
- *Non-recyclables: textiles and clothing*

5. POLYCOATED CONTAINERS: Bleached polycoated milk, to-go hot and cold beverage cups, take-out containers, ice cream, and frozen food containers. Clean containers only; soiled are “non-conforming.”

6. ASEPTIC CONTAINERS: Juice, soy/rice milk, and soup broth containers. Clean containers only; soiled are “non-conforming.”

7. SHREDDED PAPER: Long shreds (at least 8 ½ inches long and ¼ inch wide) in a clear plastic bag, tied off. Does not include confetti or crosscut shreds.

METAL

8. ALUMINUM CANS: Aluminum beverage cans (UBC) and bi-metal cans made mostly of aluminum.

9. *ALUMINUM FOIL/CONTAINERS*: Aluminum food containers, trays, and foil. Clean material only; soiled is “non-conforming.”

10. TIN FOOD CANS: Tinned steel food containers, including bi-metal cans mostly of steel. Includes attached lids.

11. OTHER FERROUS: Ferrous and alloyed ferrous scrap metals to which a magnet adheres and which are not significantly contaminated with other metals or materials and are smaller than 2 ft. x 2 ft. x 2 ft.

PLASTIC

12. SMALL PET BOTTLES: Polyethylene terephthalate bottles (containers with a narrow neck), such as soda pop and other beverage less than or equal to 24 ounces.

13. LARGE PET BOTTLES: Polyethylene terephthalate bottles (containers with a narrow neck), such as soda pop and other beverage bottles greater than 24 ounces.

14. PET JARS, TUBS, CUPS, AND OTHER CONTAINERS: Polyethylene terephthalate containers bearing a #1 in the triangular recycling symbol. Includes lids 3 inches in diameter or larger. This category also includes non-takeout PET disposable cups.[3]

15. HDPE BOTTLES: High-density polyethylene bottles (containers with a narrow neck), such as milk, juice, and detergent containers.

16. HDPE JARS, TUBS, AND OTHER CONTAINERS: High-density polyethylene items bearing a #2 in the triangular recycling symbol. Includes lids 3 inches in diameter or larger.

17. OTHER PLASTIC BOTTLES (#3-7): Plastic bottles made of types of plastic other than HDPE or PETE. When marked for identification, these items may bear the number “3,” “4,” “5,” “6,”or “7” in the triangular recycling symbol and all lids larger than 3” in diameter. Excludes expanded polystyrene (i.e., Styrofoam).

18. OTHER JARS, TUBS, CUPS, AND RIGID FOOD CONTAINERS (#3-7): Clean plastic items made of types of plastic other than HDPE or PETE. When marked for identification, these items may bear the number “3,” “4,” “5,” “6”, or “7” in the triangular recycling symbol. .

[3] *Ibid.*

Includes lids larger than 3" in diameter, single-use plant pots, deli trays, cold beverage disposable cups, single-use and semi-durable food storage containers (e.g., Tupperware, Glad, and Ziplock), and takeout containers. Excludes prescription containers expanded polystyrene (i.e., Styrofoam).[4]

19. PLASTIC BAGS AND PACKAGING: Clean plastic retail, grocery, garbage, newspaper, drycleaner bags, bubble wrap, clean product or packaging overwraps (e.g, toilet paper overwrap), and plastic shrink-wrap. Excludes all food and freezer bags, bags that are soiled or contain other items (e.g. paper advertisement, cosmetic samples, computer disks), and plastic kitchen wrap. Bags with non-plastic handles (e.g. string) are also excluded.[5]

GLASS

20. CLEAR BOTTLES: Includes clear pop, liquor, wine, juice, beer, and vinegar bottles.

21. GREEN BOTTLES: Includes green pop, liquor, wine, beer, and lemon juice bottles.

22. BROWN BOTTLES: Includes brown pop, beer, liquor, juice, vanilla extract bottles.

23. CLEAR CONTAINER GLASS: All glass containers that are clear-colored and hold materials such as mayonnaise and non-dairy creamer.

24. OTHER GLASS CONTAINERS AND BOTTLES: All glass containers (of colors except clear) holding materials such as facial cream. All bottles of colors other than clear, green or brown. Examples include blue wine and liquor bottles.

25. MIXED CULLET. Glass bottles and containers that are broken into pieces less than one square inch and of multiple colors.

CONTAMINANTS

26. NON-CONFORMING PAPER: Any paper not described in the paper category and not meeting the requirements for Seattle's recycling program, such as tissue, photographs, soiled paper, food-soiled polycoated containers, waxed cardboard, and paper bags with plastic lining (i.e. dog or cat food bags).

27. NON-CONFORMING METAL: Any metal not described in the metals category and not meeting the requirements for Seattle's recycling program, such as products containing a mixture of metals, detached metal can lids, aerosol containers, metal larger than 2 ft. x 2 ft. x 2 ft, and other materials.

28. NON-CONFORMING PLASTIC: Any plastic not described in the plastics category and not meeting the requirements for Seattle's recycling program such as toys, tarps, bubble wrap, bags with hard plastic or rope handles, expanded polystyrene (i.e., Styrofoam), plastic food bags (e.g., produce bags, Ziploc pouches), and plastic lids smaller than 3" in diameter.

29. NON-CONFORMING GLASS: Any glass from glass loads not described in the glass category and not meeting the requirements for Seattle's recycling program, such as window glass, light bulbs, and glassware.

[4] *Ibid.*
[5] *Ibid.*

30. FOOD/GREEN WASTE/CLEAN WOOD: Includes all food, green waste, and other clean wood. [6]

31. TEXTILES AND CLOTHING ACCESSORIES: Includes all organic and synthetic textiles, clothing items, purses, belts, shoes, and other clothing-related items. [7]

32. OTHER NON-RECYCLABLES: Any item that does not meet the requirements for Seattle's recycling program in either compartment, such as organic wastes, construction debris, soil, and hazardous wastes.

The component categories used to characterize Seattle's recycling stream have been refined over the years. Table A-1 tracks these changes. (An "X" signifies that the component remains the same from the previous study period; an outline border reflects how components were split apart or grouped together.)

[6] *Ibid.*
[7] *Ibid.*

Table A-1. Changes to Recycling Component Categories, 1998/99 to 2010

	1998/99	2000/01	2005	2010
PAPER				
Newsprint	X	X	X	X
Corrugated/Kraft, Unwaxed	X	X	X	X
Phone Books	X	X	X	X
Mixed Low Grade	X	X	X	X
Non-conforming Paper	X	Polycoated Containers	X	X
		Aseptic Containers	X	X
		X	X	Shredded Paper
				X
PLASTICS				
PET Bottles	X	Small PET Bottles (24 oz or smaller)	X	X
		Large PET Bottles (greater than 24 oz)	X	X
HDPE Bottles	X	X	X	X
Non-conforming Plastic	X	X	X	*#6 containers added to "Other Plastic Bottles" and "Other Plastic Jars, Tubs…"*
				X
		PET Jars, Tubs, and Other Containers	X	X
		HDPE Jars, Tubs, and Other Containers	X	X
		Other Plastic Bottles (#3-7, excluding #6)	X	Renamed "Other Plastic Bottles (#3-7)"
		Other Plastic Jars, Tubs, and Containers (#3-7, excluding #6)	X	Renamed "Other Jars, Tubs, and Rigid Food Containers (#3-7)"
		Plastic Bags and Packaging	X	X
Glass				
Clear Beverage	X	Clear Glass Bottles	X	X
Green Beverage	X	Green Glass Bottles	X	X
Brown Beverage	X	Brown Glass Bottles	X	X
Container Glass	X	Clear Container Glass	X	X

	1998/99	2000/01	2005	2010
		Other Glass Containers and Bottles	X	X
Mixed Cullet	X	X	X	X
Non-conforming Glass (Glass Compartment)	X	X	X	Renamed "Non-conforming Glass"
METALS				
Aluminum Cans	X	X	X	X
Tin Food Cans	X	X	X	X
Other Ferrous	X	X	X	X
Non-conforming Metal	X	X	X	Aluminum Foil/Containers
				X
GARBAGE				
Garbage	X	**X**		Food/Green Waste/Clean Wood
				Textiles and Clothing Accessories
			Other Non-Recyclables	X
			Recyclable Glass (Commingled Compartment)	*Category no longer needed as glass is not collected separately.*

Appendix B. SAMPLING METHODOLOGY

Overview

The objective of the 2010 Seattle Recycling Composition Study was to provide statistically significant data on the composition of residential recyclables set out by single-family and multifamily households in the City of Seattle. The residential recycling stream was last sampled in 2005. The current study followed the same basic methodology as the previous study.

This appendix outlines the sampling methodology for the current study.

Sampling Populations

This study was designed to determine the composition of curbside recycling for both single-family and multifamily residences within the city. Curbside recycling materials are hauled to a material recovery facility owned by Allied Waste locally referred to as "3rd and Lander". Recyclable materials that are either self-hauled to the city's two transfer stations or hauled from Seattle's commercial sector were excluded from this study.

The recyclables set out by residences in Seattle and collected by the two contracted haulers can be divided into eight subpopulations defined by two generator types and four collection zones. The two generator types are defined as follows:

- ***Single-family:*** Primarily detached single-family, duplex, triplex, and four-plex homes. Recycling is collected from toters.

- ***Multifamily:*** Primarily apartments and condominiums with five or more units. Recycling is primarily collected from dumpsters.[8]

Seattle's residential recyclables are collected in four recycling collection zones, as seen in Figure B-1 below. Samples were apportioned evenly across the four collection zones to ensure comparability of data.

[8] Through the Clear Alleys Program, multifamily recycling from approximately 100 downtown buildings is collected in bags. This material was excluded from the study due to the difficulty of segregating and obtaining representative samples of this material.

Figure B-1: Recycling Collection Zones

Sample Allocation & Schedule

Identify the "Universe"

One of the key steps in developing the sampling plan for the 2010 study was to identify the *universe* of collection routes for recycling setouts in Seattle. The *universe* included every collection route for single and multifamily residences within the City of Seattle. It also included the truck that was expected to service each route, the total number of loads picked up from the route on each collection day, and whether the route was in Zone 1, 2, 3, or 4.

To compile the universe, detailed route information was collected from Seattle Public Utilities (SPU) and CleanScapes, Waste Management, and their subcontractor, West Seattle Recycling.

Determine Number of Samples

To ensure comparability of data between study years, this study was designed to capture a total of 270 samples: 180 single-family and 90 multifamily samples, the same ratio used in the 2005 study. Table outlines the number of samples that were apportioned among the eight subpopulations in this study.

Table B-1. Planned Number of Samples, by Subpopulation
(January – December 2010)

Generator Type	Planned Number of Samples
Single-family	
Zone 1	45
Zone 2	45
Zone 3	45
Zone 4	45
Multifamily	
Zone 1	22-23
Zone 2	22-23
Zone 3	22-23
Zone 4	22-23
Total	**270**

Two additional routes (1 single-family and 1 multifamily) were added to the list of routes scheduled on each sampling day. The additional collection routes provided "contingency samples" which were sorted in the event that one of the vehicles for the regularly planned collection routes failed to arrive on time or were not intercepted in time to get a sample.

Develop Sampling Calendar and Apportion Samples to Days

Since the field crew could sort approximately 15 samples per day, 18 sampling days were required to meet the goal of 270 samples over the course of the study. In order to capture seasonal variations, one or two sampling days was assigned to each month of a 12-month period in 2010.

Sampling dates at each facility were selected using a random process and then adjusted in several instances for the following reasons: to avoid one holiday, accommodate the sorting crew's availability, and improve the distribution across days of the week and weeks of the month. The 2010 residential recycling study occurred concurrently with the waste study and, as a result, each sampling week included two or three days of waste sampling. The sampling calendar was developed using the following steps.

- **Step 1: Selected weeks for sampling events.** Initially, weeks were randomly selected within each month, with the exception of January, when the sorting crew was available only during the last week of the month. Three weeks were then moved to achieve a better distribution across weeks of the month and the December sampling event was moved to avoid the week of Christmas, when residential recycling collection schedules are modified and the sampling crew was not available. Finally, the calendar was revised when the sorting crew's schedule was examined and showed conflicts in February through May. While only one week was available in February, alternate weeks in March, April, and May were randomly selected from the available weeks.

- **Step 2: Selected days within each sampling week.** The six months that would include three instead of two days of waste sampling were randomly selected. Next, either waste or recycling was randomly assigned to the start of each sampling week. In two instances, waste and recycling days were switched to achieve a better distribution

across days of the week for both studies. In six instances, a Tuesday, Wednesday, or Thursday was replaced with a Monday or Friday to avoid oversampling the middle of the week, even though this change required adding non-sampling days in the middle of those weeks.

Table B-2 presents this year's calendar along with planned and actual samples sorted each day. On a typical sampling day, ten single-family loads, including two or three from each zone, and five multifamily loads, including one or two from each zone, were scheduled for sampling. The total daily target of 15 samples was met in all but one instance, although the numbers of single-family and multifamily samples differed slightly from planned.

Table B-2. Sampling Calendar
(January – December 2010)

Date	Number of Planned Samples		Total Planned	Number of Actual Samples		Total Actual	Difference
	SF	MF		SF	MF		
1/25/2010	10	5	**15**	11	4	**15**	**0**
2/8/2010	10	5	**15**	10	5	**15**	**0**
2/9/2010	10	5	**15**	10	5	**15**	**0**
3/23/2010	10	5	**15**	10	5	**15**	**0**
4/27/2010	10	5	**15**	9	6	**15**	**0**
4/28/2010	10	5	**15**	10	5	**15**	**0**
5/20/2010	10	5	**15**	10	5	**15**	**0**
6/24/2010	10	5	**15**	10	5	**15**	**0**
6/25/2010	10	5	**15**	10	5	**15**	**0**
7/9/2010	10	5	**15**	10	5	**15**	**0**
8/4/2010	10	5	**15**	10	5	**15**	**0**
8/5/2010	10	5	**15**	10	5	**15**	**0**
9/9/2010	10	5	**15**	11	4	**15**	**0**
10/19/2010	10	5	**15**	10	5	**15**	**0**
10/20/2010	10	5	**15**	9	6	**15**	**0**
11/12/2010	10	5	**15**	10	5	**15**	**0**
12/13/2010	10	5	**15**	10	5	**15**	**0**
12/14/2010	10	5	**15**	9	4	**13**	**-2**
12/22/2010[9]	0	0	**0**	1	1	**2**	**2**
Total	**180**	**90**	**270**	**180**	**90**	**270**	0

Table B-3 displays the resulting allocation of sampling days for each subpopulation by day and weeks of the month.

[9] December 22, 2010 was added as a partial make-up day to account for prior shortfalls.

Table B-3. Sampling Day Distribution, by Generator Type
(January – December 2010)

Week of Month	Monday	Tuesday	Wednesday	Thursday	Friday	Total
1			1	1	1	**3**
2	2	2		1	1	**6**
3		1	2	1		**4**
4	1	2	1	1	1	**6**
Total	**3**	**5**	**4**	**4**	**3**	**19**

Select Loads for Sorting

On each day, the number of single-family loads from each service area arriving at Third & Lander was greater than the quotas to be sampled. Therefore, it was necessary to select which specific loads were to be sampled on each sampling day. In order to select which loads were to be sampled, a random number was assigned to every load that was expected to arrive at the Third & Lander facility. These random numbers were sorted, and the loads with the lowest random numbers were selected in sequence until the quota was met for all subpopulations. For subsequent sampling days, a new random number was assigned to each load, and the process was repeated.

This study was designed to sample "pure" loads of single-family and multifamily recycling only. When mixed loads were selected for sampling, drivers were instructed by the contracted haulers to collect multifamily recycling separately from commercial recycling to deliver a pure multifamily load for sampling.[10]

Coordinate Sampling

Haulers were sent reminders the week prior to each sampling event. Several days prior to each selected sampling day, the routes believed to be scheduled for the sampling day were sent to each hauler. The hauler verified that route numbers were correct; added truck numbers, driver names, and vehicle arrival times; and returned the list. From the lists of routes, the target numbers of routes were randomly selected to correspond to the number of samples required from each subpopulation on each sampling day. The list of vehicles selected for sampling was forwarded to the hauler and verified verbally. In addition, the haulers were reminded to notify drivers of selected vehicles that they are to participate in the sampling activities.

Field Procedures

Extract Samples

As each selected route truck entered the facility, a sampling crew member verified that the vehicle was carrying recycling from the expected route and zone. The driver was then instructed to tip (unload material) as usual. Once the sample vehicle vacated the tipping area, a front-

[10] Waste Management's subcontractor West Seattle Recycling only collects from multifamily residences. Therefore, only CleanScapes drivers needed to make an effort to deliver pure multifamily recycling loads.

loader operator scooped a sample of approximately 250 pounds and placed it into a steel container. The container was then carried via forklift to the sorting location where it was transferred to a tarpaulin.

Sorting Procedures

Each sample was placed on a clean tarp and sorted by hand into the component categories as defined in Appendix A. Components were placed in plastic laundry baskets to be weighed and recorded. The field supervisor monitored the homogeneity of the component baskets as material accumulated, rejecting items that may be improperly classified. Open laundry baskets allowed the field supervisor to see the material at all times.

Comparisons to Previous Studies

The 2010 study was conducted using the same methodology as the 2005 study, with the following exceptions.

- Sampling events included both waste and recycling sample days. In previous years, the recycling study and the waste study were carried out at different times.
- Seattle's recycling is now collected as a single-stream; therefore, glass no longer needed to be sampled and analyzed separately.

Appendix C. COMMENTS ON MONTHLY SAMPLING EVENTS

This section presents monthly sampling progress reports that were sent to the SPU project manager throughout the year. Each summary presents dates of sampling, the total number of samples sorted compared to the goal for that sampling event, and whether any samples were missed or replaced by a different zone or sector. Each section also includes a table detailing the number of samples that were actually sorted versus the number planned, by sector and zone.[11]

January

On January 25th, 15 samples were sorted: 11 from single-family vehicles and 4 from multifamily vehicles. As shown below, while the overall sampling target of 15 samples was reached, one additional single-family and one fewer multifamily samples were sorted than planned. The discrepancy came about as a result of a multifamily load that entered the facility and was properly identified as a sample, but was accidentally "buried" by another non-selected recycling load. The missed multifamily sample was replaced by a single-family sample to reach the overall sampling goal. The breakdown of samples by sector and zone is listed below.

Zone	**Planned**		**Actual**	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	2	1	3	1
Two	3	1	3	1
Three	2	2	2	1
Four	3	1	3	1
Total	**10**	**5**	**11**	**4**

February

Thirty samples, 20 single-family and 10 multifamily, were collected and sorted on February 8th and 9th, as shown in the table below. All samples were collected and sorted as planned in February. The breakdown of samples by sector and zone is listed below.

Zone	**Planned**		**Actual**	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	5	3	5	3
Two	5	3	5	3
Three	5	2	5	2
Four	5	2	5	2
Total	**20**	**10**	**20**	**10**

March

15 vehicles were sampled on March 23rd: 10 single-family and 5 multifamily vehicles. As shown, we collected and sorted an extra single-family sample when an expected "second-trip" multifamily sample from Zone 3 did not materialize. The breakdown of samples by sector and zone is below.

[11] For several months, the number of planned samples differs from planned samples in the study design, as listed in Table B-1 Sampling goals were revised during the year to make up for variances from prior months' goals.

Zone	Planned		Actual	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	2	1	2	1
Two	3	1	3	1
Three	3	2	4	1
Four	1	2	1	2
Total	**9**	**6**	**10**	**5**

April

Thirty vehicles were sampled on April 27th and 28th: 19 single-family and 11 multifamily vehicles. As shown, all planned samples were collected and sorted. At this point in the study, we were currently one sample over on Zone 3 single-family samples and one sample under on Zone 4 single-family samples. The breakdown of samples by sector and zone is below.

Zone	Planned		Actual	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	5	3	5	3
Two	4	2	4	2
Three	5	4	5	4
Four	5	2	5	2
Total	19	11	19	11

May

Fifteen samples, 10 single-family and 5 multifamily, were collected and sorted on May 20th, as shown in the table below. All planned samples were collected and sorted. The breakdown of samples by sector and zone is below.

Zone	Planned		Actual	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	3	1	3	1
Two	2	2	2	2
Three	2	1	2	1
Four	3	1	3	1
Total	**10**	**5**	**10**	**5**

June

Thirty samples were captured from 20 single-family and 10 multifamily vehicles on June 24th and 25th. As shown, all planned samples were collected and sorted. The summary of the June sampling event is presented by sector and zone in the following table.

Zone	Planned		Actual	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	5	3	5	3
Two	5	2	5	2
Three	5	3	5	3
Four	5	2	5	2
Total	**20**	**10**	**20**	**10**

July

Fifteen vehicles were sampled on July 9th: 10 single-family and 5 multifamily. As shown, all planned samples were collected and sorted. The breakdown of samples by sector and zone is

below.

Zone	Planned		Actual	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	2	1	2	1
Two	3	1	3	1
Three	2	2	2	2
Four	3	1	3	1
Total	**10**	**5**	**10**	**5**

August

Thirty vehicles were sampled on August 4th and 5th: 20 single-family and 10 multifamily. As planned, ten single-family samples and five multifamily samples were captured and sorted. Due to two last second vehicle changes at CleanScapes, we selected two vehicles not on our list—one from the single-family and one from the multifamily sector—which resulted in having to exchange a Zone 2 sample for a Zone 3 sample, in each case. The breakdown of samples by sector and zone is below.

Zone	Planned		Actual	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	5	3	5	3
Two	5	2	4	1
Three	5	2	6	3
Four	5	3	5	3
Total	**20**	**10**	**20**	**10**

September

15 samples, 11 single-family and four multifamily, were collected and sorted on September 9th. As planned, 15 samples were collected and sorted, though they consisted of 11 single-family samples and four multifamily samples, instead of ten single-family and five multifamily samples. One additional single-family was selected in place of one multifamily sample as the truck carrying the last multifamily sample broke down late in the day. The breakdown of samples by sector and zone is below.

Zone	Planned		Actual	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	2	0	3	0
Two	3	3	3	2
Three	2	1	2	1
Four	3	1	3	1
Total	**10**	**5**	**11**	**4**

October

30 samples, 19 single-family and 11 multifamily, were collected and sorted on October 19th and 20th. On the 19th, the crew sorted one extra single-family sample after a planned multifamily sample was rescheduled for the 20th. On the 20th, we collected the rescheduled multifamily sample and sorted one fewer single-family sample. The breakdown of samples by sector and zone is below.

Zone	**Planned**		**Actual**	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	5	3	5	3
Two	5	4	5	4
Three	5	1	5	1
Four	4	3	4	3
Total	**19**	**11**	**19**	**11**

November

15 samples, 10 single-family and five multifamily, were collected and sorted on November 12th. As shown, all planned samples were collected and sorted. The breakdown of samples by sector and zone is below.

Zone	**Planned**		**Actual**	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	2	1	2	1
Two	3	2	3	2
Three	2	1	2	1
Four	3	1	3	1
Total	**10**	**5**	**10**	**5**

December

Thirty samples, 20 single-family and ten multifamily, were collected and sorted on December 13th, 14th, and 22nd. December 22nd was scheduled in order to make-up two missed samples from December 14. All samples were collected and sorted as planned. The breakdown of samples by sector and zone is below.

Zone	**Planned**		**Actual**	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	5	3	5	3
Two	5	1	5	1
Three	5	3	5	3
Four	5	3	5	3
Total	**20**	**10**	**20**	**10**

The below table compares the number of samples sorted and number planned by sector and zone for the entire study. Sampling targets by zone and sector were achieved.

Zone	**Planned**		**Actual**	
	Single-family	*Multifamily*	*Single-family*	*Multifamily*
One	45	22-23	45	23
Two	45	22-23	45	22
Three	45	22-23	45	23
Four	45	22-23	45	22
Total	**180**	**90**	**180**	**90**

Appendix D. RECYCLING COMPOSITION CALCULATIONS

Composition Calculations

The composition estimates represent the **ratio of the components' weight to the total sample weight** for each noted group. They are derived by summing each component's weight across all of the selected records and dividing by the sum of the total sample weight, 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 are 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).

Weighted Averages

Recycling composition estimates were calculated by using a weighted average procedure. For example, to develop composition estimates for Seattle's single-family residential recycling, sample data from all four zones were combined, with slightly more importance given to the single-family Zone 4 samples (contributing approximately 31% of total single-family recycling tons).

Seattle Public Utilities provided the estimate of tonnage disposed by each of the eight subpopulations. The composition estimates were applied to the relevant tonnages to estimate the amount of recycling for each component category for each residence type and collection zone.

The **weighted average for a composition estimate** was performed as follows:

$$E_j = (p_1 * r_{j1}) + (p_2 * r_{j2}) + (p_3 * r_{j3}) + \ldots$$

where:

p = the proportion of tonnage contributed by the noted group

r = ratio of component weight to total sample weight in the noted group

for j 1 to m
where m = number of components

The **variance of the weighted average** was calculated:

$$VarE_j = (p_1^2 * \hat{V}_{rj1}) + (p_2^2 * \hat{V}_{rj2}) + (p_3^2 * \hat{V}_{rj3}) + \ldots$$

The weighting percentages that were used to perform the composition calculations for the 2010 study are listed in Table D-1 below.

Table D-1. Weighting Percentages: Overall
(January – December 2010)

Generator	Zone	Season	Tons Disposed	Percent of Total
Single-family	Zone 1	Winter	4,041	4.93%
	Zone 1	Spring	3,702	4.52%
	Zone 1	Summer	3,872	4.72%
	Zone 1	Fall	3,770	4.60%
	Zone 2	Winter	3,181	3.88%
	Zone 2	Spring	2,941	3.59%
	Zone 2	Summer	3,065	3.74%
	Zone 2	Fall	3,026	3.69%
	Zone 3	Winter	3,732	4.55%
	Zone 3	Spring	3,446	4.21%
	Zone 3	Summer	3,601	4.39%
	Zone 3	Fall	3,527	4.30%
	Zone 4	Winter	4,974	6.07%
	Zone 4	Spring	4,605	5.62%
	Zone 4	Summer	4,839	5.90%
	Zone 4	Fall	4,641	5.66%
Multifamily	Zone 1	Winter	1,204	1.47%
	Zone 1	Spring	1,147	1.40%
	Zone 1	Summer	1,222	1.49%
	Zone 1	Fall	1,237	1.51%
	Zone 2	Winter	734	0.90%
	Zone 2	Spring	677	0.83%
	Zone 2	Summer	700	0.85%
	Zone 2	Fall	737	0.90%
	Zone 3	Winter	2,516	3.07%
	Zone 3	Spring	2,429	2.96%
	Zone 3	Summer	2,513	3.07%
	Zone 3	Fall	2,542	3.10%
	Zone 4	Winter	835	1.02%
	Zone 4	Spring	824	1.01%
	Zone 4	Summer	817	1.00%
	Zone 4	Fall	865	1.06%
			81,961	**100.00%**

Comparison Calculations

Identifying statistically significant differences requires a two-step calculation. First, assuming that the two groups to be compared have the same variance, a **pooled sample variance** was calculated:

$$S_{pool}{}^2 = \frac{\left[(n1-1)\cdot\left(n1\cdot\hat{V}_{r_j 1}\right)\right]+\left[(n2-1)\cdot\left(n2\cdot\hat{V}_{r_j 2}\right)\right]}{n1+n2-2}$$

Next, the **t-statistic** was constructed:

$$t = \frac{(r1-r2)}{\sqrt{\frac{S_{pool}{}^2}{n1}+\frac{S_{pool}{}^2}{n2}}}$$

The **p-value** of the t-statistic was calculated based on (n1+n2 -2) degrees of freedom.

Demographic Calculations

Recycling compositions for different demographic groups were calculated by considering the median household income and mean household size of each sampled recycling route. Single-family recycling samples were grouped according to whether they were collected from recycling routes with high-income, low-income, large household size, or small household size. Once the recycling samples were identified as belonging to one of these four demographic groups, recycling composition calculations were performed as described above under "Composition Calculations."

Calculations of each recycling route's **mean household size** were performed as follows:

Population and number of households were obtained for each Census Block in Seattle via the 2010 Census Redistricting Data Summary Files.[12] Geographic locations for Census Blocks in Seattle were obtained in GIS shapefile format from the Census website.

1. Census Blocks were identified by the Seattle single-family recycling route (serviced by Cleanscapes and Waste Management) that covered that Block Group area. These companies provided GIS shapefiles of their recent recycling routes. The total population and total households for each recycling route were then calculated by summing the population and number of households for all Census Blocks contained within each route.
2. Mean household size was calculated by dividing the total population of each route by the total number of households.

Calculations of each recycling route's **median income** were performed as follows, using information from the 2005-2009 American Community Survey 5-year estimates Summary File.[13] Each Census Block Group was identified by the recycling route that covers that Block Group. Figure D-1 presents an example where Block Groups A, B, and C are identified by one designated recycling route, Recycling Route 321.

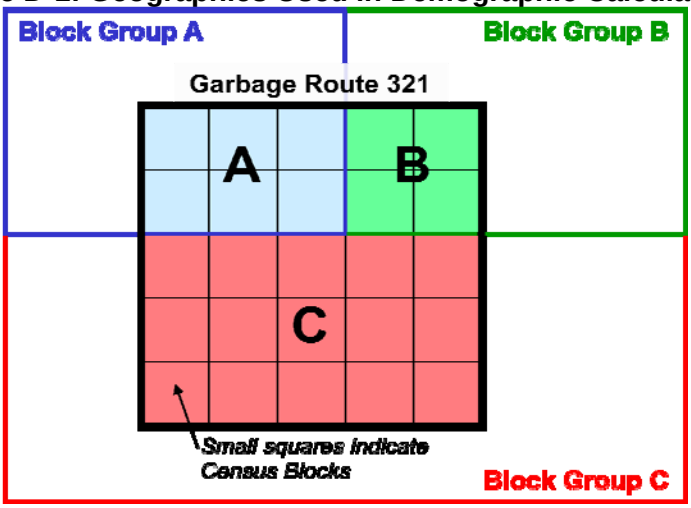
[12] http://www.census.gov/rdo/data/2010_census_redistricting_data_pl_94-171_summary_files.html
[13] http://www.census.gov/acs/www/data_documentation/summary_file/

The number of households in each Census Block Group was used to calculate a weighted median income for the route. For instance, because Block Group C contains more households than Block Group A and B, the median income of Block Group C would be given more importance than the other two Block Groups in calculating the median income for the designated recycling route, Recycling Route 321. The weighting was carried out as follows, where "Households" refers to the number of households in each Block Group, and "Income" refers to the median income of each Block Group within the designated route.

$$\textbf{Estimated Median Income of Recycling Route 321} = \frac{\textbf{A}\text{ Households} * \textbf{A}\text{ Income} + \textbf{B}\text{ Households} * \textbf{B}\text{ Income} + \textbf{C}\text{ Households} * \textbf{C}\text{ Income}}{\textbf{A}\text{ Households} + \textbf{B}\text{ Households} + \textbf{C}\text{ Households}}$$

1. The result of this weighting is an approximation of the median income for the designated route.

Figure D-1: Geographies Used in Demographic Calculations



Sampled routes were then divided into quartiles based on the median income and mean household size of each recycling route. Recycling samples from the first (0 - 25%) quartile of samples based on median income were used to calculate "low income" recycling composition and the first quartile of samples based on household size were used to calculate "small household" recycling composition. Similarly, samples from the top quartile (75% - 100%) were used to calculate separate recycling compositions for "high income" and "large households."

[This page was intentionally left blank]

Appendix E. YEAR-TO-YEAR COMPARISON CALCULATIONS

This section outlines the technical issues involved with the year-to-year comparison calculations. The calculation formulae are outlined in Appendix D.

Background

In an ongoing effort to monitor the types and amounts of residential recycling, Seattle has performed several residential recycling composition studies. Differences are often apparent between study periods. In this appendix, results from the year 2010 study are compared to 2000/01 and 2005 findings.[14] Composition variations in the percentage of each broad material category were measured for the two study years.

In order to control for population changes and other factors that may influence the total amount of material recycled from year to year, the tests described in this appendix measure recycling proportions, and not actual tonnage. For example, if newspaper accounts for 5% of a particular substream's recycling each year, and that substream recycled a total of 1,000 tons of material in one year and 2,000 tons of material in the next, while the amount of newspaper increased from 50 to 100 tons, the percentage remained the same. Therefore, the tests would indicate that there had been no change.

The purpose of conducting these comparison tests was to identify statistically significant changes in the percentage of broad material categories of recycling in each substream over time. One specific example is as follows:

Hypothesis: "There is no statistically significant difference, between the 2000/01 and 2010 study periods, in the percentage of paper recycled."

Statistics are then employed to look for evidence disproving the hypothesis. A "significant" result means that there is enough evidence to disprove the hypothesis, and it can be concluded that there is a true difference across years. "Insignificant" results indicate that either a) there is no true difference, or b) even though there may be a difference, there is not enough evidence to prove it.

The purpose of these tests was to identify changes across years. However, the study did not attempt to investigate *why* or *how* these changes occurred. The changes may be due to a variety of factors. For example, a decrease in paper recycled could be due to any combination of the following:

- Consumer preferences might have shifted so that electronic media might have captured some of the market previously held by paper.
- Technology might have changed so that manufacturers might use thinner paper than in the past, which would decrease the weight of paper, even if the same number of sheets of paper was recycled.
- Fewer residents may participate in paper recycling programs.

[14] The 2000/01 study was also conducted by Cascadia Consulting Group and followed the same basic methodology as the 2005 study. Conversely, the methodologies used in the 1993 and 1998/99 resulted in findings that are not comparable to the more recent studies.

- An increase in the recycling of another, non-paper material which would cause the percentage of recycling that is paper to decrease, even if there was no change in the tons of paper that were recycled.

Statistical Considerations

The analyses are based on the component percentages, by weight, for each selected substream. As described in Appendix D, these percentages are calculated by dividing the sum of the selected component weights by the sum of the corresponding sample weights. T-tests (modified for ratio estimation) were used to examine the year-to-year variation.

NORMALITY

The distribution of some of the broad material categories (particularly the hazardous materials) is skewed and may not follow a normal distribution. Although t-tests assume a normal distribution, they are very robust to departures from this assumption, particularly with large sample sizes. In addition, the broad material categories are sums of several individual recycling components, which improve our ability to meet the assumptions of normality.

DEPENDENCE

There may be dependence between recycling components (if a person recycles component A, they always recycle component B at the same time).

There is certainly a degree of dependence between the calculated percentages. (Since the percentages sum to 100, if the percentage of component A increases, the percentage of some other component must decrease). This type of dependence is somewhat controlled by choosing only a portion of the recycling categories for the analyses.

MULTIPLE T-TESTS

In all statistical tests, there is a chance of incorrectly concluding that a result is significant. The year-to-year comparison required conducting several t-tests, (one for each recycling broad material class) **each** of which carries that risk. However, we were willing to accept only a 2% chance for each individual test of making an incorrect conclusion. Therefore, each test was adjusted by setting the significance threshold to $\frac{0.10}{w}$ (*w* = the number of t-tests).

The adjustment can be explained as follows:

For each test, we set a $1-\frac{0.10}{w}$ chance of not making a mistake, which results in a $\left(1-\frac{0.10}{w}\right)^{w}$ chance of not making a mistake during all *w* tests.

Since one minus the chance of not making a mistake equals the chance of making a mistake, by making this adjustment, we have set the overall risk of making a wrong conclusion during any one of the tests at $\left(1-\left(1-\frac{0.10}{w}\right)^{w}\right)=0.10$.

The chance of a “false positive” for the year-to-year comparisons made in this study is restricted to 10% overall, or 2.00% for each test (10% divided by the five tests equals 2.00%).

For more detail regarding this issue, please refer to Section 11.2 “The Multiplicity Problem and the Bonferroni Inequality” of *An Introduction to Contemporary Statistics* by L.H. Koopmans (Duxbury Press, 1981).

Interpreting the Calculation Results

This section interprets the statistical results for year-to-year comparisons. Tables E-1 and E-2 presents results of the comparisons; an asterisk indicates the statistically significant differences.

For the purposes of this study, only those calculation results with a p-value of less than 2.00% are considered to be statistically significant. The t-statistic is calculated from the data; according to statistical theory, the larger the absolute value of the t-statistic, the less likely that the two populations have the same mean. The p-value describes the probability of observing the calculated t-statistic if there were no true difference between the population means.

For example, in Table E-1: Changes in Residential Recycling Composition: 2000/01 to 2010 the proportion of *plastic* increased from 1.4% to 2.6 % across the study periods. The t-statistic is relatively large (11.66) and the probability (p-value) of observing that t-statistic if there had been no true difference between years is approximately 0.0%. This value is less than the study’s pre-determined threshold for statistically significant results (alpha-level of 2.00%); thus the increase in *plastic* is considered to be a true difference.

CHANGES IN RESIDENTIAL RECYCLING

In Table E-1: Changes in Residential Recycling Composition: 2000/01 to 2010 , all broad material categories, **paper**, **metal**, **plastic**, **glass**, and **contaminants** showed significant changes across study periods. **Paper** showed a decreasing trend while the other categories showed increasing trends.

Table E-1: Changes in Residential Recycling Composition: 2000/01 to 2010

	Mean Ratio (Material Wt/Total Wt)		t-Statistic	p-Value (Cut-off for statistically valid difference = 0.02)
	2000	*2010*		
Paper	**78.2%**	**68.4%**	**6.5725**	**0.0000 ***
Metal	**1.8%**	**2.4%**	**3.7833**	**0.0002 ***
Plastic	**1.4%**	**2.6%**	**11.6572**	**0.0000 ***
Glass	**13.3%**	**17.9%**	**3.0356**	**0.0025 ***
Contaminants	**5.2%**	**8.7%**	**7.8937**	**0.0000 ***
Number of Samples	*549*	*270*		

Note: An asterisk indicates statistically significant differences.

As displayed in **Error! Reference source not found.**, all broad material categories showed significant changes since the 2005 study period. **Paper** showed a decreasing trend over the last 5 years while the other broad material categories showed increasing trends.

Table E-2. Changes in Residential Recycling Composition: 2005 to 2010

	Mean Ratio (Material Wt/Total Wt)		t-Statistic	p-Value (Cut-off for statistically valid difference = 0.02)
	2005	*2010*		
Paper	**78.3%**	**68.4%**	**6.8155**	**0.0000 ***
Metal	**1.8%**	**2.4%**	**2.9654**	**0.0032 ***
Plastic	**1.7%**	**2.6%**	**9.5010**	**0.0000 ***
Glass	**12.7%**	**17.9%**	**3.6385**	**0.0003 ***
Contaminants	**5.6%**	**8.7%**	**5.8603**	**0.0000 ***
Number of Samples	*515*	*270*		

Note: An asterisk indicates statistically significant differences.

Appendix F. FIELD FORM

The field forms are included in the following order:

- Vehicle selection sheet
- Sample Placard
- Tally sheet

Vehicle Selection Sheet

Sampling Date: **Monday, January 25, 2010**

Seattle Residential RECYCLING Composition Study

Facility: **3rd and Lander**

Sample ID	SF/MF	Zone	Hauler	Truck No.	Driver	Route	Load	ETA	# of Trips
	MF	3	CS	3056	Charlie D.	420			
	MF	3	CS	3014	Tim W.	421			
	MF	2	CS	3013	Joe J.	424			
	SF	2	CS	3007	Alex M.	322 A			
	SF	2	CS	3008	Leif M.	323 A			
	SF	2	CS	3005	Joe M.	324 A			
	SF	3	CS	3009	Jeremy A.	341 A			
	SF	3	CS	3011	Zeria M.	343 A			
	SF	1	WM	152551	Erik L.	1806			
	SF	4	WM	152555	Jacob W.	1822			
	SF	4	WM	152561	Marcus M.	1828			
	SF	4	WM	362976	Justin A.	1896			
	SF	1	WM	362978	Paul C.	1898			
	MF	1	WM-West S.	52	Larry C.	1852			
	MF	4	WM-West S.	54	Troy D.	1854			

Today's Sampling Plan 10 SF, 5 MF

Facility: 3rd & Lander

Zone:-

Sample ID:

SF-1

Hauler:
WM or
CS

Route:

Truck #:

Date: 9/9/2010

2010 City of Seattle Recycling Composition Study

Paper	Weight A	Weight B	Weight C	Weight D
Newsprint				
Corrugated/Kraft, Unwaxed				
Mixed Low Grade				
Polycoat Containers				
Aseptic Containers				
Phone Books				
Shredded Paper				
Non-conforming Paper				
Plastic				
Small PET Bottles (24 oz or smaller)				
Large PET Bottles (greater than 24 oz)				
PET Plastic Jars, Tubs and Other Containers				
HDPE Bottles				
HDPE Plastic Jars, Tubs, and Other Containers				
Other Plastic Bottles (#3-7)				
Other Jars, Tubs, and Rigid Food Containers (#3-7)				
Plastic Bags and Packaging				
Non-conforming Plastic				
Metal				
Aluminum Cans				
Aluminum Foil/Containers				
Tin Food Cans				
Other Ferrous				
Non-conforming Metal				
Glass				
Clear Bottles				
Green Bottles				
Brown Bottles				
Clear Container Glass				
Other Glass Containers and Bottles				
Mixed Cullet				
Non-conforming Glass				
Garbage				
Garbage				
Food/Green Waste/Clean Wood				
Textiles and Clothing Accessories				

Sample ID:

Sorting Date:

Generator Type:

Single-family

Multi-family

Hauler:

Waste Mgt. (incl West Seattle)

CleanScapes

Truck #:

Route #:

Load #:

Zone:

If found, please call Cascadia Consulting Group at 206/343-9759. Reward offered.