Seattle Public Utilities

2007
Construction & Demolition Waste Composition Study
FINAL Report

prepared by
Cascadia Consulting Group, Inc.

in cooperation with
Seattle Public Utilities Staff

July 2008

Table of Contents

1 OVERVIEW 1

1.1 Introduction and Background 1

1.2 Seattle's Construction and Demolition Waste Stream 2

1.3 Study Methodology 3

2 OVERALL C&D COMPOSITION 5

3 TRENDS IN C&D FOR DISPOSAL COMPOSITION: 1994/95 TO 2007 4

3.1 Changes in the Composition of C&D Waste Disposed 1994/95 to 2007 4

4 DETAILED COMPOSITION RESULTS 6

4.1 Waste Hauled to Transfer Stations 6

4.1.1 By Building Type 8

4.1.2 By Activity Type 18

4.1.3 By Hauler Type 28

4.1.4 By Vehicle Type 36

4.2 Intermodal Containers Hauled to Railheads 44

4.3 C&D Waste by Season 46

4.3.1 Spring 47

4.3.2 Summer 47

4.3.3 Fall 48

4.3.4 Winter 48

4.3.5 Comparisons among Seasons 49

5 COMPOSITION RESULTS FOR PROCESSING RESIDUALS 54

6 SEATTLE CONSTRUCTION & DEMOLITION PERMIT DATA 56

Appendix A: Waste Component Categories
Appendix B: Sampling Methodology
Appendix C: Comments on Quarterly Sampling Events
Appendix D: Waste Composition Calculations
Appendix E: Comparison Calculations
Appendix F: Analytical Database Description
Appendix G: Field Forms

Table of Tables

Table 2-1: Top Ten Components – Overall C&D (January – December 2007) 2
Table 2-2: Composition by Weight – Overall C&D (January – December 2007) 3
Table 3-1: Changes in C&D Waste – 1994/95 and 2007 Study Periods 5
Table 4-1: Overview of Samples (January – December 2007) 7
Table 4-2: Top Ten Components – Residential Buildings (January – December 2007) 9
Table 4-3: Top Ten Components – Non-residential Buildings (January – December 2007) 10
Table 4-4: Top Ten Components – Mixed Loads (January – December 2007) 11
Table 4-5: Top Ten Components - Other Structures (January – December 2007) 11
Table 4-6: Top Ten Components – Unidentified Structures (January – December 2007) 12
Table 4-7: Composition by Weight – Residential Buildings (January – December 2007) 13
Table 4-8: Composition by Weight – Non-residential Buildings (January – December 2007) 14
Table 4-9: Composition by Weight - Mixed Loads (January – December 2007) 15
Table 4-10: Composition by Weight - Other Structures (January – December 2007) 16
Table 4-11: Composition by Weight - Unidentified Structures (January – December 2007) 17
Table 4-12: Top Ten Components – New Construction (January – December 2007) 19
Table 4-13: Top Ten Components – Remodeling (January – December 2007) 20
Table 4-14: Top Ten Components – Demolition (January – December 2007) 20
Table 4-15: Top Ten Components – Roofing (January – December 2007) 21
Table 4-16: Top Ten Components – Mixed/Other C&D (January – December 2007) 21
Table 4-17: Composition by Weight – New Construction (January – December 2007) 23
Table 4-18: Composition by Weight – Remodeling (January – December 2007) 24
Table 4-19: Composition by Weight – Demolition (January – December 2007) 25
Table 4-20: Composition by Weight – Roofing (January – December 2007) 26
Table 4-21: Composition by Weight – Mixed/Other C&D (January – December 2007) 27
Table 4-22: Top Ten Components – Contracted Haulers (January – December 2007) 29
Table 4-23: Top Ten Components – C&D Haulers (January – December 2007) 29
Table 4-24: Top Ten Components – Business Self-haulers (January – December 2007) 30
Table 4-25: Top Ten Components – Homeowner Self-haulers (January – December 2007) 31
Table 4-26: Composition by Weight – Contracted Haulers (January – December 2007) 32
Table 4-27: Composition by Weight – C&D Haulers (January – December 2007) 33
Table 4-28: Composition by Weight – Business Self-haulers (January – December 2007) 34
Table 4-29: Composition by Weight – Homeowner Self-haulers (January – December 2007) 35
Table 4-30: Top Ten Components – Drop Boxes (January – December 2007) 37
Table 4-31: Top Ten Components – End Dumps (January – December 2007) 37
Table 4-32: Top Ten Components – Other Large Vehicles (January – December 2007) 38
Table 4-33: Top Ten Components – Pick-up / Passenger Vehicles (January – December 2007) 38
Table 4-34: Composition by Weight – Drop Boxes (January – December 2007) 40
Table 4-35: Composition by Weight – End Dumps (January – December 2007) 41
Table 4-36: Composition by Weight – Other Large Vehicles (January – December 2007) 42
Table 4-37: Composition by Weight – Pick-up / Passenger Vehicles (January – December 2007) 43
Table 4-38: Top Ten Components – Intermodal Containers (January – December 2007) 44
Table 4-39: Composition by Weight – Intermodal Containers (January – December 2007) 45
Table 4-40: Top Ten Components – Spring (March, April, and May 2007) 47
Table 4-41: Top Ten Components – Summer (June, July, and August 2007) 47
Table 4-42: Top Ten Components – Fall (September, October, and November 2007) 48
Table 4-43: Top Ten Components – Winter (January, February, and December 2007) 48
Table 4-44: Composition by Weight – Spring (March, April, and May 2007) 50

Table 4-45: Composition by Weight – Summer (June, July, and August 2007).....51
Table 4-46: Composition by Weight – Fall (September, October, and November 2007).....52
Table 4-47: Composition by Weight – Winter (January, February, and December 2007) 53
Table 5-1: Top Ten Components – Residuals (January – December 2007).....54
Table 5-2: Composition by Weight – Residuals (January – December 2007) 55

Table of Figures

Figure 1-1: Flow of C&D Waste Sampled in 2007 Study 2
Figure 2-1: Composition Summary – Overall C&D (January – December 2007).....1
Figure 4-1: Composition Summary, by Building Type (January – December 2007).....8
Figure 4-2: Composition Summary, by Activity Type (January – December 2007) 18
Figure 4-3: Composition Summary, by Hauler Type (January – December 2007) 28
Figure 4-4: Composition Summary, by Vehicle Type (January – December 2007).....36
Figure 4-5: Composition Summary, Intermodal Containers (January – December 2007) 44
Figure 4-6 : Composition Summary, by Season (January – December 2007).....46
Figure 5-1: Composition Summary, Residuals (January – December 2007).....54

1 Overview

1.1 Introduction and Background

In 2007, Seattle contractors disposed of approximately 200,000 tons of construction and demolition waste (C&D) at three private transfer stations facilities – Allied's Third and Lander and Black River facilities and Waste Management's Eastmont transfer station – and through the direct hauling of intermodal containers to a railhead. This amounts to more than the total municipal solid waste (MSW) disposed by all of the City's residents, and nearly equals the amount of MSW that is disposed by the City's businesses, institutions, and public sector buildings.[1] To plan and design targeted C&D waste prevention and recycling programs for this significant waste stream, SPU requires detailed information on the sources and composition of these waste streams. In response to these information needs, the City commissioned this study of the C&D waste stream in 2007 to accomplish the following objectives:

- To provide statistically significant data on the composition of waste generated via construction and demolition (C&D) activities within the City of Seattle,
- To identify materials in the disposed waste C&D stream that are potentially recyclable,
- To understand seasonal and substream differences so that targeted waste diversion programs can be designed, and
- To provide a comparison to the previous C&D study and a benchmark for continued long-term measurement of the C&D waste stream.[2]

Seattle's previous comprehensive C&D Waste Stream Composition Study was conducted in 1994/95.[3] While the results of the 2007 study can be compared with the 1994/95 study, the methodology for the 2007 study was substantially different than that used in the 1994/95 study:

- A visual sampling method was used in place of a hand-sorting method where subsamples were individually weighed;
- The number of samples for the study period increased from 242 to 786;
- The number of sampling days increased from 27 to 46;
- The 2007 study did not characterize land clearing waste;
- The 1994/95 study included sampling at City-owned transfer stations while the current study focused on private stations and included waste disposed in intermodal containers. Subsequent waste stream composition studies have been carried out of self-haul loads delivered to the City's transfer stations for disposal in 1996, 2000 and 2004.
- The component categories were revised based on changes in materials and to more accurately reflect the types of waste found in the C&D waste stream. While the samples in the 1994/95 study were characterized according to 124 component categories, the 2007 waste component list consisted of 67 categories most commonly found in C&D

[1] Disposed tonnage for 2007 is available on Seattle's website at http://www.seattle.gov/util/stellent/groups/public/@spu/@usm/documents/webcontent/spu01_002820.pdf

[2] The 200,000 tons disposed through the three private stations and intermodal boxes does not represent all of the disposed C&D generated by C&D activities conducted in Seattle. C&D waste is also delivered to City transfer stations and found in garbage cans and dumpsters.

[3] Field work for the previous study was conducted in 1994/95 and the report was finalized in 1997. The 1997 CDL Waste Composition Study can be found on Seattle Public Utilities' website at http://www.seattle.gov/util/stellent/groups/public/@spu/@usm/documents/webcontent/cos_002465.pdf.

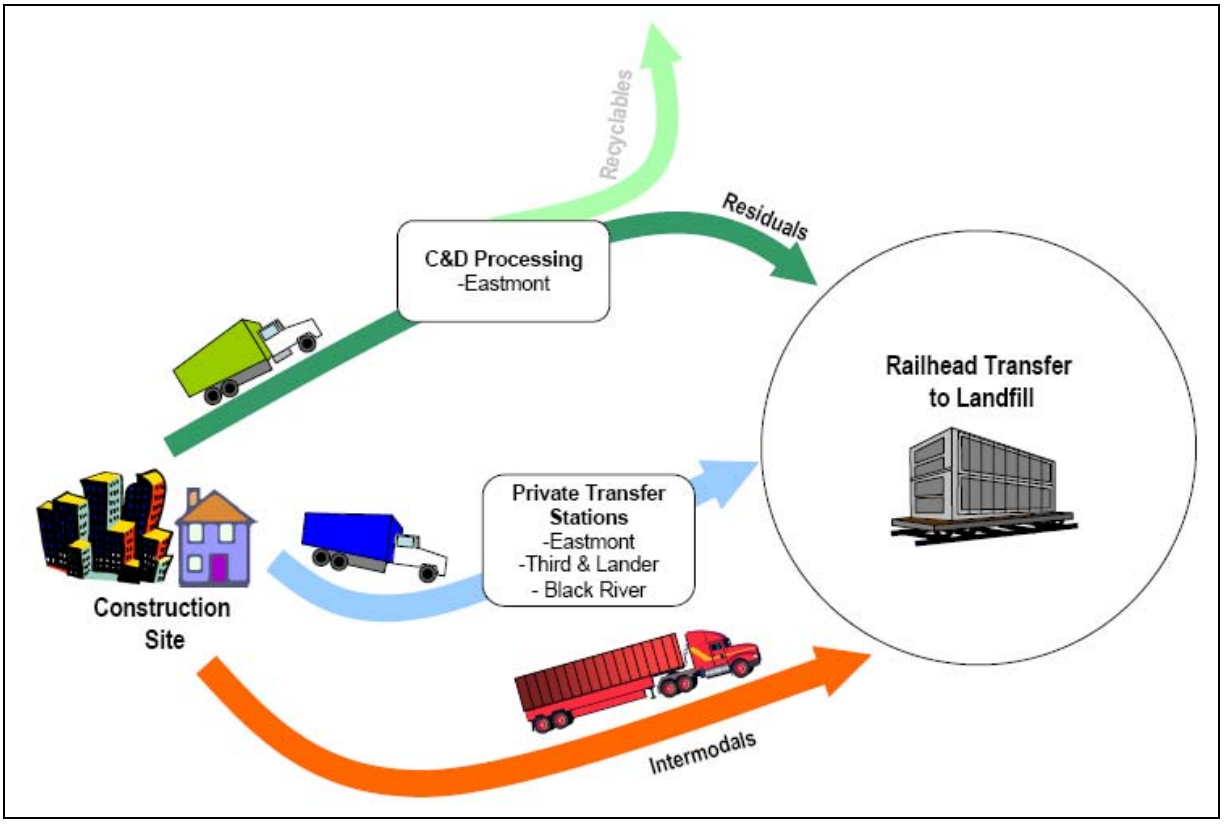
loads. Please refer to Table E-2 in Appendix E for a list of how material components were updated for the current study.

This report, which consists of five sections, presents the results of 2007 construction and demolition waste study. Section 1 briefly introduces the project and the methodology, and Section 2 summarizes the findings. In Section 3, the 2007 findings are compared to those from the 1994/95 study. Detailed results of the 2007 C&D waste composition study are presented in Section 4, while composition results from processing residuals are included in Section 5. Section 6 presents construction & demolition permit data to provide context for the study results. Appendices follow the main body of the report and provide the following: material component definitions, sampling methodology, comments on sampling events, waste composition calculations, year-to-year comparison calculations, description of the analytical database, and copies of field forms.

1.2 Seattle's Construction and Demolition Waste Stream

This study examined C&D waste disposed at three private transfer stations (Eastmont, Third & Lander, and Black River); waste hauled directly from C&D sites in intermodal containers to the railheads at Third and Lander and the Argo Yard; and residuals from C&D processing at Eastmont. Figure 1-1 shows the movement of Seattle's non-MSW C&D waste.

Figure 1-1: Flow of C&D Waste Sampled in 2007 Study



1.3 Study Methodology

The following section provides an overview of the 2007 study methodology. As shown, there were five major steps involved in conducting this waste composition study. The steps are presented according to the order in which they occurred during the course of the study. Appendix B contains a detailed description of the visual observation methodology.

Step 1: Develop Sampling Plan

- Samples were allocated among the five activity types (new construction, remodeling, demolition, roofing, and other/mixed C&D) plus intermodal and residual loads
- A sampling schedule was constructed for the 2007 calendar year, consisting of five to seven sampling days each quarter. The sampling days were randomly selected and adjusted to provide a representative distribution across the seasons as well as across the three facilities that receive C&D waste from Seattle: Eastmont, Third & Lander, and Black River.

Step 2: Coordinate Sampling Events

- Prior to each month's sampling, facility representatives and affected personnel were contacted and notified about how sampling and surveying would occur at each site.
- Haulers were contacted to obtain information regarding intermodal projects scheduled.

Step 3: Survey Vehicles and Select Samples

- In order to quantify the waste associated with each activity type, surveys were conducted at the entrance of each participating facility.
- The surveyor:
    - Verified that the load was C&D waste generated within the City of Seattle;
    - Recorded the net weight;
    - Observed the vehicle and hauler types; and
    - Asked the driver for the load's origin, construction activity type, and building type.

Data were recorded on a *Vehicle Survey Form*.

- The surveyor also selected loads for sampling based on the sampling plan and directed drivers to the sampling area. The entire load carried by each vehicle chosen for sampling constituted one sample.
- **Intermodal**: Waste collected in intermodal containers was sampled through visual observation at construction sites as it was transferred into the containers.
- **Residuals:** Residuals from the recycling sorting line at Eastmont were sampled directly on the conveyor belt.

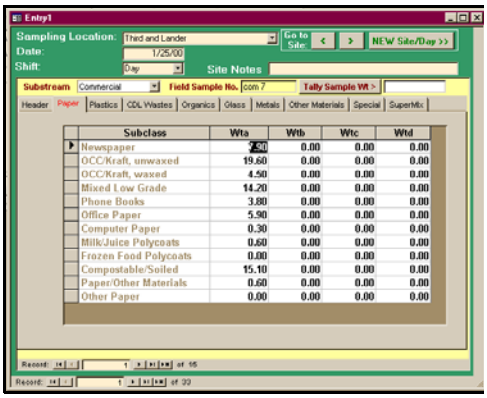
Step 4: Characterize Samples

- A visual volumetric measurement protocol was used to characterize all loads of C&D waste. The six steps in the protocol were:

1) Record the sample number and date;
2) Measure load volume;
3) Note which broad material component categories were present;
4) Estimate composition by volume for each broad material category;
5) Estimate composition by volume for each specific component; and
6) Check and reconcile percentage data.

- For this study, a total of 786 samples were sorted into 67 distinct component categories, such as *clean engineered wood* or *composition roofing*. Refer to Appendix E to see how material components were updated for the current study.

Step 5: Analyze Data and Prepare Report



- Each quarter all sorting data were entered into a customized database and reviewed for data entry errors. Volume estimates for each sample were converted to weights using accepted volume-to-weight conversion factors, which are included in Appendix D.
- At the conclusion of the study, waste composition estimates were calculated by aggregating sampling data using a weighted average procedure. These calculations were based on data provided by SPU and gathered during vehicle surveys.
- Once the data were analyzed, this report was prepared.

2 Overall C&D Composition

This section presents an overview of the characterization results for the C&D waste stream received by private transfer station facilities for disposal including intermodal loads hauled directly to railheads but excluding residuals. Composition results are presented in the following order in this report. First, a pie chart reflects the composition percentages of nine broad material categories. In these charts the material components within the broad material category ***C&D*** has been divided into seven sub-categories:

- ***C&D: Clean, Recyclable Wood*** includes the material components *clean dimensional lumber, clean engineered wood, pallets and crates,* and *other recyclable wood.*
- ***C&D: Concrete, Asphalt, and Other Aggregates*** includes the material components *concrete, asphalt paving,* and *other aggregates*.
- ***C&D: Fines*** includes the material components *rock and gravel* and *dirt and sand*.
- ***C&D: Gypsum*** includes the material components *clean gypsum board* and *painted/demolition gypsum*.
- ***C&D Painted and Treated Wood*** includes the material components *painted/stained wood, creosote-treated wood,* and *other treated wood*.
- ***C&D: Remainder/Composite*** includes the material components *cellulose insulation*, *fiberglass insulation*, and *remainder/composite C&D*.
- ***C&D: Roofing Materials*** includes the material components *composition roofing* and *other asphalt roofing*.

The remaining material components were divided into two non-C&D broad material categories: ***Other Recyclables*** and ***Other Waste. Other Recyclables*** includes the following material components:

- *Uncoated Corrugated Cardboard*
- *Plastic Sheeting and Agricultural Film*
- *Paper Bags*
- *Food*
- *Other Recyclable Paper*
- *Leaves & Grass*
- *Glass Bottles and Containers*
- *Prunings & Trimmings*
- *Other Ferrous Metal*
- *Branches & Stumps*
- *Aluminum Cans*
- *Paint*
- *Other Non-Ferrous*
- *Used Oil*
- *Brown Goods and Other Small Consumer Electronics*
- *Batteries*
- *Computer-related Electronics*
- *Textiles*
- *TV's & Other CRTs*
- *Carpet*
- *Plastic Bottles and Tubs*
- *Carpet Padding*
- *Grocery/Merchandise Bags*
- *Tires*
- *Non-Bag Packaging Film*

Other Waste includes the remaining material components:

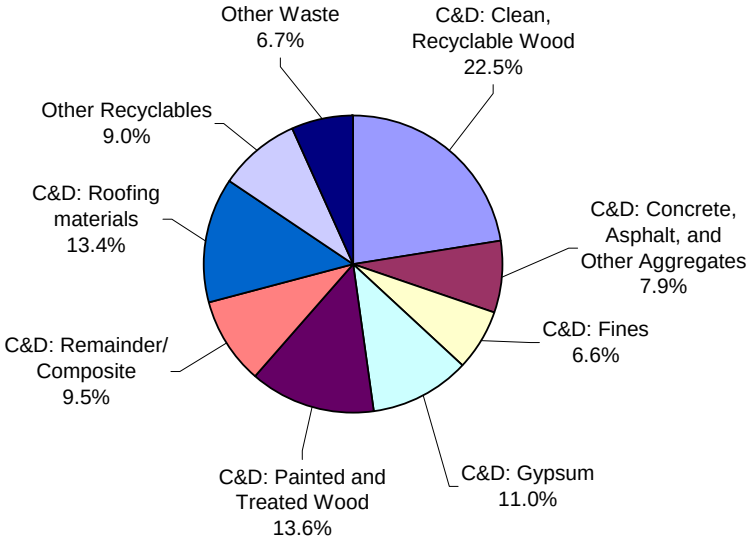
- *Remainder/Composite Paper*
- *Durable Plastic Items*
- *Flat Glass*
- *Plastic Piping*
- *Remainder/Composite Glass*
- *Remainder/Composite Plastic*
- *Tin/Steel Cans*
- *Remainder/Composite Organic*
- *Major Appliances*
- *Vehicle & Equipment Fluids*
- *Used Oil Filters*
- *Remainder/Composite HHW*
- *HVAC Ducting*
- *Ash*
- *Remainder/Composite Metal*
- *Other Film*
- *Bulky Items*
- *Other Rigid Packaging*
- *Remainder/Composite Other*
- *Expanded #6/Polystyrene Packaging/Insulation*
- *Mixed Residue*
- *Trash Bags*
- *Municipal Solid Waste (MSW)*

A table that lists the top ten components, by weight, follows the pie charts. Lastly, a detailed composition table lists the full composition results for all 67 components. Percentages may not add to 100% in tables throughout the report due to rounding.

For this study, 734 C&D waste loads (excluding residuals) were sampled between January and December 2007. A total of 201,156 tons of C&D waste were disposed in Seattle during this time. The composition estimates were applied to these tons to estimate the amount of waste disposed in 2007 for each component category.

As shown in Figure 2-1, the largest material, ***C&D: Clean, Recyclable Wood,*** accounted for an estimated 23% of C&D waste (excluding residuals), while ***C&D: Painted and Treated Wood*** and ***C&D: Roofing Materials*** each made up about 13% of the total, by weight.

Figure 2-1: Composition Summary – Overall C&D[4]
(January – December 2007)



The top ten components of Seattle's overall C&D waste are listed in Table 2-1. When summed, they account for approximately 72% of the overall C&D tonnage. The most prevalent material components were *painted/stained wood* (11.5%), *composition roofing* (9.6%), and *clean engineered wood* (9.3%). Table 2-2 lists the composition percentages, by weight, of each of 76 material components in Seattle's C&D substream.[5] The detailed results are presented in Table 2-2.

[4] Included in this section are results for all samples except for residuals.
[5] All waste composition results were derived using a 90% confidence level, meaning that there is a 90% certainty that the actual composition is within the calculated range. In charts throughout this report, the values graphed represent the mean component percentage, not the range.

Table 2-1: Top Ten Components – Overall C&D
(January – December 2007)

Component	Mean	Cum. %	Tons
Painted/Stained Wood	11.5%	11.5%	23,209
Composition Roofing	9.6%	21.2%	19,368
Clean Engineered Wood	9.3%	30.5%	18,713
Remainder/Composite C&D	9.2%	39.7%	18,473
Clean Dimensional Lumber	8.0%	47.7%	16,104
Painted/Demolition Gypsum	6.8%	54.5%	13,738
Dirt and Sand	5.5%	60.0%	10,997
Clean Gypsum Board	4.2%	64.1%	8,350
Other Asphalt Roofing	3.8%	67.9%	7,599
Concrete	3.7%	71.6%	7,538
Total	**71.6%**		**144,088**

Table 2-2: Composition by Weight – Overall C&D (January – December 2007)

Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	3,532	1.8%			*C&D*	169,550	84.3%		
Uncoated Corrugated Cardboard	1,815	0.9%	0.7%	1.1%	Concrete	7,538	3.7%	2.3%	5.2%
Paper Bags	223	0.1%	0.1%	0.2%	Asphalt Paving	1,338	0.7%	0.3%	1.0%
Other Recyclable Paper	880	0.4%	0.3%	0.6%	Composition Roofing	19,368	9.6%	8.3%	10.9%
Cellulose Insulation	110	0.1%	0.0%	0.1%	Other Asphalt Roofing	7,599	3.8%	2.4%	5.2%
R/C Paper	503	0.3%	0.1%	0.4%	Other Aggregates	6,964	3.5%	2.6%	4.4%
Glass	998	0.5%			Clean Dimensional Lumber	16,104	8.0%	6.9%	9.1%
Glass Bottles and Containers	23	0.0%	0.0%	0.0%	Clean Engineered Wood	18,713	9.3%	8.1%	10.6%
Flat Glass	706	0.4%	0.2%	0.5%	Pallets and Crates	4,405	2.2%	1.7%	2.7%
R/C Glass	270	0.1%	0.1%	0.2%	Other Recyclable Wood	5,978	3.0%	2.2%	3.8%
Metal	7,910	3.9%			Painted/Stained Wood	23,209	11.5%	10.1%	13.0%
Tin/Steel Cans	57	0.0%	0.0%	0.0%	Creosote-treated Wood	2,858	1.4%	0.7%	2.1%
Major Appliances	266	0.1%	0.1%	0.2%	Other Treated Wood	1,195	0.6%	0.4%	0.8%
Used Oil Filters	27	0.0%	0.0%	0.0%	Clean Gypsum Board	8,350	4.2%	3.2%	5.1%
HVAC Ducting	470	0.2%	0.1%	0.3%	Painted/Demolition Gypsum	13,738	6.8%	5.7%	8.0%
Other Ferrous	5,616	2.8%	2.4%	3.2%	Rock and Gravel	2,200	1.1%	0.6%	1.6%
Aluminum Cans	5	0.0%	0.0%	0.0%	Dirt and Sand	10,997	5.5%	4.0%	6.9%
Other Non-Ferrous	639	0.3%	0.2%	0.4%	Fiberglass insulation	525	0.3%	0.1%	0.4%
R/C Metal	832	0.4%	0.3%	0.5%	R/C C&D	18,473	9.2%	7.6%	10.8%
E-Waste	163	0.1%			*Hazardous Waste*	673	0.3%		
Brown Goods/Sm Consumer Electronics	106	0.1%	0.0%	0.1%	Paint	167	0.1%	0.0%	0.1%
Computer-related Electronics	7	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	2	0.0%	0.0%	0.0%
TV's & Other CRTs	51	0.0%	0.0%	0.0%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	2,918	1.5%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	63	0.0%	0.0%	0.0%	R/C Hazardous Waste	505	0.3%	0.1%	0.4%
Other Rigid Packaging	14	0.0%	0.0%	0.0%	*Special*	4,761	2.4%		
Polystyrene Packaging/Insulation	407	0.2%	0.1%	0.3%	Textiles	331	0.2%	0.1%	0.2%
Trash Bags	76	0.0%	0.0%	0.1%	Carpet	2,850	1.4%	0.7%	2.2%
Grocery/ Merch. Bags	5	0.0%	0.0%	0.0%	Carpet Padding	458	0.2%	0.1%	0.4%
Non-Bag Packaging Film	107	0.1%	0.0%	0.1%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	835	0.4%	0.3%	0.5%	Bulky Items	883	0.4%	0.3%	0.6%
Other Film	35	0.0%	0.0%	0.0%	Tires	69	0.0%	0.0%	0.1%
Durable Plastic Items	346	0.2%	0.1%	0.2%	R/C Other	169	0.1%	0.0%	0.2%
Plastic Piping	903	0.4%	0.3%	0.6%	*Mixed Residue/MSW*	6,788	3.4%		
R/C Plastic	127	0.1%	0.0%	0.1%	Mixed Residue	3,560	1.8%	1.1%	2.4%
Organics	3,863	1.9%			MSW	3,228	1.6%	1.3%	1.9%
Food	14	0.0%	0.0%	0.0%					
Leaves & Grass	1,117	0.6%	0.4%	0.7%					
Prunings & Trimmings	1,501	0.7%	0.4%	1.1%	Total Percentage	100%			
Branches & Stumps	1,144	0.6%	0.2%	0.9%	Total Tons	201,156			
R/C Organic	86	0.0%	0.0%	0.1%	Sample Count	734			

3 Trends in C&D Waste Composition: 1994/95 to 2007

Results from the previous 1994/95 study are compared to those from the 2007 study in this section. In order to be consistent with the 1994/95 study, only samples from loads delivered to transfer stations, not directly to railheads, were considered in the comparison calculations.[6] Although the methodology for the 2007 study was substantially different than that used in the 1994/95 study, the composition results of the two studies can be compared. The comparisons were made by examining the changes in composition percentages for each of nine broad waste categories: ***C&D: Wood***, ***C&D: Aggregates***, ***C&D: Other***, ***Metal***, ***Organics***, ***Paper***, ***Plastic***, ***Other Materials***, and ***MSW/Residue***.[7] See Appendix E for details about year-to-year comparison calculations.

3.1 Changes in the Composition of C&D Waste Disposed 1994/95 to 2007

Table 3-1 compares the composition percentages for each of nine broad comparison categories: ***C&D: Wood***, ***C&D: Aggregates***, ***C&D: Other***, ***Metal***, ***Organics***, ***Paper***, ***Plastic***, ***Other Materials***, and ***MSW/Residue***. Statistical t-tests were used to analyze differences in the composition percentages. The bolded broad material categories in Table 3-1 showed statistically significant changes between 1994/95 and 2007. The proportion of ***Metal***, ***Paper***, and ***Plastic*** in the C&D waste stream decreased significantly. Though the changes were not significant, the percentages of ***C&D: Wood***, ***C&D: Aggregates***, and ***C&D: Other*** each increased by about 5% to 6%. See Appendix E for a table outlining changes in broad material categories across study periods.[8]

[6] The composition figures presented in this section were calculated using an unweighted analytical process. Thus, they may not be equal to the composition percentages presented in Section 4 as these are derived using a weighted process. Appendix D provides more detail on weighted averages, while Appendix E outlines comparison calculations.

[7] The material component categories for each season have been calibrated to match 1994/95 material component list for two reasons: (1) the material components list has changed from 124 material component categories in 1994/95 to 67 material components in 2007 and (2) several components have been moved to different broad material categories to better characterize C&D waste specifically. Therefore, the percentages of broad material categories in Section 3 will not necessarily match the percentages of broad material categories presented in Section 4. This is explained in greater depth in Appendix E.

[8] The change in sorting categories may have also affected the estimated proportions of plastic, metal, and glass, causing them to be slightly higher in the 1994/95 study. The exact amount of this difference cannot be calculated.

Table 3-1: Changes in C&D Waste – 1994/95 and 2007 Study Periods

Comparison Class	Percent Composition *(Material Wt/Total Wt)*		Change in Composition	
	1994/95	*2007*		
C&D: Wood	29.8%	34.7%	4.9%	↑
C&D: Aggregates	13.5%	19.4%	5.8%	↑
C&D: Other	22.6%	27.7%	5.0%	↑
Metal	**9.7%**	**4.1%**	**-5.5%**	↓
Organics	3.6%	2.1%	-1.6%	↓
Paper	**5.2%**	**2.3%**	**-3.0%**	↓
Plastic	**4.3%**	**2.2%**	**-2.2%**	↓
Other Materials	8.7%	3.3%	-5.4%	↓
MSW/Residue	2.5%	4.3%	1.8%	↑
Total	100.0%	100.0%		

* Bold type indicates statistically significant changes

4 Detailed Composition Results

Sampling results for loads hauled to transfer stations and for intermodal containers hauled to railheads are included in this section. Data for these samples are divided into three sub-sections:

- The first section includes data for waste hauled to transfer stations by building type, activity type, hauler type, and vehicle type;
- In the second section, results for intermodal containers hauled to railheads are presented; and
- In the third section, composition results for intermodals and transfer station loads are combined to provide profiles of C&D waste by season.

4.1 Waste Hauled to Transfer Stations

A total of 702 loads hauled to transfer stations were sampled from January to December 2007. These loads were categorized by building type, activity type, hauler type, and vehicle type. Table 4-1 summarizes the sample information for each C&D subcategory. The average sample weight was approximately 5,300 pounds.

Table 4-1: Overview of Samples
(January – December 2007)

Subpopulation	Sample Count*	*(All Weights in pounds)* Total Sample	Average Sample
Building Type			
Residential	374	1,926,766	5,152
Non-residential	273	1,417,640	5,193
Mixed Loads	15	62,960	4,197
Other Structures	35	318,940	9,113
Unidentified Structures	5	23,980	4,796
Activity Type			
New Construction	171	730,998	4,275
Remodeling	232	959,271	4,135
Demolition	151	1,145,957	7,589
Roofing	100	501,040	5,010
Mixed/Other C&D	48	413,020	8,605
Hauler Type			
Contracted Haulers	190	1,255,142	6,606
C&D Haulers	128	948,000	7,406
Business Self-haulers	357	1,463,052	4,098
Homeowner Self-haulers	19	42,332	2,228
Vehicle Type			
Drop Boxes	336	2,451,182	7,295
End Dumps	285	1,133,161	3,976
Other Large Vehicles	29	58,511	2,018
Pick-up/Passenger Vehicles	41	59,692	1,456
Season			
Spring	168	1,023,640	6,093
Summer	139	1,396,214	10,045
Fall	303	1,704,390	5,625
Winter	176	909,751	5,169
Overall C&D	702	3,750,286	5,342

* Sample counts may not sum to total because some samples were not identified by type.

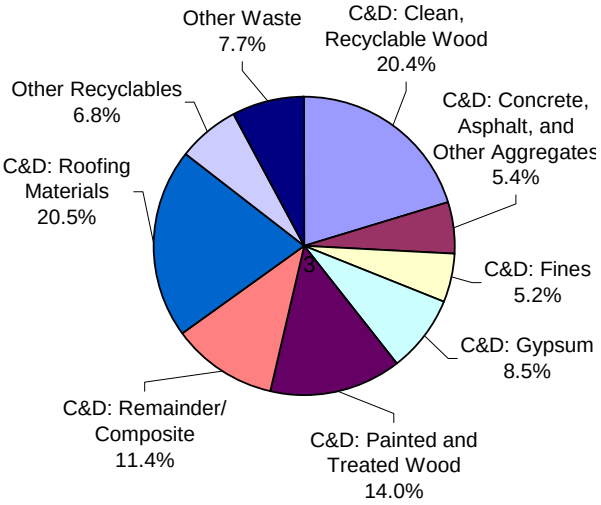
The remainder of this section presents composition estimates by building types, activity types, hauler types, vehicle types, and season. Since building and activity were considered to be the greatest predictor of composition, these profiles were weighted, while hauler and vehicle type profiles were not. Please refer to Appendix D for an explanation of the weighted average calculations. Seattle Public Utilities and the City's authorized waste haulers provided the total 2007 disposal tonnages presented in this section of the report.

4.1.1 By Building Type

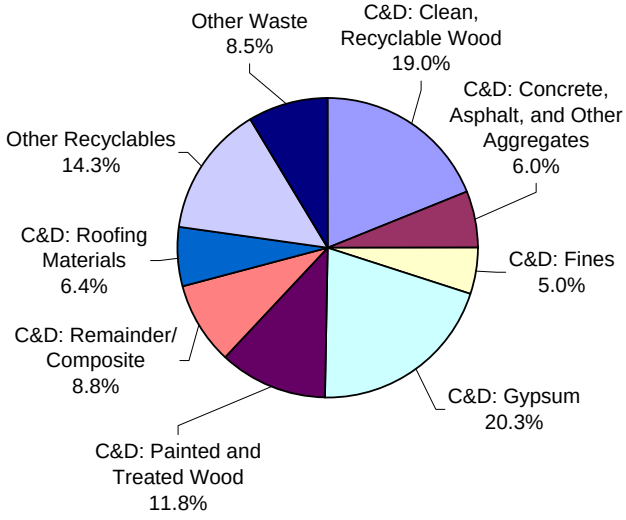
As shown in Figure 4-1, ***C&D: Clean, Recyclable Wood*** composed at least 19% of C&D waste across all building types. Residential building loads contained the highest percentage of ***C&D: Roofing Materials*** (20.5%). Non-residential buildings (20.3%), mixed loads (combined residential and non-residential buildings) (29.6%), and unidentified structures (14.9%) contained the highest percentages of ***C&D: Gypsum***. Loads from other structures contained a high percentage of ***C&D: Painted and Treated Wood*** (21.6%).

Figure 4-1: Composition Summary, by Building Type (January – December 2007)

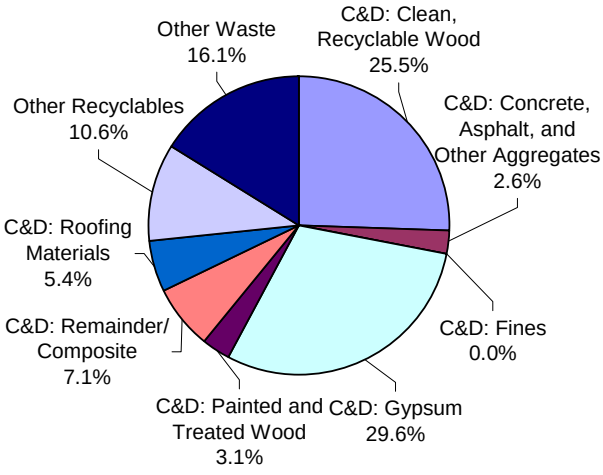
Residential Buildings



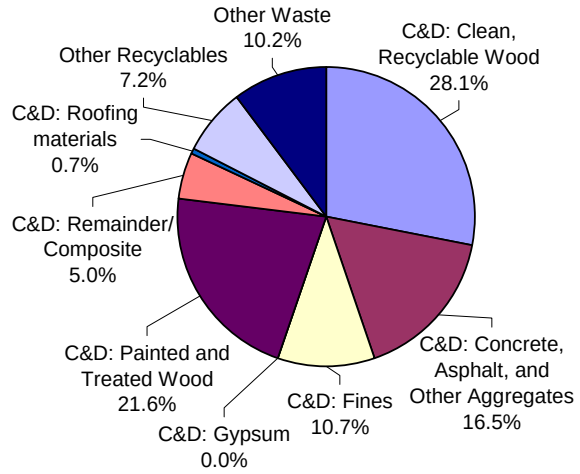
Non-Residential Buildings

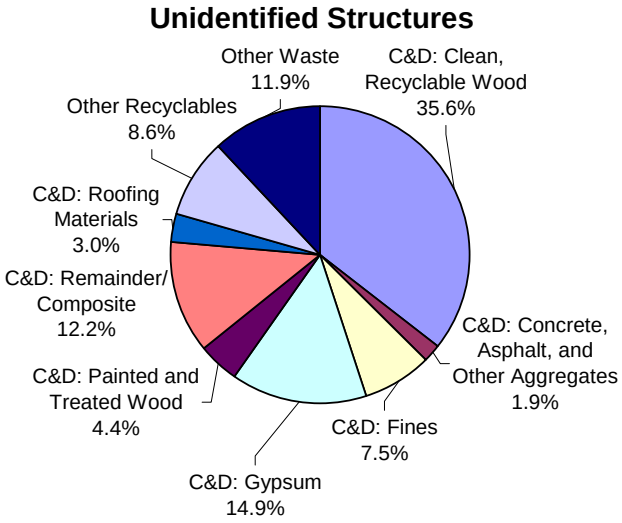


Mixed Loads



Other Structures





4.1.1a Residential Buildings

A total of 374 loads were sampled from residential buildings during the 2007 study period. C&D waste from this type of construction resulted in the disposal of an estimated 85,485 tons in 2007. As shown in Table 4-2 c*omposition roofing* (17.2%, by weight) and *painted/stained wood* (13.5%) were the largest components of the total tons disposed from residential buildings in 2007. When added together, all of the top ten components summed to approximately 79% of the total, by weight. The full composition results for residential buildings are presented in Table 4-7.

Table 4-2: Top Ten Components – Residential Buildings (January – December 2007)

Component	Mean	Cum. %	Tons
Composition Roofing	17.2%	17.2%	14,673
Painted/Stained Wood	13.5%	30.6%	11,514
Remainder/Composite C&D	11.0%	41.6%	9,379
Clean Engineered Wood	8.8%	50.4%	7,493
Clean Dimensional Lumber	8.3%	58.7%	7,115
Painted/Demolition Gypsum	5.3%	64.0%	4,497
Dirt and Sand	4.7%	68.6%	4,004
Other Aggregates	3.4%	72.0%	2,893
Other Asphalt Roofing	3.4%	75.4%	2,885
Clean Gypsum Board	3.3%	78.6%	2,781
Total	**78.6%**		**67,233**

4.1.1b Non-residential Buildings

During the calendar year 2007, 273 C&D loads coming from non-residential buildings were sampled. Waste from non-residential buildings was estimated to account for approximately 58,411 tons in 2007. As shown in Table 4-3, *painted/demolition gypsum* (12.2%) was the most prevalent material component in this type of waste. Other large components included *painted/stained wood* (9.2%), *remainder/composite C&D* (8.5%), and *clean engineered wood* (7.9%). When added together, the top ten components summed to approximately 71% of the total, by weight. The full composition results for non-residential buildings are presented in Table 4-8.

Table 4-3: Top Ten Components – Non-residential Buildings (January – December 2007)

Component	Mean	Cum. %	Tons
Painted/Demolition Gypsum	12.2%	12.2%	7,153
Painted/Stained Wood	9.2%	21.4%	5,375
Remainder/Composite C&D	8.5%	29.9%	4,945
Clean Gypsum Board	8.1%	38.0%	4,703
Clean Engineered Wood	7.9%	45.8%	4,586
Clean Dimensional Lumber	5.8%	51.6%	3,374
Other Ferrous Metal	5.6%	57.2%	3,266
Composition Roofing	4.7%	61.9%	2,743
Pallets and Crates	4.6%	66.4%	2,666
Dirt and Sand	4.1%	70.6%	2,400
Total	**70.6%**		**41,211**

4.1.1c Mixed Loads

Fifteen mixed loads were sampled during the 2007 study. Waste from this type of construction accounted for approximately 1,774 tons of waste. The weighted composition estimates were applied to these tons to estimate the amount of waste disposed for each component category. As shown in Table 4-4, *clean gypsum board* (21.8%) was the largest material component, by weight. *Clean dimensional lumber* (12.3%), *clean engineered wood* (10.9%), and *MSW* (10.2%) each made up more than 10% of waste from this substream. When added together, all of the top ten components summed to approximately 84% of the total, by weight. The full composition results for mixed loads are presented in Table 4-9.

Table 4-4: Top Ten Components – Mixed Loads
(January – December 2007)

Component	Mean	Cum. %	Tons
Clean Gypsum Board	21.8%	21.8%	387
Clean Dimensional Lumber	12.3%	34.1%	217
Clean Engineered Wood	10.9%	45.0%	194
MSW	10.2%	55.2%	181
Painted/Demolition Gypsum	7.8%	63.0%	139
Remainder/Composite C&D	6.8%	69.8%	121
Composition Roofing	5.4%	75.3%	97
Other Ferrous Metal	3.4%	78.6%	60
Painted/Stained Wood	3.1%	81.7%	54
Other Aggregates	2.6%	84.3%	46
Total	**84.3%**		**1,496**

4.1.1d Other Structures

In 2007, 35 samples were completed on waste loads from other structures. Approximately 8,907 tons of waste were estimated to have been disposed from this substream. The weighted composition estimates were applied to these tons to estimate the amount of waste disposed for each component category. As shown in Table 4-5, *clean engineered wood* (17.7%), *creosote-treated wood* (14.7%), and *concrete* (13.3%) were the largest components of the total tons disposed from other structures in 2007. When added together, all of the top ten components summed to approximately 82% of the total, by weight. The full composition results for other structures are presented in Table 4-10.

Table 4-5: Top Ten Components - Other Structures
(January – December 2007)

Component	Mean	Cum. %	Tons
Clean Engineered Wood	17.7%	17.7%	1,575
Creosote-treated Wood	14.7%	32.4%	1,313
Concrete	13.3%	45.7%	1,183
Dirt and Sand	9.4%	55.1%	836
Clean Dimensional Lumber	5.6%	60.7%	503
Painted/Stained Wood	5.4%	66.1%	477
Remainder/Composite C&D	4.9%	71.0%	441
Pallets and Crates	4.4%	75.5%	393
MSW	3.5%	79.0%	316
Plastic Sheeting and Agricultural Film	2.6%	81.6%	232
Total	**81.6%**		**7,268**

4.1.1e Unidentified Structures

A total of 5 samples were sorted from loads whose originating building could not be identified by the vehicle driver. Waste from these vehicles was estimated to have been 660 tons in 2007. As shown in Table 4-6, *clean engineered wood* made up approximately 19% of this waste, followed by *clean dimensional lumber* (13.3%), *remainder/composite C&D* (12.1%), and *clean gypsum board* (11.3%). When added together, all of the top ten components summed

to approximately 87% of the total, by weight. The full composition results from unidentified structures are presented in Table 4-11.

Table 4-6: Top Ten Components – Unidentified Structures (January – December 2007)

Component	Mean	Cum. %	Tons
Clean Engineered Wood	19.2%	19.2%	126
Clean Dimensional Lumber	13.3%	32.4%	88
Remainder/Composite C&D	12.1%	44.5%	80
Clean Gypsum Board	11.3%	55.8%	74
MSW	9.8%	65.6%	65
Dirt and Sand	7.5%	73.0%	49
Painted/Stained Wood	4.4%	77.5%	29
Painted/Demolition Gypsum	3.6%	81.1%	24
Other Ferrous Metal	3.3%	84.3%	22
Other Asphalt Roofing	3.0%	87.4%	20
Total	**87.4%**		**577**

4.1.1f Comparisons among Building Types

For all building types, *clean engineered wood*, *clean dimensional lumber*, *remainder/composite C&D*, and *painted/stained wood* were among the top ten material components disposed. *Clean gypsum board* and *painted/demolition gypsum* were top ten components in all building types with the exception of other structures. *Composition roofing* was a top ten component for residential buildings, non-residential buildings, and mixed loads. *Dirt and sand* was present in the top ten components for all building type waste except for mixed loads. *Creosote-treated wood*, *concrete*, and *plastic sheeting and agricultural film* were unique to the top ten components from other structures.

Table 4-7: Composition by Weight – Residential Buildings (January – December 2007)

Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	1,315	1.5%			*C&D*	72,964	85.4%		
Uncoated Corrugated Cardboard	658	0.8%	0.5%	1.0%	Concrete	993	1.2%	0.4%	1.9%
Paper Bags	67	0.1%	0.0%	0.1%	Asphalt Paving	707	0.8%	0.2%	1.4%
Other Recyclable Paper	247	0.3%	0.2%	0.4%	Composition Roofing	14,673	17.2%	14.9%	19.4%
Cellulose Insulation	76	0.1%	0.0%	0.2%	Other Asphalt Roofing	2,885	3.4%	1.6%	5.1%
R/C Paper	267	0.3%	0.2%	0.4%	Other Aggregates	2,893	3.4%	2.0%	4.8%
Glass	502	0.6%			Clean Dimensional Lumber	7,115	8.3%	6.8%	9.8%
Glass Bottles and Containers	17	0.0%	0.0%	0.1%	Clean Engineered Wood	7,493	8.8%	7.1%	10.4%
Flat Glass	387	0.5%	0.2%	0.7%	Pallets and Crates	1,299	1.5%	1.1%	1.9%
R/C Glass	99	0.1%	0.0%	0.2%	Other Recyclable Wood	1,536	1.8%	1.3%	2.3%
Metal	1,970	2.3%			Painted/Stained Wood	11,514	13.5%	11.1%	15.8%
Tin/Steel Cans	27	0.0%	0.0%	0.0%	Creosote-treated Wood	0	0.0%	0.0%	0.0%
Major Appliances	227	0.3%	0.1%	0.4%	Other Treated Wood	476	0.6%	0.3%	0.8%
Used Oil Filters	0	0.0%	0.0%	0.0%	Clean Gypsum Board	2,781	3.3%	1.8%	4.7%
HVAC Ducting	137	0.2%	0.0%	0.3%	Painted/Demolition Gypsum	4,497	5.3%	4.0%	6.5%
Other Ferrous	1,203	1.4%	1.1%	1.7%	Rock and Gravel	466	0.5%	0.2%	0.9%
Aluminum Cans	4	0.0%	0.0%	0.0%	Dirt and Sand	4,004	4.7%	2.5%	6.8%
Other Non-Ferrous	84	0.1%	0.0%	0.2%	Fiberglass insulation	252	0.3%	0.1%	0.5%
R/C Metal	289	0.3%	0.2%	0.5%	R/C C&D	9,379	11.0%	8.2%	13.7%
E-Waste	100	0.1%			*Hazardous Waste*	145	0.2%		
Brown Goods/Sm Consumer Electronics	60	0.1%	0.0%	0.1%	Paint	54	0.1%	0.0%	0.1%
Computer-related Electronics	1	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	2	0.0%	0.0%	0.0%
TV's & Other CRTs	39	0.0%	0.0%	0.1%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	990	1.2%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	27	0.0%	0.0%	0.0%	R/C Hazardous Waste	90	0.1%	0.0%	0.2%
Other Rigid Packaging	10	0.0%	0.0%	0.0%	*Special*	1,617	1.9%		
Polystyrene Packaging/Insulation	88	0.1%	0.0%	0.2%	Textiles	186	0.2%	0.1%	0.4%
Trash Bags	47	0.1%	0.0%	0.1%	Carpet	758	0.9%	0.6%	1.2%
Grocery/ Merch. Bags	3	0.0%	0.0%	0.0%	Carpet Padding	223	0.3%	0.1%	0.5%
Non-Bag Packaging Film	35	0.0%	0.0%	0.1%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	282	0.3%	0.2%	0.5%	Bulky Items	419	0.5%	0.2%	0.8%
Other Film	12	0.0%	0.0%	0.0%	Tires	22	0.0%	0.0%	0.1%
Durable Plastic Items	125	0.1%	0.1%	0.2%	R/C Other	8	0.0%	0.0%	0.0%
Plastic Piping	319	0.4%	0.2%	0.5%	*Mixed Residue/MSW*	3,951	4.6%		
R/C Plastic	41	0.0%	0.0%	0.1%	Mixed Residue	2,455	2.9%	1.6%	4.1%
Organics	1,931	2.3%			MSW	1,495	1.7%	1.3%	2.2%
Food	14	0.0%	0.0%	0.0%					
Leaves & Grass	719	0.8%	0.5%	1.2%					
Prunings & Trimmings	920	1.1%	0.4%	1.8%	Total Percentage	100%			
Branches & Stumps	225	0.3%	0.0%	0.5%	Total Tons	85,485			
R/C Organic	53	0.1%	0.0%	0.2%	Sample Count	374			

Table 4-8: Composition by Weight – Non-residential Buildings (January – December 2007)

Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	1,818	3.1%			*C&D*	45,077	77.2%		
Uncoated Corrugated Cardboard	989	1.7%	1.3%	2.1%	Concrete	1,335	2.3%	0.9%	3.6%
Paper Bags	153	0.3%	0.1%	0.4%	Asphalt Paving	424	0.7%	0.1%	1.4%
Other Recyclable Paper	413	0.7%	0.4%	1.0%	Composition Roofing	2,743	4.7%	3.0%	6.4%
Cellulose Insulation	35	0.1%	0.0%	0.1%	Other Asphalt Roofing	1,024	1.8%	0.1%	3.4%
R/C Paper	228	0.4%	0.1%	0.7%	Other Aggregates	1,747	3.0%	1.5%	4.4%
Glass	280	0.5%			Clean Dimensional Lumber	3,374	5.8%	4.2%	7.3%
Glass Bottles and Containers	4	0.0%	0.0%	0.0%	Clean Engineered Wood	4,586	7.9%	5.9%	9.8%
Flat Glass	220	0.4%	0.2%	0.6%	Pallets and Crates	2,666	4.6%	3.1%	6.0%
R/C Glass	55	0.1%	0.0%	0.2%	Other Recyclable Wood	442	0.8%	0.2%	1.4%
Metal	4,040	6.9%			Painted/Stained Wood	5,375	9.2%	7.2%	11.2%
Tin/Steel Cans	20	0.0%	0.0%	0.1%	Creosote-treated Wood	1,419	2.4%	0.6%	4.2%
Major Appliances	16	0.0%	0.0%	0.1%	Other Treated Wood	71	0.1%	0.0%	0.2%
Used Oil Filters	27	0.0%	0.0%	0.1%	Clean Gypsum Board	4,703	8.1%	5.9%	10.2%
HVAC Ducting	313	0.5%	0.2%	0.9%	Painted/Demolition Gypsum	7,153	12.2%	9.1%	15.4%
Other Ferrous	3,266	5.6%	4.3%	6.9%	Rock and Gravel	495	0.8%	0.1%	1.6%
Aluminum Cans	1	0.0%	0.0%	0.0%	Dirt and Sand	2,400	4.1%	1.5%	6.7%
Other Non-Ferrous	96	0.2%	0.1%	0.3%	Fiberglass insulation	172	0.3%	0.0%	0.6%
R/C Metal	303	0.5%	0.3%	0.7%	R/C C&D	4,945	8.5%	6.1%	10.8%
E-Waste	38	0.1%			*Hazardous Waste*	444	0.8%		
Brown Goods/Sm Consumer Electronics	27	0.0%	0.0%	0.1%	Paint	114	0.2%	0.1%	0.3%
Computer-related Electronics	0	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0	0.0%	0.0%	0.0%
TV's & Other CRTs	11	0.0%	0.0%	0.1%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	1,210	2.1%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	22	0.0%	0.0%	0.1%	R/C Hazardous Waste	331	0.6%	0.1%	1.1%
Other Rigid Packaging	3	0.0%	0.0%	0.0%	*Special*	2,117	3.6%		
Polystyrene Packaging/Insulation	300	0.5%	0.2%	0.8%	Textiles	67	0.1%	0.0%	0.2%
Trash Bags	20	0.0%	0.0%	0.1%	Carpet	1,600	2.7%	0.5%	5.0%
Grocery/ Merch. Bags	1	0.0%	0.0%	0.0%	Carpet Padding	57	0.1%	0.0%	0.2%
Non-Bag Packaging Film	59	0.1%	0.1%	0.1%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	297	0.5%	0.4%	0.6%	Bulky Items	379	0.6%	0.3%	1.0%
Other Film	17	0.0%	0.0%	0.0%	Tires	10	0.0%	0.0%	0.0%
Durable Plastic Items	106	0.2%	0.1%	0.3%	R/C Other	5	0.0%	0.0%	0.0%
Plastic Piping	315	0.5%	0.3%	0.8%	*Mixed Residue/MSW*	2,206	3.8%		
R/C Plastic	72	0.1%	0.0%	0.2%	Mixed Residue	1,046	1.8%	0.6%	3.0%
Organics	1,180	2.0%			MSW	1,160	2.0%	1.4%	2.6%
Food	0	0.0%	0.0%	0.0%					
Leaves & Grass	290	0.5%	0.1%	0.9%					
Prunings & Trimmings	482	0.8%	0.1%	1.5%	Total Percentage	100%			
Branches & Stumps	384	0.7%	0.1%	1.2%	Total Tons	58,411			
R/C Organic	25	0.0%	0.0%	0.1%	Sample Count	273			

Table 4-9: Composition by Weight - Mixed Loads (January – December 2007)

Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	84	4.8%			*C&D*	1,300	73.3%		
Uncoated Corrugated Cardboard	44	2.5%	1.2%	3.8%	Concrete	0	0.0%	0.0%	0.0%
Paper Bags	0	0.0%	0.0%	0.0%	Asphalt Paving	0	0.0%	0.0%	0.0%
Other Recyclable Paper	36	2.1%	0.0%	5.0%	Composition Roofing	97	5.4%	4.3%	6.6%
Cellulose Insulation	0	0.0%	0.0%	0.0%	Other Asphalt Roofing	0	0.0%	0.0%	0.0%
R/C Paper	4	0.2%	0.0%	0.6%	Other Aggregates	46	2.6%	0.0%	6.6%
Glass	3	0.2%			Clean Dimensional Lumber	217	12.3%	0.0%	24.7%
Glass Bottles and Containers	0	0.0%	0.0%	0.0%	Clean Engineered Wood	194	10.9%	0.8%	21.0%
Flat Glass	3	0.2%	0.0%	0.5%	Pallets and Crates	41	2.3%	0.5%	4.2%
R/C Glass	0	0.0%	0.0%	0.0%	Other Recyclable Wood	0	0.0%	0.0%	0.0%
Metal	76	4.3%			Painted/Stained Wood	54	3.1%	0.0%	6.4%
Tin/Steel Cans	0	0.0%	0.0%	0.0%	Creosote-treated Wood	0	0.0%	0.0%	0.0%
Major Appliances	0	0.0%	0.0%	0.0%	Other Treated Wood	0	0.0%	0.0%	0.0%
Used Oil Filters	0	0.0%	0.0%	0.0%	Clean Gypsum Board	387	21.8%	1.7%	41.9%
HVAC Ducting	1	0.1%	0.0%	0.2%	Painted/Demolition Gypsum	139	7.8%	0.0%	17.7%
Other Ferrous	60	3.4%	0.8%	6.0%	Rock and Gravel	0	0.0%	0.0%	0.0%
Aluminum Cans	0	0.0%	0.0%	0.0%	Dirt and Sand	0	0.0%	0.0%	0.0%
Other Non-Ferrous	14	0.8%	0.4%	1.2%	Fiberglass insulation	4	0.3%	0.0%	0.7%
R/C Metal	1	0.0%	0.0%	0.1%	R/C C&D	121	6.8%	0.0%	18.2%
E-Waste	0	0.0%			*Hazardous Waste*	5	0.3%		
Brown Goods/Sm Consumer Electronics	0	0.0%	0.0%	0.0%	Paint	0	0.0%	0.0%	0.0%
Computer-related Electronics	0	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0	0.0%	0.0%	0.0%
TV's & Other CRTs	0	0.0%	0.0%	0.0%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	46	2.6%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	2	0.1%	0.0%	0.3%	R/C Hazardous Waste	5	0.3%	0.0%	0.7%
Other Rigid Packaging	0	0.0%	0.0%	0.0%	*Special*	56	3.2%		
Polystyrene Packaging/Insulation	5	0.3%	0.0%	0.5%	Textiles	7	0.4%	0.0%	1.0%
Trash Bags	3	0.2%	0.1%	0.3%	Carpet	9	0.5%	0.0%	1.1%
Grocery/ Merch. Bags	2	0.1%	0.0%	0.2%	Carpet Padding	0	0.0%	0.0%	0.1%
Non-Bag Packaging Film	1	0.0%	0.0%	0.1%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	12	0.7%	0.0%	1.5%	Bulky Items	30	1.7%	0.0%	3.6%
Other Film	0	0.0%	0.0%	0.0%	Tires	0	0.0%	0.0%	0.0%
Durable Plastic Items	7	0.4%	0.0%	0.8%	R/C Other	11	0.6%	0.0%	1.6%
Plastic Piping	14	0.8%	0.0%	2.2%	*Mixed Residue/MSW*	202	11.4%		
R/C Plastic	0	0.0%	0.0%	0.0%	Mixed Residue	20	1.1%	0.0%	3.0%
Organics	0	0.0%			MSW	181	10.2%	0.6%	19.8%
Food	0	0.0%	0.0%	0.0%					
Leaves & Grass	0	0.0%	0.0%	0.0%					
Prunings & Trimmings	0	0.0%	0.0%	0.0%	Total Percentage	100%			
Branches & Stumps	0	0.0%	0.0%	0.0%	Total Tons	1,774			
R/C Organic	0	0.0%	0.0%	0.0%	Sample Count	15			

Table 4-10: Composition by Weight - Other Structures (January – December 2007)

Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	147	1.7%			*C&D*	7,358	82.6%		
Uncoated Corrugated Cardboard	105	1.2%	0.4%	1.9%	Concrete	1,183	13.3%	0.4%	26.1%
Paper Bags	1	0.0%	0.0%	0.0%	Asphalt Paving	137	1.5%	1.5%	1.5%
Other Recyclable Paper	38	0.4%	0.0%	0.9%	Composition Roofing	63	0.7%	0.0%	1.8%
Cellulose Insulation	0	0.0%	0.0%	0.0%	Other Asphalt Roofing	0	0.0%	0.0%	0.0%
R/C Paper	3	0.0%	0.0%	0.1%	Other Aggregates	153	1.7%	0.0%	4.4%
Glass	11	0.1%			Clean Dimensional Lumber	503	5.6%	2.5%	8.8%
Glass Bottles and Containers	0	0.0%	0.0%	0.0%	Clean Engineered Wood	1,575	17.7%	6.9%	28.5%
Flat Glass	10	0.1%	0.0%	0.3%	Pallets and Crates	393	4.4%	1.8%	7.0%
R/C Glass	1	0.0%	0.0%	0.0%	Other Recyclable Wood	32	0.4%	0.0%	0.7%
Metal	213	2.4%			Painted/Stained Wood	477	5.4%	2.2%	8.5%
Tin/Steel Cans	6	0.1%	0.0%	0.2%	Creosote-treated Wood	1,313	14.7%	4.7%	24.8%
Major Appliances	0	0.0%	0.0%	0.0%	Other Treated Wood	130	1.5%	0.0%	3.2%
Used Oil Filters	0	0.0%	0.0%	0.0%	Clean Gypsum Board	0	0.0%	0.0%	0.0%
HVAC Ducting	1	0.0%	0.0%	0.0%	Painted/Demolition Gypsum	0	0.0%	0.0%	0.0%
Other Ferrous	120	1.3%	0.5%	2.2%	Rock and Gravel	121	1.4%	0.0%	3.6%
Aluminum Cans	0	0.0%	0.0%	0.0%	Dirt and Sand	836	9.4%	3.0%	15.8%
Other Non-Ferrous	1	0.0%	0.0%	0.0%	Fiberglass insulation	2	0.0%	0.0%	0.0%
R/C Metal	85	0.9%	0.0%	2.0%	R/C C&D	441	4.9%	2.0%	7.9%
E-Waste	11	0.1%			*Hazardous Waste*	0	0.0%		
Brown Goods/Sm Consumer Electronics	5	0.1%	0.0%	0.1%	Paint	0	0.0%	0.0%	0.0%
Computer-related Electronics	6	0.1%	0.0%	0.2%	Vehicle & Equip. Fluids	0	0.0%	0.0%	0.0%
TV's & Other CRTs	0	0.0%	0.0%	0.0%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	503	5.6%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	7	0.1%	0.0%	0.1%	R/C Hazardous Waste	0	0.0%	0.0%	0.0%
Other Rigid Packaging	1	0.0%	0.0%	0.0%	*Special*	216	2.4%		
Polystyrene Packaging/Insulation	12	0.1%	0.0%	0.3%	Textiles	4	0.0%	0.0%	0.1%
Trash Bags	1	0.0%	0.0%	0.0%	Carpet	0	0.0%	0.0%	0.0%
Grocery/ Merch. Bags	0	0.0%	0.0%	0.0%	Carpet Padding	0	0.0%	0.0%	0.0%
Non-Bag Packaging Film	10	0.1%	0.0%	0.2%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	232	2.6%	0.3%	4.9%	Bulky Items	41	0.5%	0.0%	0.9%
Other Film	5	0.1%	0.0%	0.1%	Tires	25	0.3%	0.0%	0.8%
Durable Plastic Items	53	0.6%	0.0%	1.2%	R/C Other	146	1.6%	0.0%	3.4%
Plastic Piping	177	2.0%	0.0%	4.0%	*Mixed Residue/MSW*	354	4.0%		
R/C Plastic	5	0.1%	0.0%	0.2%	Mixed Residue	38	0.4%	0.0%	1.0%
Organics	95	1.1%			MSW	316	3.5%	0.9%	6.2%
Food	0	0.0%	0.0%	0.0%					
Leaves & Grass	61	0.7%	0.1%	1.3%					
Prunings & Trimmings	19	0.2%	0.0%	0.5%	Total Percentage	100%			
Branches & Stumps	7	0.1%	0.0%	0.2%	Total Tons	8,907			
R/C Organic	7	0.1%	0.0%	0.2%	Sample Count	35			

Table 4-11: Composition by Weight - Unidentified Structures (January – December 2007)

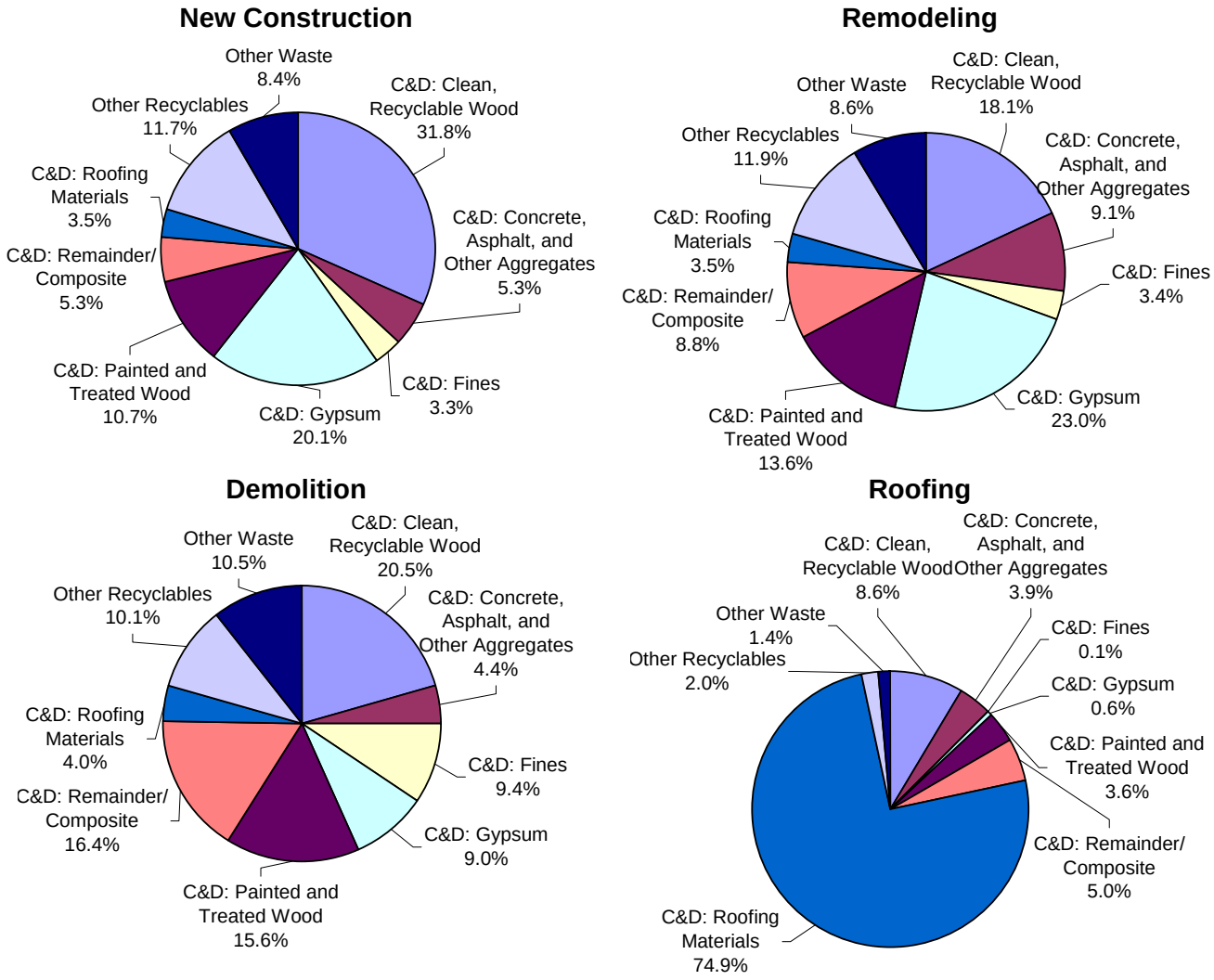
Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	15	2.3%			*C&D*	525	79.5%		
Uncoated Corrugated Cardboard	5	0.8%	0.0%	2.1%	Concrete	9	1.4%	0.5%	2.3%
Paper Bags	0	0.0%	0.0%	0.0%	Asphalt Paving	0	0.0%	0.0%	0.0%
Other Recyclable Paper	10	1.5%	0.0%	4.6%	Composition Roofing	0	0.0%	0.0%	0.0%
Cellulose Insulation	0	0.0%	0.0%	0.0%	Other Asphalt Roofing	20	3.0%	0.0%	10.5%
R/C Paper	0	0.0%	0.0%	0.0%	Other Aggregates	3	0.5%	0.0%	1.0%
Glass	2	0.2%			Clean Dimensional Lumber	88	13.3%	7.5%	19.1%
Glass Bottles and Containers	2	0.2%	0.0%	0.8%	Clean Engineered Wood	126	19.2%	6.7%	31.6%
Flat Glass	0	0.0%	0.0%	0.0%	Pallets and Crates	5	0.8%	0.0%	2.5%
R/C Glass	0	0.0%	0.0%	0.0%	Other Recyclable Wood	16	2.4%	0.0%	7.0%
Metal	22	3.3%			Painted/Stained Wood	29	4.4%	0.0%	8.8%
Tin/Steel Cans	0	0.0%	0.0%	0.0%	Creosote-treated Wood	0	0.0%	0.0%	0.0%
Major Appliances	0	0.0%	0.0%	0.0%	Other Treated Wood	0	0.0%	0.0%	0.0%
Used Oil Filters	0	0.0%	0.0%	0.0%	Clean Gypsum Board	74	11.3%	0.0%	37.0%
HVAC Ducting	0	0.0%	0.0%	0.0%	Painted/Demolition Gypsum	24	3.6%	0.0%	11.6%
Other Ferrous	22	3.3%	0.0%	7.3%	Rock and Gravel	0	0.0%	0.0%	0.0%
Aluminum Cans	0	0.0%	0.0%	0.0%	Dirt and Sand	49	7.5%	2.6%	12.4%
Other Non-Ferrous	0	0.0%	0.0%	0.0%	Fiberglass insulation	1	0.1%	0.0%	0.2%
R/C Metal	0	0.1%	0.0%	0.1%	R/C C&D	80	12.1%	0.0%	24.2%
E-Waste	0	0.0%			*Hazardous Waste*	0	0.0%		
Brown Goods/Sm Consumer Electronics	0	0.0%	0.0%	0.0%	Paint	0	0.0%	0.0%	0.0%
Computer-related Electronics	0	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0	0.0%	0.0%	0.0%
TV's & Other CRTs	0	0.0%	0.0%	0.0%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	14	2.1%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	1	0.1%	0.0%	0.2%	R/C Hazardous Waste	0	0.0%	0.0%	0.0%
Other Rigid Packaging	0	0.0%	0.0%	0.0%	*Special*	18	2.7%		
Polystyrene Packaging/Insulation	0	0.0%	0.0%	0.0%	Textiles	0	0.0%	0.0%	0.1%
Trash Bags	4	0.6%	0.0%	1.7%	Carpet	11	1.6%	0.0%	3.2%
Grocery/ Merch. Bags	0	0.0%	0.0%	0.0%	Carpet Padding	2	0.2%	0.0%	0.8%
Non-Bag Packaging Film	0	0.1%	0.0%	0.1%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	5	0.7%	0.0%	1.9%	Bulky Items	6	0.9%	0.0%	1.7%
Other Film	0	0.0%	0.0%	0.0%	Tires	0	0.0%	0.0%	0.0%
Durable Plastic Items	3	0.5%	0.0%	1.0%	R/C Other	0	0.0%	0.0%	0.0%
Plastic Piping	0	0.0%	0.0%	0.0%	*Mixed Residue/MSW*	65	9.8%		
R/C Plastic	0	0.0%	0.0%	0.1%	Mixed Residue	0	0.0%	0.0%	0.0%
Organics	0	0.0%			MSW	65	9.8%	0.0%	19.6%
Food	0	0.0%	0.0%	0.0%					
Leaves & Grass	0	0.0%	0.0%	0.0%					
Prunings & Trimmings	0	0.0%	0.0%	0.0%	Total Percentage	100%			
Branches & Stumps	0	0.0%	0.0%	0.0%	Total Tons	660			
R/C Organic	0	0.0%	0.0%	0.0%	Sample Count	5			

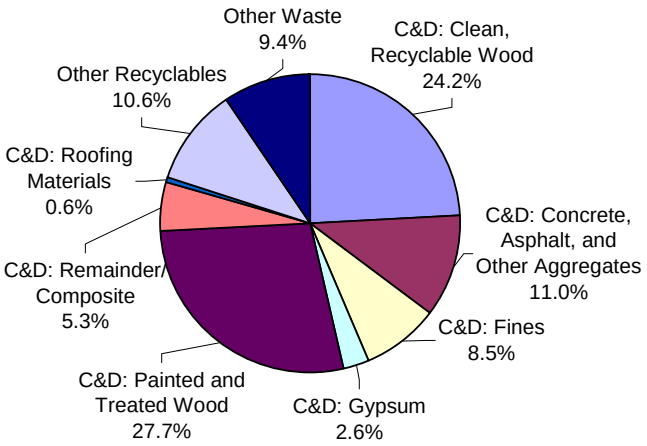
4.1.2 By Activity Type

As shown in Figure 4-2, ***C&D: Clean, Recyclable Wood*** made up between 18% and 32% of loads of new construction, remodeling, demolition, and mixed/other C&D loads. Roofing loads, as expected, contained the highest percentage of ***C&D: Roofing Materials*** (74.9%). ***C&D: Gypsum*** made up at least 20% of new construction and remodeling loads while ***C&D: Painted and Treated Wood*** accounted for about 28% of mixed/other C&D loads.

Figure 4-2: Composition Summary, by Activity Type (January – December 2007)



Mixed/Other C&D



4.1.2a New Construction

A total of 171 loads were sampled from new construction projects during the 2007 study period. An estimated 27,083 tons of C&D waste was attributable to this construction activity type. *Clean gypsum board* and *clean engineered wood* each accounted for about 13% of this waste (Table 4-12). Other large components include *clean dimensional lumber* (11.1%) and *painted/stained wood* (9.5%). When added together, all of the top ten components summed to approximately 77% of the total, by weight. The full composition results from new construction activities are presented in Table 4-17.

Table 4-12: Top Ten Components – New Construction (January – December 2007)

Component	Mean	Cum. %	Tons
Clean Gypsum Board	13.9%	13.9%	3,754
Clean Engineered Wood	13.2%	27.0%	3,562
Clean Dimensional Lumber	11.1%	38.1%	2,998
Painted/Stained Wood	9.5%	47.6%	2,575
Pallets and Crates	6.8%	54.3%	1,829
Painted/Demolition Gypsum	6.2%	60.6%	1,689
Remainder/Composite C&D	5.1%	65.7%	1,394
MSW	4.1%	69.8%	1,103
Other Ferrous Metal	3.9%	73.7%	1,053
Other Aggregates	2.9%	76.6%	791
Total	**76.6%**		**20,747**

4.1.2b Remodeling

During the 2007 study period, 232 vehicles hauling remodeling waste were sampled. Waste from this activity was estimated to be approximately 39,168 tons in 2007. As shown in Table 4-13, the two largest components, *painted/demolition gypsum* and *painted/stained wood*, each composed between 13% and 15% of this waste. The full composition results from remodeling activities are presented in Table 4-18.

Table 4-13: Top Ten Components – Remodeling
(January – December 2007)

Component	Mean	Cum. %	Tons
Painted/Demolition Gypsum	15.0%	15.0%	5,882
Painted/Stained Wood	13.3%	28.3%	5,206
Clean Gypsum Board	8.0%	36.3%	3,145
Remainder/Composite C&D	7.9%	44.3%	3,103
Clean Engineered Wood	7.6%	51.8%	2,962
Clean Dimensional Lumber	7.2%	59.0%	2,809
Other Aggregates	6.1%	65.0%	2,371
Other Ferrous Metal	3.7%	68.7%	1,450
Concrete	2.8%	71.6%	1,113
Pallets and Crates	2.5%	74.1%	966
Total	**74.1%**		**29,007**

4.1.2c Demolition

In calendar year 2007, 151 demolition loads were sampled. Waste from demolition projects was estimated to amount to 53,871 tons during this time period. The weighted composition estimates were applied to these tons to estimate the amount of waste disposed for each component category. As shown in Table 4-14, *remainder/composite C&D* and *painted/stained wood* each accounted for more than 15% of the waste disposed from demolition activities in 2007. When added together, all of the top ten components summed to approximately 81% of the total, by weight. The full composition results from demolition activities are presented in Table 4-19.

Table 4-14: Top Ten Components – Demolition
(January – December 2007)

Component	Mean	Cum. %	Tons
Remainder/Composite C&D	16.1%	16.1%	8,686
Painted/Stained Wood	15.4%	31.6%	8,320
Clean Engineered Wood	9.5%	41.1%	5,139
Dirt and Sand	8.9%	50.0%	4,780
Clean Dimensional Lumber	8.4%	58.4%	4,518
Painted/Demolition Gypsum	7.3%	65.7%	3,948
Mixed Residue	5.4%	71.1%	2,902
Composition Roofing	3.6%	74.6%	1,922
Other Ferrous Metal	3.3%	78.0%	1,793
Other Aggregates	2.6%	80.6%	1,404
Total	**80.6%**		**43,409**

4.1.2d Roofing

A total of 100 roofing loads were sampled during the 2007 study. An estimated 22,692 tons of waste were disposed from roofing activities in 2007. *Composition roofing* (62.8%) and *other asphalt roofing* (12.0%) were the largest components of the total tons disposed from roofing activities in 2007 (Table 4-15). When added together, all of the top ten components summed to approximately 96% of the total, by weight. The full composition results from roofing activities are presented in Table 4-20.

Table 4-15: Top Ten Components – Roofing
(January – December 2007)

Component	Mean	Cum. %	Tons
Composition Roofing	62.8%	62.8%	14,255
Other Asphalt Roofing	12.0%	74.9%	2,734
Remainder/Composite C&D	5.0%	79.8%	1,123
Asphalt Paving	3.8%	83.6%	861
Painted/Stained Wood	3.2%	86.9%	737
Clean Engineered Wood	2.9%	89.8%	660
Other Recyclable Wood	2.6%	92.4%	598
Clean Dimensional Lumber	1.7%	94.1%	389
Pallets and Crates	1.4%	95.5%	308
Other Ferrous Metal	0.9%	96.4%	211
Total	**96.4%**		**21,877**

4.1.2e Mixed/Other C&D

A total of 48 samples were sorted from mixed/other C&D loads during the 2007 study period. Waste from these projects was calculated to account for 12,423 tons of waste in that time period. *Creosote-treated wood* was the largest individual material component, making up almost 22% of the waste from these projects (Table 4-15). *Clean engineered wood* (13.3%) was the next largest component in this waste substream. When added together, all of the top ten components summed to approximately 78% of the total, by weight. The full composition results from mixed/other C&D activities are presented in Table 4-21.

Table 4-16: Top Ten Components – Mixed/Other C&D
(January – December 2007)

Component	Mean	Cum. %	Tons
Creosote-treated Wood	21.7%	21.7%	2,699
Clean Engineered Wood	13.3%	35.0%	1,650
Concrete	8.8%	43.8%	1,091
Dirt and Sand	7.5%	51.3%	930
Pallets and Crates	5.7%	57.0%	706
Remainder/Composite C&D	5.3%	62.3%	659
Painted/Stained Wood	4.9%	67.2%	613
Clean Dimensional Lumber	4.7%	71.9%	584
Prunings & Trimmings	2.9%	74.8%	366
MSW	2.8%	77.6%	343
Total	**77.6%**		**9,640**

4.1.2f Comparison among Activity Types

For all activity types, the top ten components included *remainder/composite C&D*, *clean engineered wood*, *clean dimensional lumber*, and *painted/stained wood*. Several material components only appeared in the top ten component list for one activity type: *clean gypsum board* for remodeling, *mixed residue* for demolition projects, *asphalt paving* and *other recyclable wood* for roofing, and *creosote-treated wood* and *prunings & trimmings* for mixed/other C&D.

Table 4-17: Composition by Weight – New Construction (January – December 2007)

Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	1,221	4.5%			*C&D*	21,624	79.8%		
Uncoated Corrugated Cardboard	718	2.7%	2.0%	3.3%	Concrete	368	1.4%	0.8%	2.0%
Paper Bags	87	0.3%	0.1%	0.5%	Asphalt Paving	270	1.0%	0.4%	1.6%
Other Recyclable Paper	247	0.9%	0.5%	1.3%	Composition Roofing	455	1.7%	0.4%	2.9%
Cellulose Insulation	1	0.0%	0.0%	0.0%	Other Asphalt Roofing	480	1.8%	0.0%	4.5%
R/C Paper	168	0.6%	0.3%	0.9%	Other Aggregates	791	2.9%	1.0%	4.9%
Glass	102	0.4%			Clean Dimensional Lumber	2,998	11.1%	8.6%	13.5%
Glass Bottles and Containers	18	0.1%	0.0%	0.2%	Clean Engineered Wood	3,562	13.2%	10.4%	15.9%
Flat Glass	44	0.2%	0.0%	0.3%	Pallets and Crates	1,829	6.8%	4.8%	8.7%
R/C Glass	40	0.1%	0.0%	0.3%	Other Recyclable Wood	215	0.8%	0.4%	1.2%
Metal	1,255	4.6%			Painted/Stained Wood	2,575	9.5%	6.7%	12.3%
Tin/Steel Cans	24	0.1%	0.0%	0.1%	Creosote-treated Wood	12	0.0%	0.0%	0.1%
Major Appliances	20	0.1%	0.0%	0.2%	Other Treated Wood	302	1.1%	0.3%	1.9%
Used Oil Filters	0	0.0%	0.0%	0.0%	Clean Gypsum Board	3,754	13.9%	8.7%	19.1%
HVAC Ducting	31	0.1%	0.0%	0.2%	Painted/Demolition Gypsum	1,689	6.2%	3.6%	8.9%
Other Ferrous	1,053	3.9%	2.8%	5.0%	Rock and Gravel	208	0.8%	0.0%	1.6%
Aluminum Cans	1	0.0%	0.0%	0.0%	Dirt and Sand	692	2.6%	1.2%	3.9%
Other Non-Ferrous	14	0.1%	0.0%	0.1%	Fiberglass insulation	30	0.1%	0.0%	0.2%
R/C Metal	112	0.4%	0.2%	0.6%	R/C C&D	1,394	5.1%	2.7%	7.6%
E-Waste	9	0.0%			*Hazardous Waste*	43	0.2%		
Brown Goods/Sm Consumer Electronics	8	0.0%	0.0%	0.1%	Paint	23	0.1%	0.0%	0.2%
Computer-related Electronics	0	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0	0.0%	0.0%	0.0%
TV's & Other CRTs	1	0.0%	0.0%	0.0%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	799	2.9%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	20	0.1%	0.0%	0.1%	R/C Hazardous Waste	19	0.1%	0.0%	0.2%
Other Rigid Packaging	9	0.0%	0.0%	0.1%	*Special*	373	1.4%		
Polystyrene Packaging/Insulation	116	0.4%	0.2%	0.6%	Textiles	52	0.2%	0.0%	0.4%
Trash Bags	24	0.1%	0.0%	0.1%	Carpet	209	0.8%	0.4%	1.2%
Grocery/ Merch. Bags	4	0.0%	0.0%	0.0%	Carpet Padding	39	0.1%	0.0%	0.2%
Non-Bag Packaging Film	34	0.1%	0.1%	0.2%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	258	1.0%	0.6%	1.3%	Bulky Items	58	0.2%	0.1%	0.4%
Other Film	6	0.0%	0.0%	0.0%	Tires	0	0.0%	0.0%	0.0%
Durable Plastic Items	33	0.1%	0.1%	0.2%	R/C Other	14	0.1%	0.0%	0.1%
Plastic Piping	258	1.0%	0.6%	1.3%	*Mixed Residue/MSW*	1,268	4.7%		
R/C Plastic	37	0.1%	0.0%	0.3%	Mixed Residue	165	0.6%	0.2%	1.0%
Organics	390	1.4%			MSW	1,103	4.1%	2.9%	5.2%
Food	13	0.0%	0.0%	0.1%					
Leaves & Grass	190	0.7%	0.3%	1.1%					
Prunings & Trimmings	152	0.6%	0.0%	1.1%	Total Percentage	100%			
Branches & Stumps	35	0.1%	0.0%	0.2%	Total Tons	27,083			
R/C Organic	0	0.0%	0.0%	0.0%	Sample Count	171			

Table 4-18: Composition by Weight – Remodeling (January – December 2007)

Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	1,242	3.2%			*C&D*	31,031	79.2%		
Uncoated Corrugated Cardboard	612	1.6%	1.0%	2.1%	Concrete	1,113	2.8%	1.0%	4.6%
Paper Bags	80	0.2%	0.0%	0.4%	Asphalt Paving	97	0.2%	0.0%	0.5%
Other Recyclable Paper	203	0.5%	0.2%	0.8%	Composition Roofing	874	2.2%	1.2%	3.3%
Cellulose Insulation	104	0.3%	0.1%	0.4%	Other Asphalt Roofing	480	1.2%	0.0%	2.4%
R/C Paper	243	0.6%	0.2%	1.1%	Other Aggregates	2,371	6.1%	3.1%	9.0%
Glass	422	1.1%			Clean Dimensional Lumber	2,809	7.2%	4.9%	9.4%
Glass Bottles and Containers	5	0.0%	0.0%	0.0%	Clean Engineered Wood	2,962	7.6%	5.1%	10.0%
Flat Glass	344	0.9%	0.4%	1.4%	Pallets and Crates	966	2.5%	1.6%	3.3%
R/C Glass	73	0.2%	0.0%	0.4%	Other Recyclable Wood	363	0.9%	0.4%	1.4%
Metal	2,046	5.2%			Painted/Stained Wood	5,206	13.3%	10.7%	15.9%
Tin/Steel Cans	16	0.0%	0.0%	0.1%	Creosote-treated Wood	0	0.0%	0.0%	0.0%
Major Appliances	97	0.2%	0.1%	0.4%	Other Treated Wood	102	0.3%	0.0%	0.5%
Used Oil Filters	27	0.1%	0.0%	0.2%	Clean Gypsum Board	3,145	8.0%	5.4%	10.6%
HVAC Ducting	141	0.4%	0.0%	0.7%	Painted/Demolition Gypsum	5,882	15.0%	11.4%	18.6%
Other Ferrous	1,450	3.7%	2.6%	4.8%	Rock and Gravel	457	1.2%	0.1%	2.3%
Aluminum Cans	2	0.0%	0.0%	0.0%	Dirt and Sand	871	2.2%	0.8%	3.6%
Other Non-Ferrous	90	0.2%	0.1%	0.4%	Fiberglass insulation	232	0.6%	0.1%	1.1%
R/C Metal	223	0.6%	0.3%	0.8%	R/C C&D	3,103	7.9%	5.8%	10.0%
E-Waste	69	0.2%			*Hazardous Waste*	218	0.6%		
Brown Goods/Sm Consumer Electronics	44	0.1%	0.0%	0.2%	Paint	134	0.3%	0.1%	0.6%
Computer-related Electronics	0	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	2	0.0%	0.0%	0.0%
TV's & Other CRTs	25	0.1%	0.0%	0.1%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	690	1.8%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	20	0.1%	0.0%	0.1%	R/C Hazardous Waste	82	0.2%	0.0%	0.4%
Other Rigid Packaging	3	0.0%	0.0%	0.0%	*Special*	1,655	4.2%		
Polystyrene Packaging/Insulation	159	0.4%	0.1%	0.7%	Textiles	141	0.4%	0.0%	0.7%
Trash Bags	42	0.1%	0.0%	0.2%	Carpet	939	2.4%	1.4%	3.4%
Grocery/ Merch. Bags	1	0.0%	0.0%	0.0%	Carpet Padding	185	0.5%	0.0%	0.9%
Non-Bag Packaging Film	24	0.1%	0.0%	0.1%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	198	0.5%	0.3%	0.7%	Bulky Items	380	1.0%	0.5%	1.4%
Other Film	14	0.0%	0.0%	0.1%	Tires	6	0.0%	0.0%	0.0%
Durable Plastic Items	84	0.2%	0.1%	0.3%	R/C Other	4	0.0%	0.0%	0.0%
Plastic Piping	116	0.3%	0.2%	0.4%	*Mixed Residue/MSW*	1,231	3.1%		
R/C Plastic	30	0.1%	0.0%	0.1%	Mixed Residue	338	0.9%	0.1%	1.6%
Organics	563	1.4%			MSW	892	2.3%	1.6%	2.9%
Food	0	0.0%	0.0%	0.0%					
Leaves & Grass	200	0.5%	0.2%	0.8%					
Prunings & Trimmings	225	0.6%	0.3%	0.9%	Total Percentage	100%			
Branches & Stumps	63	0.2%	0.0%	0.3%	Total Tons	39,168			
R/C Organic	75	0.2%	0.0%	0.4%	Sample Count	232			

Table 4-19: Composition by Weight – Demolition (January – December 2007)

Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	566	1.0%			*C&D*	42,733	79.3%		
Uncoated Corrugated Cardboard	224	0.4%	0.3%	0.6%	Concrete	930	1.7%	0.4%	3.1%
Paper Bags	34	0.1%	0.0%	0.1%	Asphalt Paving	41	0.1%	0.0%	0.2%
Other Recyclable Paper	222	0.4%	0.1%	0.7%	Composition Roofing	1,922	3.6%	1.4%	5.8%
Cellulose Insulation	4	0.0%	0.0%	0.0%	Other Asphalt Roofing	235	0.4%	0.0%	1.2%
R/C Paper	82	0.2%	0.0%	0.3%	Other Aggregates	1,404	2.6%	1.2%	4.0%
Glass	232	0.4%			Clean Dimensional Lumber	4,518	8.4%	6.3%	10.5%
Glass Bottles and Containers	0	0.0%	0.0%	0.0%	Clean Engineered Wood	5,139	9.5%	7.0%	12.1%
Flat Glass	191	0.4%	0.1%	0.6%	Pallets and Crates	596	1.1%	0.5%	1.7%
R/C Glass	41	0.1%	0.0%	0.2%	Other Recyclable Wood	778	1.4%	0.7%	2.2%
Metal	2,429	4.5%			Painted/Stained Wood	8,320	15.4%	12.0%	18.9%
Tin/Steel Cans	6	0.0%	0.0%	0.0%	Creosote-treated Wood	0	0.0%	0.0%	0.0%
Major Appliances	95	0.2%	0.0%	0.3%	Other Treated Wood	87	0.2%	0.0%	0.3%
Used Oil Filters	0	0.0%	0.0%	0.0%	Clean Gypsum Board	888	1.6%	0.9%	2.4%
HVAC Ducting	268	0.5%	0.2%	0.8%	Painted/Demolition Gypsum	3,948	7.3%	4.8%	9.9%
Other Ferrous	1,793	3.3%	2.2%	4.4%	Rock and Gravel	297	0.6%	0.1%	1.0%
Aluminum Cans	1	0.0%	0.0%	0.0%	Dirt and Sand	4,780	8.9%	4.6%	13.1%
Other Non-Ferrous	59	0.1%	0.0%	0.2%	Fiberglass insulation	166	0.3%	0.1%	0.6%
R/C Metal	207	0.4%	0.2%	0.6%	R/C C&D	8,686	16.1%	11.9%	20.3%
E-Waste	41	0.1%			*Hazardous Waste*	323	0.6%		
Brown Goods/Sm Consumer Electronics	35	0.1%	0.0%	0.1%	Paint	5	0.0%	0.0%	0.0%
Computer-related Electronics	0	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0	0.0%	0.0%	0.0%
TV's & Other CRTs	6	0.0%	0.0%	0.0%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	555	1.0%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	9	0.0%	0.0%	0.0%	R/C Hazardous Waste	318	0.6%	0.0%	1.1%
Other Rigid Packaging	1	0.0%	0.0%	0.0%	*Special*	1,669	3.1%		
Polystyrene Packaging/Insulation	20	0.0%	0.0%	0.1%	Textiles	60	0.1%	0.0%	0.2%
Trash Bags	7	0.0%	0.0%	0.0%	Carpet	1,214	2.3%	0.0%	4.7%
Grocery/ Merch. Bags	0	0.0%	0.0%	0.0%	Carpet Padding	55	0.1%	0.0%	0.2%
Non-Bag Packaging Film	22	0.0%	0.0%	0.1%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	79	0.1%	0.1%	0.2%	Bulky Items	309	0.6%	0.2%	0.9%
Other Film	7	0.0%	0.0%	0.0%	Tires	26	0.0%	0.0%	0.1%
Durable Plastic Items	117	0.2%	0.1%	0.3%	R/C Other	5	0.0%	0.0%	0.0%
Plastic Piping	260	0.5%	0.2%	0.8%	*Mixed Residue/MSW*	3,699	6.9%		
R/C Plastic	32	0.1%	0.0%	0.1%	Mixed Residue	2,902	5.4%	3.1%	7.7%
Organics	1,625	3.0%			MSW	798	1.5%	0.8%	2.1%
Food	1	0.0%	0.0%	0.0%					
Leaves & Grass	604	1.1%	0.5%	1.8%					
Prunings & Trimmings	661	1.2%	0.2%	2.3%	Total Percentage	100%			
Branches & Stumps	356	0.7%	0.0%	1.3%	Total Tons	53,871			
R/C Organic	3	0.0%	0.0%	0.0%	Sample Count	151			

Table 4-20: Composition by Weight – Roofing (January – December 2007)

Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	97	0.4%			*C&D*	21,904	96.5%		
Uncoated Corrugated Cardboard	40	0.2%	0.1%	0.2%	Concrete	17	0.1%	0.0%	0.2%
Paper Bags	19	0.1%	0.0%	0.1%	Asphalt Paving	861	3.8%	1.1%	6.5%
Other Recyclable Paper	32	0.1%	0.0%	0.3%	Composition Roofing	14,255	62.8%	55.0%	70.7%
Cellulose Insulation	2	0.0%	0.0%	0.0%	Other Asphalt Roofing	2,734	12.0%	5.4%	18.7%
R/C Paper	5	0.0%	0.0%	0.0%	Other Aggregates	0	0.0%	0.0%	0.0%
Glass	8	0.0%			Clean Dimensional Lumber	389	1.7%	1.1%	2.4%
Glass Bottles and Containers	0	0.0%	0.0%	0.0%	Clean Engineered Wood	660	2.9%	1.8%	4.1%
Flat Glass	8	0.0%	0.0%	0.1%	Pallets and Crates	308	1.4%	0.5%	2.2%
R/C Glass	0	0.0%	0.0%	0.0%	Other Recyclable Wood	598	2.6%	1.4%	3.8%
Metal	266	1.2%			Painted/Stained Wood	737	3.2%	1.7%	4.8%
Tin/Steel Cans	1	0.0%	0.0%	0.0%	Creosote-treated Wood	21	0.1%	0.0%	0.3%
Major Appliances	7	0.0%	0.0%	0.1%	Other Treated Wood	57	0.2%	0.0%	0.5%
Used Oil Filters	0	0.0%	0.0%	0.0%	Clean Gypsum Board	48	0.2%	0.0%	0.5%
HVAC Ducting	10	0.0%	0.0%	0.1%	Painted/Demolition Gypsum	77	0.3%	0.0%	0.7%
Other Ferrous	211	0.9%	0.5%	1.4%	Rock and Gravel	0	0.0%	0.0%	0.0%
Aluminum Cans	1	0.0%	0.0%	0.0%	Dirt and Sand	17	0.1%	0.0%	0.2%
Other Non-Ferrous	23	0.1%	0.0%	0.2%	Fiberglass insulation	1	0.0%	0.0%	0.0%
R/C Metal	13	0.1%	0.0%	0.1%	R/C C&D	1,123	5.0%	0.5%	9.4%
E-Waste	19	0.1%			*Hazardous Waste*	11	0.0%		
Brown Goods/Sm Consumer Electronics	0	0.0%	0.0%	0.0%	Paint	5	0.0%	0.0%	0.1%
Computer-related Electronics	1	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0	0.0%	0.0%	0.0%
TV's & Other CRTs	18	0.1%	0.0%	0.2%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	175	0.8%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	2	0.0%	0.0%	0.0%	R/C Hazardous Waste	6	0.0%	0.0%	0.1%
Other Rigid Packaging	0	0.0%	0.0%	0.0%	*Special*	32	0.1%		
Polystyrene Packaging/Insulation	96	0.4%	0.0%	0.9%	Textiles	6	0.0%	0.0%	0.0%
Trash Bags	2	0.0%	0.0%	0.0%	Carpet	11	0.0%	0.0%	0.1%
Grocery/ Merch. Bags	0	0.0%	0.0%	0.0%	Carpet Padding	3	0.0%	0.0%	0.0%
Non-Bag Packaging Film	16	0.1%	0.0%	0.1%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	47	0.2%	0.1%	0.3%	Bulky Items	12	0.1%	0.0%	0.1%
Other Film	2	0.0%	0.0%	0.0%	Tires	0	0.0%	0.0%	0.0%
Durable Plastic Items	4	0.0%	0.0%	0.0%	R/C Other	0	0.0%	0.0%	0.0%
Plastic Piping	4	0.0%	0.0%	0.0%	*Mixed Residue/MSW*	148	0.7%		
R/C Plastic	1	0.0%	0.0%	0.0%	Mixed Residue	67	0.3%	0.0%	0.8%
Organics	31	0.1%			MSW	81	0.4%	0.1%	0.6%
Food	0	0.0%	0.0%	0.0%					
Leaves & Grass	15	0.1%	0.0%	0.1%					
Prunings & Trimmings	16	0.1%	0.0%	0.2%	Total Percentage	100%			
Branches & Stumps	0	0.0%	0.0%	0.0%	Total Tons	22,692			
R/C Organic	0	0.0%	0.0%	0.0%	Sample Count	100			

Table 4-21: Composition by Weight – Mixed/Other C&D (January – December 2007)

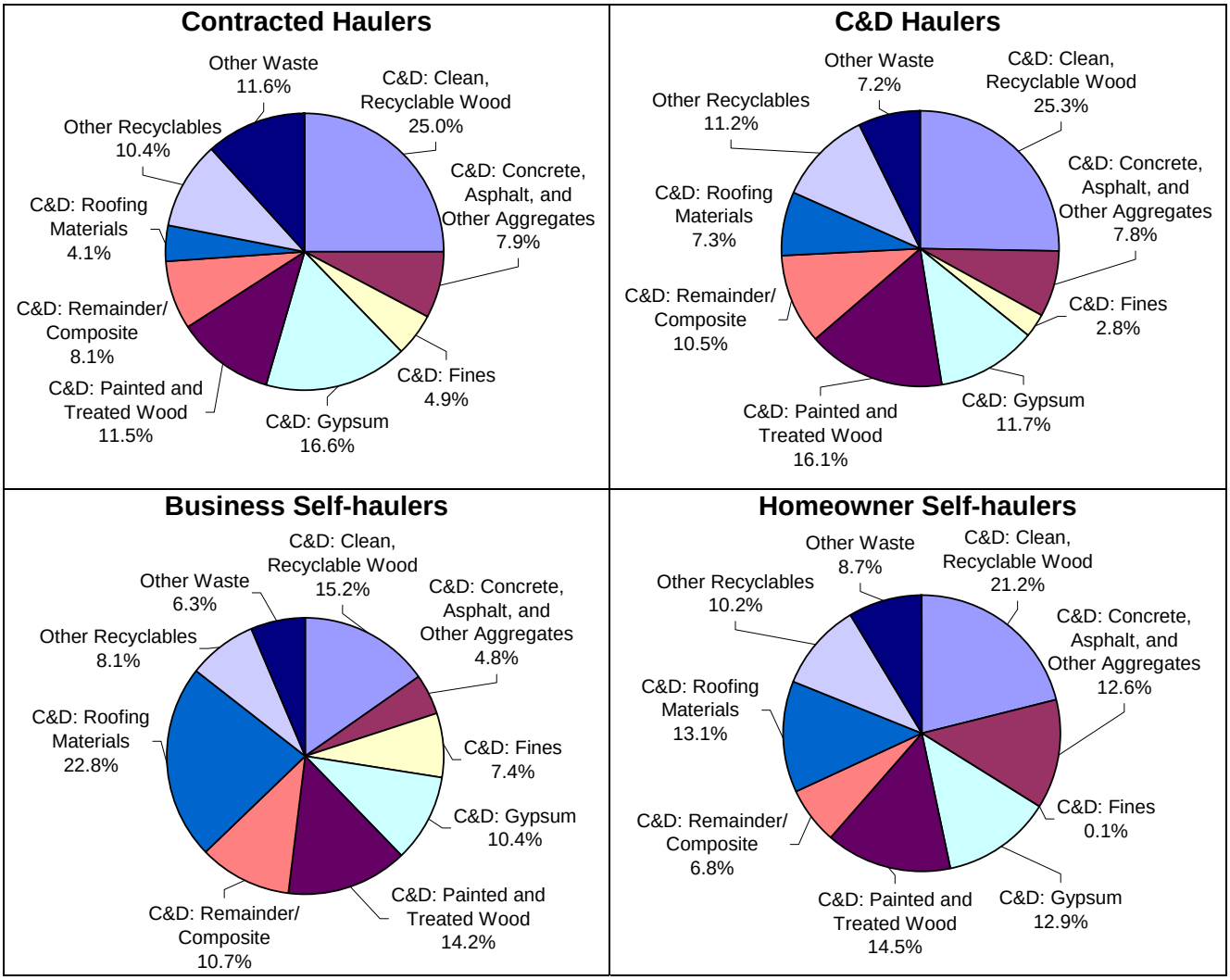
Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	254	2.0%			*C&D*	9,932	79.9%		
Uncoated Corrugated Cardboard	208	1.7%	0.6%	2.8%	Concrete	1,091	8.8%	0.0%	18.0%
Paper Bags	1	0.0%	0.0%	0.0%	Asphalt Paving	0	0.0%	0.0%	0.0%
Other Recyclable Paper	40	0.3%	0.0%	0.7%	Composition Roofing	71	0.6%	0.0%	1.3%
Cellulose Insulation	0	0.0%	0.0%	0.0%	Other Asphalt Roofing	0	0.0%	0.0%	0.0%
R/C Paper	5	0.0%	0.0%	0.1%	Other Aggregates	277	2.2%	0.0%	4.6%
Glass	34	0.3%			Clean Dimensional Lumber	584	4.7%	2.4%	7.0%
Glass Bottles and Containers	0	0.0%	0.0%	0.0%	Clean Engineered Wood	1,650	13.3%	5.5%	21.1%
Flat Glass	33	0.3%	0.0%	0.5%	Pallets and Crates	706	5.7%	1.2%	10.2%
R/C Glass	1	0.0%	0.0%	0.0%	Other Recyclable Wood	71	0.6%	0.1%	1.1%
Metal	326	2.6%			Painted/Stained Wood	613	4.9%	2.5%	7.3%
Tin/Steel Cans	6	0.1%	0.0%	0.1%	Creosote-treated Wood	2,699	21.7%	10.6%	32.8%
Major Appliances	24	0.2%	0.0%	0.4%	Other Treated Wood	130	1.0%	0.0%	2.3%
Used Oil Filters	0	0.0%	0.0%	0.0%	Clean Gypsum Board	110	0.9%	0.0%	1.8%
HVAC Ducting	1	0.0%	0.0%	0.0%	Painted/Demolition Gypsum	218	1.8%	0.0%	4.2%
Other Ferrous	163	1.3%	0.6%	2.0%	Rock and Gravel	121	1.0%	0.0%	2.5%
Aluminum Cans	0	0.0%	0.0%	0.0%	Dirt and Sand	930	7.5%	2.8%	12.2%
Other Non-Ferrous	10	0.1%	0.0%	0.2%	Fiberglass insulation	2	0.0%	0.0%	0.0%
R/C Metal	122	1.0%	0.1%	1.8%	R/C C&D	659	5.3%	2.4%	8.2%
E-Waste	11	0.1%			*Hazardous Waste*	0	0.0%		
Brown Goods/Sm Consumer Electronics	5	0.0%	0.0%	0.1%	Paint	0	0.0%	0.0%	0.0%
Computer-related Electronics	6	0.0%	0.0%	0.1%	Vehicle & Equip. Fluids	0	0.0%	0.0%	0.0%
TV's & Other CRTs	0	0.0%	0.0%	0.0%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	543	4.4%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	8	0.1%	0.0%	0.1%	R/C Hazardous Waste	0	0.0%	0.0%	0.0%
Other Rigid Packaging	1	0.0%	0.0%	0.0%	*Special*	297	2.4%		
Polystyrene Packaging/Insulation	12	0.1%	0.0%	0.2%	Textiles	6	0.0%	0.0%	0.1%
Trash Bags	1	0.0%	0.0%	0.0%	Carpet	4	0.0%	0.0%	0.1%
Grocery/ Merch. Bags	0	0.0%	0.0%	0.0%	Carpet Padding	0	0.0%	0.0%	0.0%
Non-Bag Packaging Film	10	0.1%	0.0%	0.2%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	245	2.0%	0.3%	3.6%	Bulky Items	115	0.9%	0.0%	1.8%
Other Film	5	0.0%	0.0%	0.1%	Tires	25	0.2%	0.0%	0.5%
Durable Plastic Items	56	0.4%	0.0%	0.9%	R/C Other	146	1.2%	0.0%	2.4%
Plastic Piping	187	1.5%	0.1%	2.9%	*Mixed Residue/MSW*	429	3.5%		
R/C Plastic	18	0.1%	0.0%	0.3%	Mixed Residue	87	0.7%	0.0%	1.4%
Organics	597	4.8%			MSW	343	2.8%	0.9%	4.6%
Food	0	0.0%	0.0%	0.0%					
Leaves & Grass	62	0.5%	0.1%	0.9%					
Prunings & Trimmings	366	2.9%	0.0%	6.1%	Total Percentage	100%			
Branches & Stumps	162	1.3%	0.0%	2.9%	Total Tons	12,423			
R/C Organic	7	0.1%	0.0%	0.2%	Sample Count	48			

4.1.3 By Hauler Type

As shown in Figure 4-3, ***C&D: Clean, Recyclable Wood*** made up a large portion of loads from all four types of haulers: approximately 25% of contracted and C&D hauler loads, about 21% of homeowner self-haul, and about 15% of business self-haul loads. ***C&D: Roofing Materials*** accounted for almost 23% of business self-haul loads. The composition estimates for each hauler type were estimated using an unweighted process; consequently, composition percentages were not applied to tonnages. Some loads did not have an associated hauler type, so the sum of samples by hauler type (694) does not equal total number of samples from waste hauled to transfer stations (702).

Figure 4-3: Composition Summary, by Hauler Type (January – December 2007)



4.1.3a Contracted Haulers

A total of 190 loads were sampled from contracted haulers (Waste Management and Allied, which the City contracts with to collect and dispose of MSW) during the 2007 study period. As shown in Table 4-22, *clean engineered wood* (11.7%), *painted/stained wood* (9.5%), and *clean gypsum board* (8.7%) were the largest components disposed by contracted haulers in 2007. When added together, all of the top ten components summed to approximately 71% of the total. The full composition results from contracted haulers are presented in Table 4-26.

Table 4-22: Top Ten Components – Contracted Haulers (January – December 2007)

Component	Mean	Cum. %
Clean Engineered Wood	11.7%	11.7%
Painted/Stained Wood	9.5%	21.3%
Clean Gypsum Board	8.7%	29.9%
Clean Dimensional Lumber	8.0%	38.0%
Painted/Demolition Gypsum	7.9%	45.9%
Remainder/Composite C&D	7.6%	53.5%
Concrete	4.8%	58.4%
Pallets and Crates	4.3%	62.7%
Dirt and Sand	4.1%	66.8%
MSW	4.0%	70.8%
Total	**70.8%**	

4.1.3b C&D Haulers

A total of 128 samples were sorted from C&D hauler loads during the 2007 study period. C&D haulers are companies whose principal business includes demolition and/or hauling of construction and demolition waste, such as large construction or demolition contractors. Three of the top four components were wood categories, including *painted/stained wood*, *clean engineered wood*, and *clean dimensional lumber*. The full composition results from C&D haulers are presented in Table 4-27.

Table 4-23: Top Ten Components – C&D Haulers (January – December 2007)

Component	Mean	Cum. %
Painted/Stained Wood	13.6%	13.6%
Clean Engineered Wood	11.9%	25.5%
Remainder/Composite C&D	10.1%	35.6%
Clean Dimensional Lumber	9.9%	45.5%
Painted/Demolition Gypsum	8.8%	54.2%
Other Aggregates	5.2%	59.5%
Composition Roofing	4.3%	63.8%
Other Ferrous Metal	3.4%	67.2%
Other Asphalt Roofing	3.0%	70.2%
Clean Gypsum Board	2.9%	73.1%
Total	**73.1%**	

4.1.3c Business Self-haulers

During the 2007 study, 357 business self-haul loads were sampled. As shown in Table 4-24, *composition roofing* was the largest component of this waste, accounting for about 20% of the total, by weight. *Painted/stained wood* and *remainder/composite C&D* each made up about 11% of the waste disposed by business self-haulers in 2007. When added together, all of the top ten components summed to about three-quarters of the total waste from these vehicles. The full composition results from business self-haulers are presented in Table 4-28.

Table 4-24: Top Ten Components – Business Self-haulers (January – December 2007)

Component	Mean	Cum. %
Composition Roofing	19.5%	19.5%
Painted/Stained Wood	10.6%	30.1%
Remainder/Composite C&D	10.5%	40.7%
Dirt and Sand	6.4%	47.1%
Painted/Demolition Gypsum	6.2%	53.3%
Clean Engineered Wood	5.9%	59.2%
Clean Dimensional Lumber	5.3%	64.5%
Clean Gypsum Board	4.2%	68.7%
Other Asphalt Roofing	3.3%	72.0%
Creosote-treated Wood	2.9%	74.9%
Total	**74.9%**	

4.1.3d Homeowner Self-haulers

Nineteen samples were completed on loads from homeowner self-haulers in 2007. As shown in Table 4-25, *other asphalt roofing* (13.1%), *other aggregates* (11.7%), and *painted/stained wood* (10.2%) were the largest components of the C&D waste disposed by homeowner self-haulers in 2007. *Painted/demolition gypsum* and *clean dimensional lumber* each accounted for at least 9% of the waste from these vehicles. The full composition results from homeowner self-haulers are presented in Table 4-29.

Table 4-25: Top Ten Components – Homeowner Self-haulers (January – December 2007)

Component	Mean	Cum. %
Other Asphalt Roofing	13.1%	13.1%
Other Aggregates	11.7%	24.7%
Painted/Stained Wood	10.2%	34.9%
Painted/Demolition Gypsum	9.6%	44.5%
Clean Dimensional Lumber	9.2%	53.7%
Remainder/Composite C&D	6.5%	60.1%
Clean Engineered Wood	5.4%	65.5%
Pallets and Crates	4.4%	69.9%
Other Treated Wood	4.3%	74.2%
Other Ferrous Metal	4.0%	78.2%
Total	**78.2%**	

4.1.3e Comparisons among Hauler Types

Clean dimensional lumber, clean engineered wood, painted/demolition gypsum, painted/stained wood, and remainder/composite C&D appeared in the list of top ten components for all four hauler types. *Clean gypsum board* appeared in the top ten lists for all hauler types except for homeowner self-haul, while *other asphalt roofing* was common to each hauler other than contracted haulers. *Concrete* and *MSW* were only found in the top ten list for contracted haulers. Similarly *creosote-treated wood* was unique to business self-haulers, and *other treated wood* was only found in the homeowner self-haul top ten list.

Table 4-26: Composition by Weight – Contracted Haulers (January – December 2007)

Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	3.4%			*C&D*	78.0%		
Uncoated Corrugated Cardboard	1.7%	1.2%	2.2%	Concrete	4.8%	1.2%	8.5%
Paper Bags	0.3%	0.1%	0.4%	Asphalt Paving	0.6%	0.0%	1.3%
Other Recyclable Paper	0.9%	0.6%	1.3%	Composition Roofing	3.6%	1.7%	5.5%
Cellulose Insulation	0.1%	0.0%	0.1%	Other Asphalt Roofing	0.5%	0.0%	1.2%
R/C Paper	0.4%	0.1%	0.7%	Other Aggregates	2.5%	1.1%	3.8%
Glass	0.5%			Clean Dimensional Lumber	8.0%	6.3%	9.8%
Glass Bottles and Containers	0.0%	0.0%	0.0%	Clean Engineered Wood	11.7%	8.5%	15.0%
Flat Glass	0.5%	0.2%	0.7%	Pallets and Crates	4.3%	3.2%	5.4%
R/C Glass	0.1%	0.0%	0.1%	Other Recyclable Wood	0.9%	0.4%	1.3%
Metal	4.7%			Painted/Stained Wood	9.5%	7.6%	11.4%
Tin/Steel Cans	0.1%	0.0%	0.1%	Creosote-treated Wood	1.7%	0.0%	3.8%
Major Appliances	0.2%	0.0%	0.3%	Other Treated Wood	0.3%	0.0%	0.7%
Used Oil Filters	0.0%	0.0%	0.0%	Clean Gypsum Board	8.7%	5.4%	12.0%
HVAC Ducting	0.3%	0.1%	0.6%	Painted/Demolition Gypsum	7.9%	5.3%	10.5%
Other Ferrous	3.4%	2.5%	4.3%	Rock and Gravel	0.8%	0.1%	1.5%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	4.1%	2.0%	6.2%
Other Non-Ferrous	0.1%	0.0%	0.2%	Fiberglass insulation	0.4%	0.1%	0.8%
R/C Metal	0.7%	0.4%	1.0%	R/C C&D	7.6%	5.6%	9.7%
E-Waste	0.1%			*Hazardous Waste*	0.6%		
Brown Goods/Sm Consumer Electronics	0.0%	0.0%	0.1%	Paint	0.1%	0.0%	0.2%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.1%	Used Oil	0.0%	0.0%	0.0%
Plastic	3.0%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.1%	0.0%	0.1%	R/C Hazardous Waste	0.5%	0.0%	1.0%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	2.4%		
Polystyrene Packaging/Insulation	0.2%	0.1%	0.2%	Textiles	0.2%	0.1%	0.4%
Trash Bags	0.0%	0.0%	0.0%	Carpet	0.9%	0.5%	1.3%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.1%	0.0%	0.2%
Non-Bag Packaging Film	0.1%	0.1%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	1.1%	0.5%	1.7%	Bulky Items	1.0%	0.5%	1.5%
Other Film	0.0%	0.0%	0.1%	Tires	0.1%	0.0%	0.2%
Durable Plastic Items	0.4%	0.2%	0.5%	R/C Other	0.1%	0.0%	0.1%
Plastic Piping	1.0%	0.5%	1.6%	*Mixed Residue/MSW*	6.0%		
R/C Plastic	0.1%	0.0%	0.3%	Mixed Residue	2.0%	0.7%	3.4%
Organics	1.3%			MSW	4.0%	2.9%	5.1%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	0.6%	0.3%	0.9%				
Prunings & Trimmings	0.5%	0.2%	0.7%				
Branches & Stumps	0.1%	0.0%	0.3%	Total Percentage	100.0%		
R/C Organic	0.0%	0.0%	0.1%	Sample Count	190		

Table 4-27: Composition by Weight – C&D Haulers (January – December 2007)

Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	1.7%			*C&D*	81.4%		
Uncoated Corrugated Cardboard	1.0%	0.7%	1.4%	Concrete	2.5%	0.9%	4.2%
Paper Bags	0.2%	0.1%	0.3%	Asphalt Paving	0.1%	0.0%	0.2%
Other Recyclable Paper	0.3%	0.1%	0.4%	Composition Roofing	4.3%	2.0%	6.6%
Cellulose Insulation	0.1%	0.0%	0.2%	Other Asphalt Roofing	3.0%	0.0%	6.4%
R/C Paper	0.2%	0.0%	0.4%	Other Aggregates	5.2%	2.2%	8.2%
Glass	0.4%			Clean Dimensional Lumber	9.9%	7.0%	12.8%
Glass Bottles and Containers	0.0%	0.0%	0.1%	Clean Engineered Wood	11.9%	8.6%	15.3%
Flat Glass	0.3%	0.1%	0.6%	Pallets and Crates	2.3%	0.9%	3.8%
R/C Glass	0.0%	0.0%	0.1%	Other Recyclable Wood	1.1%	0.2%	2.0%
Metal	4.7%			Painted/Stained Wood	13.6%	9.6%	17.6%
Tin/Steel Cans	0.0%	0.0%	0.0%	Creosote-treated Wood	2.4%	0.0%	6.4%
Major Appliances	0.2%	0.0%	0.4%	Other Treated Wood	0.1%	0.0%	0.3%
Used Oil Filters	0.0%	0.0%	0.0%	Clean Gypsum Board	2.9%	1.5%	4.3%
HVAC Ducting	0.6%	0.2%	1.0%	Painted/Demolition Gypsum	8.8%	5.3%	12.3%
Other Ferrous	3.4%	2.3%	4.5%	Rock and Gravel	0.3%	0.0%	0.6%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	2.5%	1.0%	4.0%
Other Non-Ferrous	0.1%	0.0%	0.2%	Fiberglass insulation	0.3%	0.0%	0.6%
R/C Metal	0.4%	0.2%	0.6%	R/C C&D	10.1%	6.9%	13.2%
E-Waste	0.1%			*Hazardous Waste*	0.3%		
Brown Goods/Sm Consumer Electronics	0.0%	0.0%	0.1%	Paint	0.1%	0.0%	0.2%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.1%	Used Oil	0.0%	0.0%	0.0%
Plastic	1.5%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.0%	R/C Hazardous Waste	0.2%	0.0%	0.3%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	3.7%		
Polystyrene Packaging/Insulation	0.2%	0.1%	0.3%	Textiles	0.1%	0.0%	0.2%
Trash Bags	0.1%	0.0%	0.1%	Carpet	2.7%	0.0%	5.7%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.4%	0.0%	0.8%
Non-Bag Packaging Film	0.1%	0.0%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	0.4%	0.2%	0.7%	Bulky Items	0.5%	0.2%	0.8%
Other Film	0.0%	0.0%	0.0%	Tires	0.0%	0.0%	0.1%
Durable Plastic Items	0.2%	0.1%	0.3%	R/C Other	0.0%	0.0%	0.0%
Plastic Piping	0.5%	0.2%	0.8%	*Mixed Residue/MSW*	3.8%		
R/C Plastic	0.0%	0.0%	0.1%	Mixed Residue	2.3%	0.8%	3.8%
Organics	2.3%			MSW	1.5%	0.8%	2.2%
Food	0.0%	0.0%	0.1%				
Leaves & Grass	0.6%	0.2%	1.1%				
Prunings & Trimmings	1.0%	0.0%	2.2%				
Branches & Stumps	0.6%	0.0%	1.3%	Total Percentage	100.0%		
R/C Organic	0.0%	0.0%	0.0%	Sample Count	128		

Table 4-28: Composition by Weight – Business Self-haulers (January – December 2007)

Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	1.7%			*C&D*	85.5%		
Uncoated Corrugated Cardboard	0.9%	0.6%	1.2%	Concrete	0.8%	0.1%	1.6%
Paper Bags	0.0%	0.0%	0.1%	Asphalt Paving	1.6%	0.6%	2.6%
Other Recyclable Paper	0.3%	0.2%	0.4%	Composition Roofing	19.5%	15.2%	23.9%
Cellulose Insulation	0.1%	0.0%	0.2%	Other Asphalt Roofing	3.3%	1.6%	5.1%
R/C Paper	0.3%	0.2%	0.5%	Other Aggregates	2.3%	1.1%	3.5%
Glass	0.6%			Clean Dimensional Lumber	5.3%	4.0%	6.5%
Glass Bottles and Containers	0.0%	0.0%	0.0%	Clean Engineered Wood	5.9%	4.6%	7.3%
Flat Glass	0.4%	0.1%	0.7%	Pallets and Crates	2.5%	1.3%	3.6%
R/C Glass	0.2%	0.0%	0.3%	Other Recyclable Wood	1.6%	1.1%	2.1%
Metal	3.2%			Painted/Stained Wood	10.6%	8.5%	12.7%
Tin/Steel Cans	0.0%	0.0%	0.0%	Creosote-treated Wood	2.9%	0.7%	5.1%
Major Appliances	0.1%	0.0%	0.2%	Other Treated Wood	0.7%	0.3%	1.1%
Used Oil Filters	0.0%	0.0%	0.1%	Clean Gypsum Board	4.2%	2.8%	5.5%
HVAC Ducting	0.0%	0.0%	0.1%	Painted/Demolition Gypsum	6.2%	4.7%	7.8%
Other Ferrous	2.5%	1.8%	3.2%	Rock and Gravel	1.0%	0.2%	1.7%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	6.4%	3.1%	9.7%
Other Non-Ferrous	0.2%	0.1%	0.3%	Fiberglass insulation	0.1%	0.1%	0.2%
R/C Metal	0.3%	0.2%	0.4%	R/C C&D	10.5%	6.8%	14.3%
E-Waste	0.1%			*Hazardous Waste*	0.2%		
Brown Goods/Sm Consumer Electronics	0.1%	0.0%	0.2%	Paint	0.1%	0.0%	0.2%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.1%	Used Oil	0.0%	0.0%	0.0%
Plastic	1.3%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.1%	R/C Hazardous Waste	0.1%	0.0%	0.2%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	2.0%		
Polystyrene Packaging/Insulation	0.4%	0.2%	0.7%	Textiles	0.2%	0.0%	0.4%
Trash Bags	0.1%	0.0%	0.1%	Carpet	1.1%	0.7%	1.6%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.1%	0.1%	0.2%
Non-Bag Packaging Film	0.1%	0.0%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	0.4%	0.2%	0.5%	Bulky Items	0.2%	0.1%	0.4%
Other Film	0.0%	0.0%	0.0%	Tires	0.0%	0.0%	0.0%
Durable Plastic Items	0.1%	0.0%	0.1%	R/C Other	0.3%	0.0%	0.7%
Plastic Piping	0.3%	0.1%	0.4%	*Mixed Residue/MSW*	3.3%		
R/C Plastic	0.0%	0.0%	0.1%	Mixed Residue	2.1%	0.9%	3.3%
Organics	2.0%			MSW	1.2%	0.9%	1.6%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	0.8%	0.3%	1.2%				
Prunings & Trimmings	0.9%	0.4%	1.3%				
Branches & Stumps	0.4%	0.0%	0.7%	Total Percentage	100.0%		
R/C Organic	0.0%	0.0%	0.1%	Sample Count	357		

Table 4-29: Composition by Weight – Homeowner Self-haulers (January – December 2007)

Calculated at a 90% confidence level

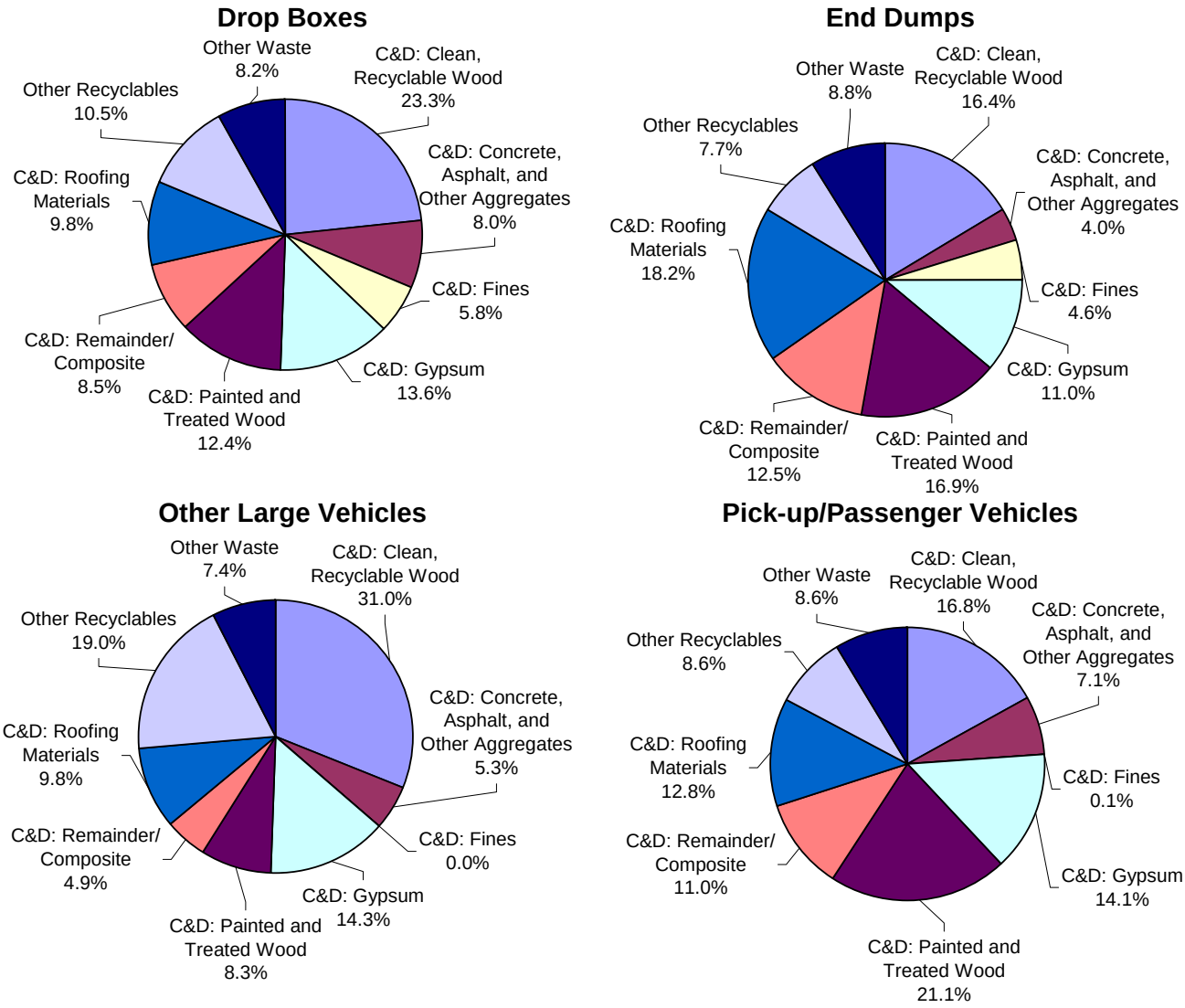
	Mean	Low	High		Mean	Low	High
Paper	2.8%			*C&D*	81.1%		
Uncoated Corrugated Cardboard	2.6%	0.0%	6.2%	Concrete	0.7%	0.0%	1.8%
Paper Bags	0.0%	0.0%	0.1%	Asphalt Paving	0.3%	0.0%	0.8%
Other Recyclable Paper	0.0%	0.0%	0.0%	Composition Roofing	0.0%	0.0%	0.0%
Cellulose Insulation	0.0%	0.0%	0.1%	Other Asphalt Roofing	13.1%	0.0%	32.6%
R/C Paper	0.2%	0.0%	0.5%	Other Aggregates	11.7%	0.0%	26.4%
Glass	0.0%			Clean Dimensional Lumber	9.2%	2.6%	15.7%
Glass Bottles and Containers	0.0%	0.0%	0.0%	Clean Engineered Wood	5.4%	0.9%	9.9%
Flat Glass	0.0%	0.0%	0.0%	Pallets and Crates	4.4%	1.2%	7.5%
R/C Glass	0.0%	0.0%	0.0%	Other Recyclable Wood	2.2%	0.0%	5.7%
Metal	4.9%			Painted/Stained Wood	10.2%	4.5%	16.0%
Tin/Steel Cans	0.1%	0.0%	0.1%	Creosote-treated Wood	0.0%	0.0%	0.0%
Major Appliances	0.0%	0.0%	0.0%	Other Treated Wood	4.3%	0.0%	10.1%
Used Oil Filters	0.0%	0.0%	0.0%	Clean Gypsum Board	3.4%	0.0%	8.1%
HVAC Ducting	0.0%	0.0%	0.0%	Painted/Demolition Gypsum	9.6%	1.6%	17.5%
Other Ferrous	4.0%	0.0%	8.2%	Rock and Gravel	0.0%	0.0%	0.0%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	0.1%	0.0%	0.2%
Other Non-Ferrous	0.1%	0.0%	0.2%	Fiberglass insulation	0.3%	0.0%	0.7%
R/C Metal	0.7%	0.0%	1.4%	R/C C&D	6.5%	1.1%	11.8%
E-Waste	0.1%			*Hazardous Waste*	0.4%		
Brown Goods/Sm Consumer Electronics	0.1%	0.0%	0.4%	Paint	0.4%	0.0%	1.0%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.0%	Used Oil	0.0%	0.0%	0.0%
Plastic	3.6%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.0%	R/C Hazardous Waste	0.0%	0.0%	0.0%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	1.6%		
Polystyrene Packaging/Insulation	2.0%	0.0%	4.3%	Textiles	0.0%	0.0%	0.0%
Trash Bags	0.5%	0.0%	1.2%	Carpet	1.3%	0.0%	3.0%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.2%	0.0%	0.5%
Non-Bag Packaging Film	0.1%	0.0%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	0.6%	0.0%	1.2%	Bulky Items	0.1%	0.0%	0.2%
Other Film	0.1%	0.0%	0.3%	Tires	0.0%	0.0%	0.0%
Durable Plastic Items	0.3%	0.0%	0.6%	R/C Other	0.0%	0.0%	0.0%
Plastic Piping	0.1%	0.0%	0.2%	*Mixed Residue/MSW*	1.6%		
R/C Plastic	0.0%	0.0%	0.0%	Mixed Residue	0.0%	0.0%	0.0%
Organics	4.0%			MSW	1.6%	0.3%	2.8%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	0.5%	0.0%	1.3%				
Prunings & Trimmings	0.2%	0.0%	0.5%				
Branches & Stumps	0.1%	0.0%	0.3%	Total Percentage	100.0%		
R/C Organic	3.2%	0.0%	8.5%	Sample Count	19		

4.1.4 By Vehicle Type

As shown in Figure 4-4, ***C&D: Clean Recyclable Wood*** made up a large portion of all vehicle type loads: between 16% and 31%. ***C&D: Painted and Treated Wood*** made up almost 17% of end dump loads and about 21% of pick-up/passenger vehicle loads. ***Other Recyclables***, which include non-C&D recyclable materials such as aluminum cans and compostable material, accounted for about 19% of other large vehicle loads.

The figures for composition by vehicle type were estimated using an unweighted process; consequently, composition percentages were not applied to tonnages. Some samples did not have a vehicle type associated, so the sum of samples by vehicle type (691) does not equal total number of loads sampled (702) from vehicles received at transfer stations.

Figure 4-4: Composition Summary, by Vehicle Type (January – December 2007)



4.1.4a Drop Boxes

A total of 336 drop box loads were sampled during the 2007 study period. The largest components in this waste stream included *painted/stained wood* (11.3%) and *clean engineered wood* (10.8%). Four components, *clean dimensional lumber*, *composite roofing*, *remainder/composite C&D*, and *painted/demolition gypsum*, each made up about 8% of the waste hauled in drop boxes. Table 4-34 presents the detailed composition results for this waste stream.

Table 4-30: Top Ten Components – Drop Boxes (January – December 2007)

Component	Mean	Cum. %
Painted/Stained Wood	11.3%	11.3%
Clean Engineered Wood	10.8%	22.1%
Clean Dimensional Lumber	8.2%	30.3%
Composition Roofing	8.1%	38.3%
Remainder/Composite C&D	8.0%	46.4%
Painted/Demolition Gypsum	8.0%	54.4%
Clean Gypsum Board	5.6%	59.9%
Dirt and Sand	5.0%	64.9%
Other Aggregates	3.8%	68.7%
Concrete	3.5%	72.2%
Total	**72.2%**	

4.1.4b End Dumps

During the 2007 study period, 285 end dumps were sampled. As listed in Table 4-31, *composition roofing* (14.4%), *remainder/composite C&D* (12.4%), and *painted/stained wood* (10.3%) were the largest components of the waste disposed by end dumps in 2007. When added together, the top ten components summed to approximately 75% of the total. The full end dump composition results are detailed in Table 4-35.

Table 4-31: Top Ten Components – End Dumps (January – December 2007)

Component	Mean	Cum. %
Composition Roofing	14.4%	14.4%
Remainder/Composite C&D	12.4%	26.8%
Painted/Stained Wood	10.3%	37.1%
Clean Engineered Wood	6.7%	43.8%
Clean Dimensional Lumber	6.1%	49.9%
Painted/Demolition Gypsum	6.0%	55.8%
Creosote-treated Wood	5.8%	61.6%
Clean Gypsum Board	5.1%	66.7%
Dirt and Sand	4.2%	70.8%
Other Asphalt Roofing	3.8%	74.6%
Total	**74.6%**	

4.1.4c Other Large Vehicles

Twenty-nine samples were completed for other large vehicle loads during the 2007 study period. *Pallets and crates* was the single largest material component in this vehicle's waste, at about 18% of the total, by weight (Table 4-32). *Painted/demolition gypsum* (11.1%), *composition roofing* (9.8%), and *painted/stained wood* (8.1%) were the next largest components. The full other large vehicle composition results are presented in Table 4-36.

Table 4-32: Top Ten Components – Other Large Vehicles (January – December 2007)

Component	Mean	Cum. %
Pallets and Crates	18.1%	18.1%
Painted/Demolition Gypsum	11.1%	29.1%
Composition Roofing	9.8%	38.9%
Painted/Stained Wood	8.1%	47.0%
Clean Engineered Wood	7.3%	54.2%
Carpet	5.8%	60.1%
Remainder/Composite C&D	4.6%	64.7%
Clean Dimensional Lumber	4.4%	69.1%
Uncoated Corrugated Cardboard	4.0%	73.1%
Clean Gypsum Board	3.2%	76.3%
Total	**76.3%**	

4.1.4d Pick-up / Passenger Vehicles

During the 2007 study period, 41 pick-up / passenger vehicles were sampled. As presented below in Table 4-33, *painted/stained wood* (17.0%) and *painted/demolition gypsum* (12.6%) were the largest components for this vehicle's waste stream. Detailed composition results for pick-up / passenger vehicles are presented in Table 4-37.

Table 4-33: Top Ten Components – Pick-up / Passenger Vehicles (January – December 2007)

Component	Mean	Cum. %
Painted/Stained Wood	17.0%	17.0%
Painted/Demolition Gypsum	12.6%	29.6%
Remainder/Composite C&D	10.5%	40.0%
Composition Roofing	8.6%	48.6%
Clean Engineered Wood	7.4%	56.0%
Clean Dimensional Lumber	6.3%	62.3%
Other Aggregates	4.5%	66.7%
Other Asphalt Roofing	4.2%	70.9%
Other Treated Wood	4.1%	75.0%
Remainder/Composite Organic	2.3%	77.3%
Total	**77.3%**	

4.1.4e Comparisons among Vehicle Types

Six material components appeared in the top ten lists for all four vehicle types: *clean engineered wood*, *composition roofing*, *clean dimensional lumber*, *painted/demolition gypsum*, *painted/stained wood*, and *remainder/composite C&D*. *Clean gypsum board* was common to the top ten lists for all vehicle types other than pick-up / passenger vehicles. *Concrete* was unique to drop boxes; *creosote-treated wood* was only present in the top ten list for end dumps; *pallets and crates* and *carpet* were unique to other large vehicles; and, lastly, *other treated wood* and *remainder/composite organic* were unique to pick-up / passenger vehicles. The *remainder/composite organic material* component includes items such as wood chips, sawdust, agricultural residues, and animal feces.

Table 4-34: Composition by Weight – Drop Boxes (January – December 2007)

Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	2.5%			*C&D*	81.3%		
Uncoated Corrugated Cardboard	1.3%	1.0%	1.6%	Concrete	3.5%	1.5%	5.5%
Paper Bags	0.2%	0.1%	0.3%	Asphalt Paving	0.7%	0.2%	1.3%
Other Recyclable Paper	0.6%	0.4%	0.8%	Composition Roofing	8.1%	5.8%	10.3%
Cellulose Insulation	0.1%	0.0%	0.2%	Other Asphalt Roofing	1.8%	0.3%	3.2%
R/C Paper	0.3%	0.1%	0.4%	Other Aggregates	3.8%	2.4%	5.2%
Glass	0.5%			Clean Dimensional Lumber	8.2%	6.7%	9.6%
Glass Bottles and Containers	0.0%	0.0%	0.0%	Clean Engineered Wood	10.8%	8.6%	13.0%
Flat Glass	0.5%	0.2%	0.7%	Pallets and Crates	3.3%	2.5%	4.1%
R/C Glass	0.0%	0.0%	0.1%	Other Recyclable Wood	1.0%	0.6%	1.5%
Metal	4.6%			Painted/Stained Wood	11.3%	9.4%	13.2%
Tin/Steel Cans	0.0%	0.0%	0.1%	Creosote-treated Wood	0.9%	0.0%	2.0%
Major Appliances	0.2%	0.1%	0.3%	Other Treated Wood	0.2%	0.0%	0.4%
Used Oil Filters	0.0%	0.0%	0.0%	Clean Gypsum Board	5.6%	3.7%	7.4%
HVAC Ducting	0.4%	0.2%	0.6%	Painted/Demolition Gypsum	8.0%	6.1%	9.9%
Other Ferrous	3.4%	2.7%	4.1%	Rock and Gravel	0.9%	0.3%	1.4%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	5.0%	3.1%	6.9%
Other Non-Ferrous	0.1%	0.0%	0.2%	Fiberglass insulation	0.3%	0.1%	0.6%
R/C Metal	0.5%	0.3%	0.7%	R/C C&D	8.0%	6.4%	9.6%
E-Waste	0.1%			*Hazardous Waste*	0.5%		
Brown Goods/Sm Consumer Electronics	0.0%	0.0%	0.1%	Paint	0.1%	0.0%	0.2%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.1%	Used Oil	0.0%	0.0%	0.0%
Plastic	2.2%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.1%	R/C Hazardous Waste	0.3%	0.1%	0.6%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	2.8%		
Polystyrene Packaging/Insulation	0.2%	0.1%	0.3%	Textiles	0.2%	0.1%	0.4%
Trash Bags	0.0%	0.0%	0.1%	Carpet	1.5%	0.3%	2.7%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.2%	0.0%	0.4%
Non-Bag Packaging Film	0.1%	0.1%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	0.7%	0.4%	1.1%	Bulky Items	0.7%	0.4%	1.0%
Other Film	0.0%	0.0%	0.0%	Tires	0.1%	0.0%	0.1%
Durable Plastic Items	0.2%	0.1%	0.3%	R/C Other	0.0%	0.0%	0.1%
Plastic Piping	0.7%	0.4%	1.0%	*Mixed Residue/MSW*	3.9%		
R/C Plastic	0.1%	0.0%	0.1%	Mixed Residue	1.4%	0.7%	2.2%
Organics	1.8%			MSW	2.4%	1.8%	3.0%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	0.8%	0.4%	1.1%				
Prunings & Trimmings	0.6%	0.2%	1.1%				
Branches & Stumps	0.3%	0.1%	0.6%	Total Percentage	100.0%		
R/C Organic	0.0%	0.0%	0.0%	Sample Count	336		

Table 4-35: Composition by Weight – End Dumps (January – December 2007)

Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	1.7%			*C&D*	83.6%		
Uncoated Corrugated Cardboard	0.9%	0.7%	1.1%	Concrete	1.1%	0.1%	2.0%
Paper Bags	0.0%	0.0%	0.1%	Asphalt Paving	1.0%	0.1%	1.9%
Other Recyclable Paper	0.3%	0.1%	0.5%	Composition Roofing	14.4%	10.1%	18.8%
Cellulose Insulation	0.0%	0.0%	0.0%	Other Asphalt Roofing	3.8%	1.6%	5.9%
R/C Paper	0.4%	0.2%	0.6%	Other Aggregates	1.9%	0.6%	3.2%
Glass	0.5%			Clean Dimensional Lumber	6.1%	4.3%	7.8%
Glass Bottles and Containers	0.0%	0.0%	0.1%	Clean Engineered Wood	6.7%	5.2%	8.2%
Flat Glass	0.2%	0.1%	0.4%	Pallets and Crates	2.0%	1.3%	2.8%
R/C Glass	0.2%	0.0%	0.4%	Other Recyclable Wood	1.6%	1.1%	2.1%
Metal	3.1%			Painted/Stained Wood	10.3%	7.7%	12.9%
Tin/Steel Cans	0.0%	0.0%	0.1%	Creosote-treated Wood	5.8%	1.5%	10.0%
Major Appliances	0.2%	0.1%	0.3%	Other Treated Wood	0.8%	0.3%	1.3%
Used Oil Filters	0.0%	0.0%	0.0%	Clean Gypsum Board	5.1%	3.5%	6.6%
HVAC Ducting	0.1%	0.0%	0.1%	Painted/Demolition Gypsum	6.0%	4.2%	7.7%
Other Ferrous	2.3%	1.5%	3.2%	Rock and Gravel	0.5%	0.0%	1.0%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	4.2%	1.1%	7.2%
Other Non-Ferrous	0.2%	0.1%	0.3%	Fiberglass insulation	0.1%	0.1%	0.2%
R/C Metal	0.3%	0.2%	0.5%	R/C C&D	12.4%	7.6%	17.2%
E-Waste	0.1%			*Hazardous Waste*	0.2%		
Brown Goods/Sm Consumer Electronics	0.1%	0.0%	0.2%	Paint	0.1%	0.0%	0.1%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.0%	Used Oil	0.0%	0.0%	0.0%
Plastic	1.3%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.1%	R/C Hazardous Waste	0.1%	0.0%	0.2%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	2.0%		
Polystyrene Packaging/Insulation	0.3%	0.1%	0.6%	Textiles	0.1%	0.0%	0.1%
Trash Bags	0.1%	0.0%	0.1%	Carpet	1.1%	0.6%	1.7%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.1%	0.0%	0.2%
Non-Bag Packaging Film	0.1%	0.0%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	0.3%	0.2%	0.5%	Bulky Items	0.3%	0.2%	0.4%
Other Film	0.0%	0.0%	0.0%	Tires	0.0%	0.0%	0.0%
Durable Plastic Items	0.1%	0.1%	0.1%	R/C Other	0.4%	0.0%	0.9%
Plastic Piping	0.3%	0.1%	0.5%	*Mixed Residue/MSW*	5.6%		
R/C Plastic	0.0%	0.0%	0.1%	Mixed Residue	3.7%	1.9%	5.4%
Organics	1.9%			MSW	1.9%	1.3%	2.6%
Food	0.0%	0.0%	0.1%				
Leaves & Grass	0.6%	0.3%	0.9%				
Prunings & Trimmings	0.9%	0.3%	1.5%				
Branches & Stumps	0.4%	0.0%	0.9%	Total Percentage	100.0%		
R/C Organic	0.0%	0.0%	0.0%	Sample Count	285		

Table 4-36: Composition by Weight – Other Large Vehicles (January – December 2007)

Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	5.1%			*C&D*	73.6%		
Uncoated Corrugated Cardboard	4.0%	0.0%	8.8%	Concrete	0.0%	0.0%	0.0%
Paper Bags	0.0%	0.0%	0.1%	Asphalt Paving	3.0%	0.0%	6.8%
Other Recyclable Paper	0.7%	0.1%	1.3%	Composition Roofing	9.8%	0.0%	22.2%
Cellulose Insulation	0.0%	0.0%	0.0%	Other Asphalt Roofing	0.0%	0.0%	0.0%
R/C Paper	0.3%	0.0%	0.8%	Other Aggregates	2.3%	0.0%	4.7%
Glass	0.7%			Clean Dimensional Lumber	4.4%	1.5%	7.2%
Glass Bottles and Containers	0.0%	0.0%	0.0%	Clean Engineered Wood	7.3%	1.8%	12.7%
Flat Glass	0.6%	0.0%	1.1%	Pallets and Crates	18.1%	0.0%	38.7%
R/C Glass	0.1%	0.0%	0.3%	Other Recyclable Wood	1.3%	0.0%	2.8%
Metal	3.7%			Painted/Stained Wood	8.1%	2.5%	13.6%
Tin/Steel Cans	0.1%	0.0%	0.1%	Creosote-treated Wood	0.0%	0.0%	0.0%
Major Appliances	0.0%	0.0%	0.0%	Other Treated Wood	0.3%	0.0%	0.6%
Used Oil Filters	0.0%	0.0%	0.0%	Clean Gypsum Board	3.2%	0.1%	6.3%
HVAC Ducting	0.1%	0.0%	0.3%	Painted/Demolition Gypsum	11.1%	2.2%	19.9%
Other Ferrous	2.8%	0.0%	6.0%	Rock and Gravel	0.0%	0.0%	0.0%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	0.0%	0.0%	0.0%
Other Non-Ferrous	0.0%	0.0%	0.1%	Fiberglass insulation	0.2%	0.0%	0.4%
R/C Metal	0.7%	0.1%	1.3%	R/C C&D	4.6%	1.1%	8.2%
E-Waste	0.5%			*Hazardous Waste*	0.1%		
Brown Goods/Sm Consumer Electronics	0.5%	0.0%	1.2%	Paint	0.0%	0.0%	0.0%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.0%	Used Oil	0.0%	0.0%	0.0%
Plastic	3.8%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.1%	R/C Hazardous Waste	0.1%	0.0%	0.3%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	7.5%		
Polystyrene Packaging/Insulation	2.0%	0.0%	4.1%	Textiles	0.5%	0.0%	1.0%
Trash Bags	0.1%	0.0%	0.1%	Carpet	5.8%	1.2%	10.4%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.7%	0.0%	1.4%
Non-Bag Packaging Film	0.0%	0.0%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	1.1%	0.0%	2.3%	Bulky Items	0.5%	0.0%	1.2%
Other Film	0.1%	0.0%	0.2%	Tires	0.0%	0.0%	0.0%
Durable Plastic Items	0.3%	0.0%	0.5%	R/C Other	0.0%	0.0%	0.1%
Plastic Piping	0.1%	0.0%	0.2%	*Mixed Residue/MSW*	2.3%		
R/C Plastic	0.1%	0.0%	0.2%	Mixed Residue	0.9%	0.0%	1.7%
Organics	2.9%			MSW	1.5%	0.1%	2.8%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	0.0%	0.0%	0.0%				
Prunings & Trimmings	2.4%	0.0%	5.3%				
Branches & Stumps	0.4%	0.0%	1.0%	Total Percentage	100.0%		
R/C Organic	0.0%	0.0%	0.1%	Sample Count	29		

Table 4-37: Composition by Weight – Pick-up / Passenger Vehicles (January – December 2007)

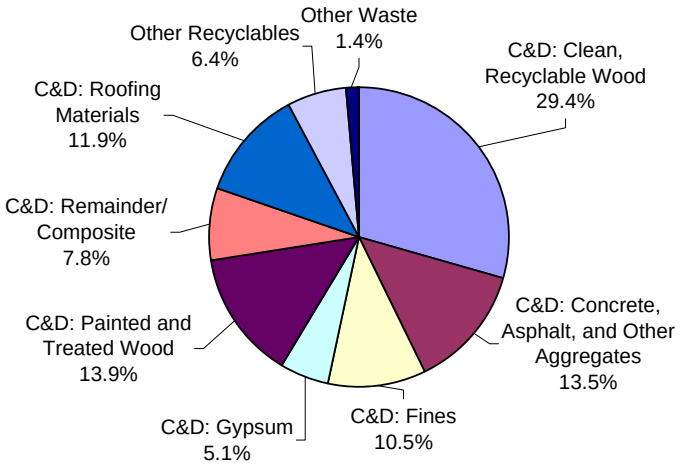
Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	3.0%			*C&D*	82.4%		
Uncoated Corrugated Cardboard	2.2%	0.0%	4.7%	Concrete	0.5%	0.0%	1.3%
Paper Bags	0.1%	0.0%	0.1%	Asphalt Paving	2.1%	0.0%	5.3%
Other Recyclable Paper	0.1%	0.0%	0.2%	Composition Roofing	8.6%	1.1%	16.1%
Cellulose Insulation	0.4%	0.0%	1.1%	Other Asphalt Roofing	4.2%	0.0%	9.3%
R/C Paper	0.2%	0.0%	0.4%	Other Aggregates	4.5%	1.6%	7.4%
Glass	1.5%			Clean Dimensional Lumber	6.3%	3.2%	9.3%
Glass Bottles and Containers	0.0%	0.0%	0.0%	Clean Engineered Wood	7.4%	3.6%	11.2%
Flat Glass	1.5%	0.0%	3.7%	Pallets and Crates	1.1%	0.2%	2.1%
R/C Glass	0.0%	0.0%	0.0%	Other Recyclable Wood	2.1%	0.0%	4.5%
Metal	4.0%			Painted/Stained Wood	17.0%	10.6%	23.4%
Tin/Steel Cans	0.0%	0.0%	0.1%	Creosote-treated Wood	0.0%	0.0%	0.0%
Major Appliances	0.1%	0.0%	0.4%	Other Treated Wood	4.1%	0.0%	8.1%
Used Oil Filters	1.0%	0.0%	2.7%	Clean Gypsum Board	1.5%	0.0%	3.3%
HVAC Ducting	0.0%	0.0%	0.0%	Painted/Demolition Gypsum	12.6%	5.5%	19.7%
Other Ferrous	2.0%	1.0%	3.0%	Rock and Gravel	0.0%	0.0%	0.0%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	0.1%	0.0%	0.2%
Other Non-Ferrous	0.1%	0.0%	0.3%	Fiberglass insulation	0.1%	0.0%	0.3%
R/C Metal	0.6%	0.1%	1.2%	R/C C&D	10.5%	5.4%	15.5%
E-Waste	0.0%			*Hazardous Waste*	0.5%		
Brown Goods/Sm Consumer Electronics	0.0%	0.0%	0.0%	Paint	0.5%	0.0%	1.0%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.0%	Used Oil	0.0%	0.0%	0.0%
Plastic	2.0%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.0%	R/C Hazardous Waste	0.0%	0.0%	0.0%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	1.1%		
Polystyrene Packaging/Insulation	0.4%	0.0%	0.8%	Textiles	0.1%	0.0%	0.1%
Trash Bags	0.4%	0.0%	0.9%	Carpet	0.6%	0.1%	1.1%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.3%	0.0%	0.6%
Non-Bag Packaging Film	0.1%	0.0%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	0.4%	0.0%	0.8%	Bulky Items	0.2%	0.0%	0.4%
Other Film	0.1%	0.0%	0.1%	Tires	0.0%	0.0%	0.0%
Durable Plastic Items	0.5%	0.0%	1.0%	R/C Other	0.0%	0.0%	0.0%
Plastic Piping	0.2%	0.0%	0.4%	*Mixed Residue/MSW*	1.1%		
R/C Plastic	0.0%	0.0%	0.1%	Mixed Residue	0.0%	0.0%	0.0%
Organics	4.4%			MSW	1.1%	0.3%	1.9%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	0.4%	0.0%	0.9%				
Prunings & Trimmings	1.4%	0.0%	3.1%				
Branches & Stumps	0.2%	0.0%	0.5%	Total Percentage	100.0%		
R/C Organic	2.3%	0.0%	5.9%	Sample Count	41		

4.2 Intermodal Containers Hauled to Railheads

A total of 32 samples were sorted from loads from intermodal containers during the 2007 study period. Waste from these loads amounted to approximately 45,919 tons of C&D waste in 2007. The weighted composition estimates were applied to these tons to estimate the amount of waste disposed for each component category. As shown in Figure 4-5, ***C&D: Clean, Recyclable Wood*** accounted for almost 30% of C&D waste disposed in intermodal containers, while ***C&D: Concrete, Asphalt, and Other Aggregates*** and ***C&D: Painted and Treated Wood*** each composed approximately 14% of intermodal container waste.

Figure 4-5: Composition Summary, Intermodal Containers (January – December 2007)



As shown in Table 4-38, *painted/stained wood* (12.5%), *clean dimensional lumber* (10.5%), and *clean engineered wood* (10.3%) were the largest components of the total tons disposed in intermodal containers in 2007. When added together, all of the top ten components summed to approximately 83% of the total, by weight. The full composition results for intermodal loads are presented in Table 4-39.

Table 4-38: Top Ten Components – Intermodal Containers (January – December 2007)

Component	Mean	Cum. %	Tons
Painted/Stained Wood	12.5%	12.5%	5,759
Clean Dimensional Lumber	10.5%	23.0%	4,807
Clean Engineered Wood	10.3%	33.3%	4,739
Concrete	8.7%	42.1%	4,018
Other Recyclable Wood	8.6%	50.7%	3,952
Dirt and Sand	8.1%	58.8%	3,708
Other Asphalt Roofing	8.0%	66.8%	3,670
Remainder/Composite C&D	7.6%	74.4%	3,508
Other Aggregates	4.6%	79.0%	2,121
Painted/Demolition Gypsum	4.2%	83.2%	1,925
Total	**83.2%**		**38,206**

Table 4-39: Composition by Weight – Intermodal Containers (January – December 2007)

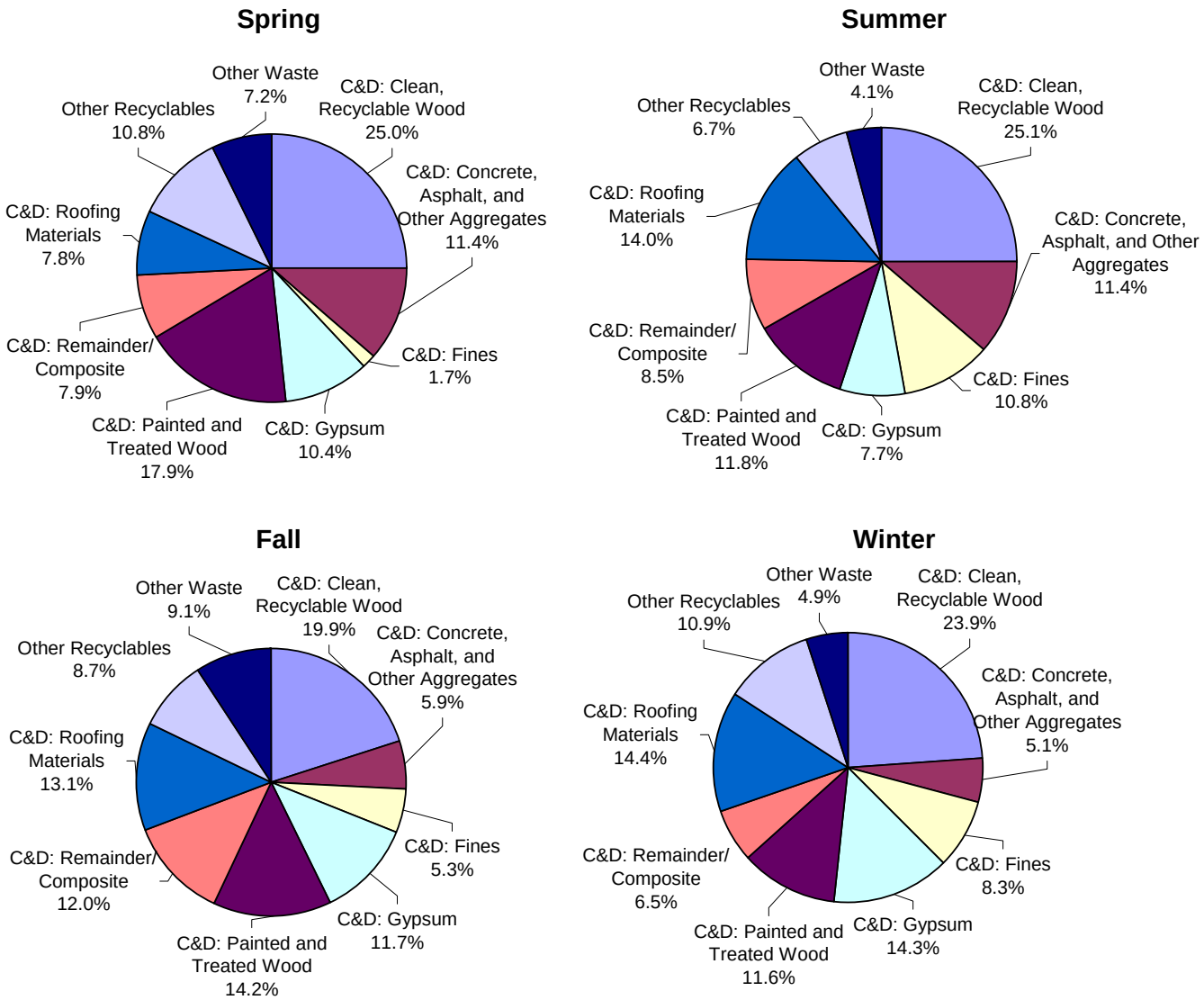
Calculated at a 90% confidence level

	Tons	Mean	Low	High		Tons	Mean	Low	High
Paper	152	0.3%			*C&D*	42,326	92.2%		
Uncoated Corrugated Cardboard	13	0.0%	0.0%	0.1%	Concrete	4,018	8.7%	3.5%	14.0%
Paper Bags	3	0.0%	0.0%	0.0%	Asphalt Paving	69	0.1%	0.0%	0.4%
Other Recyclable Paper	136	0.3%	0.0%	0.6%	Composition Roofing	1,792	3.9%	0.7%	7.1%
Cellulose Insulation	0	0.0%	0.0%	0.0%	Other Asphalt Roofing	3,670	8.0%	3.3%	12.7%
R/C Paper	0	0.0%	0.0%	0.0%	Other Aggregates	2,121	4.6%	2.4%	6.8%
Glass	200	0.4%			Clean Dimensional Lumber	4,807	10.5%	7.3%	13.6%
Glass Bottles and Containers	0	0.0%	0.0%	0.0%	Clean Engineered Wood	4,739	10.3%	7.3%	13.4%
Flat Glass	86	0.2%	0.0%	0.5%	Pallets and Crates	0	0.0%	0.0%	0.0%
R/C Glass	115	0.2%	0.0%	0.5%	Other Recyclable Wood	3,952	8.6%	5.2%	12.0%
Metal	1,588	3.5%			Painted/Stained Wood	5,759	12.5%	8.7%	16.3%
Tin/Steel Cans	4	0.0%	0.0%	0.0%	Creosote-treated Wood	125	0.3%	0.0%	0.6%
Major Appliances	24	0.1%	0.0%	0.1%	Other Treated Wood	518	1.1%	0.3%	1.9%
Used Oil Filters	0	0.0%	0.0%	0.0%	Clean Gypsum Board	404	0.9%	0.0%	2.3%
HVAC Ducting	18	0.0%	0.0%	0.1%	Painted/Demolition Gypsum	1,925	4.2%	2.0%	6.4%
Other Ferrous	946	2.1%	1.4%	2.7%	Rock and Gravel	1,118	2.4%	0.8%	4.0%
Aluminum Cans	0	0.0%	0.0%	0.0%	Dirt and Sand	3,708	8.1%	4.9%	11.3%
Other Non-Ferrous	443	1.0%	0.4%	1.5%	Fiberglass insulation	94	0.2%	0.1%	0.3%
R/C Metal	154	0.3%	0.1%	0.6%	R/C C&D	3,508	7.6%	4.1%	11.2%
E-Waste	14	0.0%			*HHW*	79	0.2%		
Brown Goods/Sm Consumer Electronics	14	0.0%	0.0%	0.1%	Paint	0	0.0%	0.0%	0.0%
Computer-related Electronics	0	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0	0.0%	0.0%	0.0%
TV's & Other CRTs	0	0.0%	0.0%	0.0%	Used Oil	0	0.0%	0.0%	0.0%
Plastic	155	0.3%			Batteries	0	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	5	0.0%	0.0%	0.0%	R/C HHW	79	0.2%	0.0%	0.5%
Other Rigid Packaging	0	0.0%	0.0%	0.0%	*Special*	736	1.6%		
Polystyrene Packaging/Insulation	3	0.0%	0.0%	0.0%	Textiles	67	0.1%	0.0%	0.3%
Trash Bags	1	0.0%	0.0%	0.0%	Carpet	473	1.0%	0.0%	2.2%
Grocery/ Merch. Bags	0	0.0%	0.0%	0.0%	Carpet Padding	176	0.4%	0.0%	0.9%
Non-Bag Packaging Film	1	0.0%	0.0%	0.0%	Ash	0	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	8	0.0%	0.0%	0.0%	Bulky Items	9	0.0%	0.0%	0.1%
Other Film	0	0.0%	0.0%	0.0%	Tires	11	0.0%	0.0%	0.1%
Durable Plastic Items	52	0.1%	0.0%	0.2%	R/C Other	0	0.0%	0.0%	0.0%
Plastic Piping	77	0.2%	0.0%	0.3%	*Mixed Residue/MSW*	12	0.0%		
R/C Plastic	8	0.0%	0.0%	0.0%	Mixed Residue	0	0.0%	0.0%	0.0%
Organics	657	1.4%			MSW	12	0.0%	0.0%	0.1%
Food	0	0.0%	0.0%	0.0%					
Leaves & Grass	47	0.1%	0.0%	0.2%					
Prunings & Trimmings	81	0.2%	0.1%	0.3%	Total Percentage	100%			
Branches & Stumps	529	1.2%	0.0%	2.4%	Total Tons	45,919			
R/C Organic	1	0.0%	0.0%	0.0%	Sample Count	32			

4.3 C&D Waste by Season

This section presents results by season for waste from vehicles hauled to transfer stations as well as waste hauled to railheads in intermodal containers. As shown in Figure 4-6, composition by wood broad material categories did not vary much across seasons: ***C&D: Clean, Recyclable Wood*** made up a large portion of C&D waste disposed in each season, between about 20% and 25%, and ***C&D: Painted and Treated Wood*** made up between approximately 11% and 18% in all seasons. C&D waste disposed during the summer contained slightly less ***C&D: Gypsum*** and more ***C&D: Fines*** than waste from other seasons. In addition, ***C&D: roofing materials*** was slightly less in spring (7.8%) than in other seasons (13.1% to 14.4%). The figures for composition by vehicle type were estimated using an unweighted process; consequently, tonnages are not applied to the composition percentages.

Figure 4-6 : Composition Summary, by Season (January – December 2007)



4.3.1 Spring

A total of 152 samples were sorted from loads during the spring 2007 study period (March-May 2007). As shown in Table 4-40, *painted/stained wood* (13.5%) and *clean engineered wood* (10.5%) were the largest components waste disposed during this time period. The next largest components, *clean dimensional lumber*, *remainder/composite C&D*, and *composition roofing* each made up more than 7% of the total for C&D waste in the spring. The detailed spring composition results are presented in Table 4-44.

Table 4-40: Top Ten Components – Spring (March, April, and May 2007)

Component	Mean	Cum. %
Painted/Stained Wood	13.5%	13.5%
Clean Engineered Wood	10.5%	24.0%
Clean Dimensional Lumber	9.9%	33.9%
Remainder/Composite C&D	7.5%	41.4%
Composition Roofing	7.0%	48.4%
Painted/Demolition Gypsum	6.4%	54.8%
Concrete	6.0%	60.8%
Clean Gypsum Board	4.0%	64.8%
Other Aggregates	3.9%	68.7%
Creosote-treated Wood	3.9%	72.6%
Total	**72.6%**	

4.3.2 Summer

During the summer months in the study period (June-August 2007), 127 samples were completed. As shown in Table 4-41, *painted/stained wood*, *clean engineered wood*, *other asphalt roofing*, and *remainder/composite C&D* each accounted for more than 8% of the waste disposed in summer 2007. Table 4-45 presents the full composition results for C&D disposed in the summer of 2007.

Table 4-41: Top Ten Components – Summer (June, July, and August 2007)

Component	Mean	Cum. %
Painted/Stained Wood	9.7%	9.7%
Clean Engineered Wood	9.2%	18.9%
Other Asphalt Roofing	8.6%	27.5%
Remainder/Composite C&D	8.3%	35.8%
Clean Dimensional Lumber	7.9%	43.7%
Dirt and Sand	7.8%	51.6%
Other Recyclable Wood	7.0%	58.5%
Concrete	6.0%	64.5%
Composition Roofing	5.4%	69.9%
Painted/Demolition Gypsum	5.4%	75.3%
Total	**75.3%**	

4.3.3 Fall

During the fall 2007 (September-November 2007), 291 loads were sampled. *Remainder/composite C&D*, *painted/stained wood*, and *composition roofing* each made up more than 10% of the C&D waste disposed in the fall. Table 4-46 presents detailed waste composition results for this season's C&D waste.

Table 4-42: Top Ten Components – Fall (September, October, and November 2007)

Component	Mean	Cum. %
Remainder/Composite C&D	11.9%	11.9%
Painted/Stained Wood	11.5%	23.4%
Composition Roofing	10.3%	33.7%
Clean Engineered Wood	8.5%	42.2%
Painted/Demolition Gypsum	7.7%	49.9%
Clean Dimensional Lumber	6.9%	56.7%
Dirt and Sand	4.9%	61.6%
Clean Gypsum Board	4.0%	65.6%
MSW	3.2%	68.8%
Concrete	3.1%	71.9%
Total	**71.9%**	

4.3.4 Winter

During winter 2007, 164 samples of C&D waste were completed. As shown in Table 4-43, *composition roofing*, *painted/stained wood*, and *clean engineered wood* each accounted for more than 11% of the waste disposed in winter 2007. Table 4-47 lists the detailed composition results for waste disposed in winter 2007.

Table 4-43: Top Ten Components – Winter (January, February, and December 2007)

Component	Mean	Cum. %
Composition Roofing	12.4%	12.4%
Painted/Stained Wood	11.4%	23.8%
Clean Engineered Wood	11.1%	34.9%
Clean Dimensional Lumber	8.8%	43.8%
Clean Gypsum Board	7.6%	51.4%
Dirt and Sand	7.4%	58.8%
Painted/Demolition Gypsum	6.7%	65.4%
Remainder/Composite C&D	5.8%	71.2%
Other Aggregates	3.6%	74.8%
Pallets and Crates	3.6%	78.4%
Total	**78.4%**	

4.3.5 Comparisons among Seasons

The following material components were included in the list of top ten components in all seasons: *clean dimensional lumber*, *clean engineered wood*, *composition roofing*, *painted/demolition gypsum*, *painted/stained wood*, and *remainder/composite C&D*. *Concrete* was listed in the top ten components in all seasons other than winter; *clean gypsum board* was common to all except summer; and *dirt and sand* was only absent from the spring top ten list. Materials unique to one season include *creosote-treated wood* in spring, *other recyclable wood* in summer, *MSW* in fall, and *pallets and crates* in winter.

Table 4-44: Composition by Weight – Spring (March, April, and May 2007)

Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	1.4%			*C&D*	81.9%		
Uncoated Corrugated Cardboard	0.8%	0.5%	1.1%	Concrete	6.0%	0.6%	11.3%
Paper Bags	0.0%	0.0%	0.1%	Asphalt Paving	1.5%	0.2%	2.8%
Other Recyclable Paper	0.4%	0.1%	0.7%	Composition Roofing	7.0%	3.6%	10.4%
Cellulose Insulation	0.1%	0.0%	0.1%	Other Asphalt Roofing	0.7%	0.1%	1.4%
R/C Paper	0.1%	0.0%	0.2%	Other Aggregates	3.9%	1.3%	6.5%
Glass	0.6%			Clean Dimensional Lumber	9.9%	7.2%	12.6%
Glass Bottles and Containers	0.0%	0.0%	0.0%	Clean Engineered Wood	10.5%	7.3%	13.7%
Flat Glass	0.3%	0.1%	0.5%	Pallets and Crates	2.3%	1.3%	3.3%
R/C Glass	0.3%	0.0%	0.7%	Other Recyclable Wood	2.3%	0.0%	5.3%
Metal	4.7%			Painted/Stained Wood	13.5%	9.0%	18.0%
Tin/Steel Cans	0.0%	0.0%	0.0%	Creosote-treated Wood	3.9%	0.7%	7.0%
Major Appliances	0.1%	0.0%	0.3%	Other Treated Wood	0.5%	0.2%	0.8%
Used Oil Filters	0.0%	0.0%	0.0%	Clean Gypsum Board	4.0%	1.4%	6.5%
HVAC Ducting	0.2%	0.0%	0.4%	Painted/Demolition Gypsum	6.4%	3.9%	8.9%
Other Ferrous	3.7%	2.5%	5.0%	Rock and Gravel	0.0%	0.0%	0.0%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	1.7%	0.4%	3.0%
Other Non-Ferrous	0.0%	0.0%	0.1%	Fiberglass insulation	0.3%	0.0%	0.6%
R/C Metal	0.6%	0.3%	0.8%	R/C C&D	7.5%	4.8%	10.1%
E-Waste	0.1%			*Hazardous Waste*	0.6%		
Brown Goods/Sm Consumer Electronics	0.0%	0.0%	0.1%	Paint	0.1%	0.0%	0.2%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.1%	0.0%	0.1%	Used Oil	0.0%	0.0%	0.0%
Plastic	2.1%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.0%	R/C Hazardous Waste	0.5%	0.0%	1.1%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	3.8%		
Polystyrene Packaging/Insulation	0.3%	0.1%	0.4%	Textiles	0.5%	0.1%	0.8%
Trash Bags	0.1%	0.0%	0.1%	Carpet	2.6%	0.0%	5.4%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.3%	0.0%	0.8%
Non-Bag Packaging Film	0.1%	0.0%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	1.0%	0.2%	1.7%	Bulky Items	0.4%	0.2%	0.6%
Other Film	0.0%	0.0%	0.0%	Tires	0.0%	0.0%	0.0%
Durable Plastic Items	0.3%	0.1%	0.6%	R/C Other	0.0%	0.0%	0.0%
Plastic Piping	0.3%	0.1%	0.5%	*Mixed Residue/MSW*	3.6%		
R/C Plastic	0.1%	0.0%	0.1%	Mixed Residue	2.7%	1.0%	4.3%
Organics	1.2%			MSW	1.0%	0.5%	1.4%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	0.1%	0.0%	0.3%				
Prunings & Trimmings	0.4%	0.2%	0.7%				
Branches & Stumps	0.6%	0.0%	1.5%	Total Percentage	100.0%		
R/C Organic	0.0%	0.0%	0.0%	Sample Count	152		

Table 4-45: Composition by Weight – Summer (June, July, and August 2007)

Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	1.2%			*C&D*	89.2%		
Uncoated Corrugated Cardboard	0.6%	0.2%	1.0%	Concrete	6.0%	1.9%	10.0%
Paper Bags	0.1%	0.0%	0.2%	Asphalt Paving	0.3%	0.0%	0.6%
Other Recyclable Paper	0.2%	0.0%	0.4%	Composition Roofing	5.4%	2.5%	8.3%
Cellulose Insulation	0.0%	0.0%	0.0%	Other Asphalt Roofing	8.6%	4.9%	12.3%
R/C Paper	0.3%	0.0%	0.5%	Other Aggregates	5.1%	2.9%	7.3%
Glass	0.2%			Clean Dimensional Lumber	7.9%	5.4%	10.5%
Glass Bottles and Containers	0.0%	0.0%	0.0%	Clean Engineered Wood	9.2%	6.5%	11.9%
Flat Glass	0.1%	0.0%	0.1%	Pallets and Crates	1.0%	0.0%	2.0%
R/C Glass	0.2%	0.0%	0.4%	Other Recyclable Wood	7.0%	4.6%	9.3%
Metal	4.2%			Painted/Stained Wood	9.7%	7.5%	11.9%
Tin/Steel Cans	0.0%	0.0%	0.1%	Creosote-treated Wood	1.4%	0.0%	3.3%
Major Appliances	0.1%	0.0%	0.1%	Other Treated Wood	0.8%	0.1%	1.4%
Used Oil Filters	0.0%	0.0%	0.0%	Clean Gypsum Board	2.3%	0.5%	4.1%
HVAC Ducting	0.4%	0.1%	0.8%	Painted/Demolition Gypsum	5.4%	3.4%	7.4%
Other Ferrous	2.4%	1.8%	3.0%	Rock and Gravel	3.0%	1.4%	4.5%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	7.8%	4.7%	11.0%
Other Non-Ferrous	0.9%	0.5%	1.4%	Fiberglass insulation	0.2%	0.1%	0.2%
R/C Metal	0.4%	0.1%	0.6%	R/C C&D	8.3%	5.0%	11.6%
E-Waste	0.1%			*Hazardous Waste*	0.1%		
Brown Goods/Sm Consumer Electronics	0.1%	0.0%	0.2%	Paint	0.0%	0.0%	0.1%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.0%	Used Oil	0.0%	0.0%	0.0%
Plastic	0.8%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.1%	R/C Hazardous Waste	0.1%	0.0%	0.2%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	1.5%		
Polystyrene Packaging/Insulation	0.1%	0.0%	0.3%	Textiles	0.1%	0.0%	0.2%
Trash Bags	0.0%	0.0%	0.0%	Carpet	0.5%	0.3%	0.7%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.1%	0.1%	0.2%
Non-Bag Packaging Film	0.0%	0.0%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	0.2%	0.1%	0.3%	Bulky Items	0.3%	0.1%	0.6%
Other Film	0.0%	0.0%	0.0%	Tires	0.0%	0.0%	0.1%
Durable Plastic Items	0.1%	0.1%	0.1%	R/C Other	0.3%	0.0%	0.7%
Plastic Piping	0.3%	0.1%	0.5%	*Mixed Residue/MSW*	1.4%		
R/C Plastic	0.0%	0.0%	0.0%	Mixed Residue	0.7%	0.0%	1.7%
Organics	1.3%			MSW	0.7%	0.2%	1.3%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	0.2%	0.1%	0.3%				
Prunings & Trimmings	0.4%	0.1%	0.6%				
Branches & Stumps	0.7%	0.0%	1.6%	Total Percentage	100.0%		
R/C Organic	0.0%	0.0%	0.1%	Sample Count	127		

Table 4-46: Composition by Weight – Fall (September, October, and November 2007)

Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	2.4%			*C&D*	82.1%		
Uncoated Corrugated Cardboard	1.1%	0.9%	1.4%	Concrete	3.1%	1.6%	4.7%
Paper Bags	0.2%	0.1%	0.3%	Asphalt Paving	0.7%	0.1%	1.3%
Other Recyclable Paper	0.7%	0.4%	1.0%	Composition Roofing	10.3%	7.3%	13.3%
Cellulose Insulation	0.0%	0.0%	0.0%	Other Asphalt Roofing	2.8%	0.0%	5.8%
R/C Paper	0.3%	0.2%	0.5%	Other Aggregates	2.0%	0.9%	3.1%
Glass	0.6%			Clean Dimensional Lumber	6.9%	5.3%	8.4%
Glass Bottles and Containers	0.0%	0.0%	0.1%	Clean Engineered Wood	8.5%	6.5%	10.5%
Flat Glass	0.5%	0.3%	0.8%	Pallets and Crates	2.7%	1.9%	3.4%
R/C Glass	0.0%	0.0%	0.1%	Other Recyclable Wood	1.9%	1.3%	2.5%
Metal	3.4%			Painted/Stained Wood	11.5%	9.4%	13.5%
Tin/Steel Cans	0.0%	0.0%	0.1%	Creosote-treated Wood	1.9%	0.0%	4.1%
Major Appliances	0.1%	0.0%	0.2%	Other Treated Wood	0.9%	0.4%	1.3%
Used Oil Filters	0.0%	0.0%	0.0%	Clean Gypsum Board	4.0%	2.7%	5.3%
HVAC Ducting	0.1%	0.1%	0.2%	Painted/Demolition Gypsum	7.7%	5.4%	10.0%
Other Ferrous	2.4%	1.8%	3.1%	Rock and Gravel	0.5%	0.1%	0.8%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	4.9%	2.6%	7.1%
Other Non-Ferrous	0.2%	0.1%	0.3%	Fiberglass insulation	0.1%	0.1%	0.2%
R/C Metal	0.5%	0.3%	0.7%	R/C C&D	11.9%	8.5%	15.3%
E-Waste	0.1%			*Hazardous Waste*	0.3%		
Brown Goods/Sm Consumer Electronics	0.1%	0.0%	0.1%	Paint	0.0%	0.0%	0.0%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.0%	Used Oil	0.0%	0.0%	0.0%
Plastic	2.0%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.1%	R/C Hazardous Waste	0.3%	0.0%	0.5%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	2.6%		
Polystyrene Packaging/Insulation	0.2%	0.1%	0.4%	Textiles	0.1%	0.0%	0.1%
Trash Bags	0.1%	0.0%	0.1%	Carpet	1.6%	0.6%	2.6%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.3%	0.0%	0.7%
Non-Bag Packaging Film	0.1%	0.0%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	0.5%	0.3%	0.6%	Bulky Items	0.4%	0.2%	0.6%
Other Film	0.0%	0.0%	0.0%	Tires	0.1%	0.0%	0.2%
Durable Plastic Items	0.2%	0.1%	0.3%	R/C Other	0.1%	0.0%	0.1%
Plastic Piping	0.8%	0.4%	1.2%	*Mixed Residue/MSW*	5.2%		
R/C Plastic	0.1%	0.0%	0.2%	Mixed Residue	2.1%	1.1%	3.1%
Organics	1.3%			MSW	3.2%	2.4%	4.0%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	0.7%	0.4%	0.9%				
Prunings & Trimmings	0.3%	0.1%	0.5%				
Branches & Stumps	0.3%	0.0%	0.6%	Total Percentage	100.0%		
R/C Organic	0.0%	0.0%	0.0%	Sample Count	291		

Table 4-47: Composition by Weight – Winter (January, February, and December 2007)

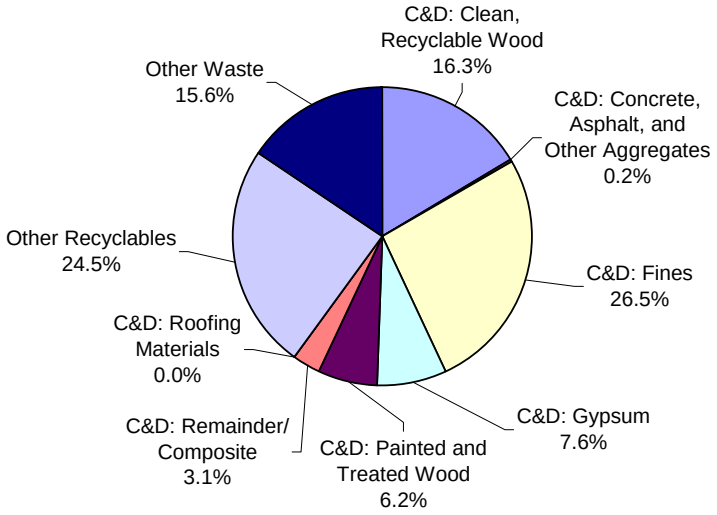
Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	2.0%			*C&D*	84.0%		
Uncoated Corrugated Cardboard	1.2%	0.8%	1.6%	Concrete	1.3%	0.1%	2.5%
Paper Bags	0.1%	0.0%	0.1%	Asphalt Paving	0.2%	0.0%	0.5%
Other Recyclable Paper	0.3%	0.1%	0.5%	Composition Roofing	12.4%	7.6%	17.2%
Cellulose Insulation	0.2%	0.0%	0.3%	Other Asphalt Roofing	1.9%	0.2%	3.7%
R/C Paper	0.2%	0.1%	0.3%	Other Aggregates	3.6%	1.9%	5.3%
Glass	0.6%			Clean Dimensional Lumber	8.8%	6.0%	11.6%
Glass Bottles and Containers	0.0%	0.0%	0.0%	Clean Engineered Wood	11.1%	7.3%	14.9%
Flat Glass	0.5%	0.1%	1.0%	Pallets and Crates	3.6%	2.0%	5.3%
R/C Glass	0.1%	0.0%	0.1%	Other Recyclable Wood	0.4%	0.0%	0.9%
Metal	3.7%			Painted/Stained Wood	11.4%	8.1%	14.7%
Tin/Steel Cans	0.0%	0.0%	0.1%	Creosote-treated Wood	0.0%	0.0%	0.0%
Major Appliances	0.3%	0.1%	0.5%	Other Treated Wood	0.2%	0.0%	0.5%
Used Oil Filters	0.1%	0.0%	0.2%	Clean Gypsum Board	7.6%	4.4%	10.8%
HVAC Ducting	0.1%	0.0%	0.1%	Painted/Demolition Gypsum	6.7%	4.1%	9.2%
Other Ferrous	2.9%	1.9%	3.9%	Rock and Gravel	0.9%	0.1%	1.6%
Aluminum Cans	0.0%	0.0%	0.0%	Dirt and Sand	7.4%	3.6%	11.2%
Other Non-Ferrous	0.1%	0.0%	0.2%	Fiberglass insulation	0.5%	0.1%	1.0%
R/C Metal	0.3%	0.1%	0.4%	R/C C&D	5.8%	3.9%	7.7%
E-Waste	0.0%			*Hazardous Waste*	0.4%		
Brown Goods/Sm Consumer Electronics	0.0%	0.0%	0.0%	Paint	0.3%	0.1%	0.5%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.0%	Used Oil	0.0%	0.0%	0.0%
Plastic	1.1%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.0%	0.0%	0.0%	R/C Hazardous Waste	0.1%	0.0%	0.3%
Other Rigid Packaging	0.0%	0.0%	0.0%	*Special*	1.6%		
Polystyrene Packaging/Insulation	0.2%	0.1%	0.3%	Textiles	0.1%	0.0%	0.2%
Trash Bags	0.0%	0.0%	0.0%	Carpet	0.8%	0.4%	1.2%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.1%	0.0%	0.1%
Non-Bag Packaging Film	0.1%	0.0%	0.1%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	0.3%	0.2%	0.4%	Bulky Items	0.7%	0.2%	1.1%
Other Film	0.0%	0.0%	0.0%	Tires	0.0%	0.0%	0.0%
Durable Plastic Items	0.1%	0.0%	0.1%	R/C Other	0.0%	0.0%	0.0%
Plastic Piping	0.3%	0.1%	0.5%	*Mixed Residue/MSW*	1.7%		
R/C Plastic	0.1%	0.0%	0.2%	Mixed Residue	0.7%	0.0%	1.5%
Organics	4.8%			MSW	1.1%	0.5%	1.6%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	1.3%	0.5%	2.1%				
Prunings & Trimmings	2.4%	0.6%	4.1%				
Branches & Stumps	1.0%	0.2%	1.8%	Total Percentage	100.0%		
R/C Organic	0.2%	0.0%	0.5%	Sample Count	164		

5 Composition Results for Processing Residuals

A total of 52 samples were sorted from loads from residuals from the recycling sorting line at the Eastmont facility during the 2007 study period.[9] The composition estimates for residuals are presented below. These results were calculated using an unweighted process.[10] As shown in Figure 5-1, ***C&D: Fines*** accounted for approximately 27% of C&D waste in the residual stream, while ***Other Recyclables*** made up about 25%, and ***C&D: Clean, Recyclable Wood*** composed about 16% of this waste stream.

Figure 5-1: Composition Summary, Residuals (January – December 2007)



As shown in Table 5-1, *dirt and sand* (14.4%) and *rock and gravel* (12.1%) were the largest components of C&D residuals in 2007. *Clean dimensional lumber* made up almost 10% of the residual waste. The full composition results for residuals are presented in Table 5-2.

Table 5-1: Top Ten Components – Residuals (January – December 2007)

Component	Mean	Cum. %
Dirt and Sand	14.4%	14.4%
Rock and Gravel	12.1%	26.5%
Clean Dimensional Lumber	9.9%	36.4%
Carpet	6.9%	43.3%
Painted/Demolition Gypsum	6.8%	50.1%
Painted/Stained Wood	6.2%	56.3%
Clean Engineered Wood	5.6%	61.9%
Remainder/Composite Metal	5.0%	67.0%
Uncoated Corrugated Cardboard	4.5%	71.5%
Other Ferrous Metal	3.7%	75.2%
Total	**75.2%**	

[9] The annual tonnage of the residual substream was not available through the facility's tonnage tracking system.
[10] Composition calculations and the weighted average process are described in Appendix D.

Table 5-2: Composition by Weight – Residuals (January – December 2007)

Calculated at a 90% confidence level

	Mean	Low	High		Mean	Low	High
Paper	8.5%			*C&D*	59.9%		
Uncoated Corrugated Cardboard	4.5%	0.0%	9.1%	Concrete	0.2%	0.0%	0.5%
Paper Bags	2.1%	0.4%	3.8%	Asphalt Paving	0.0%	0.0%	0.0%
Other Recyclable Paper	1.7%	0.6%	2.9%	Composition Roofing	0.0%	0.0%	0.0%
Cellulose Insulation	0.0%	0.0%	0.0%	Other Asphalt Roofing	0.0%	0.0%	0.0%
R/C Paper	0.1%	0.0%	0.4%	Other Aggregates	0.0%	0.0%	0.0%
Glass	1.4%			Clean Dimensional Lumber	9.9%	3.7%	16.1%
Glass Bottles and Containers	0.0%	0.0%	0.0%	Clean Engineered Wood	5.6%	0.8%	10.5%
Flat Glass	0.7%	0.0%	2.0%	Pallets and Crates	0.1%	0.0%	0.2%
R/C Glass	0.6%	0.0%	1.6%	Other Recyclable Wood	0.7%	0.0%	1.5%
Metal	8.9%			Painted/Stained Wood	6.2%	3.6%	8.7%
Tin/Steel Cans	0.0%	0.0%	0.0%	Creosote-treated Wood	0.0%	0.0%	0.0%
Major Appliances	0.0%	0.0%	0.0%	Other Treated Wood	0.0%	0.0%	0.0%
Used Oil Filters	0.0%	0.0%	0.0%	Clean Gypsum Board	0.8%	0.0%	1.9%
HVAC Ducting	0.0%	0.0%	0.0%	Painted/Demolition Gypsum	6.8%	1.3%	12.3%
Other Ferrous	3.7%	0.0%	7.8%	Rock and Gravel	12.1%	0.7%	23.6%
Aluminum Cans	0.1%	0.0%	0.2%	Dirt and Sand	14.4%	5.9%	22.9%
Other Non-Ferrous	0.0%	0.0%	0.0%	Fiberglass insulation	0.1%	0.0%	0.2%
R/C Metal	5.0%	0.0%	13.1%	R/C C&D	3.0%	1.0%	5.0%
E-Waste	0.0%			*Hazardous Waste*	0.0%		
Brown Goods/Sm Consumer Electronics	0.0%	0.0%	0.0%	Paint	0.0%	0.0%	0.0%
Computer-related Electronics	0.0%	0.0%	0.0%	Vehicle & Equip. Fluids	0.0%	0.0%	0.0%
TV's & Other CRTs	0.0%	0.0%	0.0%	Used Oil	0.0%	0.0%	0.0%
Plastic	9.4%			Batteries	0.0%	0.0%	0.0%
Plastic Bottles and Tubs	0.1%	0.0%	0.2%	R/C Hazardous Waste	0.0%	0.0%	0.0%
Other Rigid Packaging	0.0%	0.0%	0.1%	*Special*	9.2%		
Polystyrene Packaging/Insulation	0.4%	0.1%	0.8%	Textiles	0.5%	0.0%	0.9%
Trash Bags	0.0%	0.0%	0.1%	Carpet	6.9%	0.0%	15.9%
Grocery/ Merch. Bags	0.0%	0.0%	0.0%	Carpet Padding	0.0%	0.0%	0.0%
Non-Bag Packaging Film	2.7%	0.4%	5.0%	Ash	0.0%	0.0%	0.0%
Plastic Sheeting and Agricultural Film	1.7%	0.6%	2.8%	Bulky Items	1.9%	0.0%	4.2%
Other Film	0.0%	0.0%	0.1%	Tires	0.0%	0.0%	0.0%
Durable Plastic Items	1.2%	0.2%	2.3%	R/C Other	0.0%	0.0%	0.0%
Plastic Piping	0.4%	0.0%	0.8%	*Mixed Residue/MSW*	2.2%		
R/C Plastic	2.7%	0.0%	6.7%	Mixed Residue	0.4%	0.0%	1.1%
Organics	0.5%			MSW	1.8%	0.0%	4.1%
Food	0.0%	0.0%	0.0%				
Leaves & Grass	0.2%	0.0%	0.6%				
Prunings & Trimmings	0.2%	0.0%	0.5%				
Branches & Stumps	0.1%	0.0%	0.3%	Total Percentage	100.0%		
R/C Organic	0.0%	0.0%	0.0%	Sample Count	52		

6 Seattle Construction & Demolition Permit Data

In 2007, the Seattle Department of Planning and Development issued 8,865 permits, which allowed the removal of 1,032 existing units and the construction of 8,601 new units.[11] Of these permits, 29 were issued for large projects (greater than $500,000), which added a total of 122 new units. The Department of Planning and Development valued the 29 large projects at $108,971,731 and the remaining projects at $2,808,800,092, for a total of $2,917,771,823. Using the total number and value of permits listed above, it is possible to calculate C&D generated per permit and per C&D dollar spent in 2007. Of the 201,156 tons C&D disposed in 2007 through the three private stations and intermodal containers, 22.69 tons, or 45,382 pounds, of waste was disposed per permit issued and 0.14 pounds of waste was disposed for each estimated dollar of permit value.

[11] Data provided by the Seattle Department of Planning and Development on their website http://www.seattle.gov/dpd/Research/Issued_Building_Permit_Stats/default.asp.

Appendix A: Waste Component Categories

Waste samples were characterized according to the following 67 component categories.

PAPER

UNCOATED CORRUGATED CARDBOARD: corrugated boxes without any wax coating on the inside or outside. Examples include entire cardboard containers, such as shipping and moving boxes, computer packaging cartons, and sheets and pieces of boxes and cartons. This category does not include chipboard.

PAPER BAGS: bags and sheets made from Kraft paper. Examples include paper grocery bags, fast food bags, department store bags, and heavyweight sheets of Kraft packing paper.

OTHER RECYCLABLE PAPER: recyclable items made mostly of paper that do not fit into the above category. Paper may be combined with minor amounts of other materials such as wax or glues. This category includes items made of bond paper, newsprint, glossy coated paper, chipboard, groundwood paper, and deep-toned or fluorescent dyed paper. Examples include ledger, newspaper, manila folders, cereal and cracker boxes, unused paper plates and cups, goldenrod colored paper, school construction paper/butcher paper, milk cartons, ice cream cartons and other frozen food boxes, junk mail, colored envelopes for greeting cards, pulp paper egg cartons, unused pulp paper plant pots, magazines and catalogues, phone books and directories, and softcover books.

CELLULOSE INSULATION: pulped paper, usually newsprint, installed as insulation in walls using a dense-packing or spraying technique. These items are typically treated with fire retardants.

REMAINDER/COMPOSITE PAPER: items made mostly of paper but combined with large amounts of other materials such as wax, plastic, glues, foil, food, and moisture. Examples include waxed corrugated cardboard, aseptic packages, waxed paper, tissue, paper towels, blueprints, sepia, onion skin, fast food wrappers, carbon paper, self-adhesive notes, hardcover books, and photographs.

GLASS

GLASS BOTTLES AND CONTAINERS: glass beverage and food containers. Examples include whole or broken soda and beer bottles, fruit juice bottles, peanut butter jars, whole or broken wine bottles, and mayonnaise jars.

FLAT GLASS: clear or tinted glass that is flat. Examples include glass window panes, doors, and table tops, flat automotive window glass (side windows), safety glass, and architectural glass. This category does not include windshields, laminated glass, or any curved glass.

REMAINDER/COMPOSITE GLASS: glass that cannot be put in any other category, including items made mostly of glass but combined with other materials. Examples include Pyrex, Corningware, crystal and other glass tableware, mirrors, non-fluorescent light bulbs, and auto windshields.

METAL

TIN/STEEL CANS: rigid containers made mainly of steel. These items will stick to a magnet and may be tin-coated. This category is used to store food, beverages, paint, and a variety of other household and consumer products. Examples include canned food and beverage containers, empty metal paint cans, empty spray paint and other aerosol containers, and bimetal containers with steel sides and aluminum ends.

MAJOR APPLIANCES: discarded major appliances of any color. These items are often enamel-coated. Examples include washing machines, clothes dryers, hot water heaters, stoves, refrigerators, furnaces, and heating and cooling equipment. This category does not include electronics, such as televisions and stereos.

USED OIL FILTERS: metal oil filters used in motor vehicles and other engines, which contain a residue of used oil.

HVAC DUCTING: sheet metal tubing, typically galvanized, used for conveying ventilation air.

OTHER FERROUS: any iron or steel that is magnetic or any stainless steel item. This category does not include "tin/steel cans." Examples include structural steel beams, boilers, metal clothes hangers, metal pipes, stainless steel cookware, security bars, scrap ferrous items, and galvanized items such as nails and flashing.

ALUMINUM CANS: any food or beverage container made mainly of aluminum. Examples include aluminum soda or beer cans, and some pet food cans. This category does not include bimetal containers with steel sides and aluminum ends.

OTHER NON-FERROUS: any metal item, other than aluminum cans, that is not stainless steel and that is not magnetic. These items may be made of aluminum, copper, brass, bronze, lead, zinc, or other metals. Examples include aluminum window frames, aluminum siding, uninsulated copper wire, shell casings, brass pipe, and aluminum foil.

REMAINDER/COMPOSITE METAL: metal that cannot be put in any other category. This category includes items made mostly of metal but combined with other materials and items made of both ferrous metals and non-ferrous metal combined. Examples include small non-electronic appliances such as toasters and hair dryers, motors, insulated wire, and finished products that contain a mixture of metals, or metals and other materials, whose weight is derived significantly from the metal portion of its construction.

ELECTRONICS

BROWN GOODS AND OTHER SMALL CONSUMER ELECTRONICS: non-computer-related electronic goods that have some circuitry. Examples include microwaves, stereos, VCRs, DVD players, radios, audio/visual equipment, non-CRT televisions (such as LCD televisions), personal digital assistants (PDAs), cell phones, phone systems, phone answering machines, computer games and other electronic toys, portable CD players, camcorders, and digital cameras.

COMPUTER-RELATED ELECTRONICS: electronics with large circuitry that is computer-related. Examples include processors, mice, keyboards, laptops, disk drives, printers, modems, and fax machines.

TELEVISIONS AND OTHER ITEMS WITH CRTS: televisions, computer monitors, and other items containing a cathode ray tube (CRT).

PLASTIC

PLASTIC BOTTLES AND TUBS: clear or colored bottles or tubs. When marked for identification, these items may bear numbers 1 through 7 in the triangular recycling symbol. Examples include soft drink and water bottles, some liquor bottles, cooking oil containers, aspirin bottles, milk jugs, water jugs, detergent bottles, some dairy tubs, some hair-care bottles, salad dressings, vegetable oils, syrup bottles, and margarine tubs. This category does not include toxic product containers, such as for oil or antifreeze.

OTHER RIGID PACKAGING: rigid plastic packaging made of types of plastic numbers 1 through 7 and unmarked rigid plastic packaging (excluding expanded polystyrene), such as

clamshells, salad trays, lids, cookie tray inserts, plastic spools, plastic frozen food trays, plastic plant pots, and plastic toothpaste tubes. This category also includes toxic product containers, such as for oil or antifreeze.

EXPANDED POLYSTYRENE PACKAGING AND INSULATION: items marked with "PS" or "6." Examples include packaging peanuts, meat and vegetable packaging trays, and clamshell containers. This category also includes expanded polystyrene packaging blocks and insulation.

TRASH BAGS: plastic bags sold for use as trash bags, for both residential and commercial use. This category does not include other plastic bags like shopping bags that might have been used to contain trash.

GROCERY AND OTHER MERCHANDISE BAGS: plastic shopping bags used to contain merchandise to transport from the place of purchase, given out by the store with the purchase. Includes dry-cleaning plastic bags intended for 1-time use.

NON-BAG COMMERCIAL AND INDUSTRIAL PACKAGING FILM: film plastic used for large-scale packaging or transport packaging. Examples include shrink-wrap, mattress bags, furniture wrap, and film bubble wrap.

PLASTIC SHEETING AND AGRICULTURAL FILM: plastic film used for purposes other than packaging. Examples include agricultural film (films used in various farming and growing applications, such as silage greenhouse films, mulch films, and wrap for hay bales), plastic sheeting used as drop cloths, and building wrap/Tyvek packaging.

OTHER FILM: all other plastic film that does not fit into any other category. Examples include other types of plastic bags (sandwich bags, zipper-recloseable bags, newspaper bags, produce bags, frozen vegetable bags, bread bags), food wrappers such as candy-bar wrappers, mailing pouches, bank bags, X-ray film, metalized film (wine containers and balloons), and plastic food wrap.

DURABLE PLASTIC ITEMS: plastic objects other than containers and film plastic. This category also includes plastic objects other than containers or film that bear the numbers 1 through 7 in the triangular recycling symbol. These items are usually made to last for more than one use. Examples include plastic outdoor furniture, plastic toys, sporting goods, CDs, and plastic house wares, such as mop buckets, dishes, cups, and cutlery. This category also includes building materials (house siding, window sashes, and frames) and housings for electronics such as computers, televisions, and stereos.

PLASTIC PIPING: pipes and fittings made of PVC (polyvinyl chloride), ABS (acrylonitrile butadiene styrene), or other rigid plastics.

REMAINDER/COMPOSITE PLASTIC: plastics that cannot be put in any other category and usually recognized by their optical opacity. This category includes items made mostly of plastic but combined with other materials. Examples include auto parts made of plastic attached to metal, plastic drinking straws, foam packing blocks (not including expanded polystyrene blocks), plastic strapping, new plastic laminate (e.g., Formica), vinyl, linoleum, plastic lumber, imitation ceramics, handles and knobs, plastic lids, some kitchen wares, toys, plastic string (as used for hay bales), and plastic rigid bubble/foil packaging (as for medications).

ORGANICS

FOOD: food material resulting from the processing, storage, preparation, cooking, handling, or consumption of food. This category includes material from industrial, commercial, or residential sources. Examples include discarded meat scraps, dairy products, egg shells, fruit or vegetable peels, and other food items from homes, stores, and restaurants. This category includes grape

pomace and other processed residues or material from canneries, wineries, or other industrial sources.

LEAVES AND GRASS: plant material, except woody material, from any public or private landscapes. Examples include leaves, grass clippings, sea weed, and plants. This category does not include woody material or material from agricultural sources.

PRUNINGS AND TRIMMINGS: woody plant material up to 4 inches in diameter from any public or private landscape. Examples include prunings, shrubs, and small branches with branch diameters that do not exceed 4 inches. This category does not include stumps, tree trunks, or branches exceeding 4 inches in diameter and does not include material from agricultural sources.

BRANCHES AND STUMPS: woody plant material, branches, and stumps that exceed four inches in diameter from any public or private landscape.

REMAINDER/COMPOSITE ORGANICS: organic material that cannot be put in any other category. Examples include wood chips, sawdust, agricultural residues, and animal feces.

CONSTRUCTION & DEMOLITION

CONCRETE: a hard material made from sand, gravel, aggregate, cement mix, and water. This category includes concrete containing steel mesh and/or reinforcement bars, or "rebar". Examples include pieces of building foundations, concrete paving, and cinder blocks.

ASPHALT PAVING: a black or brown, tar-like material mixed with aggregate used as a paving material. This category includes asphalt paving containing steel mesh and/or reinforcement bars, or "rebar."

COMPOSITION ROOFING: composite shingles composed of fiberglass or organic felts saturated with asphalt and covered with inert aggregates as well as attached roofing tar and tar paper. This category is commonly known as three tab roofing and does not include built-up roofing. Examples include asphalt shingles and attached roofing tar and tar paper.

OTHER ASPHALT ROOFING (Built-up Roofing): other roofing material made with layers of felt, asphalt, aggregates, and attached roofing tar and tar paper normally used on flat/low pitched roofs usually on commercial buildings.

OTHER AGGREGATES: aggregates other than concrete and asphalt paving such as bricks, masonry tile, ceramics, porcelain toilets, and clay roofing tiles.

CLEAN DIMENSIONAL LUMBER: unpainted new or demolition dimensional lumber. Examples include materials such as 2 x 4s, 2 x 6s, 2 x 12s, and other residual materials from framing and related construction activities. May contain nails or other trace contaminants.

CLEAN ENGINEERED WOOD: unpainted new or demolition scrap from sheeted goods such as plywood, particleboard, wafer board, oriented strand board, and other residual materials used for sheathing and related construction uses. May contain nails or other trace contaminants.

PALLETS AND CRATES: unpainted wood pallets, crates, and packaging made of lumber/engineered wood.

OTHER RECYCLABLE WOOD: recyclable wood not included in any other category. This may include scrap from production of prefabricated wood products such as wood furniture or cabinets that have not been treated with paint, stain, or other chemical finish. This category also includes recyclable demolition wood and untreated or unpainted wood roofing and siding as long as the wood material is not contaminated with another material (i.e. tar). May be recycled into ethanol, adhesives, or other engineered wood products.

PAINTED/STAINED WOOD: wood that has had an external coating applied, such as paint, stain, or varnish. Examples include handrails and finished furniture.

CREOSOTE-TREATED WOOD: wood that has been treated with creosote. Examples include railroad ties, marine timbers and pilings, landscape timbers, and telephone poles.

OTHER TREATED WOOD: wood that has been treated with a chemical preservative not included in any other category, such as chromated copper arsenate (CCA), also called "pressure-treated wood." This type of wood may have a greenish tint or be perforated. Examples include some cedar shakes and shingles and most wood from playgrounds, decks, and other outdoor structures.

CLEAN GYPSUM BOARD: unpainted gypsum wallboard or interior wall covering made of a sheet of gypsum sandwiched between paper layers. Examples include used or unused, broken or whole sheets. Gypsum board may also be called sheetrock, drywall, plasterboard, gypboard, gyproc, or wallboard.

PAINTED/DEMOLITION GYPSUM BOARD: painted gypsum wallboard or interior wall covering made of a sheet of gypsum sandwiched between paper layers. Examples: This category includes used or unused, broken or whole sheets. Gypsum board may also be called sheetrock, drywall, plasterboard, gypboard, gyproc, or wallboard.

ROCK AND GRAVEL: pieces of mineral matter or rock. Examples include landscaping rock, paving stones, pathway gravel, and other natural or mechanically crushed materials.

DIRT AND SAND: nutrient rich decayed organic matter and fine pieces of mineral matter, often left over from land clearing activities. This category also includes non-hazardous contaminated soil.

FIBERGLASS INSULATION: various types of synthetic fiber insulation including both faced and unfaced batts and rigid board types. Used in ceilings, walls, and around ducting for both thermal insulation and sound attenuation.

REMAINDER/COMPOSITE CONSTRUCTION AND DEMOLITION: construction and demolition material that cannot be put in any other category. This category may include items from different categories combined, which would be very hard to separate. This category may also include demolition debris that is a mixture of materials such as non-porcelain sinks, synthetic counter tops, fiber or composite acoustic ceiling tiles, plate glass, wood, tiles, gypsum board, and aluminum scrap.

HOUSEHOLD HAZARDOUS WASTE

PAINT: containers with paint in them. Examples include latex paint, oil based paint, aerosol cans containing paint, and tubes of pigment or fine art paint. This category does not include dried paint, empty paint cans, or empty aerosol containers.

VEHICLE AND EQUIPMENT FLUIDS: containers with fluids used in vehicles or engines, except used oil. Examples include used antifreeze and brake fluid. This category does not include empty vehicle and equipment fluid containers.

USED OIL: means the same as defined in Health and Safety Code section 25250.1(a). Examples include spent lubricating oil such as crankcase and transmission oil, gear oil, and hydraulic oil.

BATTERIES: any type of battery including both dry cell and lead acid. Examples include car, flashlight, small appliance, watch, and hearing aid batteries.

REMAINDER/COMPOSITE HOUSEHOLD HAZARDOUS: household hazardous material that cannot be put in any other category. This category also includes household hazardous material

that is mixed. Examples include household hazardous waste which, if improperly put in the solid waste stream, may present handling problems or other hazards, such as fluorescent light bulbs, pesticides, and caustic cleaners.

OTHER MATERIALS

TEXTILES: items made of thread, yarn, fabric, or cloth. Examples include clothes, fabric trimmings, draperies, and all natural and synthetic cloth fibers. This category does not include cloth-covered furniture, mattresses, leather shoes, leather bags, or leather belts.

CARPET: flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material. This category does not include carpet padding.

CARPET PADDING: plastic, foam, felt, and other materials used under carpet to provide insulation and padding.

ASH: a residue from the combustion of any solid or liquid material. Examples include ash from structure fires, fireplaces, incinerators, biomass facilities, waste-to-energy facilities, and barbecues.

BULKY ITEMS: large hard to handle items that are not defined separately, including furniture, mattresses, and other large items. Examples include all sizes and types of furniture, mattresses, box springs, and base components.

TIRES: vehicle tires. Examples include tires from trucks, automobiles, motorcycles, heavy equipments, and bicycles.

REMAINDER/COMPOSITE OTHER MATERIALS: special waste that cannot be put in any other category. Examples include asbestos-containing materials, such as certain types of pipe insulation and floor tiles, auto fluff, auto-bodies, trucks, trailers, truck cabs, untreated medical waste/pills/hypodermic needles, and artificial fireplace logs.

MIXED RESIDUE/MSW

MIXED RESIDUE: material that cannot be put in any other category. This category includes mixed residue that cannot be further sorted. Examples include residual material from a materials recovery facility or other sorting process that cannot be put in any of the previous remainder/composite categories. This category also includes clay and other fines.

MSW: mixed household garbage, including leather items, cork, hemp rope, garden hoses, rubber items, hair, cigarette butts, diapers, feminine hygiene products, and wood products (Popsicle sticks and toothpicks).

Appendix B: Sampling Methodology

Overview

The objectives of the 2007 Seattle C&D Waste Composition Study were as follows:

- To provide statistically significant data on the composition of waste generated via construction and demolition (C&D) activities within the City of Seattle,
- To identify materials in the disposed waste C&D stream that are potentially recyclable,
- To understand seasonal and substream differences so that targeted waste diversion programs can be designed, and
- To provide a comparison to the previous C&D study and a benchmark for continued long-term measurement of the C&D waste stream.

The Seattle C&D waste stream was last analyzed in 1994/95. While the results of the 2007 study can be compared with the 1994/95 study, the methodology for the 2007 study was substantially different than that used in the 1994/95 study. This document outlines the sampling methodology for the current study.

Sampling Populations

This study examined C&D waste that is generated exclusively in the City of Seattle, by both residential and commercial sources. C&D waste was defined as waste generated from new construction, remodeling, demolition, roofing, and other/mixed activities, such as public infrastructure projects and remodeling. Loads that contained at least 80% C&D were eligible for inclusion in the study.

Beginning in February 2007, C&D waste was collected from three hauler types: the city's two contracted haulers (Waste Management and Allied), C&D haulers, and self haulers. These types are defined as follows.

- **Contracted haulers**: The two haulers, Waste Management and Allied, that the City contracts with to collect and dispose of commercial waste.
- **C&D haulers**: Companies whose principal business includes demolition and/or hauling of construction and demolition materials, such as large construction or demolition contractors Bobby Wolford Trucking & Demolition, Democon, and Renu.
- **Self-haulers**: Any party other than a certificated or C&D hauler whose primary business is an activity other than waste hauling. This includes contractors, residents, and small business owners and is divided into business self-haulers and homeowner self-haulers.

Waste samples were collected from the three transfer stations that accept Seattle C&D waste: Eastmont, Third & Lander, and Black River. In addition, samples were collected from construction sites where C&D waste is placed directly into shipping, or intermodal, containers so that it can be transferred onto a train.

Sample Allocation

Sampling targets were based on construction activity types. C&D waste was categorized according to activity types as follows.

- **New Construction**: Construction materials generated from the construction of new structures.

- **Remodeling**: Construction or demolition materials generated from the remodeling of buildings.
- **Demolition**: Materials generated from the tearing down of any facility, structure, or building, whether interior or exterior.
- **Roofing**: Construction or demolition materials generated from the new construction, remodeling, and/or demolition of residential or non-residential roofs.
- **Mixed/Other C&D**: Construction or demolition materials generated from activities not otherwise classified, such as the building, repair, and/or demolition of roads, bridges, and other public infrastructure.

Approximately 786 samples of C&D waste were characterized during 46 days of sampling.

The samples were allocated to construction activity types as detailed in Table B-1.

Table B-1: Targets vs. Actual Samples Completed, by Activity Type

Activity Type	Number of Samples	
	Actual	Target
New Construction	171	170-200
Remodeling	232	170-200
Demolition	151	120-160
Roofing	100	85-105
Other/Mixed	48	85-105
Residuals	52	50
Intermodal	32	32
Total	**786**	**782**

Sampling days were distributed across the four quarters of the year on randomly selected days and apportioned to the three facilities that receive C&D waste from Seattle: Eastmont, Third & Lander, and Black River. Sampling of intermodal containers at construction sites were initially scheduled to coincide with sampling at the facilities, although it frequently occurred on separate days due to limited intermodal projects. Additionally, to characterize waste from C&D sorting operations, samples were allocated to residual materials at Eastmont. Eastmont is the only one of the three facilities currently sorting C&D materials for recoverable material. Including the residuals in the study allows for the entire disposed C&D waste stream to be characterized.

Sampling at Disposal Sites

Sampling Calendar

Sampling at disposal sites was scheduled quarterly: winter (February), spring (May), summer (August), and fall (September, October, and November). As shown in Table B-2 below, sampling occurred every quarter with additional days scheduled for the fourth quarter to make up for previous shortages. Eastmont was visited during all four seasons, while Third & Lander and Black River were visited during three seasons. Third & Lander was only visited in winter and fall due to sampling conflicts, including construction, at the facility. Black River was visited in spring, summer, and fall. Sampling across all four seasons ensured that seasonally-influenced differences were adequately represented in the overall results and that comparable data were obtained for each sector.

Table B-2: Waste Sampling Calendar – Disposal Sites

Date	Facility	Day of Week	Week of Month
2/21/2007	Third & Lander	Wednesday	3
2/22/2007	Third & Lander	Thursday	4
2/23/2007	Eastmont	Friday	4
2/26/2007	Eastmont	Monday	4
2/27/2007	Eastmont	Tuesday	4
5/15/2007	Black River	Tuesday	3
5/16/2007	Black River	Wednesday	3
5/17/2007	Eastmont	Thursday	3
5/18/2007	Eastmont	Friday	3
5/19/2007	Eastmont	Saturday	3
5/21/2007	Eastmont	Monday	3
5/22/2007	Third & Lander	Tuesday	4
5/23/2007	Black River	Wednesday	4
8/7/2007	Eastmont	Tuesday	1
8/9/2007	Eastmont	Thursday	2
8/10/2007	Eastmont	Friday	2
8/21/2007	Eastmont	Tuesday	3
8/22/2007	Eastmont	Wednesday	4
8/23/2007	Black River	Thursday	4
8/24/2007	Black River	Friday	4
9/25/2007	Third & Lander	Tuesday	4
9/26/2007	Third & Lander	Wednesday	4
10/11/2007	Eastmont	Thursday	2
10/12/2007	Eastmont	Friday	2
10/15/2007	Eastmont	Monday	3
10/16/2007	Third & Lander	Tuesday	3
10/17/2007	Third & Lander	Wednesday	3
10/25/2007	Black River	Thursday	4
10/25/2007	Eastmont	Thursday	4
10/26/2007	Black River	Friday	4
10/26/2007	Eastmont	Friday	4
11/5/2007	Third & Lander	Monday	1
11/9/2007	Third & Lander	Friday	2
11/8/2007	Eastmont	Thursday	2

Table B-3: Distribution of Waste Sampling Days – Disposal Sites

			Number of Waste Sampling Days: Total						
			Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Overall**
Black River	Winter	Week 1							
		Week 2							
		Week 3							
		Week 4							
	Winter Total								
	Spring	Week 1							
		Week 2							
		Week 3		1	1				2
		Week 4			1				1
	Spring Total			*1*	*2*				*3*
	Summer	Week 1							
		Week 2							
		Week 3							
		Week 4				1	1		2
	Summer Total					*1*	*1*		*2*
	Fall	Week 1							
		Week 2							
		Week 3							
		Week 4				1	1		2
	Fall Total					*1*	*1*		*2*
Black River Total				**1**	**2**	**2**	**2**		**7**
Eastmont	Winter	Week 1							
		Week 2							
		Week 3							
		Week 4	1	1			1		3
	Winter Total		*1*	*1*			*1*		*3*
	Spring	Week 1							
		Week 2							
		Week 3	1			1	1	1	4
		Week 4							
	Spring Total		*1*			*1*	*1*	*1*	*4*
	Summer	Week 1		1					1
		Week 2				1	1		2
		Week 3		1					1
		Week 4			1				1
	Summer Total			*2*	*1*	*1*	*1*		*5*
	Fall	Week 1							
		Week 2				2	1		3
		Week 3	1						1
		Week 4				1	1		2
	Fall Total		*1*			*3*	*2*		*6*
Eastmont Total			**3**	**3**	**1**	**5**	**5**	**1**	**18**
Third & Lander	Winter	Week 1							
		Week 2							
		Week 3			1				1
		Week 4				1			1
	Winter Total				*1*	*1*			*2*
	Spring	Week 1							
		Week 2							
		Week 3							
		Week 4		1					1
	Spring Total			*1*					*1*
	Summer	Week 1							
		Week 2							
		Week 3							
		Week 4							
	Summer Total								
	Fall	Week 1	1						1
		Week 2					1		1
		Week 3		1	1				2
		Week 4		1	1				2
	Fall Total		*1*	*2*	*2*		*1*		*6*
Third & Lander Total			**1**	**3**	**3**	**1**	**1**		**9**
Grand Total			**4**	**7**	**6**	**8**	**8**	**1**	**34**

Hauler and Transfer Station Participation

For sampling at facilities (Eastmont, Third & Lander, and Black River), the Project Manager met with facility representatives during the study design phase to explain the details of the study and determine how the sampling and surveying would be conducted at each site. All affected personnel received a sampling schedule prior to the first sampling event. Additionally, they were contacted the week before and the day prior to each sampling event. The facilities were asked to notify their staff of each sampling event.

Vehicle Survey

In order to quantify the waste associated with each activity type, surveys were conducted at the entrance of each participating facility. The surveys were administered to the driver of each vehicle entering the facility through the gate at which the surveyor was posted. The surveys were conducted at each participating disposal facility on the same days that sampling occurred. On each survey day, the surveyor was on-site for an eight-hour period, inclusive of all necessary rest breaks and a meal break. The window for surveying was from 6am to 6pm and starting times were chosen between 6am and 10am.

The information collected on the Vehicle Survey Form corresponds to six main categories of information: vehicle type, hauler, load origin, construction activity type, and building. A copy of the Vehicle Survey Form is included in Appendix G. The net weights of each vehicle were also obtained. The survey process consists of six steps.

Step 1. Verify that the load is eligible. The surveyor must first confirm that the load contains at least 80 percent C&D waste, originated in Seattle, and will be disposed, not recycled. The survey excluded loads that contained C&D that is recycled or those that contained more than 20 percent MSW.[1]

Step 2. Record net weight. The procedure for obtaining vehicle net weights may have differed by facility. If the surveyor was positioned before the vehicle reaches the scale house, the driver was given a numbered card so that the surveyor could record the net weight for the load as the vehicle exits the facility. If the surveyor was positioned after the vehicles weigh, it was possible to look at the ticket and record the net weight if the vehicle had a tare weight in the system. If the vehicle did not have a tare weight, a numbered card was given to the driver. A second surveyor may have been needed at some sites to obtain net weights.

Step 3. Observe. Next, the surveyor observed and recorded the following:

1. **Vehicle type** – The surveyor recorded the vehicle type, according to the five categories: drop-box/roll-off, end-dump (includes flatbeds that dump), tractor/trailer (semi), other large vehicle, or pick-up (includes truck, van, auto, and other small vehicles).[2]
2. **Hauler** – The surveyor determined if the vehicle was a contracted hauler, C&D hauler, or self-hauler. Surveyors had a list of all certificated hauling companies and examples of C&D haulers. If it was a self-hauler, the driver was asked if the load was from a business or residence.

Step 4. Ask all drivers for specified information. All surveyed drivers were then asked for the following information:

[1] Loads generated by C&D activities generally contain more than 80% C&D waste. Having a cut-off of 80% C&D material will likely exclude small loads, such as residential self-haul, that contain a large portion of MSW.
[2] No tractor/trailer (semi) loads were sampled in the study.

3. **Load origin –** The surveyor asked the driver the address, or cross streets, from which the load originated.
4. **Building type –** The surveyor asked the driver to choose the category that best describes the building: residential, non-residential, mixed (both residential and non-residential construction), or other structures.
5. **Construction activity type –** For the final question, the surveyor asked if the load contained waste from new construction, remodeling, demolition, roofing, or other/mixed C&D.

The surveyor recorded data from the interviews on a *Vehicle Survey Form*. Cascadia's project manager was on-site at the beginning of the sampling and survey phase of the project and trained the surveyor in the implementation of the survey and the use of the *Vehicle Survey Form*. Following each day of surveying, the completed *Vehicle Survey Forms* were delivered to Cascadia's office for entry into a customized Microsoft Access database.

Vehicle Selection

The staff member conducting the vehicle surveys had the additional duty of selecting vehicles for sampling. At the start of the survey day, every third new construction, remodeling, and demolition load was selected for sampling. Because roofing and other/mixed loads are less common, every load of those types was selected. These sampling intervals were adjusted as needed, based on traffic flows, in order to meet each day's sampling goals. Paper *Vehicle Selection Forms* were created for each day and each location of sampling activity. When a vehicle was selected, the staff member assigned a unique sample ID number to the load and recorded that sample ID number on the *Vehicle Survey Form*.

The surveyor placed the *Sample Placard* on the vehicle's windshield or dashboard to identify it as a vehicle intended for sampling and directed the driver to the sampling area. The entire load carried by each vehicle chosen for sampling constituted one sample.

Collection of C&D Visual Characterization Data at Disposal Sites

A visual volumetric measurement protocol was used to characterize loads of C&D waste. Visual sampling is more effective than the hand-sorting method due to the heavy, bulky and highly variable nature of the C&D load. This leads to a more representative characterization of each load and, therefore, the waste stream as a whole. A professional visual estimator used the field-tested, six-step process described below to estimate the composition of all C&D loads.

Step 1. Record the sample number and date. Record this information on the V*isual Sampling Form*.

Step 2. Measure load volume. Measure and record the length, width, and height of the load while it is still in the vehicle (if possible). Record measurements on the *Visual Sampling Form*.

Step 3. Note which broad material categories are present. After the driver has dumped the load onto the ground and it has been spread out, walk entirely around the load and indicate on the sampling form which broad material categories are present in the load. Broad material categories include paper, glass, metal, electronics, plastic, other organic, construction and demolition, household hazardous waste (HHW), special waste, and mixed residue/MSW.

Step 4. Estimate composition by volume for each broad material category. Beginning with the largest broad material category present by volume, estimate the percentage by volume of this broad material category and record it on the form. Repeat this process for the next most common broad material category, and so forth, until the volumetric percentage of every broad

material category has been estimated. Then calculate the total for this step, ensuring that it totals 100 percent.

Step 5. Estimate composition by volume for each specific component. Consider each broad material category separately and estimate the percentage by volume of the major class that is made up of each specific component. An example of a specific component within the broad material category of metal would be *other ferrous metal*. While considering only the metal broad material category, estimate the volumetric percentage of metal each component comprises. The total of percentages for all of the components must equal 100 percent. Repeat this process for the other broad material categories, with all the components in each broad material category totaling 100 percent.

Step 6. Check and reconcile percentage data. Verify that the percentage estimates for the broad material categories add up to 100 percent. Also, the percentage estimates for the components within each major class must total 100 percent.

The visual estimator used a *Visual Sampling Form* to record the composition estimates and the information obtained from the *Sample Placard* for each sampled vehicle. The estimator also took a photograph of the sample featuring the *Sample Placard*. Appendix G: includes a copy of the *Visual Sampling Form* and *Sample Placard*. Copies of each completed form were made and the originals were sent to Cascadia's office for entry into a database.

Sampling of Residuals

At Eastmont, highly recoverable loads of C&D waste are diverted to the sorting line, where recyclable materials, such as untreated wood and cardboard, are separated for recycling. Fifty-two samples of residuals, or non-recyclable materials, from this operation were sampled while on the conveyor belt. A process for sampling this material was refined with facility personnel so that the safety of the sampling staff and that of the visual estimator were ensured. This conveyor belt was stopped for each sample so that the estimator characterized material on approximately 10 feet of the conveyor belt at one time. Since the sampling plan included 13 days of sampling at Eastmont, the target for residuals was 3 to 5 samples each day. On each sampling day, a sampling time was designated to coincide with the hours the estimator was on-site and the hours the sorting line was operational that day.

Sampling at Construction Sites

Waste collected in intermodal containers at construction sites is only visible as it is being transferred into the container and at the landfill when it is being dumped. For this reason, construction sites with intermodal container service were visited as part of the study.

Sampling Calendar

As with the disposal sites, sampling occurred quarterly at construction sites: spring (March-May), summer (June-August), fall (September-November), and winter (December). Sampling dates are listed in Table B-4.

Table B-4: Waste Sampling Calendar – Construction Sites

Date	Day of Week	Week of Month
3/23/2007	Friday	4
4/27/2007	Friday	4
5/18/2007	Friday	3
5/21/2007	Monday	3
6/5/2007	Tuesday	1
6/7/2007	Thursday	1
7/16/2007	Monday	3
7/19/2007	Thursday	3
7/20/2007	Friday	3
7/21/2007	Saturday	3
8/13/2007	Thursday	2
8/17/2007	Friday	3
8/20/2007	Monday	3
9/19/2007	Wednesday	3
10/2/2007	Tuesday	1
11/5/2007	Monday	1
12/19/2007	Wednesday	3

Table B-5: Distribution of Waste Sampling Days – Construction Sites

		Number of Waste Sampling Days: Total						
		Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Grand Total**
Winter	Week 1							
	Week 2							
	Week 3			1				1
	Week 4							
Winter Total				*1*				*1*
Spring	Week 1							
	Week 2							
	Week 3	1				1		2
	Week 4					2		2
Spring Total		*1*				*3*		*4*
Summer	Week 1		1		1			2
	Week 2				1			1
	Week 3	2			1	2	1	6
	Week 4							
Summer Total		*2*	*1*		*3*	*2*	*1*	*9*
Fall	Week 1	1	1					2
	Week 2							
	Week 3			1				1
	Week 4							
Fall Total		*1*	*1*	*1*				*3*
Grand Total		**4**	**2**	**2**	**3**	**5**	**1**	**17**

Hauler Participation

For sampling at construction sites, the Project Manager contacted the individuals at Waste Management and Allied who schedule intermodal service to explain the study and obtain any information that could have impacted the study design.

In addition to receiving a sampling schedule prior to the beginning of fieldwork, the appropriate hauler representatives were contacted the week before and the day prior to each sampling event. Sampling at the construction sites for intermodal container waste was coordinated with the intermodal scheduling staff.

Each hauler was contacted prior to each scheduled sampling event as to whether sites had requested intermodal service. When necessary, sampling was re-scheduled to accommodate intermodal service requests.

Collection of C&D Visual C*h*aracterization Data at Construction Sites

A visual estimator stood at a safe distance from the construction activity at each site. Using the visual sampling method, the estimator characterized waste as it was placed in the intermodal container. One sample was completed at each site. Each sample took up to 4 hours, including travel time.

Changes in Methodology from 1994/95 Study

The sampling methodology for this study differed from the 1994/95 study in the following ways:

- A visual sampling method was used in place of a hand-sorting method;
- The number of samples for the study period increased from 242 to 786;
- The number of sampling days increased from 27 to 46;
- The 2007 study did not characterize land clearing waste;
- The 1994/95 study included sampling at City-owned transfer stations while the current study focused on private stations and included waste disposed in intermodal containers; and
- The component categories were revised based on changes in materials and to more accurately reflect the types of waste found in the C&D waste stream. While the samples in the 1994/95 study were characterized according to 124 component categories, the 2007 waste component list consisted of 67 categories. Please refer to Table E-2 in Appendix E for a list of how material components were updated for the current study.

Appendix C: Comments on Quarterly Sampling Events

Season One Sampling

The table below presents the numbers of completed samples for the spring sampling season. We were able to get one on-site/intermodal sample last week, although we are still 7 behind for the spring. We are actually seven samples ahead overall. Part of this is due to decreasing our daily target for 3rd & Lander from 50 to 37. We realized that there were not enough loads going to the lower, hand-unload area for a person stationed there to get 25 in a day, as we had originally planned. This change will likely require adding extra days at 3rd & Lander in subsequent seasons.

Table C-1. Season One Samples

Activity Type	Overall Study Target	3rd & Lander 2/21/2007	3rd & Lander & On-site 2/22/2007	Eastmont & On-site 2/23/2007	Eastmont & On-site 2/26/2007	Eastmont & On-site 2/27/2007	*Make-up Day* 3/23/2007	Total Samples	Current Target	Difference from Current
New Construction	170-200	8	10	5	8	8	0	39	40	(1)
Remodeling	170-200	19	10	10	7	8	0	54	40	14
Demolition	120-160	14	8	3	6	7	0	38	30	8
Roofing	85-105	2	8	6	3	4	0	23	21	2
Other/Mixed	85-105	1	4	1	2	1	0	9	21	(12)
Residuals	50	0	0	4	2	6	0	12	11	1
On-Site	32	0	0	0	0	0	1	1	6	(5)
Total	782	44	40	29	28	34	1	176	169	7
Daily Target*		37	39	31	31	31	0			
Difference from Daily Target		7	1	(2)	(3)	3	1			

*Note: Daily targets are 29 for Eastmont, which includes 4 residual samples, and 37 for Third & Lander. Two samples are added to each daily target when on-site sampling is scheduled.

Season Two Sampling

The table below presents the numbers of completed samples for Season 2. Sampling on 5/16 at Black River was impacted by an equipment replacement at the facility, so 5/23 was scheduled as a make-up day. For this reason, the daily target for 5/16 was set to 2 in the table, to reflect scheduled intermodal samples that day. On Saturday, 5/19, there were very few loads at Eastmont. We stayed at the site until eleven that day. Approximately 5 trucks entered the facility during that time; most of these were from outside Seattle.

Table C-2. Season Two Samples

Activity Type		New Construction	Remodeling	Demolition	Roofing	Other/Mixed	Residuals	On-Site	Total	Daily Target*	Difference from Daily Target
Overall Study Target		170-200	170-200	120-160	85-105	85-105	50	32	782		
Intermodal Only	4/27/2007	0	0	0	0	0	0	2	2	0	2
Black River	5/15/2007	4	11	3	3	0	0	0	21	27	-6
Black River	5/16/2007	1	1	0	2	4	0	0	8	2	6
Eastmont	5/17/2007	7	7	5	3	1	0	0	23	31	-8
Eastmont	5/18/2007	2	5	4	3	0	8	1	23	31	-8
Eastmont	5/19/2007	0	2	0	0	0	0	0	2	29	-27
Eastmont	5/21/2007	3	11	9	5	0	8	1	37	31	6
3rd & Lander	5/22/2007	10	16	9	2	2	0	0	39	37	2
Black River	5/23/2007	2	5	3	0	2	0	0	12	27	-15
Intermodal Only	6/5/2007	0	0	0	0	0	0	4	4	0	4
Intermodal Only	6/7/2007	0	0	0	0	0	0	3	3	0	3
Season 2 Total		29	58	33	18	9	16	11	174	215	-41
Current Total (incl. previous sampling)		68	112	71	41	18	28	12			
Current Target		90	91	68	47	47	25	16			
Difference from Current Target		-22	21	3	-6	-29	3	-4			-34

*Note: Daily targets are 29 for Eastmont, which includes 4 residual samples, 37 for Third & Lander, and 25 for Black River. Two samples are added to each daily target when on-site sampling is Sampling on 5/16 at Black River was impacted by an equipment replacement at the facility, so 5/23 was scheduled as a make-up day. For this reason, the daily target for 5/16 was set to 2, to reflect scheduled intermodal samples that day.

Season Three Sampling

The table below presents the numbers of completed samples for Season 3. We did not sample at Third & Lander during this season as they were in the beginning stages of a construction project at the time. During the week of August 6th, sampling at Eastmont was interrupted due to issues with one of the compactors. Additionally, fewer Seattle loads arrived at Black River than we had targeted for sampling.

The number of demolition, roofing, and residual samples are approximately in line with sampling targets. More remodeling loads, and fewer new construction and other/mixed loads have been sampled than originally planned. We have been able to complete 26 intermodal, or on-site, samples. Following this sampling event, we were short 51 samples for the overall study.

Table C-3. Season Three Samples

Activity Type		New Construction	Remodeling	Demolition	Roofing	Other/Mixed	Residuals	On-Site	Total	Daily Target*	Difference from Daily Target
Overall Study Target		170-200	170-200	120-160	85-105	85-105	50	32	782		
Intermodal Only	7/16/2007	0	0	0	0	0	0	1	1	0	1
Intermodal Only	7/19/2007	0	0	0	0	0	0	4	4	0	4
Intermodal Only	7/20/2007	0	0	0	0	0	0	1	1	0	1
Intermodal Only	7/21/2007	0	0	0	0	0	0	1	1	0	1
Eastmont	8/7/2007	3	6	7	5	2	0	0	23	31	-8
Eastmont	8/9/2007	3	5	3	3	5	0	2	21	31	-10
Eastmont	8/10/2007	4	9	6	3	3	0	0	25	31	-6
Intermodal Only	8/13/2007	0	0	0	0	0	0	3	3	2	1
Intermodal Only	8/17/2007	0	0	0	0	0	0	1	1	0	1
Intermodal Only	8/20/2007	0	0	0	0	0	0	1	1	0	1
Eastmont (Residuals)	8/21/2007	0	0	0	0	0	6	0	6	0	6
Eastmont (Residuals)	8/22/2007	0	0	0	0	0	6	0	6	0	6
Black River	8/23/2007	3	10	2	2	2	0	0	19	27	-8
Black River	8/24/2007	5	10	0	4	1	0	0	20	27	-7
Season 3 Total		18	40	18	17	13	12	14	132	149	-17
Current Total (incl. previous sampling)		86	152	89	58	31	40	26			
Current Target		126	126	95	65	65	32	24			
Difference from Current Target		-40	26	-6	-7	-34	8	2			-51

*Note: Daily targets are 29 for Eastmont, which includes 4 residual samples, 37 for Third & Lander, and 25 for Black River. Two samples are added to each daily target when on-site sampling is scheduled.

Season Four Sampling

The table below presents the numbers of completed samples for Season 4. The closure of the lower tipping area at 3rd & Lander prevented us from having a second person sampling, as we had planned in the study design. Because of this change, there is a gap of about 12 samples per day between the target and actual samples for this site. On 10/11 at Eastmont, the recycling line was shut down earlier than we expected, so all 12 residual samples were completed on 10/12 and 10/15.

At the end of the four planned sampling events, the number of remodeling, demolition, roofing, and residual samples are within, or very close, the upper and lower targets. Fewer new construction and other/mixed loads have been sampled than originally planned. We have been able to complete 29 intermodal, or on-site, samples. Following this sampling event, we are short 111 samples for the overall study. This shortfall is mainly due to construction at 3rd & Lander, and lower vehicle counts than anticipated at Eastmont on one Saturday and Black River in general.

Table C-4. Season Four Samples

Activity Type		New Construction	Remodeling	Demolition	Roofing	Other/Mixed	Residuals	On-Site	Total	Daily Target*	Difference from Daily Target
Overall Study Target		170-200	170-200	120-160	85-105	85-105	50	32	782		
Intermodal Only	9/19/2007	0	0	0	0	0	0	2	2	0	2
3rd & Lander	9/25/2007	5	6	8	3	3	0	0	25	37	-12
3rd & Lander	9/26/2007	7	7	5	2	4	0	0	25	37	-12
Intermodal Only	10/2/2007	0	0	0	0	0	0	1	1	0	1
Eastmont	10/11/2007	5	10	2	3	0	0	0	20	29	-9
Eastmont	10/12/2007	6	5	8	3	1	6	0	29	31	-2
Eastmont	10/15/2007	8	11	4	3	1	6	0	33	31	2
3rd & Lander	10/16/2007	6	4	7	7	2	0	0	26	39	-13
3rd & Lander	10/17/2007	10	7	6	4	1	0	0	28	39	-11
Season 4 Total		47	50	40	25	12	12	3	189	243	-54
Current Total (incl. previous sampling)		133	202	129	83	43	52	29			
Current Target		185	185	140	95	95	50	32			
Difference from Current Target		-52	17	-11	-12	-52	2	-3			-111
Difference from Overall Study Goals		-52	17	-11	-12	-52	2	-3			-111

*Note: Daily targets are 29 for Eastmont, which includes 4 residual samples, 25 for Third & Lander, and 25 for Black River. Two samples are added to each daily target when on-site sampling is scheduled.

Additional Sampling

The table below presents the numbers of completed samples for the make-up sampling conducted in October and November. As planned, we made up samples at Black River and Eastmont on October 25th & 26th since we had crews out at these sites on those days. We also made up 3 days at 3rd & Lander in the beginning of November.

At the completion of sampling, the number of new construction, demolition, and roofing samples are within the upper and lower targets. More remodeling and fewer other/mixed loads were sampled than originally planned. We completed 31 intermodal, or on-site, samples and 52 residual samples. Following this sampling event, we have exceeded the overall study goal of 782 samples by 3 samples.[3]

Table C-5. Additional Samples

Activity Type		New Construction	Remodeling	Demolition	Roofing	Other/Mixed	Residuals	On-Site	Total
Overall Study Target		170-200	170-200	120-160	85-105	85-105	50	32	782
Eastmont	10/25/2007	3	3	0	4	0	0	0	10
Black River	10/25/2007	2	5	2	2	0	0	0	11
Eastmont	10/26/2007	4	1	2	3	1	0	0	11
Black River	10/26/2007	4	0	6	0	1	0	0	11
3rd & Lander	11/5/2007	7	8	4	4	2	0	0	25
Intermodal	11/5/2007	0	0	0	0	0	0	2	2
Eastmont	11/8/2007	11	6	6	2	0	0	0	25
3rd & Lander	11/9/2007	7	6	3	2	1	0	0	19
Season 4 Total		38	29	23	17	5	0	2	114
Current Total (incl. previous sampling)		171	232	151	100	48	52	31	
Current Target		185	185	140	95	95	50	32	
Difference from Current Target		-14	47	11	5	-47	2	-1	3
Within Target Range?		*Yes*	*No (+32)*	*Yes*	*Yes*	*No (-37)*	*N/A*	*N/A*	

[3] One final intermodal sample was completed after this summary was sent to the client, making the total number of samples 786.

Appendix D: Waste Composition Calculations

Estimating Waste Composition

Visual estimates from sampling, in the form of percentages, were converted first to volume estimates and second to weights using material-specific densities. Densities used for these calculations are presented in

Table D-12.

Converting Volumes to Weights

The composition calculations rely on the availability of individual material weights for each sample. As described above in the section "Visually Characterizing Loads," the data that were collected to characterize each sample in this study were volume estimates. Cascadia converted volume estimates to weights using accepted waste density conversion factors. These factors are listed in

Table D-12, and data sources accompany the table.

Using the volume-to-weight conversion factors and the volume estimates obtained during the characterization of each sample, individual material weights were calculated using the following formula:

$$c = m \times s \times v \times d$$

where:

c = the total weight of the specific material in the sample

m = percentage estimate of the material, as a portion of material class (e.g., the extent to which *newspaper* constitutes all of the *paper* in the sample)

s = percentage estimate of the material class, as a portion of all of the material in the sample (e.g., the extent to which *paper* constitutes all of the material in the sample)

v = total volume of the sample (in cubic yards)

d = density conversion of the material (in pounds/cubic yard)

Composition Calculations

The composition estimate, denoted by r_j, represents the ratio of the material's weight to the total sample weight for each noted group. It is derived by summing each material's weight across all of the selected samples 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 material

w = sum of all material weights

for *i* = 1 to *n*, where *n* = number of selected samples

for *j* = 1 to *m*, where *m* = number of materials

The confidence interval for this estimate is derived in two steps. First, the variance around the estimate is calculated, accounting for the fact that the ratio includes two random variables (the material and total sample weights).[4] The variance of the ratio estimator equation follows:

$$\mathrm{Var}(r_j) \approx \left(\frac{1}{n}\right)\left(\frac{1}{\overline{w}^2}\right)\left(\frac{\sum_i \left(c_{ij} - r_j w_i\right)^2}{n-1}\right)$$

where:

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

Second, precision levels at the 90 percent confidence interval are calculated for a component's mean as follows:

$$r_j \pm \left(z\sqrt{\mathrm{Var}(r_j)}\right)$$

where *z* = the value of the *z*-statistic (1.645) corresponding to a 90 percent confidence level

Weighted Averages

For the building and activity type substreams, composition data were combined in a weighted fashion, as described below. Tonnages calculated from the vehicle surveys conducted by Cascadia and facility disposal figures provided by the City of Seattle were used to create weighting factors. The composition estimates were applied to the relevant tonnages to estimate the amount of waste disposed for each component category for each building type and activity type, and for intermodals.

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

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

where:

p = the proportion of tonnage contributed by the noted substream

r = ratio of component weight to total waste weight in the noted substream

for j 1 to m

where m = number of components

The variance of the weighted average will be calculated:

$$VarO_j = \left(p_1^{\,2} * V_{r_{j1}}^{2}\right) + \left(p_2^{\,2} * V_{r_{j2}}^{2}\right) + \left(p_3^{\,2} * V_{r_{j3}}^{2}\right) + \ldots$$

The following tables show the sets of weighting percentages that were used to produce the estimates for overall C&D waste, and then for each building type and activity type.

[4] For more information regarding the variance calculation, please refer to William G. Cochran, *Sampling Techniques, 3rd Edition*, John Wiley & Sons, Inc., Indianapolis, Indiana, 1977

Overall Weightings

Table D-1: Weighting Percentages, Overall

Activity	Building Type	Tons Disposed	Percent of Total
New Construction	Residential Buildings	10,350	5.15%
New Construction	Non-residential Buildings	14,661	7.29%
New Construction	Mixed Load	1,459	0.73%
New Construction	Other Structures	246	0.12%
New Construction	Unidentified	367	0.18%
Remodel	Residential Buildings	21,846	10.86%
Remodel	Non-residential Buildings	17,322	8.61%
Remodel	Other Structures	0	0.00%
Demolition	Residential Buildings	34,480	17.14%
Demolition	Non-residential Buildings	18,908	9.40%
Demolition	Mixed Load	190	0.09%
Demolition	Unidentified	293	0.15%
Roof	Residential Buildings	18,045	8.97%
Roof	Non-residential Buildings	4,522	2.25%
Roof	Mixed Load	125	0.06%
Other C&D	Residential Buildings	764	0.38%
Other C&D	Non-residential Buildings	2,998	1.49%
Other C&D	Other Structures	8,661	4.31%
Intermodal	Intermodal	45,919	22.83%
Overall		**201,156**	**100.00%**

Weighting by Building Type

Table D-2: Weighting Percentages, Residential Buildings

Activity	Building Type	Tons Disposed	Percent of Total
New Construction	Residential Buildings	10,350	12.11%
Remodel	Residential Buildings	21,846	25.56%
Demolition	Residential Buildings	34,480	40.33%
Roof	Residential Buildings	18,045	21.11%
Other C&D	Residential Buildings	764	0.89%
Overall		**85,485**	**100.00%**

Table D-3: Weighting Percentages, Non-residential Buildings

Activity	Building Type	Tons Disposed	Percent of Total
New Construction	Non-residential Buildings	14,661	25.10%
Remodel	Non-residential Buildings	17,322	29.66%
Demolition	Non-residential Buildings	18,908	32.37%
Roof	Non-residential Buildings	4,522	7.74%
Other C&D	Non-residential Buildings	2,998	5.13%
Overall		**58,411**	**100.00%**

Table D-4: Weighting Percentages, Mixed Loads

Activity	Building Type	Tons Disposed	Percent of Total
New Construction	Mixed Load	1,459	82.23%
Demolition	Mixed Load	190	10.72%
Roof	Mixed Load	125	7.05%
Overall		**1,774**	**100.00%**

Table D-5: Weighting Percentages, Other Structures

Activity	Building Type	Tons Disposed	Percent of Total
New Construction	Other Structures	246	2.76%
Remodel	Other Structures	0	0.00%
Other C&D	Other Structures	8,661	97.24%
Overall		**8,907**	**100.00%**

Table D-6: Weighting Percentages, Unidentified Buildings

Activity	Building Type	Tons Disposed	Percent of Total
New Construction	Unidentified	367	55.58%
Demolition	Unidentified	293	44.42%
Overall		**660**	**100.00%**

Weighting by Activity Type

Table D-7: Weighting Percentages, New Construction

Activity	Building Type	Tons Disposed	Percent of Total
New Construction	Residential Buildings	10,350	38.22%
New Construction	Non-residential Buildings	14,661	54.13%
New Construction	Mixed Load	1,459	5.39%
New Construction	Other Structures	246	0.91%
New Construction	Unidentified	367	1.36%
Overall		**27,083**	**100.00%**

Table D-8: Weighting Percentages, Remodeling

Activity	Building Type	Tons Disposed	Percent of Total
Remodel	Residential Buildings	21,846	55.78%
Remodel	Non-residential Buildings	17,322	44.22%
Remodel	Other Structures	0	0.00%
Overall		**39,168**	**100.00%**

Table D-9: Weighting Percentages, Demolition

Activity	Building Type	Tons Disposed	Percent of Total
Demolition	Residential Buildings	34,480	64.00%
Demolition	Non-residential Buildings	18,908	35.10%
Demolition	Mixed Load	190	0.35%
Demolition	Unidentified	293	0.54%
Overall		**53,871**	**100.00%**

Table D-10: Weighting Percentages, Roofing

Activity	Building Type	Tons Disposed	Percent of Total
Roof	Residential Buildings	18,045	79.52%
Roof	Non-residential Buildings	4,522	19.93%
Roof	Mixed Load	125	0.55%
Overall		**22,692**	**100.00%**

Table D-11: Weighting Percentages, Other C&D Activity

Activity	Building Type	Tons Disposed	Percent of Total
Other C&D	Residential Buildings	764	6.15%
Other C&D	Non-residential Buildings	2,998	24.13%
Other C&D	Other Structures	8,661	69.72%
Overall		**12,423**	**100.00%**

The composition calculations rely on the availability of individual component weights for each sample. As described in the Sampling Methodology, the data that were collected to characterize each sample in this study are in the form of volume estimates. The volume estimates were converted to weights using accepted waste density conversion factors, as listed in Table D-12 with accompanying data sources.

Table D-12: Volume-to-weight Conversion Factors Used in Composition Calculations

Broad Material Category	Component Category	Density (lbs/cubic yard)	Source
Paper	Uncoated Corrugated Cardboard	53.00	CIWMB 2004
Paper	Paper Bags	108.00	San Diego - Kraft Paper
Paper	Other Recyclable Paper	295.00	U.S. EPA (Average of newspaper, office paper, and magazines)
Paper	Cellulose Insulation	17.00	U.S. EPA
Paper	R/C Paper	363.50	U.S. EPA
Glass	Glass Bottles and Containers	600.00	U.S. EPA
Glass	Flat Glass	1,400.00	U.S. EPA
Glass	R/C Glass	1,400.00	U.S. EPA

Broad Material Category	Component Category	Density (lbs/cubic yard)	Source
Metal	Tin/Steel Cans	150.00	U.S. EPA
Metal	Major Appliances	145.00	CIWMB 2004
Metal	Used Oil Filters	834.40	Tellus
Metal	HVAC Ducting	47.00	CIWMB 2004
Metal	Other Ferrous	225.00	CIWMB 2004
Metal	Aluminum Cans	65.00	U.S. EPA
Metal	Other Non-Ferrous	225.00	CIWMB 2004
Metal	R/C Metal	142.83	Average of "metals" without Used Oil Filters
Electronics	Brown Goods and Other Small Consumer Electronics	343.17	CIWMB Staff Measurement
Electronics	Computer-related Electronics	354.08	CIWMB
Electronics	TV's & Other CRTs	405.00	CIWMB
Plastic	Plastic Bottles and Tubs	29.50	Average of PETE Containers and HDPE Containers
Plastic	Other Rigid Packaging	21.76	Tellus
Plastic	Expanded #6/Polystyrene Packaging/Insulation	32.00	CIWMB 2004
Plastic	Trash Bags	35.00	CIWMB 2004
Plastic	Grocery/Merch. Bags	35.00	CIWMB 2004
Plastic	Non-Bag Packaging Film	35.00	CIWMB 2004
Plastic	Plastic Sheeting and Agricultural Film	35.00	CIWMB 2004 - non bag packaging film
Plastic	Other Film	22.55	Tellus
Plastic	Durable Plastic Items	50.00	U.S. EPA
Plastic	Plastic Piping	281.50	Tellus/Cascadia
Plastic	R/C Plastic	50.00	U.S. EPA
Organics	Food	486.00	FEECO, Tellus
Organics	Leaves & Grass	312.50	U.S. EPA
Organics	Prunings & Trimmings	127.00	CIWMB 2004
Organics	Branches & Stumps	127.00	CIWMB 2004
Organics	R/C Organics	263.13	Average of all "Organics"
C&D	Concrete	860.00	CIWMB 2004
C&D	Asphalt Paving	772.80	Tellus scaled down by factor from Florida C&D study
C&D	Composition Roofing	731.00	CIWMB 2004
C&D	Other Asphalt Roofing	731.00	CIWMB 2004
C&D	Other Aggregates	860.00	CIWMB 2004
C&D	Clean Dimensional Lumber	169.00	CIWMB 2004
C&D	Clean Engineered Wood	268.00	CIWMB 2004
C&D	Pallets and Crates	169.00	CIWMB 2004
C&D	Other Recyclable Wood	169.00	CIWMB 2004

Broad Material Category	Component Category	Density (lbs/cubic yard)	Source
C&D	Painted/Stained Wood	169.00	CIWMB 2004
C&D	Creosote-treated Wood	169.00	CIWMB 2004
C&D	Other Treated Wood	169.00	CIWMB 2004
C&D	Clean Gypsum Board	467.00	CIWMB 2004
C&D	Painted/Demolition Gypsum	467.00	CIWMB 2004
C&D	Rock and Gravel	999.00	CIWMB 2004
C&D	Dirt and Sand	929.00	CIWMB 2004
C&D	Fiberglass insulation	17.00	Tellus
C&D	R/C C&D	416.53	CIWMB 2004
HHW	Paint	1,836.00	Tellus
HHW	Vehicle & Equipment Fluids	1,653.00	Tellus
HHW	Used Oil	1,524.94	Tellus
HHW	Batteries	2,400.00	CIWMB
HHW	R/C HHW	1,671.31	Average of "HHW" liquids
Other Materials	Textiles	225.00	Tellus
Other Materials	Carpet	147.00	CIWMB 2004
Other Materials	Carpet Padding	62.00	CIWMB 2004
Other Materials	Ash	1,012.50	FEECO
Other Materials	Bulky Items	80.00	Tellus
Other Materials	Tires	200.00	CIWMB
Other Materials	R/C Other	142.80	Average of all "other materials," except ash
Mixed Residue/ MSW	Mixed Residue	999.00	FEECO
Mixed Residue/ MSW	MSW	225.00	U.S. EPA

Sources:

Cascadia refers to direct measurements of representative samples taken by Cascadia staff members for this and other studies.

CIWMB refers to measurements, estimates, or correspondence from California Integrated Waste Management Board staff during 2006.

CIWMB 2004 refers to *Targeted Statewide Waste Characterization Study: Detailed Characterization of Construction and Demolition Waste*, performed by Cascadia Consulting Group for California Integrated Waste Management Board, 2006.

FEECO refers to FEECO International, Complete Systems and Equipment Handbook, 9th printing.

Florida C&D Study refers to Converting C&D Debris from Volume to Weight: A Fact Sheet for C&D Debris Facility Operators, University of Florida, 2000.

San Diego refers to conversion factors that were used in the San Diego Waste Comp. Study, conducted by Cascadia Consulting Group in 2000.

Tellus refers to the Tellus Institute, Boston, Massachusetts.

U.S. EPA refers to the U.S. Environmental Protection Agency's "Measuring Recycling: A Guide for State and Local Governments," document no. EPA530-R-97-011, published September 1997.

Appendix E: Comparison Calculations

This appendix outlines the comparison methodology and calculations.

Background

In an ongoing effort to monitor the types and amounts of C&D materials disposed locally, Seattle has performed two C&D waste composition studies. In this appendix, detailed results from a comparison of the two project years are presented. The results of these comparisons can be used to indicate trends in the composition data.

In order to control for population changes and other factors that may influence the total amount of waste disposed from year to year, the tests described in this appendix measure waste proportions, not actual tonnage. For example, say that *mixed low-grade* paper accounts for 10% of a particular substream's disposed waste each year, and that a total of 1,000 tons of waste were disposed in one year and 2,000 tons of waste in the next. While the amount of newspaper increased from 100 to 200 tons, the percentage remained the same. Therefore, the tests would indicate that there had been no change.

The purpose of conducting these comparisons is to identify changes within the C&D waste stream, in the percentage of selected types of waste disposed over time. One specific example is stated as follows:

Hypothesis: "There is no statistically significant difference, between the 1994/95 and 2007 study periods, in the percentage of paper disposed."

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.[5]

The purpose of these tests is 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 metal could be due to any combination of the following:

- Consumer Preferences—plastic building products, such as vinyl siding, might have captured some of the market previously held by metal products.
- Technology—manufacturers might use less metal than in the past, which would decrease the weight of metal products, even if the same number of items were disposed.
- Recycling—more metal may be recycled because the markets are stronger than in the past.

Future studies could be designed to test the influence of various potential factors on the increase/decrease of specific materials in the disposed C&D waste stream.

Statistical Considerations

The analyses were based on the component percentages, by weight. As described in Appendix D, these percentages are calculated by dividing the sum of the selected component weights by

[5] Please see the "Power Analysis" discussion on page E-3.

the sum of the corresponding sample weights. T-tests (modified for ratio estimation) were used to examine the variations between the two years.

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** will be calculated:

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

Next, the **t-statistic** will be constructed:

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

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

Normality

The distributions of some of the waste categories (particularly the hazardous materials) are 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, most of the selected categories are sums of several individual waste components, which improve our ability to meet the assumptions of normality.

Dependence

There may be dependence between waste types (if a person disposes of material A, they always dispose of material B at the same time).

There is certainly a degree of dependence between the calculated percentages. Because the percentages sum to 100, if the percentage of material A increases, the percentage of some other material must decrease.

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 waste category) **each** of which carries that risk. However, we were willing to accept only a 10% chance, **overall**, 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 1.25% for each test (10% divided by the eight tests within the residential substream equals 1.25%). 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).

Power Analysis

As the number of samples is increased, so is the ability to detect differences. In the future, a *priori* power analysis might benefit this research by determining how many samples would be required to detect a particular minimum difference of interest.

Interpreting the Comparison Calculation Results

The following tables include detailed calculation results. An asterisk notes the statistically significant differences.

For the purposes of this study, only those calculation results with a p-value of less than 1.25% for the C&D substream are considered to be statistically significant. As described above, the threshold for determining statistically significant results (the "alpha-level") is conservative, accounting for the fact that so many individual tests were calculated.

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. Table E-1 shows that the proportion of ***Organics*** increase between 1994/95 and 2007, while the proportion of ***C&D: Other***, ***Metal, Other Materials***, and ***Paper*** decreased. Changes in the proportions of ***C&D: Aggregates***, ***C&D: Wood***, ***Plastic***, and ***Special*** were not significant.

Table E-1. Comparison of Residential Composition Results, 1994/95 vs. 2007

	Mean Ratio (Material Wt/Total Wt)		t-Statistic	p-Value (Cut-off for statistically valid difference = 0.0125)
	1997	*2007*		
C&D:Aggregates	13.5%	19.4%	1.9929	0.0466
C&D:Other	22.6%	27.7%	1.6637	0.0965
C&D:Wood	29.8%	34.7%	1.6525	0.0988
Metal	9.7%	4.1%	6.1707	0.0000 *
Organics	3.6%	2.1%	1.9325	0.0536
Other Materials	8.7%	3.3%	1.8623	0.0629
Paper	5.2%	2.3%	4.5244	0.0000 *
Plastic	4.3%	2.2%	5.5906	0.0000 *
MSW/Residue	2.5%	4.3%	4.0391	0.0001 *
Number of Samples	*242*	*702*		

Material Groupings

Material components from 1994/94 and 2007 were compared and consolidated into the uniform material components and comparison classes listed in Table E-2.

Table E-2 . Material Components – 1994/94 and 2007

Material Component		Uniform Material Component	Comparison
1994/95	*2007*		Class
OCC/Kraft	Uncoated Corrugated Cardboard	Uncoated Corrugated Cardboard	Paper
Low Grade Recyclable	Paper Bags	Paper Bags	Paper
Newspaper	Other Recyclable Paper	Other Recyclable Paper	Paper
High Grade Printing	R/C Paper	R/C Paper	Paper
Computer Paper	R/C Paper	R/C Paper	Paper
Bleached Polycoats	R/C Paper	R/C Paper	Paper
Paper/Other Materials	R/C Paper	R/C Paper	Paper
	R/C Paper	R/C Paper	Paper
Other/NR Paper	Cellulose Insulation	R/C Paper	Paper
Clear Containers	Glass Bottles and Containers	Glass Bottles and Containers	Other Materials
Green Containers	Glass Bottles and Containers	Glass Bottles and Containers	Other Materials
Brown Containers	Glass Bottles and Containers	Glass Bottles and Containers	Other Materials
Refillable Beer	Glass Bottles and Containers	Glass Bottles and Containers	Other Materials
Window Glass	Flat Glass	Flat glass	Other Materials
Mirror Glass	Flat Glass	Flat glass	Other Materials
Other/NR Glass	R/C Glass	R/C Glass	Other Materials

Material Component		Uniform Material Component	Comparison
1994/95	*2007*		**Class**
Kitchen Ware	R/C Glass	R/C Glass	Other Materials
Tinned Food Cans	Tin/Steel Cans	Tin/Steel Cans	Metal
Other Tinned Cans	Tin/Steel Cans	Tin/Steel Cans	Metal
Large Appliances	Major Appliances	Major Appliances	Metal
	Other Ferrous	Other Ferrous	Metal
Other Ferrous	Used Oil Filters	Other Ferrous	Metal
Galvanized Steel	HVAC Ducting	Other Ferrous	Metal
Aluminum Cans	Aluminum Cans	Aluminum Cans	Metal
Other Aluminum	Other Non-Ferrous	Other Non-Ferrous	Metal
Other Nonferrous	Other Non-Ferrous	Other Non-Ferrous	Metal
Mixed Metals/Materials	R/C Metal	R/C Metal	Metal
Insulated Wire/Cable	R/C Metal	R/C Metal	Metal
Electric Motors	R/C Metal	R/C Metal	Metal
Aerosol Cans	R/C Metal	R/C Metal	Metal
CFC Compressors	R/C Metal	R/C Metal	Metal
Small Appliances	Brown Goods/Small Consumer Electronics	Small Appliances	Metal
PET #1 Bottles	Plastic Bottles and Tubs	Plastic Bottles and Tubs	Plastic
HDPE #2 Bottles	Plastic Bottles and Tubs	Plastic Bottles and Tubs	Plastic
Other Containers	Other Rigid Packaging	Other Rigid Packaging	Plastic
Other Packaging	Other Rigid Packaging	Other Rigid Packaging	Plastic
Polystyrene Foam	Polystyrene Packaging/Insulation	Polystyrene Packaging/Insulation	Plastic
Polystyrene Insulation	Polystyrene Packaging/Insulation	Polystyrene Packaging/Insulation	Plastic
Tyvek	Plastic Sheeting and Agricultural Film	Plastic Sheeting and Agricultural Film	Plastic
Film and Bags	Trash Bags	Other Film	Plastic
	Grocery/Merchandise Bags	Other Film	Plastic
	Other Film	Other Film	Plastic
	Non-Bag Packaging Film	Other Film	Plastic
	Plastic Sheeting and Agricultural Film	Other Film	Plastic
5 Gal. #2 with Handles	Durable Plastic Items	Durable Plastic Items	Plastic
5 Gal. #2 w/o Handles	Durable Plastic Items	Durable Plastic Items	Plastic
Plastic Products	Durable Plastic Items	Durable Plastic Items	Plastic
	Carpet Padding	Durable Plastic Items	Plastic
PVC Pipe	Plastic Piping	Plastic Piping	Plastic
ABS Pipe	Plastic Piping	Plastic Piping	Plastic
Polyurethane Foam	R/C Plastic	R/C Plastic	Plastic
Thermoset Products	R/C Plastic	R/C Plastic	Plastic
Plastic/Other Materials	R/C Plastic	R/C Plastic	Plastic
Laminate/Formica	R/C Plastic	R/C Plastic	Plastic

Material Component		Uniform Material Component	Comparison
1994/95	*2007*		**Class**
Linoleum	R/C Plastic	R/C Plastic	Plastic
Food Wastes	Food	Food	Organics
Leaves & Grass	Leaves & Grass	Leaves & Grass	Organics
Large Prunings	Prunings & Trimmings	Prunings & Trimmings	Organics
Small Prunings	Prunings & Trimmings	Prunings & Trimmings	Organics
Stumps	Branches & Stumps	Branches & Stumps	Organics
Bulky Yard Waste	Branches & Stumps	Branches & Stumps	Organics
Animal Carcasses	R/C Organic	R/C Organic	Organics
Animal Feces	R/C Organic	R/C Organic	Organics
Wax	R/C Organic	R/C Organic	Organics
Misc. Organics	R/C Organic	R/C Organic	Organics
Concrete with Rebar	Concrete	Concrete	C&D: Aggregates
Concrete w/o Rebar	Concrete	Concrete	C&D: Aggregates
Asphaltic Concrete	Asphalt Paving	Asphalt Paving	C&D: Aggregates
Composition Shingles	Composition Roofing	Composition Roofing	C&D: Aggregates
Tarpaper/Felt	Composition Roofing	Composition Roofing	C&D: Aggregates
Built-Up Roofing	Other Asphalt Roofing	Other Asphalt Roofing	C&D: Aggregates
Bricks	Other Aggregates	Other Aggregates	C&D: Aggregates
CMU	Other Aggregates	Other Aggregates	C&D: Aggregates
Masonry Tile	Other Aggregates	Other Aggregates	C&D: Aggregates
Mortar	Other Aggregates	Other Aggregates	C&D: Aggregates
Clay Roofing Tile	Other Aggregates	Other Aggregates	C&D: Aggregates
Slate/Quarry Tile	Other Aggregates	Other Aggregates	C&D: Aggregates
Ceramic Tile	Other Aggregates	Other Aggregates	C&D: Aggregates
Porcelain	Other Aggregates	Other Aggregates	C&D: Aggregates
New Lumber	Clean Dimensional Lumber	Clean Dimensional Lumber	C&D: Wood
New Panelboard	Clean Engineered Wood	Clean Engineered Wood	C&D: Wood
Pallets & Crates	Pallets and Crates	Pallets and Crates	C&D: Wood
Remanufacturing Scrap	Other Recyclable Wood	Other Recyclable Wood	C&D: Wood
Other Wood	Other Recyclable Wood	Other Recyclable Wood	C&D: Wood
Demo Panelboard	Painted/Stained Wood	Painted/Stained Wood	C&D: Wood
Painted/Stained Wood	Painted/Stained Wood	Painted/Stained Wood	C&D: Wood
Creosote Wood	Creosote-treated Wood	Creosote Wood	C&D: Wood
Demo Lumber	Other Treated Wood	Other Treated Wood	C&D: Wood
Roofing/Siding	Other Treated Wood	Other Treated Wood	C&D: Wood
Pressure Treated Wood	Other Treated Wood	Pressure Treated Wood	C&D: Wood
New Gypsum Scrap	Clean Gypsum Board	Clean Gypsum Board	C&D: Other
Mixed/Demo Gypsum Scrap	Painted/Demolition Gypsum	Painted/Demolition Gypsum	C&D: Other
Gravel	Rock and Gravel	Rock and Gravel	C&D: Other
Sand	Dirt and Sand	Dirt and Sand	C&D: Other
Topsoil	Dirt and Sand	Dirt and Sand	C&D: Other

Material Component		Uniform Material Component	Comparison
1994/95	*2007*		**Class**
Mineral Wool	Fiberglass insulation	Fiberglass insulation	C&D: Other
Fiberglass Insulation	Fiberglass insulation	Fiberglass insulation	C&D: Other
Contaminated Demo Wood	R/C C&D	R/C C&D	C&D: Other
Wood/Other Materials	R/C C&D	R/C C&D	C&D: Other
Sawdust	R/C C&D	R/C C&D	C&D: Other
Plaster	R/C C&D	R/C C&D	C&D: Other
Fiberglass Ceiling Panels	R/C C&D	R/C C&D	C&D: Other
Structural Fiberglass	R/C C&D	R/C C&D	C&D: Other
Latex Paint	Paint	Paint	Other Materials
Gas/Fuel Oil	Vehicle & Equip. Fluids	Vehicle & Equip. Fluids	Other Materials
Antifreeze	Vehicle & Equip. Fluids	Vehicle & Equip. Fluids	Other Materials
Used Oil	Used Oil	Used Oil	Other Materials
Vehicle Batteries	Batteries	Batteries	Other Materials
Household Batteries	Batteries	Batteries	Other Materials
Wood Preservatives	R/C HHW	R/C HHW	Other Materials
Varnishes & Finishes	R/C HHW	R/C HHW	Other Materials
Solvents/Thinners	R/C HHW	R/C HHW	Other Materials
Adhesives/Glues	R/C HHW	R/C HHW	Other Materials
Cleaners and Corrosives	R/C HHW	R/C HHW	Other Materials
Pesticides/Herbicides	R/C HHW	R/C HHW	Other Materials
Medical Waste	R/C HHW	R/C HHW	Other Materials
Asbestos	R/C HHW	R/C HHW	Other Materials
Other Hazardous	R/C HHW	R/C HHW	Other Materials
Textiles/Clothes	Textiles	Textiles	Other Materials
Upholstery	Textiles	Textiles	Other Materials
Textile Related Products	Textiles	Textiles	Other Materials
Carpet	Carpet	Carpet	Other Materials
Ashes	Ash	Ash	Other Materials
Unfinished Furnishings	Bulky Items	Bulky Items	Other Materials
Finished Furnishings	Bulky Items	Bulky Items	Other Materials
Furniture/Mattresses	Bulky Items	Bulky Items	Other Materials
Tires	Tires	Tires	Other Materials
Misc. Inorganics	R/C Other	R/C Other	Other Materials
	TV's & Other CRTs	R/C Other	Other Materials
	Computer-related Electronics	R/C Other	Other Materials
Non-distinct Fines	Mixed Residue	Mixed Residue	MSW/Residue
Disposable Diapers	MSW	MSW	MSW/Residue
Rubber Products	MSW	MSW	MSW/Residue

Appendix F: Analytical Database Description

Data were double entered into a Microsoft Access database specifically constructed for this project to minimize entry errors. In addition to the actual waste results, each record includes information about the building, construction activity, hauler, and vehicle. A description of the key data fields and structure of each record follows.

Analytical Database Structure

Each record consists of data stored in many fields of fixed size and type. The database file is compatible with the dBase III Plus file construct. A complete description of all fields is given below.

The field types used include AutoNumber, Number, Text, Date/Time, and Yes/No. Dates are carried as "mm/dd/yy." Each sample record can have an associated Memo to record additional comments or notes about the sample.

Data Tables

The basic relationships of the database are illustrated in Figure F-1. As shown, SvyKey is the unique identifier linking each sample to its composition while SchedID links the sample to the information about date of collection. In addition, the database contains "code" tables, linked to these key tables, which translate values into specific information about each sample.

Figure F-1 . Basic Database Relationships

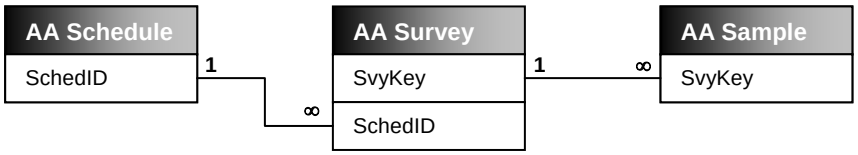


Figure F-2. AA Schedule

Field Name	Type	Description	Corresponding Code Table
ScheduleID	Number	Unique ID for each sampling field day.	☐
SiteID	Number	Links to SiteID field in [Code Site].	☑
Site	Text	Corresponding sample site.	☐
Date	Date/Time	Date during which sampling occurred.	☐
Season	Number	Links to SeasonID in [Code Season].	☑
Month	Text	Month during which sampling occurred.	☐
Day	Text	Day during which sampling occurred.	☐
StudyPeriod	Text	Study year during which sampling occurred.	☐
StudyPdAsNumber	Number	For use when screening by study period	☐
Week/End	Text	Designates weekday and weekend sampling.	☐

Figure F-3. AA Sample

Field Name	Type	Description	Corresponding Code Table
Samp ID	Number	Unique ID for each material component within each sample.	☐
SampKey	Number	Used to cross-check sample IDs.	☐
Uniform Subclass ID	Number	Corresponds to baseline set of material components.	☐
Original Subclass ID	Number	Corresponds to set of materials for most current study.	☐
Weight	Number	Net weight of material in given sample.	☐
SvyKey	Number	Links each material component to associated sample in [AA Survey].	☐

Figure F-4. AA Survey

Field Name	Type	Description	Corresponding Code Table
SvyKey	Number	Links to SvyKey field in [AASample].	☐
Sched ID	Number	Links to ScheduleID field in [AA Schedule].	☐
SampleID	Text	Unique field ID, assigned by field crew.	☐
Activity	Number	Links to Code Activity field in [Code Activity].	☑
Time	Date/Time	Time sample was completed in the field. Can also be time of entry into database.	☐
SortSample?	Yes/No	If yes, then associated weight data in [AA Sample].	☐
ActualSampleWeight	Number	Only used with intermodal samples.	☐
SampleComplete	Yes/No	Check when Sample is complete and needs no follow-up	☐
Scaled?	Yes/No	Automatically checked if sample has been scaled.	☐
ftDim1	Number	dimension 1 in feet	☐
inDim1	Number	dimension 1 in inches	☐
ftDim2	Number	dimension 2 in feet	☐
inDim2	Number	dimension 2 in inches	☐
ftDim3	Number	dimension 3 in feet	☐
inDim3	Number	dimension 3 in inches	☐
ccVolume	Number	Volume in cubic yards	☐
class_Paper	Number	% of total sample	☐
class_Glass	Number	% of total sample	☐
class_Metals	Number	% of total sample	☐
class_Special	Number	% of total sample	☐
class_Organics	Number	% of total sample	☐
class_Plastic	Number	% of total sample	☐
class_CD	Number	% of total sample	☐
class_HHW	Number	% of total sample	☐
class_Ewaste	Number	% of total sample	☐
class_Mixed	Number	% of total sample	☐
Check Class Totals	Number	sum of all classes, should equal 1 or 100%	☐
Comments	Memo	Additional notes regarding sample.	☐
Net Weight	Number	Net weight of vehicle	☐
Units_NetWeight	Text	Pounds or tons	☐
PoolAll	Text	Field used to exclude samples from analysis and sample counts.	☐
BuildingType	Number	Links to BuildingTypeID field in [CodeBuildingType].	☑
VehicleType	Number	Links to VehicleID field in [CodeVehicle].	☑
Hauler	Number	Links to HaulerID field in [CodeHauler].	☑
SurveyComments	Text	Notes from field crew.	☐
Origin/Zip	Text	Location of construction project.	☐
BuildingTypeWeighting	Number	Used for analysis.	☐

Code Tables

Code Subclass is linked to AA Sample. Please refer to Appendix A: for a complete listing of the field names of each waste component.

Figure F-5. Code Subclass

Field Name	Type	Description
UniKey	AutoNumber	Primary key for this table.
ClassID	Number	ID for broad material categories.
ClassName	Text	Name of broad material categories.
ClassOrder	Number	For reporting purposes, order of broad material categories.
TClass	Text	Category designations for t-tests
Uniform ID	Number	ID's to compare waste component weights across years (54 total)
Uniform_Name	Text	Names of baseline set of material components.
Report Order	Number	For reporting purposes, order of broad material categories.
Chart Order	Number	Order as shown in the Tracking Chart
OldClassName	Text	Field no longer used.
DE Subclass	Number	Data Entry code for current year subclass ID. Order in data entry form is based on this field.
DE Class	Text	Class name for current year.
Subclass	Text	Subclass name for current year.
2007_Class	Text	Names of broad material categories used for the 2007 study year.
2007_ClassOrder	Number	Associated ID for broad material categories used for the 2007 study year.
2007_ID	Number	67 subclasses
2007_Name	Text	Name of material components used for 2007 study year.

Code Site is linked to AA Schedule by the field “SiteID.”

Figure F-6. Code Site

Field Name	Type	Description
SiteID	Number	Links to SiteID field in [AASchedule].
Site	Text	Name of facility.
SiteType	Text	Description of facility. (City, private, or intermodal.)

Code Activity is linked to AA Survey by the field “Code Activity.”

Figure F-7. Code Activity

Field Name	Type	Description
Code Activity	Number	Links to SiteID field in [AASchedule].
Site	Text	Not used in current study. Designates C&D study.
Activity	Text	Designates type of activity.
ActivityID	Text	Text code corresponding to activity type. Corresponds to text in sample IDs.

Code Building Type is linked to AA Survey by the field "BuildingTypeID."

Figure F-8. Code Building Type

Field Name	Type	Description
BuildingTypeID	Number	Links to BuildingType in [AA Survey].
BuildingAbbrev	Text	Text code used on survey field forms.
Report Order	Number	For reporting purposes.
Type	Text	Description of building type (e.g., residential, non-residential, etc.).

Code Hauler is linked to AA Survey by the field "HaulerID."

Figure F-9. Code Hauler

Field Name	Type	Description
HaulerID	AutoNumber	Links to Hauler field in [AA Survey].
Hauler	Text	Designates hauler type (e.g., contracted hauler, business self-haul, etc.).
Report Order	Number	For reporting purposes.
Abbreviation	Text	From previous studies.

Code Season is linked to AA Schedule by the field "SeasonID."

Figure F-10. Code Season

Field Name	Type	Description
SeasonID	Number	Links to Season in [AA Schedule].
Season	Text	Designates season. (Spring, Summer, Autumn, Fall)
SeasonDescription	Text	Months included in season plus year, for multi-year studies (e.g. Fall (October - December 1992)).

Code Vehicle is linked to AA Survey by the field "VehicleID."

Figure F-11. Code Vehicle

Field Name	Type	Description
VehicleID	Number	Links to VehicleType in [AA Survey].
Vehicle	Text	Designates vehicle (e.g., Rear Loader, Loose Roll-off, etc.).
VehicleAbbrev	Text	Text code used on survey field forms.

Code Study Period is linked to AA Schedule by the field "StudyPeriod."

Figure F-12. Code Study Period

Field Name	Type	Description
StudyPdID	AutoNumber	Unique ID.
StudyPeriod	Text	Links to StudyPeriod in [AASchedule].
StudyPdAsNumber	Number	For use when screening by study period

Appendix G: Field Forms

The field forms are included in the following order:

- Vehicle Survey Form
- Vehicle Selection Sheet
- Sample Placard
- Visual Sampling Form

Vehicle Survey Form (front)

Verify that the load contains at least 80% C&D waste, is from Seattle, AND is to be disposed (not recycled).					
SAMPLE ID	**ORIGIN**	**VEHICLE**	**HAULER**	**ACTIVITY**	**BUILDING TYPE**	**NET WT**	**NOTES**
	Ask Sampled Vehicles Only Address or cross streets the waste comes from	DB=drop-box ED=end dump SE=semi truck LG=other large vehicle PU=pick-up/passenger	COM=contracted haulers C&D=C&D haulers BSH=business self-haul HSH=homeowner self-haul	NC=new construction R=remodel DEMO=demolition RF=roofing OC=other c&d/mixed DK=don't know	R=residential buildings NR=non-residential buildings M=Mixed load OS=Other structures	Net weights only Record gross weights in NOTES	Record the following, if applicable: 1) Comments 2) Weigh Back Transaction #'s 3) Min. Vehicle Gross Weights 4) Min. Vehicle Make & Model 5) Weigh back card ID
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		
		DB ED SE LG PU	COM C&D BSH HSH	NC R DEMO RF OC DK	R NR M OS		

Vehicle Survey Form (back)

Complete this section for every page

Page _____ of _____

Circle the site:

Date _____

Third & Lander

Gatekeeper _____

Eastmont

Black River

Complete this section for first page only

Inclement Weather? _____

Start Time _____ Stop Time _____

Other Notes about Today's Sampling:

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

Vehicle Selection Sheet

2007 Seattle C&D Study
Recoverable Material Waste Characterization Study
Vehicle Selection Form

Site: Eastmont
Date: Wednesday, February 21, 2007

Goal: 25 Samples Total

When you reach the number circled, ask this vehicle to go to the sorting area.

New Construction — NEED 7 TOTAL

(1)	2	3	(4)	5	6	(7)	8	9	(10)	11	12	(13)	14	15	(16)	17	18	(19)	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

Remodeling — NEED 7 TOTAL

(1)	2	3	(4)	5	6	(7)	8	9	(10)	11	12	(13)	14	15	(16)	17	18	(19)	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

Demolition — NEED 5 TOTAL

(1)	2	3	(4)	5	6	(7)	8	9	(10)	11	12	(13)	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

Roofing — NEED 3 TOTAL

(1)	(2)	(3)	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Other/Mixed — NEED 3 TOTAL

(1)	(2)	(3)	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Sample Placard

Visual Sampling Form

Step 1:
Site: 3rd & Lander Black River

Eastmont Intermodal_____

Date: _____

Numbered Card: _____

Step 2: Measure and record the load volume.
(Include trailer dimensions if applicable.)

Dimensions:

_____ft x _____ft x _____ft

_____ft x _____ft x _____ft

Step 3: Identify and record all broad material categories (in bold) that appear in the load.

Step 4: Estimate composition of load by volume for each broad material category (in bold).

Step 5: For each broad materail category, estimate composition by volume of each specific material component.

Step 6: Make sure broad material category estimates AND material component estimates EACH total 100%.

☐ **Paper: _____%**	
	OCC
	Kraft Paper Bags
	Other Recyclable Paper
	Cellulose Insulation
	R/C Paper
%	***Subtotal (must equal 100%)***

☐ **Glass: _____%**	
	Glass Bottles and Containers
	Flat Glass
	R/C Glass
%	***Subtotal (must equal 100%)***

☐ **Metals: _____%**	
	Tin/Steel Cans
	Major Appliances
	Used Oil Filters
	HVAC Ducting
	Other Ferrous Metals
	Aluminum Cans
	Other Non-Ferrous
	R/C Metal
%	***Subtotal (must equal 100%)***

☐ **Plastic: _____%**	
	Plastic Bottles and Tubs
	Other Rigid Packaging
	Expanded Polystyrene Packaging and Insulation
	Trash Bags
	Grocery/Other Merchandise Bags
	Non-Bag Commercial and Industrial Packaging Film
	Plastic Sheeting/Agricultural Film
	Other Film
	Durable Plastic Items
	Plastic Piping
	R/C Plastic
%	***Subtotal (must equal 100%)***

☐ **Compostables: _____%**	
	Food
	Leaves and Grass
	Prunings and Trimmings
	Branches and Stumps
	R/C Compostables
%	***Subtotal (must equal 100%)***

☐ **Construction & Demolition: _____%**	
	Concrete
	Asphalt Paving
	Composting Roofing
	Other Asphalt Roofing
	Other Aggregates
	Clean Dimensional Lumber
	Clean Engineered Wood
	Pallets and Crates
	Other Recyclable Wood
	Painted/Stained Wood
	Creosote-treated Wood
	Other Treated Wood
	Clean Gypsum Board
	Painted/Demolition Gypsom Board
	Rock and Gravel
	Dirt and Sand
	Fiberglass Insulation
	R/C C&D
%	***Subtotal (must equal 100%)***

☐ **Electronics: _____%**	
	Brown Goods/Other Small Consumer Electronics
	Computer Related Electronics
	Televisions/Other Items with CRT's
%	***Subtotal (must equal 100%)***

☐ **Other Materials: _____%**	
	Textiles
	Carpet
	Carpet Padding
	Ash
	Bulky Items
	Tires
	R/C Other Materials
%	***Subtotal (must equal 100%)***

☐ **Household Hazardous Waste: ____%**	
	Paint
	Vehicle and Equipment Fluids
	Used Oil
	Batteries
	R/C Household
%	***Subtotal (must equal 100%)***

☐ **Mixed Residue/MSW: _____%**	
	Mixed Residue
	MSW
%	***Subtotal (must equal 100%)***

Grand Total:_____%
(Must equal 100%)

NOTES: _____