

2015 Anacostia Watershed Litter Survey

A Survey of Litter along
96 Roadway and Non-Roadway Sites
within the Anacostia Watershed

Conducted in

**District of Columbia,
Montgomery County,
and
Prince George's County**

by

Environmental Resources Planning, LLC

Final Report

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2015 Anacostia Watershed Litter Survey

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2015 Anacostia Watershed Litter Survey

Executive Summary

In October and November 2014, Environmental Resources Planning, LLC conducted a comprehensive litter survey of the Anacostia Watershed, which encompassed certain **portions of the District of Columbia (DC) as well as Montgomery and Prince George's** Counties in Maryland. The purpose of this survey was to gauge the amount and composition of litter along roadways and in non-roadway sites in and/or adjacent to waterways identified by Anacostia Watershed Society as indicator streams.

The methodology used to conduct these litter surveys consisted of tallying each littered item observed and making note of its material composition. This is comparable to the methodology used with most litter surveys conducted throughout the U.S. and Canada.

Methodology Overview

The first part of this survey consisted of selecting 84 roadway sites using a stratified random selection process. This involved identifying each census tract located within the Anacostia Watershed and weighting each of them based on population density. **In addition, 18 of these sites were selected from Montgomery and Prince George's** Counties to ensure representation of Anacostia communities in Maryland.

The second part of this survey focused on 12 special research (non-roadway) sites. Eight of these site locations were provided by Anacostia Watershed Society and were adjacent to indicator streams or trash traps monitored by Anacostia Watershed Society. The remaining four sites were selected based on their proximity to indicator streams for trash in the Anacostia Watershed. The sites surveyed in this part of this survey were selected based on geographic representation of the three major jurisdictions sampled, public access and sufficient area for sampling using mapping software to visually assess each site. Since the non-roadway sites were hot spots and not randomly selected areas, the resulting data will be informative, but cannot be extrapolated or statistically tested.

For both parts of this survey, litter was classified as either *Large Litter* (four inches or larger) or *Small Litter* (smaller than four inches). The optimal site length was 300 feet and the optimal width was 18 feet. *Small Litter* was counted on the entire site when feasible. Otherwise, three transects at the beginning, middle, and end of each site were surveyed. The optimal size of each transect was six feet in width and 18 feet in length. The resulting data was extrapolated to the entire length of the site.

Each site was photographed and documented. Each item was characterized by material composition. A short video was taken if the site was heavily littered. *Misc. Paper* and *Misc. Plastic* refer to unidentifiable items that have typically been mowed over and/or weathered so that the exact product type is uncertain. Items made of multiple materials (e.g., toys, vehicle parts and certain home articles, etc.) were classified as *Composite*. Items designated as recyclables in the lists below were those materials currently accepted in local recycling programs.

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Litter Survey Results - Highlights

The data below represents all sites surveyed in DC, Montgomery County and Prince George's County. Detailed breakdowns of this data can be found in the main report and in the Appendix.

Data from the 84 roadway sites was based on a stratified random sampling methodology and is representative of roadway litter in the Anacostia Watershed.

Roadways - Large Litter

- Largest Components by Count
 1. *Sweet Snack Wrappers* (7.9 percent)
 2. *Paper Fast Food Napkins - Unbranded* (6.9 percent)
 3. *Misc. Paper* (5.9 percent)

Roadways - Small Litter

- Largest Components by Count
 1. Glass (28.7 percent)
 2. Cigarette Butts (23.8 percent)
 3. Paper Scraps (15.0 percent)

Data from the 12 non-roadway sites was based on areas identified as litter hot spots. This data is instructive and represents materials that are problematic in specific areas, but is not statistically representative of overall conditions.

Non-Roadways - Large Litter

- Largest Components by Count
 1. Water Bottles - Plastic (5.4 percent)
 2. Beer Cans (5.2 percent)
 3. Snack Food Packaging (4.1 percent)

Non-Roadways - Small Litter

- Largest Component by Count
 1. Glass (23.4 percent)
 2. Paper Scraps (15.6 percent)
 3. Hard Plastic (11.0 percent)

2015 Anacostia Watershed Litter Survey

Introduction

In October and November 2014, Environmental Resources Planning, LLC conducted a comprehensive litter survey of the Anacostia Watershed, which encompassed certain **portions of DC as well as Montgomery County and Prince George's County in Maryland**. The purpose of this survey was to gauge the amount and composition of litter along roadways and in non-roadway sites in and/or adjacent to waterways identified by Anacostia Watershed Society as indicator streams. Roadway sampling began on October 30, 2014 and was completed on November 20, 2014.

The methodology used to conduct these litter surveys consisted of tallying each littered item observed and making note of its material composition. This is comparable to the methodology used with most litter surveys conducted throughout the U.S. and Canada.

Roadways - Litter Survey

Roadways - Sampling Methodology

The first part of this survey consisted of selecting 84 roadway sites based on a stratified random selection process. This involved identifying each census tract located within Anacostia and weighting each of them based on population density.

Roadway sites were selected using ArcGIS, a geospatial analysis and GIS mapping **software suite**. **Census tract maps of DC, Montgomery County and Prince George's County** were downloaded along with a separate map of the Anacostia Watershed. Once these two maps were then overlaid, ArcGIS was used to highlight tracts from the census maps that fell within the area of the watershed. Each map file has an associated data table, so once tracts that didn't have the watershed boundaries running through them were eliminated, it effectively left a list of the tracts that were located within the Anacostia as shown in Figure 1 on the following page.

Of the total 84 roadway sites, 18 were selected from Montgomery County and Prince **George's County to ensure representation of Anacostia Watershed communities in Maryland**.

The second part of this survey focused on 12 special research sites. Anacostia Watershed Society provided eight of these sites, which were adjacent to indicator streams or trash traps monitored by Anacostia Watershed Society. The remaining four sites were selected based on their status as indicator streams for trash in the Anacostia Watershed. The sites surveyed in this part of this survey were selected based on representation, public access and sufficient area for sampling using mapping software to visually assess each site.

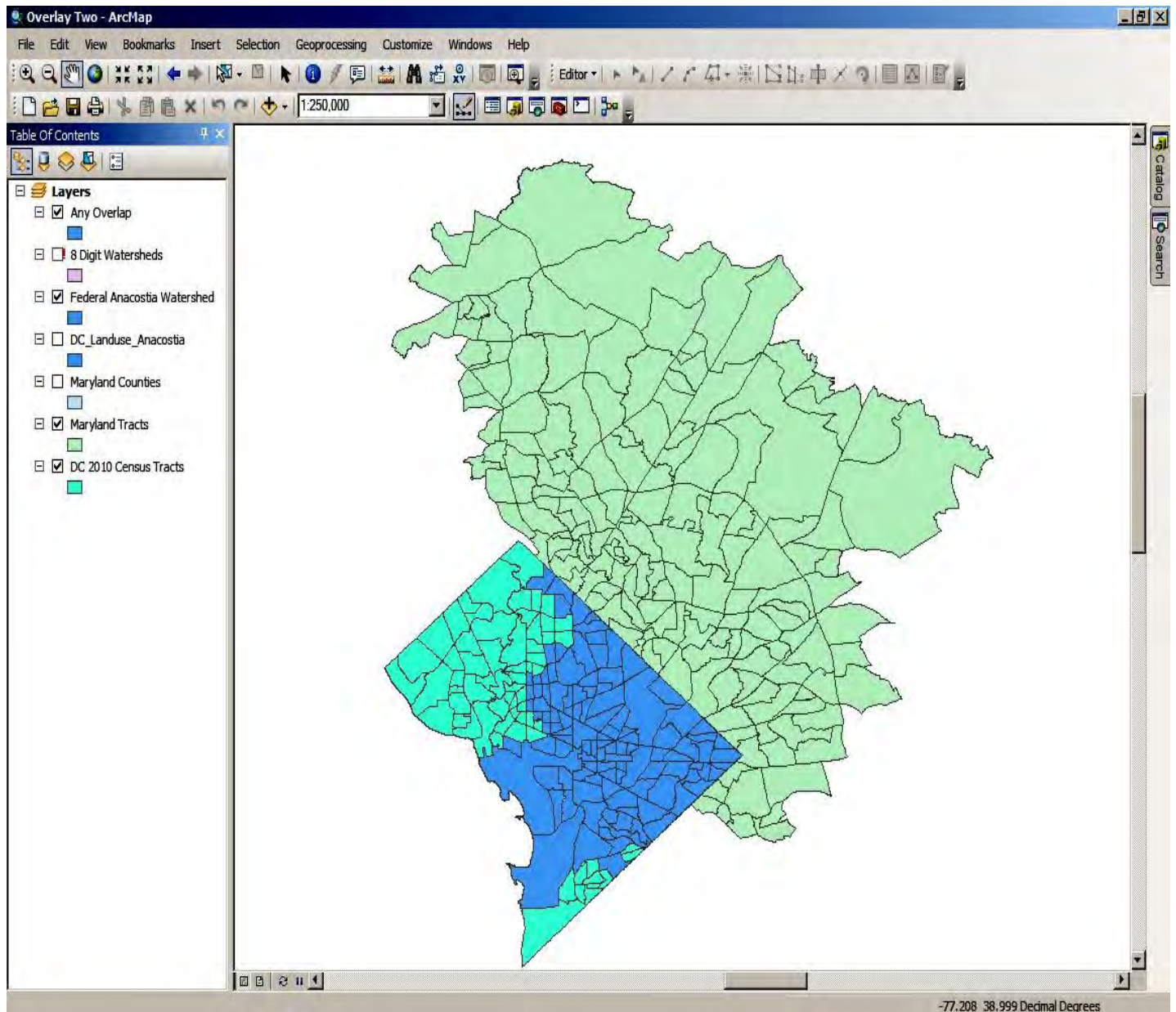
For both parts of this survey, litter was classified as either *Large Litter* (four inches or larger) or *Small Litter* (smaller than four inches). The optimal site length was 300 feet and the optimal width was 18 feet.

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Small Litter was counted on the entire site when feasible. Otherwise, three transects at the beginning, middle, and end of each site were surveyed. The optimal size of each transect was six feet in width and 18 feet in length. The resulting data was extrapolated to the entire length of the site.

The survey results are broken down into sections addressing *Large Litter* and *Small Litter* separately. Additional details regarding the data recorded in this survey can be found in the Appendix.

Figure 1 - GIS Map of Census Tracts within the Anacostia Watershed



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Based on the size of the Anacostia Watershed, these parameters yielded a more representative sample than most statewide litter surveys. Field crews surveyed a total area of more than 500,000 square feet along roadways and non-roadway areas. Data for both the large and small components of litter were entered directly onto field forms.

Litter was classified into 94 categories of *Large Litter* and 19 categories of *Small Litter*. Each site was photographed and documented. Each item was characterized by material composition. A short video was taken if the site was heavily littered. *Misc. Paper* and *Misc. Plastic* refer to unidentifiable items that have typically been mowed over and/or weathered so that the exact product type is uncertain.

Items made of multiple materials (e.g., toys, vehicle parts and certain home articles, etc.) were classified as *Composite*. Items designated as recyclables were those materials currently accepted in local recycling programs. *Misc. Plastic* and *Misc. Paper* refer to unidentifiable items that have typically been mowed over and/or weathered so that the exact product type is uncertain.

Data records from the National Climatic Data Center were reviewed and indicated that no major weather events had occurred in Anacostia within the 30 day period preceding this litter survey, although windy conditions were observed during this survey.

Despite the fact that this survey was completed on November 18, more than two weeks after Halloween, *Sweet Snack Wrappers* were still the largest single component of litter overall.

Roadway and Non-Roadway Sites by Jurisdiction

The project parameters called for surveying 75 percent of the sites in DC areas located within the Anacostia Watershed and 25 percent of the sites in Montgomery County and Prince George's County areas located within the Anacostia Watershed. The distribution of sites is shown in Table 1.

Table 1 - Roadway and Non-Roadway Sites by Jurisdiction and Site Type

Jurisdiction	Roads	Non-Roads	Total
District of Columbia	66	6	72
Montgomery County	9	3	12
Prince George's County	9	3	12
Total	84	12	96

To better understand the distribution of litter by product type, the 94 components were rolled-up into 11 categories. The category components can be found in the Appendix.

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Figure 2 - Roadway Site in Northeast DC



Figure 2 shows a roadway site in Northeast DC. Loose trash setouts are a known source of litter as seen in this photo.

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Roadways - Litter Survey Results

Large Litter on Roadways

A total of 2,474 large items of litter were counted on the 84 roadway sites, or an average of about 29 items per site. *Large Litter* accounted for 7 percent of all litter (*Large Litter* and *Small Litter* combined) on roadways by count. Recyclables comprised 33 percent of *Large Litter* along roadways.

Of the 94 categories of *Large Litter*, the three individual items most frequently found were *Sweet Snack Wrappers* (7.9 percent), *Unbranded Paper Napkins* (6.9 percent) and *Misc. Paper* (5.9 percent). Table 2 shows the 20 largest components of *Large Litter*, which comprise 70.7 percent of the total. The complete list can be found in the Appendix.

Table 2 - Large Litter on All Roadways -20 Largest Components

#	Large Litter	Percent
1	Sweet Snack Wrappers (Candy, Cake)	7.9%
2	Paper Fast Food Napkins - Unbranded	6.9%
3	Misc. Paper	5.9%
4	Stationery (School and Business Paper)	4.9%
5	Construction Debris	4.7%
6	Tobacco Packaging (Packs, Matches, Lighters)	4.6%
7	Misc. Plastic	3.9%
8	Misc. Glass	3.9%
9	Snack Food Packaging (Chips)	3.6%
10	Receipts (Business, Transfers)	3.0%
11	Printed Material (Newspapers)	2.8%
12	Corrugated Boxes/Pieces	2.8%
13	Water Bottles (Plastic)	2.7%
14	Plastic Straws	2.5%
15	Plastic Cup Lids/Pieces	2.4%
16	Plastic Packaging - Other (Film, etc.)	1.9%
17	Plastic Drink Cups	1.7%
18	Home Articles (Lamps, Lawn Chairs)	1.7%
19	Beer (Cans)	1.6%
20	Paper Cups (Cold)	1.4%
Large Litter -20 Largest Components		70.7%

Once litter components were rolled-up by product type, *Business and Home Papers* (17.3 percent) were the most prevalent type of litter followed by *Other Fast Food Related* (13.1 percent) and *Snack Packaging* (13.1 percent) as shown in Table 3.

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The components of each category can be found in the Appendix.

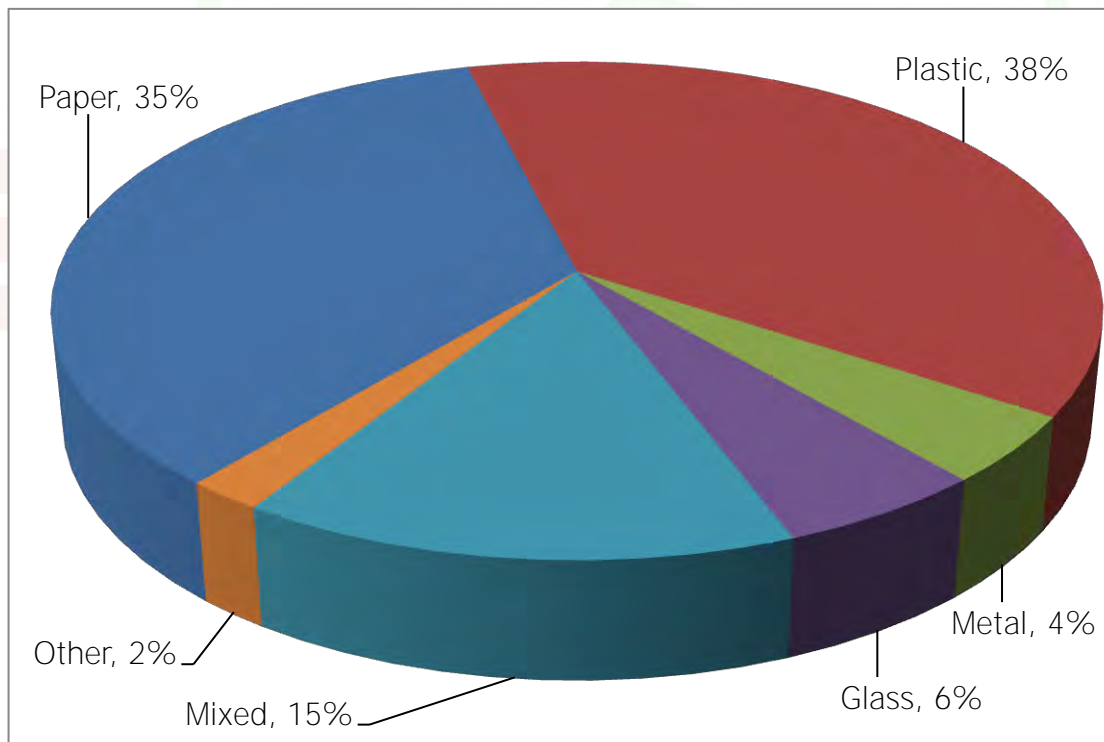
Table 3 - Large Litter on All Roadways by Category

Large Litter Category	Percent
Business and Home Papers	17.3%
Other Fast Food Related	13.1%
Snack Packaging	13.1%
Cups, Lids and Straws	10.5%
Beverage Containers	10.2%
Miscellaneous	7.9%
Paper and Plastic Bags	6.7%
Other Containers	6.1%
Construction/Vehicle Debris	5.4%
Tobacco-Related	5.1%
Retail Packaging	4.6%
Total	100.0%

Large Litter on All Roadways by Material

In terms of composition, *Large Litter* was predominantly plastic (38 percent) and paper (35 percent) items as shown in Figure 3.

Figure 3 - Large Litter on All Roadways by Material



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Small Litter on All Roadways

A total of 32,133 items of *Small Litter* or an average of about 383 pieces per site was counted. Thus, *Small Litter* comprised 93 percent of all litter on roadway sites. As shown in Table 4, *Glass* was the largest component of *Small Litter* (28.7 percent), followed by *Cigarette Butts* (23.8 percent) and *Paper* (15.0 percent).

Broken windshield and beverage container glass were pervasive throughout the survey area, particularly in low-income neighborhoods. This was very different from most other litter surveys where *Glass* is typical a smaller component of litter.

Similar to their counterparts in *Large Litter*, the high number of some items (paper and plastic in particular) may result from mowing without cleaning up litter beforehand.

Table 4 - Small Litter on All Roadways

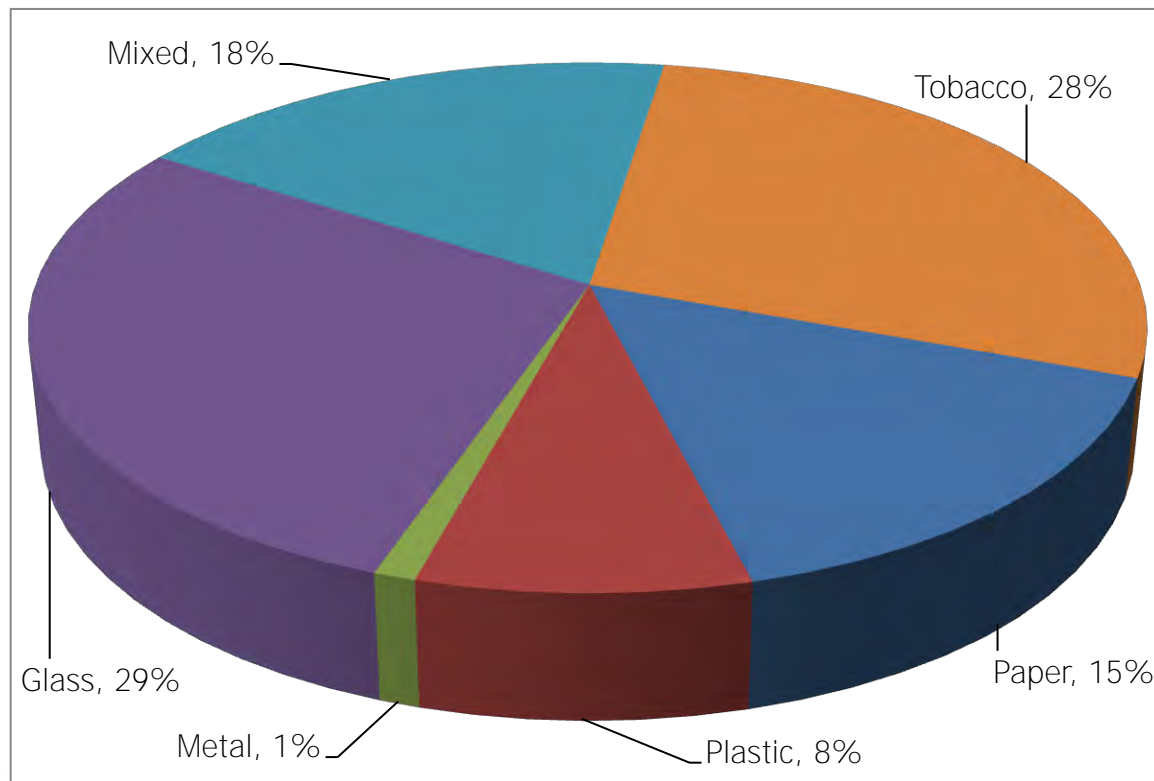
Small Litter	Percent
Glass	28.7%
Cigarette Butts	23.8%
Paper	15.0%
Candy/Gum Wrappers	11.2%
Bottle Caps	4.1%
Plastic Film	3.8%
Hard Plastic	3.1%
Tobacco Packaging	2.7%
Cigar Butts/Tips	1.5%
Other Materials	1.3%
Food	1.3%
Aluminum	0.7%
Rubber/Tire Pieces	0.6%
Paper Straw Wrappers	0.5%
Polystyrene Foam Food Products - Cups/Plates/Clams	0.4%
Straws - Plastic	0.4%
Polystyrene Foam Packaging - Chunks	0.4%
Metal (not Aluminum)	0.4%
Polystyrene Foam Packaging - Peanuts	0.2%
Total	100.0%

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Small Litter on All Roadways by Material

Glass (broken windshields and beverage container bottles) comprised 29 percent of *Small Litter* along roadways. Tobacco-Related litter was almost as abundant (28 percent). The breakdown of *Small Litter* by material throughout the Anacostia Watershed can be seen in Figure 4.

Figure 4 - Small Litter on All Roadways by Material



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Figure 5 - Roadway Site in Prince George's County



Figure 5 shows a roadway site in Prince George's County where fences and heavy brush have collected and trapped litter.

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Roadways - Litter Survey Results by Jurisdiction

This survey was designed to reflect a characterization of Anacostia Watershed litter by representing the portions of DC, Montgomery County and Prince George's County located within the Anacostia Watershed. This approach provided valuable data about the different characterizations and rates of litter in all three jurisdictions. This section provides data for the roadways portion of this litter survey broken down by jurisdiction.

Roadway Survey Results - DC

Large Litter on DC Roadways

A total of 2,103 items of *Large Litter* were tallied on all 66 DC roadway sites for an average of about 32 pieces per site. Recyclables comprised 34 percent of *Large Litter* in DC.

Sweet Snack Wrappers (7.9 percent) was the largest component of *Large Litter* followed by *Paper Fast Food Napkins - Unbranded* (7.0 percent) and *Misc. Paper* (6.6 percent). As shown in Table 5, the top 20 components comprised 71.0 percent of *Large Litter* in DC.

Table 5 - Large Litter on DC Roadways - 20 Largest Components

Large Litter Components	Percent
Sweet Snack Wrappers (Candy, Cake)	7.9%
Paper Fast Food Napkins - Unbranded	7.0%
Misc. Paper	6.6%
Stationery (School, Business)	5.0%
Tobacco Packaging (Packs, Matches, Lighters)	4.7%
Misc. Glass	4.6%
Construction Debris	4.6%
Misc. Plastic	3.5%
Snack Food Packaging (Chips)	3.2%
Receipts (Business, Transfers)	3.0%
Water Bottles (Plastic)	2.9%
Corrugated Boxes/Pieces	2.7%
Printed Material (Newspapers)	2.5%
Plastic Straws	2.1%
Plastic Cup Lids/Pieces	2.1%
Plastic Packaging - Other (Film, etc.)	2.0%
Plastic Drink Cups	1.9%
Beer (Cans)	1.7%

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Home Articles (Lamps, Lawn Chairs)	1.6%
Paper Cups (Cold)	1.5%
Large Litter - Top 20 Components	71.0%

Once litter components were rolled-up by product category, as shown in Table 6, *Business and Home Papers* (17.7 percent) comprised the largest category of *Large Litter* in DC, followed by *Other Fast Food Related* (13.2 percent) and *Snack Packaging* (11.9 percent). The components of each category can be found in the Appendix.

Table 6 - Large Litter on DC Roadways by Category

Large Litter Category	Percent
Business and Home Papers	17.7%
Other Fast Food Related	13.2%
Snack Packaging	11.9%
Construction/Vehicle Debris	10.9%
Beverage Containers	10.5%
Cups , Lids and Straws	9.9%
Paper and Plastic Bags/Film	6.6%
Other Containers	5.4%
Tobacco-Related	5.2%
Retail Packaging	4.7%
Miscellaneous	4.2%
Total	100%

Small Litter on DC Roadways

A total of 23,193 items of *Small Litter* were tallied on all 66 DC roadway sites for an average of about 351 pieces per site. *Glass* (broken windshields and beverage containers) was pervasive throughout DC, particularly in areas identified by field crews as poverty-stricken neighborhoods, and comprised the largest component of *Small Litter* (37.2 percent) followed by *Cigarette Butts* (22.5 percent) and *Paper* (11.4 percent) as shown in Table 7.

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Table 7 - Small Litter on DC Roadways

Small Litter Components	Percent
Glass	37.2%
Cigarette Butts	22.5%
Paper	11.4%
Candy/Gum Wrappers	10.9%
Hard Plastic	3.4%
Plastic Film	3.0%
Tobacco Packaging	2.3%
Bottle Caps	2.2%
Cigar Butts/Tips	1.7%
Food	1.4%
Other Materials	1.0%
Aluminum	0.7%
Rubber/Tire Pieces	0.6%
Straws - Plastic	0.5%
Straws/Wrappers - Paper	0.4%
Metal (not Aluminum)	0.4%
Polystyrene Foam Food - Cups/Plates/Clams	0.2%
Polystyrene Foam Packaging - Peanuts	0.1%
Polystyrene Foam Packaging - Chunks	0.0%
Total	100%

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Roadway Survey Results - Montgomery County

Large Litter on Montgomery County Roadways

A total of 134 items of *Large Litter* were tallied on the nine Montgomery County roadway sites for an average of about 15 pieces per site. Recyclables comprised 20 percent of *Large Litter* in Montgomery County.

The data shows that *Misc. Plastic* (16.4 percent) was the largest component of *Large Litter*, followed by *Sweet Snack Wrappers* (12.4 percent) and *Construction Debris* (10.9 percent). The top 20 components comprised 83.3 percent of *Large Litter* in Montgomery County as shown in Table 8.

Table 8 - Large Litter on Montgomery County Roadways - 20 Largest Components

Large Litter Components	Percent
Misc. Plastic	16.4%
Sweet Snack Wrappers (Candy, Cake)	12.4%
Construction Debris	10.9%
Paper Fast Food Napkins - Unbranded	5.7%
Plastic Straws	5.3%
Misc. Paper	4.5%
Container Lids (Plastic)	3.5%
Home Articles (Lamps, Lawn Chairs)	3.0%
Water Bottles (Plastic)	2.5%
Paper Cups (Hot)	2.4%
Stationery (School, Business)	2.4%
Snack Food Packaging (Chips)	2.4%
Plastic Cup Lids/Pieces	2.2%
Soft Drink (Cans)	1.7%
Six-Pack Plastic Rings	1.5%
Other Paper Cups	1.5%
Printed Material (Newspapers)	1.5%
Foil Fast Food Wrappers (Burger Wraps)	1.5%
Other Plastic Shells/Boxes	1.3%
Paper Straw Wrappers	0.9%
Large Litter - Top 20 Components	83.3 %

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Once litter components were rolled-up by product category, as shown in Table 9, *Retail Packaging* (17.9 percent) comprised the largest category of *Large Litter* in Montgomery County, followed by *Snack Packaging* (14.8 percent) and *Cups, Lids and Straws* (13.0 percent). The components of each category can be found in the Appendix.

Table 9 - Large Litter on Montgomery County Roadways by Category

Large Litter Roll-Up Category	Percent
Retail Packaging	17.9%
Snack Packaging	14.8%
Cups, Lids and Straws	13.0%
Construction/Vehicle Debris	10.9%
Other Fast Food Related	10.2%
Business and Home Papers	9.2%
Beverage Containers	8.0%
Other Containers	5.9%
Miscellaneous	4.6%
Paper and Plastic Bags/Film	4.1%
Tobacco-Related	1.5%
Total	100%

Small Litter - Montgomery County Roadways

A total of 2,307 items of *Small Litter* were tallied on the nine Montgomery County roadway sites for an average of about 256 pieces per site. The compiled data shows that *Paper* (38.6 percent) was the largest component, followed by *Cigarette Butts* (18.6 percent) and *Candy/Gum Wrappers* (8.5 percent) as shown in Table 10.

Table 10 - Small Litter on Montgomery County Roadways

Small Litter Components	Percent
Paper	38.6%
Cigarette Butts	18.6%
Candy/Gum Wrappers	8.5%
Plastic Film	7.0%
Bottle Caps	6.9%
Hard Plastic	4.7%
Tobacco Packaging	4.0%
Cigar Butts/Tips	3.7%
Polystyrene Foam Packaging - Chunks	2.1%
Aluminum	1.4%
Rubber/Tire Pieces	1.4%

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Straw Wrappers - Paper	0.8%
Metal (not Aluminum)	0.7%
Other Materials	0.7%
Polystyrene Foam Packaging - Peanuts	0.7%
Food	0.0%
Glass	0.0%
Polystyrene Foam Food - Cups/Plates/Clams	0.0%
Straws - Plastic	0.0%
Total	100%



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Roadway Survey Results - Prince George's County

Large Litter on Prince George's County Roadways

A total of 236 items of *Large Litter* were tallied on all nine Prince George's County roadway sites for an average of about 26 pieces per site. Recyclables comprised 35 percent of *Large Litter* on Prince George's County roadways, slightly higher than on DC roadways and much higher than on Montgomery County roadways.

Snack Food Packaging (8.0 percent) was the largest component of *Large Litter*, followed by *Printed Material* (7.1 percent) and *Stationery* (6.6 percent). The top 20 components comprised 75.7 percent of *Large Litter* in Prince George's County as shown in Table 11.

Table 11 - Large Litter on Prince George's County Roadways - 20 Largest Components

Large Litter Category	Percent
Snack Food Packaging (Chips)	8.0%
Printed Material (Newspapers)	7.1%
Stationery (School, Business)	6.6%
Paper Fast Food Napkins - Unbranded	6.6%
Tobacco Packaging (Packs, Matches, Lighters)	5.8%
Corrugated Boxes/Pieces	5.3%
Plastic Cup Lids/Pieces	4.9%
Plastic Straws	4.9%
Sweet Snack Wrappers (Candy, Cake)	4.9%
Juice (Plastic)	3.5%
Receipts (Business, Transfers)	3.1%
Construction Debris	2.2%
Water Bottles (Plastic)	1.8%
Paper Cups (Hot)	1.8%
Plastic Retail Bags - Branded	1.8%
Plastic Packaging - Other (Film, etc.)	1.8%
Paper Food Wrap (Meat Wrap)	1.8%
Plastic Jars / Bottles (Non-Beverage)	1.3%
Plastic Drink Cups	1.3%
Polystyrene Foam Clamshells	1.3%
Large Litter Roll-Up - Top 20 Components	75.7 %

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Once litter components were rolled-up by product category, as shown in Table 12, *Business and Home Papers* (18.1 percent) comprised the largest category of *Large Litter in Prince George’s County*, followed by *Cups, Lids and Straws* (15.0 percent) and *Other Fast Food Related* (14.6 percent). The components of each category can be found in the Appendix.

Table 12 - Large Litter on Prince George’s County Roadways by Category

Large Litter Category	Percent
Business and Home Papers	18.1%
Cups, Lids and Straws	15.0%
Other Fast Food Related	14.6%
Snack Packaging	13.3%
Beverage Containers	8.8%
Paper and Plastic Bags/Film	8.8%
Retail Packaging	6.2%
Tobacco-Related	5.8%
Other Containers	3.1%
Construction/Vehicle Debris	3.1%
Miscellaneous	3.1%
Total	100%

Small Litter on Prince George’s County Roadways

A total of 6,633 items of *Small Litter* were tallied on all nine Prince George’s County roadway sites for an average of about 737 pieces per site. The compiled data shows that *Cigarette Butts* (30.5 percent) was the largest component followed by *Paper* (19.1 percent) and *Candy/Gum Wrappers* (13.2 percent) as shown in Table 13.

Table 13 - Small Litter on Prince George’s County

Small Litter Components	Percent
Cigarette Butts	30.5%
Paper	19.1%
Candy/Gum Wrappers	13.2%
Bottle Caps	9.7%
Glass	9.0%
Plastic Film	5.5%
Tobacco Packaging	3.7%
Other Materials	2.5%
Hard Plastic	1.7%
Food	1.3%

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Polystyrene Foam Food - Cups/Plates/Clams	1.0%
Polystyrene Foam Packaging - Chunks	1.0%
Aluminum	0.5%
Straws/Wrappers - Paper	0.5%
Polystyrene Foam Packaging - Peanuts	0.5%
Rubber/Tire Pieces	0.3%
Cigar Butts/Tips	0.0%
Metal (not Aluminum)	0.0%
Straws - Plastic	0.0%
Total	100%



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Non-Roadways - Litter Survey Results

The survey results for the 12 non-roadway sites are broken down into sections addressing *Large Litter* and *Small Litter*. Since some of this data was gathered from waterways, the data will tend to disproportionately emphasize the floatable components of litter over those items more likely to sink or remain in the water column. It is not feasible to precisely tally non-floatable items in muddy waterways such as the ones encountered during this litter survey. Additional details regarding non-roadway site data can be found in individual sections on non-roadway data within each jurisdiction and in the Appendix.

Data from these 12 non-roadway sites was based on areas identified as litter hot spots. This data is instructive and represents materials that are problematic in specific areas. However, since these sites were not statistically derived, they are not expected to provide a statistical representation of overall conditions.

Large Litter on Non-Roadway Sites

A total of 5,410 large items of litter were counted on the 12 non-roadway sites, or an average of about 451 items per site, significantly higher than on roadway sites. Recyclables comprised 44 percent of *Large Litter* on non-roadways compared to 33 percent for roadways.

Large Litter, items more likely to be visible and targeted for cleanup, accounted for 84 percent of all litter, almost the exact opposite of litter along roadways, which was predominantly *Small Litter*.

The largest single component of *Large Litter* was *Water Bottles (Plastic)*, which comprised 5.4 percent of all items. *Beer Cans* were the second largest component (5.2 percent), followed by *Snack Packaging* (4.1 percent). Together the top 20 components comprised 57.9 percent of all *Large Litter* as shown in Table 14. The complete list of *Large Litter* components can be found in the Appendix.

Table 14 - Large Litter on Non-Roadways - Top 20 Components

#	Large Litter	Percent
1	Water Bottles (Plastic)	5.4%
2	Beer (Cans)	5.2%
3	Snack Food Packaging (Chips)	4.1%
4	Sweet Snack Wrappers (Candy, Cake)	4.0%
5	Misc. Paper	3.3%
6	Soft Drink (Plastic)	3.2%
7	Wine/Liquor (Glass)	3.1%
8	Misc. Plastic	3.1%

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9	Printed Material (Newspapers)	2.7%
10	Tire & Rubber Debris	2.5%
11	Soft Drink (Cans)	2.5%
12	Plastic Wrap (Retail Food and Non-Food)	2.3%
13	Polystyrene Foam Chunks (Packaging, Coolers)	2.3%
14	Utensils & Chopsticks (Plastic)	2.3%
15	Polystyrene Foam Clamshells	2.3%
16	Beer Bottles (Glass)	2.1%
17	Plastic Packaging - Other (Film, etc.)	1.9%
18	Plastic Retail Bags - Branded	1.9%
19	Polystyrene Foam Cups	1.9%
20	Clothing or Clothing Pieces	1.8%
Large Litter - Top 20 Items		57.9%

To understand the distribution of litter more clearly, the 94 components were rolled-up into 32 categories, showing how the floatable components of litter are naturally predominant when surveying waterways. *Beverage Containers* were the largest component (25.8 percent), followed by *Paper and Plastic Bags/Film* (12.4 percent) and *Other Fast Food Related* (12.4 percent) as shown in Table 15. The components of each category can be found in the Appendix.

Table 15 - Large Litter on Roadways Roll-Up

Large Litter	Percent
Beverage Containers	25.8%
Paper and Plastic Bags/Film	12.4%
Other Fast Food Related	12.4%
Snack Packaging	8.9%
Business and Home Papers	8.5%
Other Containers	8.2%
Cups, Lids and Straws	7.0%
Retail Packaging	6.1%
Construction/Vehicle Debris	4.9%
Miscellaneous	4.2%
Tobacco-Related	1.6%
Total	100%

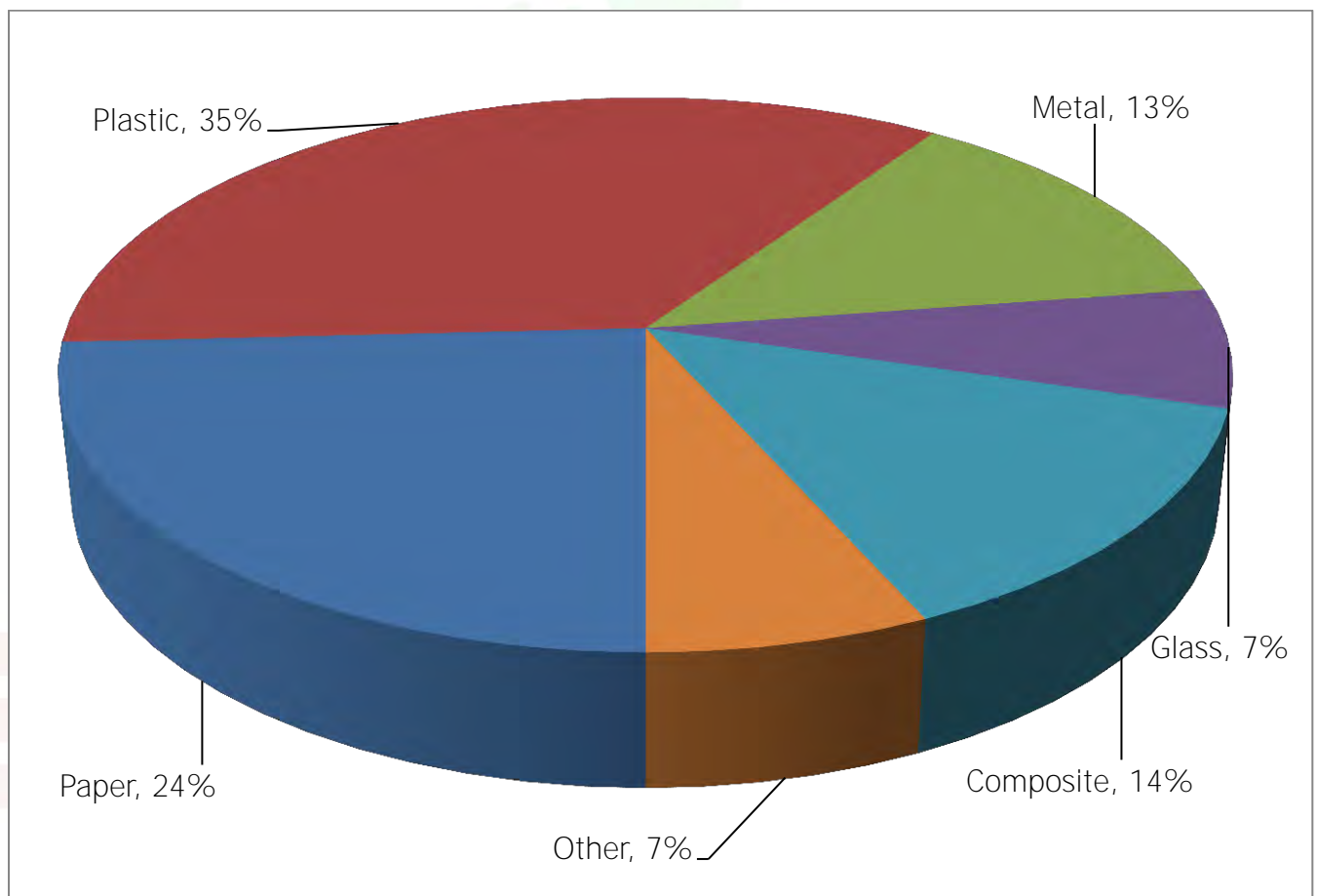
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Large Litter on Non-Roadways by Material

Items found at non-roadway sites were categorized based on their composition in order to form a comparison by material. For purposes of litter surveys, *Composite* refers to items made of multiple materials (e.g., toys, vehicle parts and certain home articles).

Figure 6 shows that *Large Litter* in non-roadways by material composition was predominantly Plastic (35 percent) and Paper (24 percent).

Figure 6 - Large Litter on Non-Roadways by Material



Small Litter on Non-Roadways

A total of 1,018 items of *Small Litter* were tallied on all 12 non-roadway sites for an average of about 85 pieces per site. *Small Litter* accounted for 16 percent of all litter found on non-roadway sites. As shown in Table 16 *Glass* items comprised the largest portion of *Small Litter* (23.4 percent). This is unusual for litter surveys.

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Pieces of glass windshields and beverage containers were found throughout this survey and were pervasive. The next largest components included *Paper* (15.6 percent) and *Hard Plastic* (11.0 percent).

Table 16 - Small Litter on Non-Roadways

Small Litter	Percent
Glass	23.4%
Paper	15.6%
Hard Plastic	11.0%
Cigarette Butts	8.9%
Polystyrene Foam Packaging - Peanuts	6.8%
Aluminum	5.8%
Candy/Gum Wrappers	5.2%
Food	4.9%
Polystyrene Foam Packaging - Chunks	4.2%
Bottle Caps	3.9%
Polystyrene Foam Food - Cups/Plates/Clams	3.8%
Plastic Film	3.0%
Straw Wrappers - Paper	1.0%
Metal (not Aluminum)	0.8%
Rubber/Tire Pieces	0.7%
Cigar Butts/Tips	0.4%
Tobacco Packaging	0.4%
Straws - Plastic	0.2%
Other Items	0.0%
Small Litter - Total	100.0%

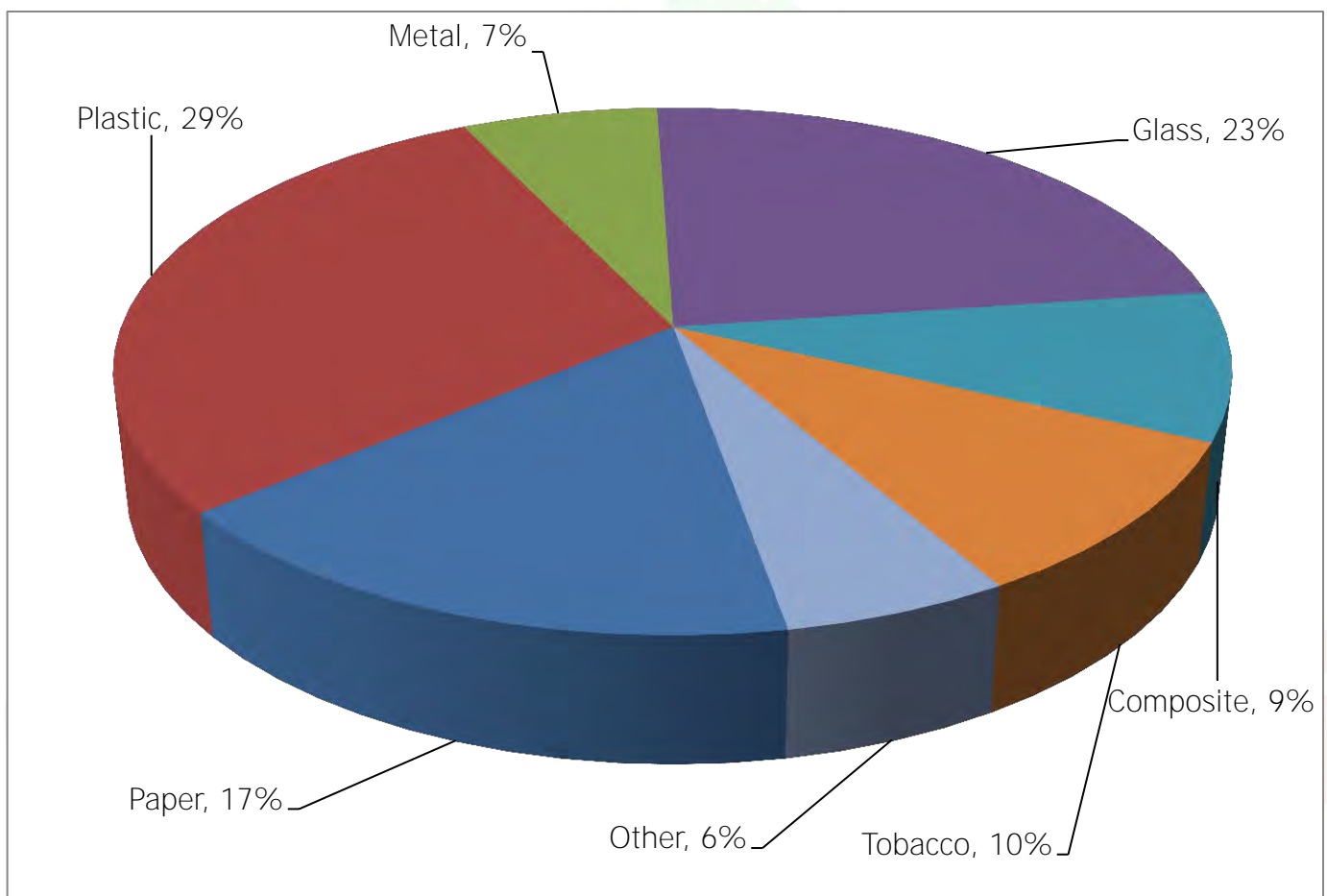
As Table 16 shows, the top three components accounted for 50 percent of all *Small Litter* found on non-roadway sites.

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Small Litter on Non-Roadways by Material

Small Litter found during the non-roadway sampling was also classified based on its material composition. Items made of multiple materials (e.g., toys, vehicle parts and certain home articles) were classified as *Composite*. In terms of material composition, *Small Litter* was predominantly Plastic (29 percent) and Glass (23 percent) as shown in Figure 7. As observed on roadway sites, broken windshields and beverage container bottles were observed throughout the Anacostia Watershed, particularly in DC and Prince George's County.

Figure 7 - Small Litter on Non-Roadways by Material



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Non-Roadway Survey Results - DC

Large Litter on DC Non-Roadways

A total of 4,327 items of *Large Litter* were tallied on the six DC non-roadway sites for an average of about 721 pieces per site. Recyclables comprised 41 percent of these items.

Beer Cans (6.0 percent) was the largest component of *Large Litter*, followed by *Water Bottles (Plastic)* (4.3 percent) and *Snack Food Packaging* (4.0 percent). As shown in Table 17, the top 20 components comprised 61.3 percent of all *Large Litter* found on DC non-roadways.

Data from these six non-roadway sites was based on areas identified as litter hot spots. This data is instructive and represents materials that are problematic in specific areas. However, six sites would not be statistically representative of overall conditions.

Table 17 - Large Litter on DC Non-Roadways -20 Largest Components

#	Large Litter	Percent
1	Beer (Cans)	6.0%
2	Water Bottles (Plastic)	4.3%
3	Snack Food Packaging (Chips)	4.0%
4	Misc. Paper	4.0%
5	Misc. Plastic	3.7%
6	Wine/Liquor (Glass)	3.5%
7	Soft Drink (Plastic)	3.2%
8	Tire & Rubber Debris	3.2%
9	Sweet Snack Wrappers (Candy, Cake)	3.2%
10	Soft Drink (Cans)	3.0%
11	Printed Material (Newspapers)	2.9%
12	Plastic Wrap (Retail Food/Non-Food)	2.8%
13	Utensils & Chopsticks (Plastic)	2.8%
14	Polystyrene Foam Packaging - Chunks	2.6%
15	Clothing or Clothing Pieces	2.3%
16	Polystyrene Foam Food Service - Clamshells	2.1%
17	Beer Bottles (Glass)	2.0%
18	Construction Debris	2.0%
19	Foil Fast Food Wrappers (Burger Wraps)	2.0%
20	Paper Retail Bags - Unbranded	1.9%
Large Litter -20 Largest Components		61.3%

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Once litter components were rolled-up by product category, as shown in Table 18, *Beverage Containers* (25.6 percent) comprised the largest category of *Large Litter* on DC non-roadways, followed by *Other Fast Food Related* (13.4 percent) and *Paper and Plastic Bags/Film* (11.8 percent). The largest component of *Beverage Containers* was Beer Containers (8.0 percent), while the largest component of *Paper and Plastic Bags/Film* was *Plastic Wrap* (2.8 percent).

Table 18 - Large Litter on DC Non-Roadways by Category

Large Litter Category	Percent
Beverage Containers	25.6%
Other Fast Food Related	13.4%
Paper and Plastic Bags/Film	11.8%
Other Containers	9.5%
Snack Packaging	8.0%
Business and Home Papers	7.7%
Retail Packaging	6.2%
Cups, Lids and Straws	5.9%
Construction/Vehicle Debris	5.6%
Miscellaneous	4.5%
Tobacco-Related	1.9%
Total	100.0%

Small Litter on DC Non-Roadways

A total of 748 items of *Small Litter* were tallied on all six DC non-roadway sites for an average of about 125 pieces per site. The compiled data shows that *Glass* (36.9 percent) was the largest component followed by *Cigarette Butts* (22.1 percent) and *Paper* (11.5 percent) as shown in Table 19.

The non-roadway sites surveyed are considered hot spots, areas where certain components of litter may tend to accumulate over time, but would not be statistically representative of overall conditions, particularly for small items of litter.

Table 19 - Small Litter on Roadways

Small Litter	Percent
Glass	36.9%
Cigarette Butts	22.1%
Paper	11.5%
Candy/Gum Wrappers	10.7%
Hard Plastic	3.7%
Plastic Film	2.9%
Bottle Caps	2.3%

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Tobacco Packaging	2.2%
Cigar Butts/Tips	1.7%
Food	1.5%
Other Materials	1.0%
Aluminum	0.8%
Rubber/Tire Pieces	0.6%
Straws - Plastic	0.5%
Straw Wrappers - Paper	0.4%
Metal (not Aluminum)	0.4%
Polystyrene Foam Packaging - Peanuts	0.4%
Polystyrene Foam Food -	0.2%
Polystyrene Foam Packaging - Chunks	0.1%
Total	100.0%

Figure 8 - Non-Roadway Site in DC



Figure 8 shows litter at a non-roadway site at Pope's Branch in DC.

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Non-Roadway Survey Results - Montgomery County

Large Litter on Montgomery County Non-Roadways

A total of 104 items of *Large Litter* were tallied on the three Montgomery County non-roadway sites for an average of about 35 pieces per site, about 95 percent less than the amount found on DC non-roadways. Recyclables comprised 64 percent of these items.

Stationery (57.7 percent) was, overwhelmingly, the largest component of *Large Litter*, followed by *Plastic Packaging - Other* (5.8 percent) and *Sweet Snack Wrappers* (5.8 percent). As shown in Table 20, the top 20 components comprised 95.2 percent of all *Large Litter* found on Montgomery County non-roadways.

Data from these three non-roadway sites was based on areas identified as litter hot spots. This data is instructive and represents materials that are problematic in specific areas. However, three sites are not statistically representative of overall conditions.

Table 20 - Large Litter on Montgomery County Non-Roadways - 20 Largest Components

#	Large Litter	Percent
1	Stationery (School, Business)	57.7%
2	Plastic Packaging - Other (Film, etc.)	5.8%
3	Sweet Snack Wrappers (Candy, Cake)	5.8%
4	Construction Debris	4.8%
5	Polystyrene Foam Cups	2.9%
6	Beer Bottles (Glass)	1.9%
7	Polystyrene Foam Clamshells	1.9%
8	Plastic Retail Bags - Unbranded	1.9%
9	Misc. Plastic	1.9%
10	Beer (Cans)	1.0%
11	Juice (Cans)	1.0%
12	Polystyrene Foam Packaging - Chunks	1.0%
13	Plastic Retail Bags - Branded	1.0%
14	Plastic Bags - Not Retail (Leaf , Trash)	1.0%
15	Plastic Wrap (Retail Food/Non-Food)	1.0%
16	Printed Material (Newspapers)	1.0%
17	Paper Fast Food Napkins - Unbranded	1.0%
18	Other Plastic Shells/Boxes	1.0%
19	Foil Fast Food Wrappers (Burger Wraps)	1.0%
20	Gum Wrappers	1.0%
Large Litter -20 Largest Components		95.2%

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Once litter components were rolled-up by product category, as shown in Table 21, *Business and Home Papers* (58.7 percent) comprised the largest category of *Large Litter* on Montgomery County non-roadways, followed by *Paper /Plastic Bags and Film* (10.6 percent) and *Snack Packaging* (7.7 percent). *Paper/Plastic Bags and Film* was predominantly *Plastic Packaging - Other* (5.8 percent).

Table 21 - Large Litter on Montgomery County Non-Roadways by Category

Large Litter Category	Percent
Business and Home Papers	58.7%
Paper/Plastic Bags and Film	10.6%
Snack Packaging	7.7%
Construction/Vehicle Debris	6.7%
Other Fast Food Related	4.8%
Beverage Containers	3.8%
Cups, Lids and Straws	2.9%
Other Containers	2.9%
Retail Packaging	1.0%
Miscellaneous	1.0%
Tobacco-Related	0.0%
Total	100.0%

Small Litter on Montgomery County Non-Roadways

A total of 45 items of *Small Litter* were tallied on the three Montgomery County non-roadway sites for an average of 15 pieces per site. *Glass* (28.9 percent) was the largest component followed by *Polystyrene Foam Packaging - Chunks* (17.8 percent) and *Polystyrene Foam Packaging - Peanuts* (15.6 percent) as shown in Table 22.

Care should be taken when evaluating this particular data set since it was based on small pieces of litter found on just three sites. The non-roadway sites surveyed are considered hot spots, areas where certain components of litter may tend to accumulate over time, but would not be statistically representative of overall conditions, particularly for small items of litter.

Table 22 - Small Litter on Roadways

Small Litter	Percent
Glass	28.9%
Polystyrene Foam Packaging - Chunks	17.8%
Polystyrene Foam Packaging - Peanuts	15.6%
Hard Plastic	11.1%
Candy/Gum Wrappers	8.9%
Paper	6.7%

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Plastic Film	4.4%
Polystyrene Foam Food - Cups/Plates/Clams	4.4%
Cigarette Butts	2.2%
Aluminum	0.0%
Bottle Caps	0.0%
Cigar Butts/Tips	0.0%
Food	0.0%
Metal (not Aluminum)	0.0%
Other Materials	0.0%
Tobacco Packaging	0.0%
Rubber/Tire Pieces	0.0%
Straw Wrappers - Paper	0.0%
Straws - Plastic	0.0%
Total	100.0%



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Non-Roadway Survey Results - Prince George's County

Large Litter on Prince George's County Non-Roadways

A total of 980 items of *Large Litter* were tallied on the three Prince George's County non-roadway sites for an average of about 327 pieces per site, about ten times the amount found on Montgomery County non-roadways, but about half the amount found on DC non-roadways. Recyclables comprised 45 percent of these items.

Water Bottles - Plastic (11.5 percent) was the largest component of *Large Litter on Prince George's County non-roadways*, followed by *Sweet Snack Wrappers* (7.0 percent) and *Snack Food Packaging* (5.8 percent). As shown in Table 23, the top 20 components comprised 74.4 percent of all *Large Litter* found on Prince George's County non-roadways.

Data from these three non-roadway sites was based on areas identified as litter hot spots. This data is instructive and represents materials that are problematic in specific areas. However, three sites are not statistically representative of overall conditions.

Table 23 - Large Litter on Prince George's County Non-Roadways - 20 Largest Components

#	Large Litter	Percent
1	Water Bottles (Plastic)	11.5%
2	Sweet Snack Wrappers (Candy, Cake)	7.0%
3	Snack Food Packaging (Chips)	5.8%
4	Polystyrene Foam Cups	4.8%
5	Plastic Retail Bags - Branded	4.4%
6	Soft Drink (Plastic)	4.2%
7	Plastic Packaging - Other (Film, etc.)	3.7%
8	Beer Bottles (Glass)	3.4%
9	Plastic Retail Bags - Unbranded	3.4%
10	Paper Packaging - Other	3.4%
11	Polystyrene Foam Clamshells	3.1%
12	Sport Drink (Plastic)	3.0%
13	Plastic Cup Lids/Pieces	2.8%
14	Beer (Cans)	2.4%
15	Wine/Liquor (Glass)	2.3%
16	Plastic Drink Cups	2.1%
17	Plastic Bags - Not Retail (Leaf, Trash)	1.9%
18	Corrugated Boxes/Pieces	1.7%
19	Printed Material (Newspapers)	1.7%

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20	Juice (Plastic)	1.6%
Large Litter -20 Largest Components		74.4%

As shown in Table 24, *Beverage Containers* (32.7 percent) comprised the largest category of *Large Litter on Prince George’s County non-roadways*, followed by *Paper /Plastic Bags and Film* (15.7 percent) and *Snack Packaging* (14.1 percent). The largest component of *Beverage Containers* was *Water Bottles* (11.5 percent). The largest component of *Paper/Plastic Bags and Film* was *Retail Plastic Bags - Branded* (4.4 percent).

Table 24 - Large Litter on PGC Non-Roadways by Category

Large Litter Category	Percent
Beverage Containers	32.7%
Paper and Plastic Bags/Film	15.7%
Snack Packaging	14.1%
Cups, Lids and Straws	11.4%
Other Fast Food Related	7.6%
Retail Packaging	6.7%
Business and Home Papers	5.3%
Other Containers	2.5%
Miscellaneous	2.1%
Construction/Vehicle Debris	1.4%
Tobacco-Related	0.4%
Total	100.0%

Small Litter on PGC Non-Roadways

A total of 225 items of *Small Litter* were tallied on the three Prince George’s County non-roadway sites for an average of 75 pieces per site. *Paper* (26.4 percent) was the largest component followed by *Aluminum* (14.6 percent) and *Candy/Gum Wrappers* (14.5 percent) as shown in Table 25.

Care should be taken when evaluating this particular data set since it was based on small pieces of litter found on just three sites. The non-roadway sites surveyed are considered hot spots, areas where certain components of litter may tend to accumulate over time, but would not be statistically representative of overall conditions, particularly for small items of litter.

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Table 25 - Small Litter on Roadways

Small Litter	Percent
Paper	26.4%
Aluminum	14.6%
Candy/Gum Wrappers	14.5%
Polystyrene Foam Food - Cups/Plates/Clams	14.0%
Plastic Film	7.3%
Polystyrene Foam Packaging - Chunks	4.1%
Hard Plastic	4.0%
Straw Wrappers - Paper	4.0%
Polystyrene Foam Packaging - Peanuts	2.7%
Metal (not Aluminum)	2.5%
Cigarette Butts	2.3%
Bottle Caps	1.8%
Glass	1.4%
Rubber/Tire Pieces	0.5%
Cigar Butts/Tips	0.0%
Food	0.0%
Other Materials	0.0%
Tobacco Packaging	0.0%
Straws - Plastic	0.0%
Total	100.0%

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Figure 9 - Non-Roadway Site in Prince George's County



Figure 9 shows floatable litter found at a non-roadway site at Bladensburg, MD in Prince George's County.

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Polystyrene Foam Food Service Items in Litter

The tables in this section compile all of the data regarding polystyrene foam food service items found in litter by type and jurisdiction.

Polystyrene Foam Food Service Items in Roadway Litter

Foam food service items comprised an average of 2.4 percent of *Large Litter* in all three jurisdictions overall as shown in Table 26. This is similar to data from recent litter surveys conducted in Rhode Island (2014), San Francisco (2007, 2008, 2009), San Jose (2008, 2009), Texas (2013), Toronto (2012), and Keep America Beautiful's National Litter Survey (2009).

Table 26 - Polystyrene Foam Food Service Items in Large Litter on Roadways

Large Litter Component	All	DC	MC	PGC
Polystyrene Foam Cups	1.1%	1.2%	0.7%	0.4%
Polystyrene Foam Clamshells	1.1%	1.1%	0.0%	1.3%
Polystyrene Foam Fast Food Plates	0.1%	0.2%	0.0%	0.0%
Polystyrene Foam Trays	0.1%	0.0%	0.0%	0.9%
Total	2.4%	2.5%	0.7%	2.6%

Similar results were found in the components of *Small Litter*, where foam food service items were also a very small component overall (0.4 percent) as shown in Table 27.

Table 27 - Polystyrene Foam Food Service Items in Small Litter on Roadways

Small Litter Component	All	DC	MC	PGC
Polystyrene Foam Food - Cups/Plates/Clams	0.4%	0.2%	0.0%	1.0%

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Polystyrene Foam Food Service Items in Non-Roadway Litter

Data for non-roadway sites was based on a small sampling of areas identified as litter hot spots. This data is instructive and represents materials that are problematic in the specific areas that they were observed. However, since these sites were not statistically derived, they are not expected to provide a statistical representation of overall conditions.

Foam food service items comprised an average of 4.8 percent of *Large Litter* in all three jurisdictions overall as shown in Table 28. This is virtually identical to data from the 2014 Rhode Island Litter Survey (4.7 percent).

Table 28 - Polystyrene Foam Food Service Items in Large Litter on Non-Roadways

Large Litter Component	All	DC	MC	PGC
Polystyrene Foam Cups	1.9%	1.4%	2.9%	4.8%
Polystyrene Foam Clamshells	2.3%	2.1%	1.9%	3.1%
Polystyrene Foam Fast Food Plates	0.5%	0.5%	0.0%	0.7%
Polystyrene Foam Trays	0.1%	0.0%	0.0%	0.7%
Total	4.8%	4.0%	4.8%	9.3%

Foam food service items comprised an average of 3.8 percent of *Small Litter* on non-roadways as shown in Table 29. This was slightly higher than in Rhode Island (2.4 percent).

These items comprised a very low portion of *Small Litter* in DC (0.4 percent), but the highest portion in Prince George's County (14.0 percent).

Table 29 - Polystyrene Foam Food Service Items in Small Litter on Non-Roadways

Small Litter Component	All	DC	MC	PGC
Polystyrene Foam Food - Cups/Plates/Clams	3.8%	0.4%	4.4%	14.0%

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Polystyrene Foam Packaging Items in Litter

The tables in this section compile the data for polystyrene foam packaging items. These include packaging items such as peanuts and block items used to protect items during shipping as well as ice chests.

Polystyrene Foam Packaging Items in Roadway Litter

Foam packaging items comprised a very small portion (0.1 percent) of *Large Litter* on roadways as shown in Table 30.

Table 30 - Polystyrene Items in Large Litter on Roadways

Large Litter Component	All	DC	MC	PGC
Polystyrene Foam Packaging - Chunks	0.1%	0.1%	0.0%	0.0%

Foam packaging items comprised a small portion (0.6 percent) of *Small Litter* on roadways, particularly in DC (0.1 percent) as shown in Table 31.

Table 31 - Polystyrene Items in Small Litter on Roadways

Small Litter Component	All	DC	MC	PGC
Polystyrene Foam Packaging - Peanuts	0.2%	0.1%	0.7%	0.5%
Polystyrene Foam Packaging - Chunks	0.4%	0.0%	2.1%	1.0%
Total	0.6%	0.1%	2.8%	1.5%

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Polystyrene Foam Packaging Items in Non-Roadway Litter

Data for non-roadway sites was based on a small sampling of areas identified as litter hot spots. This data is instructive and represents materials that are problematic in the specific areas that they were observed. However, since these sites were not statistically derived, they are not expected to provide a statistical representation of overall conditions.

Polystyrene Items in Non-Roadway Litter

Foam packaging items comprised a small portion of *Large Litter* on non-roadways, more in DC (2.6 percent) than in either of the two Maryland counties as shown in Table 32.

Table 32 - Polystyrene Items in Large Litter on Non-Roadways - Summary

Large Litter Component	All	DC	MC	PGC
Polystyrene Foam Packaging - Chunks	2.3%	2.6%	1.0%	1.3%

Foam packaging items comprised a larger amount of *Small Litter* on non-roadways as shown in Table 33. Although foam packaging was a large percentage in Montgomery County non-roadway sites, this is based on a small sample size (three sites) and a small amount of litter found (15 of 45 total items).

Table 33 - Polystyrene Items in Small Litter on Non-Roadways

Small Litter Component	All	DC	MC	PGC
Polystyrene Foam Packaging - Peanuts	6.8%	0.2%	15.6%	2.7%
Polystyrene Foam Packaging - Chunks	4.2%	0.1%	17.8%	4.1%
Total	11.0%	0.3%	33.4%	6.8%

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Statistical Tests

A number of statistical tests were conducted to examine various aspects of litter rates and potential relationships among related factors.

These tests were limited to roadway data, which was collected from roadway sites through the use of *Probability Proportional to Size*, a sampling method appropriate to the circumstances of this study and commonly used when population or, in this case, the population density of various census tracts, is the basis for site selection:

*"Probability proportional to size (PPS) is a sampling technique for use with surveys or mini-surveys in which the probability of selecting a sampling unit (e.g., village, zone, district, health center) is proportional to the size of its population. It gives a probability (i.e., random, representative) sample."*¹

Sites were selected within a stratified random sampling of census tracts located within the Anacostia Watershed. Each census tract was weighted by population density, so that, for example, a tract with 1.2 times higher population density was also 1.2 times more likely to be chosen for site selection. If the census tracts chosen for site selection had been weighted with equal probability, then the likelihood of selecting a census tract with a higher population density would actually have been lower than a census tract with a lower population density.

Using this modified stratified sampling technique reduces standard error and bias, which ensures a more accurate selection of census tracts, avoiding the innate complications of conducting calculations to account for variations and density during the analysis.

Since non-roadway sites were chosen using different means, that data does not represent a random, representative sample of all such potential sites, and therefore does not lend itself to statistical testing of the sort engaged in here. Nor should the non-roadway data be combined with the roadway data for such testing.

Correlation Analyses

A correlation analysis, which utilized the data for all 84 roadway sites in the survey, was performed to determine if there was a relationship between the presence of *Large Litter* and *Small Litter* on roadways within the Anacostia Watershed. For example, at a site where a substantial amount of *Large Litter* was present, an observer might expect to find a considerable amount of small litter as well. Or, if Site X had less small litter than Site Y, an observer might expect that there would be less large litter at Site X as well.

¹ Therese McGinn, Heilbrunn Department of Population and Family Health, Mailman School of Public Health, Columbia University

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However, such did not prove in general to be the case. There was no significant correlation between *Large Litter* rates and *Small Litter* rates.

Analyses were also conducted to determine whether substantial relationships existed between the level of litter and the presence or absence of specified conditions. Such conditions involved the proximity of certain types of retail establishments or other litter indicators. These included the presence or absence of fast food outlets, convenience stores, solid waste facilities, traffic signals, and areas with beautification efforts.

However, none of these proximity factors showed a strong correlation to litter rates at the 84 roadway sites. That is, the amounts of large or small litter found at the surveyed sites were, overall, neither greater nor less at sites near, say, a traffic signal. Therefore, no clear relationship was found between proximity factors and the level of litter.

Comparison of Litter Rates

To examine litter rates from a number of different perspectives, the 84 roadway sites were assigned to categories for the purpose of making comparisons. In each case, an average count for large, small, and all litter was calculated for the given category; these average litter rates are reported here. Where appropriate, tests were performed to determine if observed differences in litter rates were statistically significant.

Comparison of Roadside Litter Rates by Jurisdiction

The 84 surveyed sites were classified according to jurisdiction: Montgomery County (MC), Prince George's County (PGC), and the District of Columbia (DC). Average litter counts were then calculated independently for each jurisdiction. The results are shown in Table 34.

Table 34 - Comparison of Litter Rates by Jurisdiction

Jurisdiction	Number	Large	Small	Total
MC	9	15	256	271
PGC	9	26	737	763
DC	66	32	351	383

There are considerable differences among the litter rates. Montgomery County shows the lowest rates for both *Large Litter* and *Small Litter* (and therefore all litter). Prince George's County has the highest *Small Litter* rate, while DC has the highest *Large Litter* rate. This result may seem surprising, but as noted above there was no definitive relationship found in this survey between *Large Litter* rates and *Small Litter* rates. Also, field crews specifically noted that litter in certain Prince George's County sites had clearly been mowed, which likely created more *Small Litter* while reducing to some extent the amount of *Large Litter*.

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The differences among the jurisdictions in average rates for *Small Litter* are substantial. However, these differences did not prove to be statistically significant. One mitigating factor was that within each jurisdiction there was considerable variation among the small litter counts; that is, the counts were widely dispersed.

The rates for large litter are, of course, much lower than for *Small Litter*; thus, the differences between averages by jurisdiction are also much less. Nonetheless, the *Large Litter* rate for DC was found to be statistically greater (at the .05 level of significance) than the *Large Litter* rate for Montgomery County.

Average Litter Rates by Jurisdiction and Quadrant

Taking this perspective one step farther, the data for DC was broken down into four quadrants. The results, with the MC and PGC numbers repeated from above, are shown in Table 35.

Roadway sites were separated into jurisdictions and, in the case of DC, into quadrants as well. Note that within DC, the SE quadrant had the highest rate of *Large Litter*, but the lowest rate of *Small Litter* (as well as all litter, which is predominantly comprised of *Small Litter*). Again the lack of correspondence between *Large Litter* rates and *Small Litter* rates may be seen. Data for the SW quadrant was based on only two sites. Thus, it was not included in this comparison. Still, it is interesting to note that data for the SW and SE quadrants were similar.

Table 35 - Average Litter Rates by Jurisdiction and Quadrant

Area	N	Large	Small	Total
MC	9	15	256	271
PGC	9	26	737	763
NW	24	26	396	422
SE	19	38	208	246
NE	21	33	449	481
SW	2	38	154	192

Litter by Land Use Zoning

Sites were also compared by zoning. Although many sites were in close proximity to both residential and commercial zones, for the purpose of this analysis, the zones deemed most prevalent near the site were used.

As shown in Table 36, residential zones had more litter than commercial zones. This generalization encompasses both *Large Litter* and *Small Litter*, and thus all litter as well. However, the differences between residential and commercial litter rates did not prove to be statistically significant.

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While the number of industrial and mixed zones were not large enough to make statistical comparisons, it is interesting that those two zone types also yielded lower rates of *Large Litter* and *Small Litter* than did the residential zones.

Table 36 - Average Litter Rates by Land Use Zoning

Land Use Zoning	N	Large	Small	Total
Residential	63	31	412	443
Commercial	14	27	326	352
Industrial	3	19	150	169
Mixed	4	24	286	310

Litter by Population Density

The final categorization of the 84 roadway sites involved classifying each with regard to its population density, assessed from low to high. Two sites were regarded as having “mixed” population density and were excluded from this analysis.

There are relatively few “low to moderate” and “high” density sites, so the averages for these categories should be viewed cautiously. Nonetheless, it is interesting, and perhaps surprising, that the rates for *Large Litter* are actually highest at low density population sites.

The results are not the same for *Small Litter* and all litter. Focusing attention on the “low” and “moderate” density categories, which include most of the surveyed sites, the average *Small Litter* rate is considerably higher for moderate sites.

Indeed, this difference is statistically significant at the .01 level, and the same statement is true for all litter (which is mostly *Small Litter*) as well. Thus, analysis of the data suggests that *Small Litter* rates, though not *Large Litter* rates, are associated with population density as shown in Table 37. This is not unexpected, since larger items are cleaned up more easily than smaller items. However, smaller items, even if they are result of litter that has been mowed, may be a more accurate indicator of actual littering in a given area.

Table 37 - Average Litter Rates by Population Density

Population Density	N	Large	Small	Total
Low	26	35	187	222
Low to Moderate	7	22	155	177
Moderate	43	29	543	572
High	6	25	416	441

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Conclusions

Jurisdictions within the Anacostia Watershed have significant recycling and waste diversion programs in place. The continuing growth of single-stream recycling and the use of recycling carts over bins can help reduce litter.

- Litter within the Anacostia Watershed is diverse and included an unusually large amount of glass items.
- A significant amount of paper and commingled containers of all types (particularly beverage containers) found in *Large Litter* (38-42 percent) would have been recyclable.
- *Water Bottles (Plastic)* were the most littered type of beverage container in this survey.
- *Snack Wrappers* and *Paper Napkins* were significant components of *Large Litter* and *Small Litter* in all three jurisdictions.
- There was no correlation between the amounts of *Large Litter* and *Small Litter* on roadway sites. This may suggest that *Large Litter* is cleaned up more effectively and because of that, *Small Litter* is a better indicator of actual littering habits.
- Sites adjacent to residential areas had higher litter rates than sites adjacent to commercial areas. This may suggest that commercial entities clean up litter more frequently in areas for which they are deemed responsible.
- Despite the fact that this survey was completed on November 18, more than two weeks after Halloween, *Sweet Snack Wrappers* were still the largest single component of litter overall.

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Recommendations

The following recommendations can contribute to more effective litter abatement in the Anacostia Watershed.

- Forge litter abatement partnerships that include all stakeholders including governmental entities, NGOs and industry. Anti-littering efforts that exclude stakeholders limit their opportunity for successful litter abatement considerably.
- Promote programs such as Adopt-a-Highway and Sponsor-a-Highway, ensuring that they track relevant metrics such as the number of bags of litter collected and the most frequently found items to help direct the focus of litter abatement programs.
- Monitor and enforce littering violations caused by trash and recycling collection vehicles when these vehicles are improperly secured during the collection and transportation process.*
- Monitor and enforce proper trash setouts. Improper setouts were observed spreading litter while this survey was being conducted.*
- Consider using hidden cameras in areas where wide-spread littering and illegal dumping occur to record the license plates of offending vehicles for enforcement activities. This has been successfully done in other communities.*
- Ensure that all funds generated by material restriction taxes or fees are dedicated to programs focusing solely on litter abatement.
- Consider the benefit of implementing a litter hotline where littering and illegal dumping can be reported easily. This can be set up so that the vehicle owner receives a letter describing the reported incident.

* While enforcement is just one tool in a successful litter abatement program, without some level of enforcement in the areas noted above, the message received by motorists, pedestrian and trash/recycling collection companies will be that litter abatement is not a high priority for communities within the Anacostia Watershed.

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Appendix

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- Appendix B - Large Litter on Roadways - DC
- Appendix C - Large Litter on Roadways - Montgomery County
- Appendix D - Large Litter on Roadways - **Prince George's County**
- Appendix E - Small Litter on Roadways - All
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- Appendix G - Small Litter on Roadways - Montgomery County
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Appendix A - Large Litter on Roadways - All

Large Litter Category	Percent
Sweet Snack Wrappers (Candy, Cake)	7.9%
Paper Fast Food Napkins - Unbranded	6.9%
Misc. Paper	5.9%
Stationery (School, Business)	4.9%
Construction Debris	4.7%
Tobacco Packaging (Packs, Matches, Lighters)	4.6%
Misc. Plastic	3.9%
Misc. Glass	3.9%
Snack Food Packaging (Chips)	3.6%
Receipts (Business, Transfers)	3.0%
Printed Material (Newspapers)	2.8%
Corrugated Boxes/Pieces	2.8%
Water Bottles (Plastic)	2.7%
Plastic Straws	2.5%
Plastic Cup Lids and Pieces	2.4%
Plastic Packaging - Other (Film, etc.)	1.9%
Plastic Drink Cups	1.7%
Home Articles (Lamps, Lawn Chairs)	1.7%
Beer (Cans)	1.6%
Paper Cups (Cold)	1.4%
Polystyrene Foam Cups	1.1%
Paper Bags - Fast Food	1.1%
Polystyrene Foam Clamshells	1.1%
Paper Packaging - Other	0.9%
Utensils & Chopsticks (Plastic)	0.9%
Food Items (Apple Core, etc.)	0.9%
Juice (Plastic)	0.9%
Other Plastic Shells/Boxes	0.9%
Foil Materials/Pieces (Not Fast Food)	0.8%
Plastic Bags - Not Retail (Leaf, Trash)	0.8%
Plastic Retail Bags - Unbranded	0.8%
Tire & Rubber Debris	0.8%
Zipper and Sandwich Bags	0.8%
Soft Drink (Cans)	0.8%
Vehicle & Metal Road Debris	0.8%
Paper Cups (Hot)	0.7%
Condiment Package (Salt, Ketchup)	0.7%
Plastic Jars / Bottles (Non-Beverage)	0.7%
Beer Bottles (Glass)	0.7%
Paperboard (Cereal, Shoe Boxes)	0.7%
Lottery Ticket Debris	0.7%

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Large Litter Category	Percent
Soft Drink (Plastic)	0.7%
Gum Wrappers	0.7%
Container Lids (Plastic)	0.6%
Wine/Liquor (Glass)	0.5%
Plastic Retail Bags - Branded	0.5%
Clothing or Clothing Pieces	0.5%
Sport Drink (Plastic)	0.5%
Cigar Butts/Tips (>4")	0.5%
Paper Food Wrap (Meat Wrap)	0.5%
Misc. Cardboard	0.4%
Paper Straw Wrappers	0.4%
Juice (Cans)	0.4%
Foil Fast Food Wrappers (Burger Wraps)	0.4%
Juice (Glass)	0.4%
Paper Fast Food Plates	0.4%
Paper Trays	0.4%
Paper Retail Bags - Unbranded	0.3%
Other Plastic Fast Food Plates	0.3%
Milk/Juice (Gable Top)	0.2%
Wine/Liquor (Plastic)	0.2%
Foil Drink Pouches	0.2%
Paper Clamshells	0.2%
Sport Drink (Cans)	0.2%
Plastic Wrap (Retail Food and Non-Food)	0.2%
Plates - Other Materials	0.2%
Misc. Paperboard	0.2%
Other Paper Cups	0.2%
Trays - Other Materials	0.2%
Polystyrene Foam Fast Food Plates	0.1%
Cans - Steel (Food and Non-Food)	0.1%
Six-Pack Plastic Rings	0.1%
Paper Retail Bags - Branded	0.1%
Paper Bags - Not Retail (Leaf, etc.)	0.1%
Other Cloth (Rugs, Rags, Tarps, etc.)	0.1%
Aseptic Drink Boxes (Rectangular Boxes)	0.1%
Container Lids (Metal)	0.1%
Polystyrene Foam Trays (Meat, etc.)	0.1%
Polystyrene Foam Chunks	0.1%
Paper Fast Food Napkins - Branded	0.1%
Tea (Can)	0.0%
Tea (Plastic)	0.0%
Broken Container Glass	0.0%
Glass Jars/ Bottles (Non-Beverage)	0.0%

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Large Litter Category	Percent
Cigarette Debris (>4")	0.0%
Composite Materials - Other	0.0%
Soft Drink (Glass)	0.0%
Water Bottles (Glass)	0.0%
Cans - Aluminum (Non-Beverage)	0.0%
Aerosol Cans (Paint, Oils, Etc.)	0.0%
Paper Beverage Cases (6/12 pack)	0.0%
Utensils & Chopsticks (Wooden)	0.0%
Utensils (Metal)	0.0%
Foil Containers (Ice Cream)	0.0%



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Appendix B - Large Litter on Roadways - DC

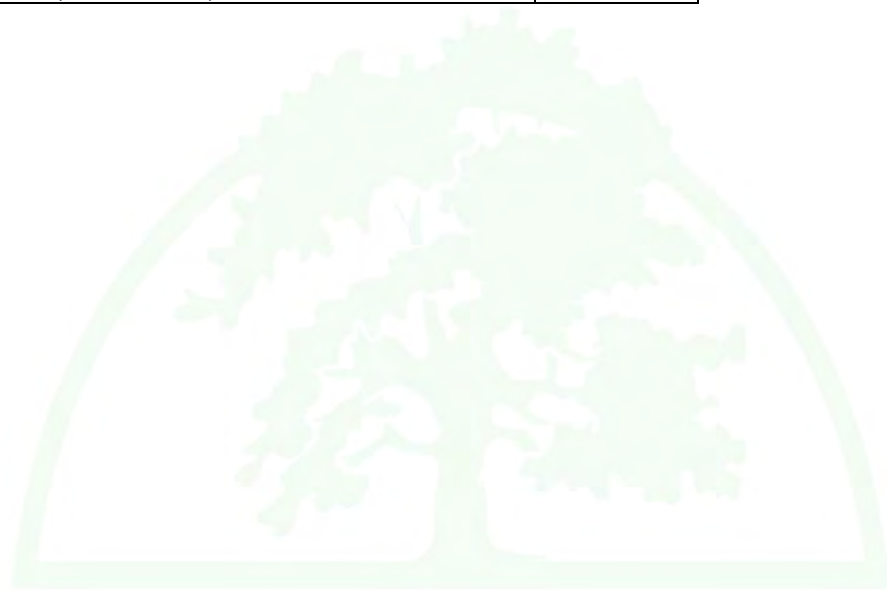
Large Litter Category	Percent
Sweet Snack Wrappers (Candy, Cake)	7.9%
Paper Fast Food Napkins - Unbranded	7.0%
Misc. Paper	6.6%
Stationery (School, Business)	5.0%
Tobacco Packaging (Packs, Matches, Lighters)	4.7%
Misc. Glass	4.6%
Construction Debris	4.6%
Misc. Plastic	3.5%
Snack Food Packaging (Chips)	3.2%
Receipts (Business, Transfers)	3.0%
Water Bottles (Plastic)	2.9%
Corrugated Boxes/Pieces	2.7%
Printed Material (Newspapers)	2.5%
Plastic Straws	2.1%
Plastic Cup Lids/Pieces	2.1%
Plastic Packaging - Other (Film, etc.)	2.0%
Plastic Drink Cups	1.9%
Beer (Cans)	1.7%
Home Articles (Lamps, Lawn Chairs)	1.6%
Paper Cups (Cold)	1.5%
Polystyrene Foam Cups	1.2%
Paper Bags - Fast Food	1.1%
Polystyrene Foam Clamshells	1.1%
Paper Packaging - Other	1.0%
Utensils & Chopsticks (Plastic)	1.0%
Food Items (Apple Core, etc.)	1.0%
Other Plastic Shells/Boxes	1.0%
Tire & Rubber Debris	1.0%
Plastic Retail Bags - No Brand Name	0.9%
Foil Materials/Pieces (Not Fast Food)	0.8%
Plastic Bags - Not Retail (Leaf , Trash)	0.8%
Soft Drink (Plastic)	0.8%
Vehicle & Metal Road Debris	0.8%
Beer Bottles (Glass)	0.8%
Soft Drink (Cans)	0.8%
Paperboard (Cereal , Shoe Boxes)	0.8%
Zipper Bags/ Sandwich	0.8%
Condiment Package (Salt, Ketchup)	0.8%
Gum Wrappers	0.7%
Plastic Jars / Bottles (Non-Beverage)	0.6%
Juice (Plastic)	0.6%

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Large Litter Category	Percent
Lottery Ticket Debris	0.6%
Wine/Liquor (Glass)	0.6%
Paper Cups (Hot)	0.5%
Clothing or Clothing Pieces	0.5%
Cigar Butts/Tips (>4")	0.5%
Sport Drink (Plastic)	0.5%
Misc. Cardboard	0.5%
Paper Fast Food Plates	0.4%
Paper Straw Wrappers	0.4%
Container Lids (Plastic)	0.4%
Juice (Cans)	0.4%
Plastic Retail Bags - Brand Name	0.4%
Paper Trays	0.4%
Juice (Glass)	0.3%
Paper Retail Bags - No Brand Name	0.3%
Foil Fast Food Wrappers (Burger Wraps)	0.3%
Paper Food Wrap (Meat Wrap)	0.3%
Foil Drink Pouches (Capri Sun)	0.3%
Sport Drink (Cans)	0.2%
Milk/Juice (Gable Top)	0.2%
Paper Clamshells	0.2%
Other Plastic Fast Food Plates	0.2%
Wine/Liquor (Plastic)	0.2%
Polystyrene Foam Fast Food Plates	0.2%
Plastic Wrap (Retail Food/Non-Food)	0.2%
Plates - Other Materials	0.2%
Cans - Steel (Food/Non-Food)	0.2%
Other Cloth (Rugs, Rags, Tarps, etc.)	0.1%
Misc. Paperboard	0.1%
Trays - Other Materials	0.1%
Container Lids (Metal)	0.1%
Polystyrene Foam Chunks	0.1%
Paper Bags - Not Retail (Leaf, etc.)	0.1%
Paper Fast Food Napkins - Branded	0.1%
Aseptic Drink Boxes (Rectangular Box)	0.0%
Tea (Can)	0.0%
Tea (Plastic)	0.0%
Broken Container Glass	0.0%
Six-Pack Plastic Rings	0.0%
Other Paper Cups	0.0%
Paper Retail Bags - Brand Name	0.0%
Cigarette Debris (>4")	0.0%
Composite Materials - Other	0.0%

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Large Litter Category	Percent
Soft Drink (Glass)	0.0%
Water Bottles (Glass)	0.0%
Glass Jars/ Bottles (Non-Beverage)	0.0%
Cans - Aluminum (Non-Beverage)	0.0%
Aerosol Cans (Paint, Oils, Etc.)	0.0%
Polystyrene Foam Trays (Meat, etc.)	0.0%
Paper Beverage Cases (6/12 pack)	0.0%
Utensils & Chopsticks (Wooden)	0.0%
Utensils (Metal)	0.0%
Foil Containers (Ice Cream)	0.0%



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2015 Anacostia Watershed Litter Survey

Appendix C - Large Litter on Roadways - Montgomery County

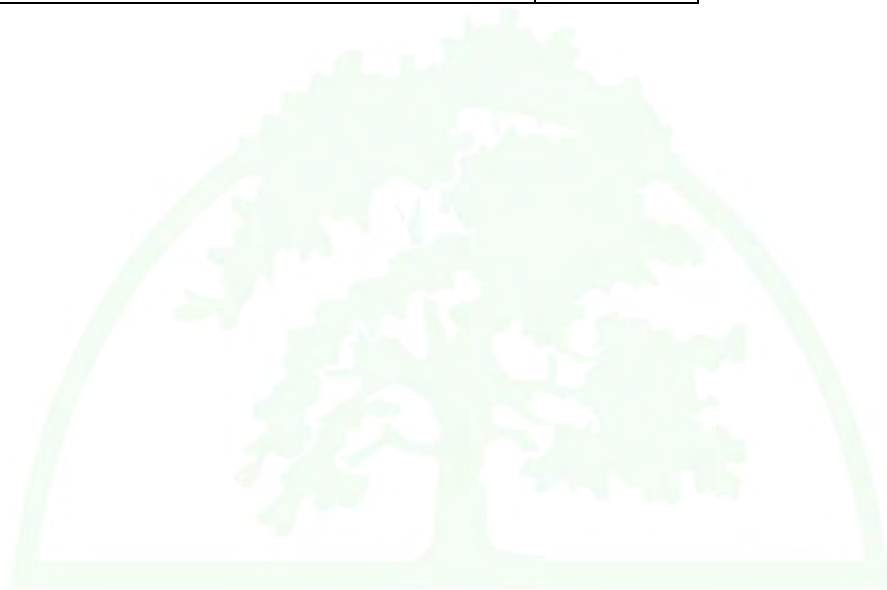
Large Litter Category	Percent
Misc. Plastic	16.4%
Sweet Snack Wrappers (Candy, Cake)	12.4%
Construction Debris	10.9%
Paper Fast Food Napkins - Unbranded	5.7%
Plastic Straws	5.3%
Misc. Paper	4.5%
Container Lids (Plastic)	3.5%
Home Articles (Lamps, Lawn Chairs)	3.0%
Water Bottles (Plastic)	2.5%
Paper Cups (Hot)	2.4%
Stationery (School, Business)	2.4%
Snack Food Packaging (Chips)	2.4%
Plastic Cup Lids/Pieces	2.2%
Soft Drink (Cans)	1.7%
Six-Pack Plastic Rings	1.5%
Other Paper Cups	1.5%
Printed Material (Newspapers)	1.5%
Foil Fast Food Wrappers (Burger Wraps)	1.5%
Other Plastic Shells/Boxes	1.3%
Paper Straw Wrappers	0.9%
Plastic Retail Bags - No Brand Name	0.9%
Plastic Bags - Not Retail (Leaf, Trash)	0.9%
Zipper Bags/ Sandwich	0.9%
Receipts (Business, Transfers)	0.9%
Paper Clamshells	0.9%
Other Plastic Fast Food Plates	0.9%
Foil Materials/Pieces (Not Fast Food)	0.9%
Misc. Paperboard	0.9%
Beer (Cans)	0.7%
Beer Bottles (Glass)	0.7%
Sport Drink (Plastic)	0.7%
Milk/Juice (Gable Top)	0.7%
Aseptic Drink Boxes (Rectangular Box)	0.7%
Plastic Jars / Bottles (Non-Beverage)	0.7%
Glass Jars/ Bottles (Non-Beverage)	0.7%
Polystyrene Foam Cups	0.7%
Plastic Retail Bags - Brand Name	0.7%
Paper Bags - Fast Food	0.7%
Clothing or Clothing Pieces	0.7%
Cigar Butts/Tips (>4")	0.7%
Tobacco Packaging (Packs, Matches, Lighters)	0.7%

2015 Anacostia Watershed Litter Survey

Large Litter Category	Percent
Soft Drink (Glass)	0.0%
Soft Drink (Plastic)	0.0%
Sport Drink (Cans)	0.0%
Water Bottles (Glass)	0.0%
Wine/Liquor (Glass)	0.0%
Wine/Liquor (Plastic)	0.0%
Juice (Cans)	0.0%
Juice (Plastic)	0.0%
Juice (Glass)	0.0%
Foil Drink Pouches (Capri Sun)	0.0%
Tea (Can)	0.0%
Tea (Plastic)	0.0%
Broken Container Glass	0.0%
Cans - Steel (Food/Non-Food)	0.0%
Cans - Aluminum (Non-Beverage)	0.0%
Container Lids (Metal)	0.0%
Aerosol Cans (Paint, Oils, Etc.)	0.0%
Plastic Drink Cups	0.0%
Paper Cups (Cold)	0.0%
Polystyrene Foam Clamshells	0.0%
Polystyrene Foam Fast Food Plates	0.0%
Polystyrene Foam Trays (Meat, etc.)	0.0%
Polystyrene Foam Chunks	0.0%
Plastic Packaging - Other (Film, etc.)	0.0%
Plastic Wrap (Retail Food/Non-Food)	0.0%
Paper Retail Bags - Brand Name	0.0%
Paper Retail Bags - No Brand Name	0.0%
Paper Bags - Not Retail (Leaf, etc.)	0.0%
Corrugated Boxes/Pieces	0.0%
Paperboard (Cereal , Shoe Boxes)	0.0%
Lottery Ticket Debris	0.0%
Paper Packaging - Other	0.0%
Paper Beverage Cases (6/12 pack)	0.0%
Paper Fast Food Napkins - Branded	0.0%
Paper Trays	0.0%
Paper Fast Food Plates	0.0%
Paper Food Wrap (Meat Wrap)	0.0%
Condiment Package (Salt, Ketchup)	0.0%
Utensils & Chopsticks (Plastic)	0.0%
Utensils & Chopsticks (Wooden)	0.0%
Utensils (Metal)	0.0%
Plates - Other Materials	0.0%
Trays - Other Materials	0.0%

2015 Anacostia Watershed Litter Survey

Large Litter Category	Percent
Foil Containers (Ice Cream)	0.0%
Gum Wrappers	0.0%
Food Items (Apple Core, etc.)	0.0%
Other Cloth (Rugs, Rags, Tarps, etc.)	0.0%
Cigarette Debris (>4")	0.0%
Misc. Cardboard	0.0%
Misc. Glass	0.0%
Vehicle & Metal Road Debris	0.0%
Composite Materials - Other	0.0%
Tire & Rubber Debris	0.0%



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2015 Anacostia Watershed Litter Survey

Appendix D - Large Litter on Roadways - Prince George's County

Large Litter Category	Percent
Snack Food Packaging (Chips)	8.0%
Printed Material (Newspapers)	7.1%
Stationery (School, Business)	6.6%
Paper Fast Food Napkins - Unbranded	6.6%
Tobacco Packaging (Packs, Matches, Lighters)	5.8%
Corrugated Boxes/Pieces	5.3%
Plastic Cup Lids/Pieces	4.9%
Plastic Straws	4.9%
Sweet Snack Wrappers (Candy, Cake)	4.9%
Juice (Plastic)	3.5%
Receipts (Business, Transfers)	3.1%
Construction Debris	2.2%
Water Bottles (Plastic)	1.8%
Paper Cups (Hot)	1.8%
Plastic Retail Bags - Brand Name	1.8%
Plastic Packaging - Other (Film, etc.)	1.8%
Paper Food Wrap (Meat Wrap)	1.8%
Plastic Jars / Bottles (Non-Beverage)	1.3%
Plastic Drink Cups	1.3%
Polystyrene Foam Clamshells	1.3%
Plastic Bags - Not Retail (Leaf , Trash)	1.3%
Lottery Ticket Debris	1.3%
Home Articles (Lamps, Lawn Chairs)	1.3%
Wine/Liquor (Plastic)	0.9%
Juice (Cans)	0.9%
Paper Cups (Cold)	0.9%
Polystyrene Foam Trays (Meat, etc.)	0.9%
Paper Retail Bags - Brand Name	0.9%
Paper Bags - Fast Food	0.9%
Zipper Bags/ Sandwich	0.9%
Condiment Package (Salt, Ketchup)	0.9%
Other Plastic Fast Food Plates	0.9%
Foil Materials/Pieces (Not Fast Food)	0.9%
Misc. Plastic	0.9%
Vehicle & Metal Road Debris	0.9%
Beer (Cans)	0.4%
Sport Drink (Plastic)	0.4%
Juice (Glass)	0.4%
Milk/Juice (Gable Top)	0.4%
Container Lids (Plastic)	0.4%
Paper Straw Wrappers	0.4%

2015 Anacostia Watershed Litter Survey

Large Litter Category	Percent
Other Paper Cups	0.4%
Polystyrene Foam Cups	0.4%
Plastic Wrap (Retail Food/Non-Food)	0.4%
Paper Retail Bags - No Brand Name	0.4%
Paper Bags - Not Retail (Leaf, etc.)	0.4%
Paperboard (Cereal , Shoe Boxes)	0.4%
Paper Packaging - Other	0.4%
Paper Trays	0.4%
Utensils & Chopsticks (Plastic)	0.4%
Plates - Other Materials	0.4%
Trays - Other Materials	0.4%
Foil Fast Food Wrappers (Burger Wraps)	0.4%
Gum Wrappers	0.4%
Food Items (Apple Core, etc.)	0.4%
Clothing or Clothing Pieces	0.4%
Misc. Cardboard	0.4%
Beer Bottles (Glass)	0.0%
Soft Drink (Cans)	0.0%
Soft Drink (Glass)	0.0%
Soft Drink (Plastic)	0.0%
Sport Drink (Cans)	0.0%
Water Bottles (Glass)	0.0%
Wine/Liquor (Glass)	0.0%
Aseptic Drink Boxes (Rectangular Box)	0.0%
Foil Drink Pouches (Capri Sun)	0.0%
Tea (Can)	0.0%
Tea (Plastic)	0.0%
Broken Container Glass	0.0%
Six-Pack Plastic Rings	0.0%
Glass Jars/ Bottles (Non-Beverage)	0.0%
Cans - Steel (Food/Non-Food)	0.0%
Cans - Aluminum (Non-Beverage)	0.0%
Container Lids (Metal)	0.0%
Aerosol Cans (Paint, Oils, Etc.)	0.0%
Polystyrene Foam Fast Food Plates	0.0%
Polystyrene Foam Chunks	0.0%
Plastic Retail Bags - No Brand Name	0.0%
Paper Beverage Cases (6/12 pack)	0.0%
Paper Fast Food Napkins - Branded	0.0%
Paper Clamshells	0.0%
Paper Fast Food Plates	0.0%
Utensils & Chopsticks (Wooden)	0.0%
Utensils (Metal)	0.0%

2015 Anacostia Watershed Litter Survey

Large Litter Category	Percent
Other Plastic Shells/Boxes	0.0%
Foil Containers (Ice Cream)	0.0%
Other Cloth (Rugs, Rags, Tarps, etc.)	0.0%
Cigarette Debris (>4")	0.0%
Cigar Butts/Tips (>4")	0.0%
Misc. Paper	0.0%
Misc. Paperboard	0.0%
Misc. Glass	0.0%
Composite Materials - Other	0.0%
Tire & Rubber Debris	0.0%



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2015 Anacostia Watershed Litter Survey

Appendix E - Small Litter on Roadways - All

Small Litter Category	Percent
Glass	28.7%
Cigarette Butts	23.8%
Paper	15.0%
Candy/Gum Wrappers	11.2%
Bottle Caps	4.1%
Plastic Film	3.8%
Hard Plastic	3.1%
Tobacco Packaging	2.7%
Cigar Butts/Tips	1.5%
Other Materials	1.3%
Food	1.3%
Aluminum	0.7%
Rubber/Tire Pieces	0.6%
Straw Wrappers - Paper	0.5%
Polystyrene Foam Food Service - Cups/Plates/Clams	0.4%
Straws - Plastic	0.4%
Polystyrene Foam Packaging - Chunks	0.4%
Metal (not Aluminum)	0.4%
Polystyrene Foam Packaging - Peanuts	0.2%

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2015 Anacostia Watershed Litter Survey

Appendix F - Small Litter on Roadways - DC

Small Litter Category	Percent
Glass	37.2%
Cigarette Butts	22.5%
Paper	11.4%
Candy/Gum Wrappers	10.9%
Plastic - Hard	3.4%
Plastic - Film	3.0%
Tobacco Packaging	2.3%
Bottle Caps	2.2%
Cigar Butts/Tips	1.7%
Food	1.4%
Other Materials	1.0%
Aluminum	0.7%
Rubber/Tire Pieces	0.6%
Straws - Plastic	0.5%
Straw Wrappers - Paper	0.4%
Metal (not Aluminum)	0.4%
Polystyrene Foam Food - Cups/Plates/Clams	0.2%
Polystyrene Foam Packaging - Peanuts	0.1%
Polystyrene Foam Packaging - Chunks	0.0%

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2015 Anacostia Watershed Litter Survey

Appendix G - Small Litter on Roadways - Montgomery County

Small Litter Category	Percent
Paper	38.6%
Cigarette Butts	18.6%
Candy/Gum Wrappers	8.5%
Plastic Film	7.0%
Bottle Caps	6.9%
Hard Plastic	4.7%
Tobacco Packaging, etc.	4.0%
Cigar Butts/Tips	3.7%
Polystyrene Foam Packaging - Chunks	2.1%
Aluminum	1.4%
Rubber/Tire Pieces	1.4%
Straws/Wrappers - Paper	0.8%
Metal (not Aluminum)	0.7%
Other Materials (Describe)	0.7%
Polystyrene Foam Packaging - Peanuts	0.7%
Food	0.0%
Glass	0.0%
Polystyrene Foam Food - Cups/Plates/Clams	0.0%
Straws - Plastic	0.0%

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2015 Anacostia Watershed Litter Survey

Appendix H - Small Litter on Roadways - Prince George's County

Small Litter Category	Percent
Cigarette Butts	30.5%
Paper	19.1%
Candy/Gum Wrappers	13.2%
Bottle Caps	9.7%
Glass	9.0%
Plastic Film	5.5%
Tobacco Packaging, etc.	3.7%
Other Materials (Describe)	2.5%
Hard Plastic	1.7%
Food	1.3%
Polystyrene Foam Food - Cups/Plates/Clams	1.0%
Polystyrene Foam Packaging - Chunks	1.0%
Aluminum	0.5%
Straws/Wrappers - Paper	0.5%
Polystyrene Foam Packaging - Peanuts	0.5%
Rubber/Tire Pieces	0.3%
Cigar Butts/Tips	0.0%
Metal (not Aluminum)	0.0%
Straws - Plastic	0.0%

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2015 Anacostia Watershed Litter Survey

Appendix I - Large Litter on Non-Roadways - All

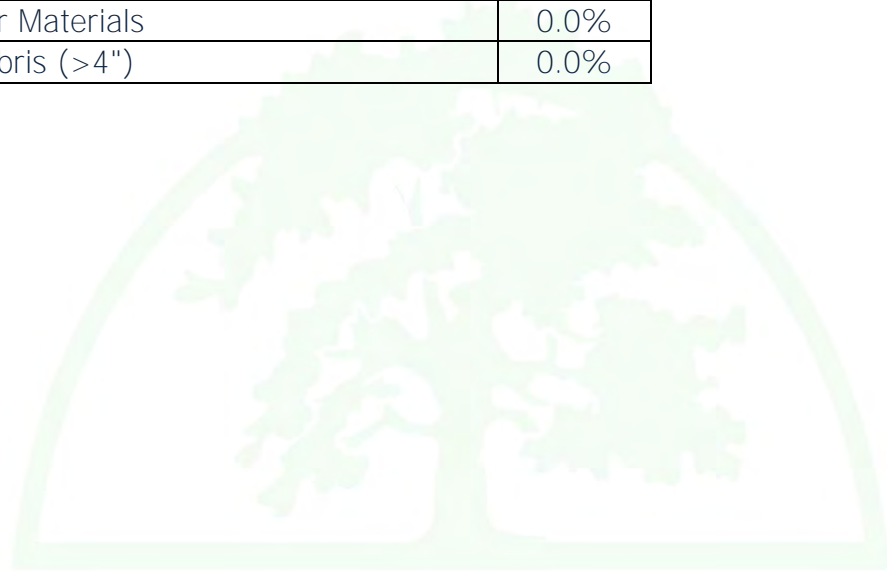
Large Litter Category	Percent
Water Bottles (Plastic)	5.4%
Beer (Cans)	5.2%
Snack Food Packaging (Chips)	4.1%
Sweet Snack Wrappers (Candy, Cake)	4.0%
Misc. Paper	3.3%
Soft Drink (Plastic)	3.2%
Wine/Liquor (Glass)	3.1%
Misc. Plastic	3.1%
Printed Material (Newspapers)	2.7%
Tire & Rubber Debris	2.5%
Soft Drink (Cans)	2.5%
Plastic Wrap (Retail Food and Non-Food)	2.3%
Polystyrene Foam Chunks (Packaging, Coolers)	2.3%
Utensils & Chopsticks (Plastic)	2.3%
Polystyrene Foam Clamshells	2.3%
Beer Bottles (Glass)	2.1%
Plastic Packaging - Other (Film, etc.)	1.9%
Plastic Retail Bags - Branded	1.9%
Polystyrene Foam Cups	1.9%
Clothing or Clothing Pieces	1.8%
Foil Fast Food Wrappers (Burger Wraps)	1.8%
Construction Debris	1.8%
Paper Retail Bags - Unbranded	1.7%
Corrugated Boxes and Pieces	1.7%
Tobacco Packaging (Packs, Matches, Lighters)	1.3%
Misc. Paperboard	1.3%
Stationery (School, Business)	1.3%
Plastic Retail Bags - Unbranded	1.3%
Plastic Bags - Not Retail (Leaf , Trash)	1.2%
Misc. Cardboard	1.2%
Sport Drink (Plastic)	1.2%
Plastic Drink Cups	1.1%
Paper Cups (Hot)	1.1%
Paper Fast Food Napkins - Unbranded	1.1%
Other Cloth (Rugs, Rags, Tarps, etc.)	1.0%
Paper Beverage Cases (6/12 pack)	1.0%
Container Lids (Plastic)	1.0%
Paper Food Wrap (Meat Wrap)	1.0%
Broken Container Glass	0.9%

2015 Anacostia Watershed Litter Survey

Large Litter Category	Percent
Cans - Steel (Food and Non-Food)	0.9%
Paper Retail Bags - Branded	0.9%
Gum Wrappers	0.8%
Paper Bags - Fast Food	0.8%
Plastic Cup Lids and Pieces	0.7%
Lottery Ticket Debris	0.7%
Paper Straw Wrappers	0.7%
Paper Cups (Cold)	0.7%
Condiment Package (Salt, Ketchup)	0.7%
Food Items (Apple Core, etc.)	0.7%
Aerosol Cans (Paint, Oils, Etc.)	0.6%
Utensils (Metal)	0.6%
Foil Containers (Ice Cream)	0.6%
Polystyrene Foam Fast Food Plates	0.5%
Receipts (Business, Transfers)	0.5%
Plastic Straws	0.5%
Paper Packaging - Other	0.4%
Milk/Juice (Gable Top)	0.4%
Paper Clamshells	0.4%
Juice (Plastic)	0.4%
Juice (Cans)	0.4%
Paper Bags - Not Retail (Leaf, etc.)	0.4%
Paper Fast Food Napkins - Branded	0.4%
Misc. Glass	0.3%
Soft Drink (Glass)	0.3%
Paperboard (Cereal , Shoe Boxes)	0.3%
Wine/Liquor (Plastic)	0.3%
Foil Materials and Pieces (Not Fast Food)	0.3%
Six-Pack Plastic Rings	0.3%
Other Paper Cups	0.3%
Plates - Other Materials	0.3%
Cigar Butts/Tips (>4")	0.3%
Paper Fast Food Plates	0.3%
Home Articles (Lamps, Lawn Chairs)	0.3%
Vehicle & Metal Road Debris	0.2%
Juice (Glass)	0.1%
Polystyrene Foam Trays (Meat, etc.)	0.1%
Other Plastic Shells and Boxes	0.1%
Foil Drink Pouches	0.1%
Paper Trays	0.1%
Sport Drink (Cans)	0.1%

2015 Anacostia Watershed Litter Survey

Large Litter Category	Percent
Container Lids (Metal)	0.1%
Zipper and Sandwich Bags	0.1%
Composite Materials - Other	0.1%
Aseptic Drink Boxes (Rectangular Box)	0.0%
Plastic Jars and Bottles (Non-Beverage)	0.0%
Cans - Aluminum (Non-Beverage)	0.0%
Water Bottles (Glass)	0.0%
Glass Jars and Bottles (Non-Beverage)	0.0%
Utensils and Chopsticks (Wooden)	0.0%
Other Plastic Fast Food Plates	0.0%
Trays - Other Materials	0.0%
Cigarette Debris (>4")	0.0%



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2015 Anacostia Watershed Litter Survey

Appendix J - Large Litter on Non-Roadways - DC

Large Litter Category	Percent
Beer (Cans)	6.0%
Water Bottles (Plastic)	4.3%
Misc. Paper	4.0%
Snack Food Packaging (Chips)	4.0%
Misc. Plastic	3.7%
Wine/Liquor (Glass)	3.5%
Soft Drink (Plastic)	3.2%
Sweet Snack Wrappers (Candy, Cake)	3.2%
Tire & Rubber Debris	3.2%
Soft Drink (Cans)	3.0%
Printed Material (Newspapers)	2.9%
Plastic Wrap (Retail Food/Non-Food)	2.8%
Utensils & Chopsticks (Plastic)	2.8%
Polystyrene Foam Chunks	2.6%
Clothing or Clothing Pieces	2.3%
Polystyrene Foam Clamshells	2.1%
Beer Bottles (Glass)	2.0%
Construction Debris	2.0%
Foil Fast Food Wrappers (Burger Wraps)	2.0%
Paper Retail Bags - No Brand Name	1.9%
Corrugated Boxes/Pieces	1.6%
Misc. Paperboard	1.6%
Tobacco Packaging (Packs, Matches, Lighters)	1.6%
Plastic Packaging - Other (Film, etc.)	1.4%
Polystyrene Foam Cups	1.4%
Plastic Retail Bags - Brand Name	1.3%
Cans - Steel (Food/Non-Food)	1.2%
Container Lids (Plastic)	1.2%
Misc. Cardboard	1.2%
Other Cloth (Rugs, Rags, Tarps, etc.)	1.2%
Paper Beverage Cases (6/12 pack)	1.2%
Paper Cups (Hot)	1.2%
Paper Food Wrap (Meat Wrap)	1.2%
Paper Retail Bags - Brand Name	1.2%
Plastic Bags - Not Retail (Leaf, Trash)	1.1%
Broken Container Glass	1.0%
Plastic Drink Cups	1.0%
Aerosol Cans (Paint, Oils, Etc.)	0.8%
Condiment Package (Salt, Ketchup)	0.8%
Foil Containers (Ice Cream)	0.8%
Food Items (Apple Core, etc.)	0.8%

2015 Anacostia Watershed Litter Survey

Large Litter Category	Percent
Gum Wrappers	0.8%
Lottery Ticket Debris	0.8%
Paper Bags - Fast Food	0.8%
Paper Fast Food Napkins - Unbranded	0.8%
Paper Straw Wrappers	0.8%
Plastic Retail Bags - No Brand Name	0.8%
Sport Drink (Plastic)	0.8%
Utensils (Metal)	0.8%
Paper Cups (Cold)	0.6%
Plastic Straws	0.6%
Paper Fast Food Napkins - Branded	0.5%
Polystyrene Foam Fast Food Plates	0.5%
Cigar Butts/Tips (>4")	0.4%
Juice (Cans)	0.4%
Milk/Juice (Gable Top)	0.4%
Misc. Glass	0.4%
Other Paper Cups	0.4%
Paper Bags - Not Retail (Leaf, etc.)	0.4%
Paper Clamshells	0.4%
Paperboard (Cereal , Shoe Boxes)	0.4%
Plates - Other Materials	0.4%
Six-Pack Plastic Rings	0.4%
Soft Drink (Glass)	0.4%
Paper Fast Food Plates	0.3%
Home Articles (Lamps, Lawn Chairs)	0.2%
Juice (Plastic)	0.2%
Wine/Liquor (Plastic)	0.2%
Foil Drink Pouches (Capri Sun)	0.1%
Aseptic Drink Boxes (Rectangular Box)	0.0%
Cans - Aluminum (Non-Beverage)	0.0%
Cigar Butts/Tips (>4")	0.0%
Composite Materials - Other	0.0%
Container Lids (Metal)	0.0%
Foil Materials/Pieces (Not Fast Food)	0.0%
Glass Jars/ Bottles (Non-Beverage)	0.0%
Juice (Glass)	0.0%
Other Plastic Fast Food Plates	0.0%
Other Plastic Shells/Boxes	0.0%
Paper Packaging - Other	0.0%
Paper Trays	0.0%
Plastic Cup Lids/Pieces	0.0%
Plastic Jars / Bottles (Non-Beverage)	0.0%
Polystyrene Foam Trays (Meat, etc.)	0.0%

2015 Anacostia Watershed Litter Survey

Large Litter Category	Percent
Receipts (Business, Transfers)	0.0%
Sport Drink (Cans)	0.0%
Stationery (School, Business)	0.0%
Tea (Can)	0.0%
Tea (Plastic)	0.0%
Trays - Other Materials	0.0%
Utensils & Chopsticks (Wooden)	0.0%
Vehicle & Metal Road Debris	0.0%
Water Bottles (Glass)	0.0%
Zipper Bags/ Sandwich	0.0%



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Appendix K- Large Litter on Non-Roadways - Montgomery County

Large Litter Category	Percent
Stationery (School, Business)	57.7%
Plastic Packaging - Other (Film, etc.)	5.8%
Sweet Snack Wrappers (Candy, Cake)	5.8%
Construction Debris	4.8%
Polystyrene Foam Cups	2.9%
Beer Bottles (Glass)	1.9%
Misc. Plastic	1.9%
Plastic Retail Bags - No Brand Name	1.9%
Polystyrene Foam Clamshells	1.9%
Beer (Cans)	1.0%
Composite Materials - Other	1.0%
Foil Fast Food Wrappers (Burger Wraps)	1.0%
Gum Wrappers	1.0%
Juice (Cans)	1.0%
Misc. Cardboard	1.0%
Misc. Glass	1.0%
Other Plastic Shells/Boxes	1.0%
Paper Fast Food Napkins - Unbranded	1.0%
Plastic Bags - Not Retail (Leaf , Trash)	1.0%
Plastic Retail Bags - Brand Name	1.0%
Plastic Wrap (Retail Food/Non-Food)	1.0%
Polystyrene Foam Chunks	1.0%
Printed Material (Newspapers)	1.0%
Snack Food Packaging (Chips)	1.0%
Vehicle & Metal Road Debris	1.0%
Aerosol Cans (Paint, Oils, Etc.)	0.0%
Aseptic Drink Boxes (Rectangular Box)	0.0%
Broken Container Glass	0.0%
Cans - Aluminum (Non-Beverage)	0.0%
Cans - Steel (Food/Non-Food)	0.0%
Cigar Butts/Tips (>4")	0.0%
Cigarette Debris (>4")	0.0%
Clothing or Clothing Pieces	0.0%
Condiment Package (Salt, Ketchup)	0.0%
Container Lids (Metal)	0.0%
Container Lids (Plastic)	0.0%
Corrugated Boxes/Pieces	0.0%
Foil Containers (Ice Cream)	0.0%
Foil Drink Pouches (Capri Sun)	0.0%
Foil Materials/Pieces (Not Fast Food)	0.0%
Food Items (Apple Core, etc.)	0.0%

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Large Litter Category	Percent
Glass Jars/ Bottles (Non-Beverage)	0.0%
Home Articles	0.0%
Juice (Glass)	0.0%
Juice (Plastic)	0.0%
Lottery Ticket Debris	0.0%
Milk/Juice (Gable Top)	0.0%
Misc. Paper	0.0%
Misc. Paperboard	0.0%
Other Cloth (Rugs, Rags, Tarps, etc.)	0.0%
Other Paper Cups	0.0%
Other Plastic Fast Food Plates	0.0%
Paper Bags - Fast Food	0.0%
Paper Bags - Not Retail (Leaf, etc.)	0.0%
Paper Beverage Cases (6/12 pack)	0.0%
Paper Clamshells	0.0%
Paper Cups (Cold)	0.0%
Paper Cups (Hot)	0.0%
Paper Fast Food Napkins - Branded	0.0%
Paper Fast Food Plates	0.0%
Paper Food Wrap (Meat Wrap)	0.0%
Paper Packaging - Other	0.0%
Paper Retail Bags - Brand Name	0.0%
Paper Retail Bags - No Brand Name	0.0%
Paper Straw Wrappers	0.0%
Paper Trays	0.0%
Paperboard (Cereal , Shoe Boxes)	0.0%
Plastic Cup Lids/Pieces	0.0%
Plastic Drink Cups	0.0%
Plastic Jars / Bottles (Non-Beverage)	0.0%
Plastic Straws	0.0%
Plates - Other Materials	0.0%
Polystyrene Foam Fast Food Plates	0.0%
Polystyrene Foam Trays (Meat, etc.)	0.0%
Receipts (Business, Transfers)	0.0%
Six-Pack Plastic Rings	0.0%
Soft Drink (Cans)	0.0%
Soft Drink (Glass)	0.0%
Soft Drink (Plastic)	0.0%
Sport Drink (Cans)	0.0%
Sport Drink (Plastic)	0.0%
Tea (Can)	0.0%
Tea (Plastic)	0.0%
Tire & Rubber Debris	0.0%

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Large Litter Category	Percent
Tobacco Packaging (Packs, Matches, Lighters)	0.0%
Trays - Other Materials	0.0%
Utensils & Chopsticks (Wooden)	0.0%
Utensils & Chopsticks (Plastic)	0.0%
Utensils (Metal)	0.0%
Water Bottles (Glass)	0.0%
Water Bottles (Plastic)	0.0%
Wine/Liquor (Glass)	0.0%
Wine/Liquor (Plastic)	0.0%
Zipper Bags/ Sandwich	0.0%



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Appendix L - Large Litter on Non-Roadways - Prince George's County

Large Litter Category	Percent
Water Bottles (Plastic)	11.5%
Sweet Snack Wrappers (Candy, Cake)	7.0%
Snack Food Packaging (Chips)	5.8%
Polystyrene Foam Cups	4.8%
Plastic Retail Bags - Brand Name	4.4%
Soft Drink (Plastic)	4.2%
Plastic Packaging - Other (Film, etc.)	3.7%
Beer Bottles (Glass)	3.4%
Paper Packaging - Other	3.4%
Plastic Retail Bags - No Brand Name	3.4%
Polystyrene Foam Clamshells	3.1%
Sport Drink (Plastic)	3.0%
Plastic Cup Lids/Pieces	2.8%
Beer (Cans)	2.4%
Wine/Liquor (Glass)	2.3%
Plastic Drink Cups	2.1%
Plastic Bags - Not Retail (Leaf , Trash)	1.9%
Corrugated Boxes/Pieces	1.7%
Printed Material (Newspapers)	1.7%
Juice (Plastic)	1.6%
Receipts (Business, Transfers)	1.6%
Paper Fast Food Napkins - Unbranded	1.5%
Polystyrene Foam Chunks	1.3%
Gum Wrappers	1.2%
Wine/Liquor (Plastic)	1.2%
Stationery (School, Business)	1.1%
Vehicle & Metal Road Debris	1.1%
Foil Materials/Pieces (Not Fast Food)	1.0%
Juice (Glass)	1.0%
Paper Retail Bags - No Brand Name	1.0%
Misc. Plastic	0.8%
Paper Cups (Cold)	0.8%
Paper Bags - Fast Food	0.7%
Paper Cups (Hot)	0.7%
Polystyrene Foam Fast Food Plates	0.7%
Polystyrene Foam Trays (Meat, etc.)	0.7%
Broken Container Glass	0.6%
Misc. Cardboard	0.6%
Foil Fast Food Wrappers (Burger Wraps)	0.5%
Misc. Paper	0.5%
Soft Drink (Cans)	0.5%

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Large Litter Category	Percent
Home Articles (Lamps, Lawn Chairs)	0.4%
Lottery Ticket Debris	0.4%
Tobacco Packaging (Packs, Matches, Lighters)	0.4%
Construction Debris	0.3%
Container Lids (Plastic)	0.3%
Foil Drink Pouches (Capri Sun)	0.3%
Misc. Paperboard	0.3%
Other Cloth (Rugs, Rags, Tarps, etc.)	0.3%
Other Plastic Shells/Boxes	0.3%
Paper Beverage Cases (6/12 pack)	0.3%
Paper Trays	0.3%
Plastic Wrap (Retail Food/Non-Food)	0.3%
Sport Drink (Cans)	0.3%
Container Lids (Metal)	0.2%
Food Items (Apple Core, etc.)	0.2%
Juice (Cans)	0.2%
Milk/Juice (Gable Top)	0.2%
Paper Bags - Not Retail (Leaf, etc.)	0.2%
Paper Clamshells	0.2%
Paper Fast Food Plates	0.2%
Paper Straw Wrappers	0.2%
Plastic Jars / Bottles (Non-Beverage)	0.2%
Utensils & Chopsticks (Plastic)	0.2%
Cans - Aluminum (Non-Beverage)	0.1%
Clothing or Clothing Pieces	0.1%
Composite Materials - Other	0.1%
Zipper Bags/ Sandwich	0.1%
Aerosol Cans (Paint, Oils, Etc.)	0.0%
Aseptic Drink Boxes (Rectangular Box)	0.0%
Cans - Steel (Food/Non-Food)	0.0%
Cigar Butts/Tips (>4")	0.0%
Cigarette Debris (>4")	0.0%
Condiment Package (Salt, Ketchup)	0.0%
Foil Containers (Ice Cream)	0.0%
Glass Jars/ Bottles (Non-Beverage)	0.0%
Misc. Glass	0.0%
Other Paper Cups	0.0%
Other Plastic Fast Food Plates	0.0%
Paper Fast Food Napkins - Branded	0.0%
Paper Food Wrap (Meat Wrap)	0.0%
Paper Retail Bags - Brand Name	0.0%
Paperboard (Cereal , Shoe Boxes)	0.0%
Plastic Straws	0.0%

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Large Litter Category	Percent
Plates - Other Materials	0.0%
Six-Pack Plastic Rings	0.0%
Soft Drink (Glass)	0.0%
Tea (Can)	0.0%
Tea (Plastic)	0.0%
Tire & Rubber Debris	0.0%
Trays - Other Materials	0.0%
Utensils & Chopsticks (Wooden)	0.0%
Utensils (Metal)	0.0%
Water Bottles (Glass)	0.0%



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Appendix M - Small Litter on Non-Roadways - All

Small Litter Category	Percent
Glass	23.4%
Paper	15.6%
Hard Plastic	11.0%
Cigarette Butts	8.9%
Polystyrene Foam Packaging - Peanuts	6.8%
Aluminum	5.8%
Candy/Gum Wrappers	5.2%
Food	4.9%
Polystyrene Foam Packaging - Chunks	4.2%
Bottle Caps	3.9%
Polystyrene Foam Food Service - Cups/Plates/Clams	3.8%
Plastic Film	3.0%
Straw Wrappers - Paper	1.0%
Metal (not Aluminum)	0.8%
Rubber/Tire Pieces	0.7%
Cigar Butts/Tips	0.4%
Tobacco Packaging	0.4%
Straws - Plastic	0.2%
Other Materials	0.0%

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Appendix N - Small Litter on Non-Roadways - DC

Small Litter Category	Percent
Glass	36.9%
Cigarette Butts	22.1%
Paper	11.5%
Candy/Gum Wrappers	10.7%
Hard Plastic	3.7%
Plastic Film	2.9%
Bottle Caps	2.3%
Tobacco Packaging	2.2%
Cigar Butts/Tips	1.7%
Food	1.5%
Other Materials	1.0%
Aluminum	0.8%
Rubber/Tire Pieces	0.6%
Straws - Plastic	0.5%
Straw Wrappers - Paper	0.4%
Metal (not Aluminum)	0.4%
Polystyrene Foam Packaging - Peanuts	0.4%
Polystyrene Foam Food - Cups/Plates/Clams	0.2%
Polystyrene Foam Packaging - Chunks	0.1%

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Appendix O - Small Litter on Non-Roadways - Montgomery County

Small Litter Category	Percent
Glass	28.9%
Polystyrene Foam Packaging - Chunks	17.8%
Polystyrene Foam Packaging - Peanuts	15.6%
Hard Plastic	11.1%
Candy/Gum Wrappers	8.9%
Paper	6.7%
Plastic Film	4.4%
Polystyrene Foam Food - Cups/Plates/Clams	4.4%
Cigarette Butts	2.2%
Aluminum	0.0%
Bottle Caps	0.0%
Cigar Butts/Tips	0.0%
Food	0.0%
Metal (not Aluminum)	0.0%
Other Materials	0.0%
Tobacco Packaging	0.0%
Rubber/Tire Pieces	0.0%
Straw Wrappers - Paper	0.0%
Straws - Plastic	0.0%

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Appendix P - Small Litter on Non-Roadways - Prince George's County

Small Litter Category	Percent
Paper	26.4%
Aluminum	14.6%
Candy/Gum Wrappers	14.5%
Polystyrene Foam Food - Cups/Plates/Clams	14.0%
Plastic Film	7.3%
Polystyrene Foam Packaging - Chunks	4.1%
Hard Plastic	4.0%
Straw Wrappers - Paper	4.0%
Polystyrene Foam Packaging - Peanuts	2.7%
Metal (not Aluminum)	2.5%
Cigarette Butts	2.3%
Bottle Caps	1.8%
Glass	1.4%
Rubber/Tire Pieces	0.5%
Cigar Butts/Tips	0.0%
Food	0.0%
Other Materials	0.0%
Tobacco Packaging	0.0%
Straws - Plastic	0.0%

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Appendix Q - Large Litter Categories and Descriptions

#	Large Litter Items	Material	Description
1	Beer Cans	Metal	Beer in aluminum cans
2	Beer Bottles (Glass)	Glass	Beer in glass bottles
3	Soft Drink (Glass)	Glass	Soft drinks in glass containers
4	Soft Drink (Cans)	Metal	Soft drinks in metal can containers
5	Soft Drink (Plastic)	Plastic	Soft drinks in plastic containers
6	Sport Drink (Glass)	Glass	Sport drinks in glass bottles
7	Sport Drink (Plastic)	Plastic	Sport drinks in plastic containers
8	Water Bottles (Glass)	Glass	Packaged water in glass bottles
9	Water Bottles (Plastic)	Plastic	Packaged water in plastic containers
10	Wine/ Liquor (Glass)	Glass	Wine & liquor in glass bottles
11	Wine/ Liquor (Plastic)	Plastic	Wine & liquor in plastic or other formats
12	Juice (Cans)	Metal	Juice in aluminum cans
13	Juice (Plastic)	Plastic	Juice in plastic containers
14	Juice (Glass)	Glass	Juice containers in glass bottles
15	Milk/Juice (Gable)	Paper	Milk or juice in gable top cartons
16	Tea (Cans)	Metal	Tea in aluminum cans
17	Tea (Plastic)	Plastic	Tea in plastic containers
18	Foil Pouches	Composite	Juice in foil/plastic packaging
19	Aseptic (Box)	Composite	Beverages in coated paper boxes
20	Broken Container Glass	Glass	Glass beverage container pieces
21	Six Pack Plastic Rings	Plastic	Plastic handles for carrying cans/bottles
22	Foil Containers	Metal	Ice cream foil wraps, etc.
23	Plastic Drink Cups	Plastic	Cups, all resin types
24	Paper Cups (Cold)	Paper	Cups, all paper types - cold drinks
25	Paper Cups (Hot)	Paper	Cups, all paper types - hot drinks
26	Polystyrene Foam Cups	Plastic	Cups, all polystyrene types - hot drinks
27	Other Paper Cups	Paper	Cups, other materials
28	Cup Lids/Pieces	Plastic	Cups, lids, and pieces
29	Plastic Straws	Plastic	Straws used with cups
30	Paper Straw Wrappers	Paper	Paper wrappers used with straws
31	Plastic Retail Bags - Branded	Plastic	Retail plastic bags with brand name/logo
32	Plastic Retail Bags - Unbranded	Plastic	Generic or blank retail plastic bags
33	Paper Retail Bags	Paper	Whole\pieces of retail paper bags
34	Paper Bags - Fast Food	Paper	Whole\pieces of fast food paper bags
35	Plastic Bags - Not Retail	Plastic	Whole\pieces of non-retail plastic bags
36	Paper Bags - Not Retail	Paper	Paper bags & sacks (e.g., leaf debris)
37	Zipper Bags/ Sandwich	Plastic	Plastic lunch bags and sacs
38	Cardboard Boxes	Paper	All cardboard boxes and pieces
39	Paperboard (Cereal Type)	Paper	Cereal/shoe boxes and pieces
40	Paper Beverage Cases	Paper	Outer packaging for beverage products
41	Polystyrene Clamshells	Plastic	Expanded foam food containers

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#	Large Litter Items	Material	Description
42	Paper Clamshells	Paper	Paper-based food containers
43	Other Plastic Shells/Boxes	Plastic	PET, PVC, HDPE, other material shells
44	Plastic Jars/Bottles/Lids	Plastic	Non-beverage (detergent bottles, etc.)
45	Glass Jars/ Bottles Misc.	Glass	Glass jars/bottles not described above
46	Cans - Steel	Metal	Steel food/non-food containers
47	Cans - Aluminum	Metal	Aluminum food/non-food containers
48	Container Lids (metal)	Metal	Metal lids, closures, and pieces
49	Container Lids (plastic)	Plastic	Plastic lids, closures, and pieces
50	Aerosol Cans	Metal	Paint, Hairspray spray cans, etc.
51	Paper Food Wrap	Paper	Commercial/Non-commercial food wrap (e.g., meat wrap)
52	Paper/Foil Composite Wrap	Composite	Hamburger wrappers, etc.
53	Plastic Wrap	Plastic	All plastic wrap types, food, non-food
54	Condiment Package	Composite	Ketchup, salt, creamers, etc.
55	Utensils	Plastic	Forks, knives, chop sticks etc.
56	Branded Fast Food Napkins	Paper	Napkins with identifiable Branded
57	Paper Fast Food Plates	Paper	Paper plates for serving fast food
58	Polystyrene Fast Food Plates	Plastic	Polystyrene plates for serving fast food
59	Other Plastic Fast Food Plates	Plastic	Plastic materials other than Polystyrene for serving fast food
60	Plates - Other Materials	Other	Picnic plates, etc.
61	Polystyrene Trays	Plastic	Microwavable, display trays
62	Paper Trays	Paper	Microwavable, display trays
63	Other Material Trays	Composite	Microwavable, display trays
64	Gum Wrappers	Composite	Packaging for sealing gum products
65	Candy Bar Wrappers	Composite	Packaging for sealing candy products
66	Candy Pouches	Composite	Packaging for sealing candy products
67	Sweet Packaging	Composite	Packaging for sealing cakes, etc.
68	Other Confectionery	Composite	All other packaging for confections
69	Snack Food Packaging	Composite	Potato chips, etc.
70	Clothing	Fabric	Shirts, socks, etc.
71	Other Cloth	Fabric	Tarps, industrial fabrics etc.
72	Plastic Packaging - Other	Plastic	Plastic packaging not otherwise described
73	Paper Packaging - Other	Paper	Paper packaging not otherwise described
74	Composite - Other	Composite	Composite debris not otherwise described
75	Foil Materials	Metal	Aluminum food and industrial foils
76	Unbranded Napkins	Paper	Napkins with no brand identification
77	Lottery Ticket Debris	Paper	Tickets and gaming items
78	Printed Material	Paper	Newspapers, magazines, flyers, etc.
79	Stationery	Paper	School papers, business forms, etc.
80	Receipts	Paper	Receipts, tickets, transfers, etc.
81	Cigarette Debris	Tobacco	Cigarette debris larger than four inches
82	Cigar Butts/Tips	Tobacco	Cigar debris larger than four inches
83	Tobacco Packaging	Composite	Matches, lighters, etc.
84	Misc. Paper	Paper	Unidentifiable paper scraps

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#	Large Litter Items	Material	Description
85	Misc. Plastic	Plastic	Unidentifiable plastic scraps
86	Misc. Paperboard	Paper	Unidentifiable paperboard scraps
87	Misc. Cardboard	Paper	Unidentifiable cardboard scraps
88	Misc. Glass	Glass	Unidentifiable glass items
89	Vehicle & Metal Road Debris	Composite	Auto parts, etc.
90	Construction Debris	Composite	Discarded from construction or demolition
91	Tire & Rubber Debris	Rubber	Rubber sheets/pieces, tire pieces, etc.
92	Home Articles	Composite	Toiletries, toys, etc.
93	Polystyrene Foam Chunks	Plastic	Foam durable goods packaging
94	Polystyrene Foam Meat Trays	Plastic	Polystyrene foam used with raw meat



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Appendix R - Large Litter Category Components

Large Litter Category	Components
Beverage Containers	Beer (Cans)
	Beer Bottles (Glass)
	Soft Drink (Cans)
	Soft Drink (Glass)
	Soft Drink (Plastic)
	Sport Drink (Cans)
	Sport Drink (Plastic)
	Water Bottles (Glass)
	Water Bottles (Plastic)
	Wine/Liquor (Glass)
	Wine/Liquor (Plastic)
	Juice (Cans)
	Juice (Plastic)
	Juice (Glass)
	Milk/Juice (Gable Top)
	Aseptic Drink Boxes (Rectangular Box)
	Foil Drink Pouches (Juice)
	Tea (Can)
	Tea (Plastic)
	Broken Container Glass
Cups, Lids and Straws	Plastic Drink Cups
	Plastic Cup Lids/Pieces
	Plastic Straws
	Paper Straw Wrappers
	Paper Cups (Cold)
	Paper Cups (Hot)
	Other Paper Cups
Other Fast Food Related	Polystyrene Foam Cups
	Polystyrene Foam Clamshells
	Polystyrene Foam Fast Food Plates
	Polystyrene Foam Trays (Meat, etc.)
	Paper Fast Food Napkins - Branded
	Paper Fast Food Napkins - Unbranded
	Paper Clamshells
	Paper Trays
	Paper Fast Food Plates
	Paper Food Wrap (Meat Wrap)
	Condiment Package (Salt, Ketchup)
	Utensils & Chopsticks (Plastic)
Utensils & Chopsticks (Wooden)	
Utensils (Metal)	

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Large Litter Category	Components
	Other Plastic Shells/Boxes
	Other Plastic Fast Food Plates
	Plates - Other Materials
	Trays - Other Materials
	Foil Containers (Ice Cream)
	Foil Fast Food Wrappers (Burger Wraps)
Paper and Plastic Bags/Film	Plastic Retail Bags - Branded
	Plastic Retail Bags - Unbranded
	Plastic Bags - Not Retail (Leaf, Trash)
	Plastic Packaging - Other (Film, etc.)
	Plastic Wrap (Retail Food/Non-Food)
	Paper Retail Bags - Branded
	Paper Retail Bags - Unbranded
	Paper Bags - Not Retail (Leaf, etc.)
	Paper Bags - Fast Food
	Zipper Bags/ Sandwich
Business and Home Papers	Lottery Ticket Debris
	Printed Material (Newspapers)
	Stationery (School, Business)
	Receipts (Business, Transfers)
	Misc. Paper
Snack Packaging	Gum Wrappers
	Sweet Snack Wrappers (Candy, Cake)
	Snack Food Packaging (Chips)
Tobacco-Related	Cigarette Debris
	Cigar Butts/Tips
	Tobacco Packaging (Packs, Matches, Lighters)
Retail Packaging	Six-Pack Plastic Rings
	Polystyrene Foam Chunks
	Corrugated Boxes/Pieces
	Paperboard (Cereal, Shoe Boxes)
	Paper Packaging - Other
	Paper Beverage Cases (6/12 pack)
Other Containers	Plastic Jars / Bottles (Non-Beverage)
	Glass Jars/ Bottles (Non-Beverage)
	Cans - Steel (Food/Non-Food)
	Cans - Aluminum (Non-Beverage)
	Container Lids (Metal)
	Container Lids (Plastic)
	Aerosol Cans (Paint, Oils, Etc.)
	Misc. Plastic
	Misc. Paperboard
	Misc. Cardboard

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Large Litter Category	Components
Construction/Vehicle Debris	Misc. Glass
	Vehicle & Metal Road Debris
	Construction Debris
	Tire & Rubber Debris
Miscellaneous	Foil Materials/Pieces (Not Fast Food)
	Clothing or Clothing Pieces
	Other Cloth (Rugs, Rags, Tarps, etc.)
	Composite Materials - Other
	Home Articles (Lamps, Lawn Chairs)
	Food Items (Apple Core, etc.)



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Appendix S - List of Roadway Sites

#	Tract	Site Location	Area	Start
1	23.01	2nd Street	NW	Varnum Street toward Webster Street
2	23.01	Allison Street	NW	5th Street toward 4th Street
3	28.02	Monroe Street	NW	50 feet from Corner of 16th Street going east
4	28.02	Park Road	NW	50 feet from Corner of 16th Street going east
5	28.02	Hiatt Place	NW	Park Road going south
6	28.02	Irving Street	NW	15th Street going east
7	30	Kenyon Street	NW	13th Street going west toward 14th Street
8	31	Morton Street	NW	50 feet past Corner of Sherman Avenue east
9	33.01	Channing Street	NW	50 feet from Corner of North Capitol Street west
10	33.01	1st Street	NW	W Street north toward Adams Street
11	33.02	T Street	NW	50 feet from 1st Street going east
12	33.02	Quincy Place	NW	North Capitol Street going west
13	36	13th Street	NW	Euclid Street north toward Fairmont Street
14	37	Fuller Street	NW	16th Street toward 15th Street
15	43	Caroline Street	NW	16th Street toward 15th Street
16	43	U Street	NW	15th Street toward 14th Street
17	44	12th Street	NW	W Street toward V Street
18	47.01	Pierce Street	NW	New Jersey Avenue toward 1st Street
19	48.01	Wiltberger Street	NW	T Street south toward S Street
20	50.01	Rhode Island Avenue	NW	12th Street west toward Vermont Avenue
21	59	F Street	NW	4th Street west
22	65	F Street	SE	1st Street toward 2nd Street
23	67	13th Street	SE	100 Feet North on Independence Avenue
24	67	Walter Street	SE	12th Street toward 13th Street
25	70	E Street	SE	8th Street toward 10th Street
26	70	7th Street	SE	G Street toward E Street
27	72	Fourth Street	SE	Water Street west
28	73.04	Mississippi Avenue	SE	15th Street west
29	73.04	Anderson Place	SE	15th Street east
30	74.06	Sheridan Road	SE	Pomeroy Road north
31	74.06	Douglas Road	SE	Douglas Place east
32	74.07	Sheridan Road	SE	Howard Road northeast toward Morris Road
33	74.08	Alabama Street	SE	Knox Street south toward Irving Street
34	76.05	23rd Street	SE	S Street south
35	77.07	Burns Street	SE	Hilldreth Street south
36	77.08	Dubois Place	SE	34th Street west toward 33rd Street
37	77.09	Fairlawn Avenue	SE	N Street north toward Nash Place
38	78.09	Jay Street	NE	50th Place east toward 51st Street
39	79.01	17th Street	NE	Gales Street south toward F Street
40	79.01	Isherwood Street	NE	15th Street east toward 17th Street
41	80.01	E Street	NE	13th Street toward 14th Street
42	81	11th Street	NE	C Street toward Constitution Avenue
43	82	3rd Street	NE	A Street north toward Constitution Avenue

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#	Tract	Site Location	Area	Start
44	83.01	4th Street	NE	G Street south toward F Street
45	83.01	D Street	NE	3rd Street east toward 4th Street
46	83.02	Lexington Place	NE	7th Street west toward 6th Street
47	84.1	K Street	NE	9th Street toward 10th Street
48	84.1	I Street	NE	11th Street toward 12th Street
49	87.01	Uhland Terrace	NE	Summit Place toward 2nd Street
50	87.01	R Street	NE	Lincoln Road east
51	88.02	Morse Street	NE	Montello Avenue east
52	88.04	Meigs Place	NE	Trinidad Avenue west toward Montello Avenue
53	93.02	Franklin Street	NE	13th Street toward 12th Street
54	94	South Dakota Avenue	NE	Quincy Street southeast
55	95.04	Rock Creek Church Road	NE	200 feet south from Riggs Road
56	95.08	Galloway Street	NE	7th Street toward 8th Street
57	96.02	Hayes Street	NE	Anacostia Avenue northwest
58	99.03	Ayers Place	SE	55th Street east toward 56th Street
59	99.03	58th Street	SE	East Capital Street south
60	99.07	Falls Terrace	SE	Alabama Avenue east
61	110	O Street	SW	4th Street east
62	110	6th Street	SW	M Street south toward Water Street
63	103	Elder Street	NW	7th Street west toward 8th Street
64	88.02	Oates Street	NE	100 feet East of Montello Avenue
65	43	Waverly Terrace	NW	U Street toward Paloma Way
66	23.01	Illinois Avenue	NW	Upshur Street south toward Taylor Street
67	7016.01	I-495 Exit	MC	Off of New Hampshire Avenue
68	7016.02	Oakview Drive	MC	Bus stop near corner of Braddock Road
69	7019	Clayborn Avenue	MC	Traffic circle toward Garland Avenue
70	7021.01	E. Franklin Avenue	MC	School driveway toward the bus stop
71	7024.02	Easley Drive	MC	Parking lot after driveway to industrial site
72	7032.15	Route 182	MC	Corner directly south of Bel Pre Road
73	7032.21	Park Vista Drive	MC	South of traffic circle to Wingate Drive
74	7034.02	Hathaway Drive	MC	Directly south of Georgia Avenue
75	7020	Parking Lot	MC	Carroll Avenue at University Boulevard East
76	8024.04	Walker Mill Road	PGC	Before Addison Road south split
77	8028.03	Brooke Road	PGC	Bus stop in front of recreation center south
78	8031	Columbia Park Road	PGC	Near turn-in to Cheverly Metro Station
79	8056.01	University Boulevard East	PGC	Near corner of New Hampshire Avenue
80	8059.06	Erie Street	PGC	Past 20th Avenue east toward Adelphi Road
81	8059.07	Northampton Drive	PGC	Turning south onto New Hampshire Avenue
82	8066.01	Riverdale Road	PGC	East from corner of frontage road to I-295
83	8067.11	Greenbelt Road	PGC	Corner with Cipriano Road
84	8068	Kenilworth Avenue	PGC	South from corner of Pontiac Street

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Appendix T - List of Non-Roadway Sites

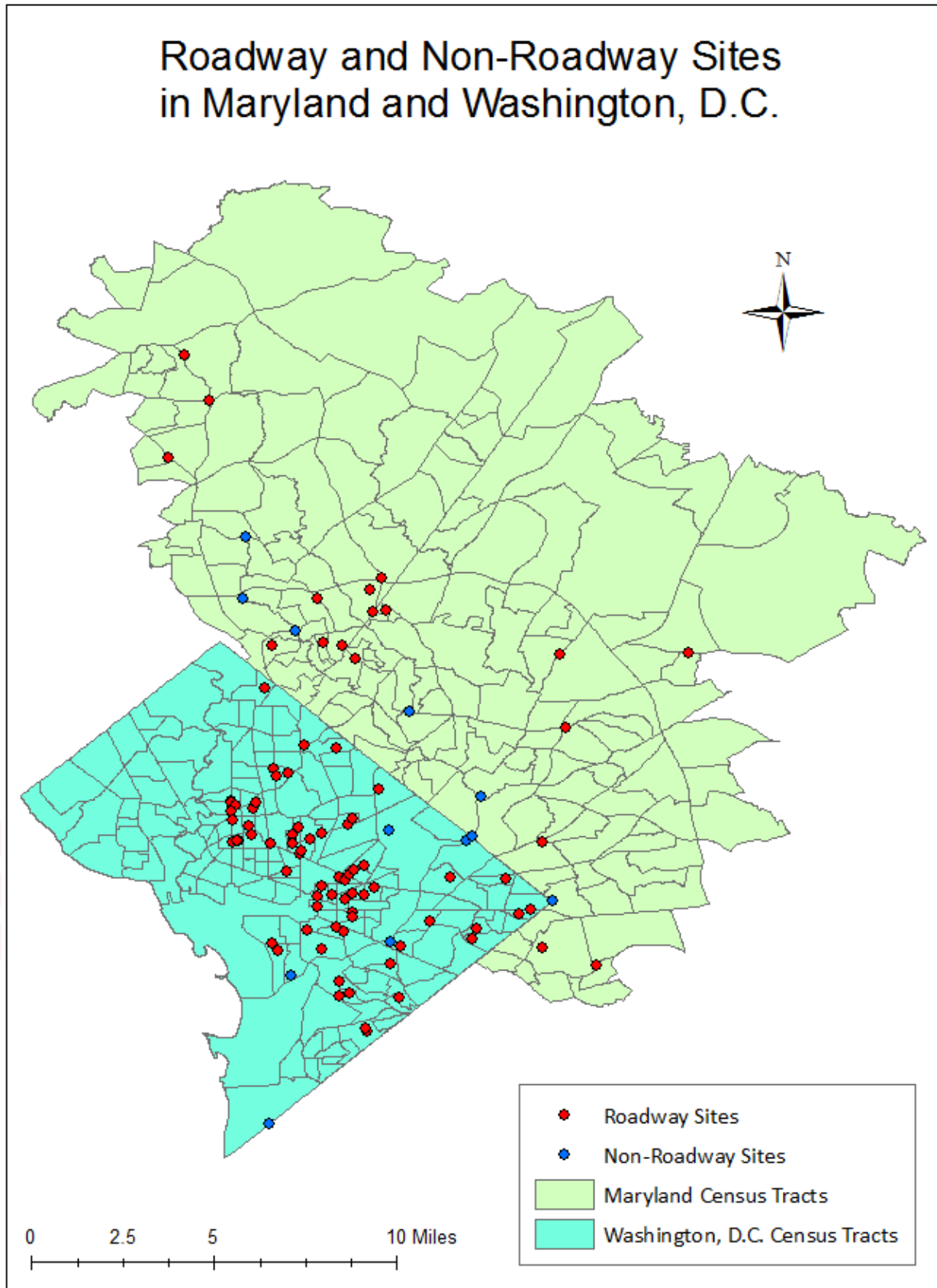
#	Tract	Site Location
1	DC-1	Hickey Run south of Route 50 New York Avenue NE
2	DC-2	James Creek Discharge at Buzzard Point SW
3	DC-3	Nash Run at 295 south where it is open channel
4	DC-4	Oxon Run at South Capitol Street SE
5	DC-5	Open channel at Pope's Branch near Fairlawn Avenue & M Street SE before I-295
6	DC-6	Railroad tracks at Queen's Chapel Road North under bridge
7	PG-1	Drainage ditch prior to trash rack near 4601 Annapolis Road in Bladensburg
8	PG-2	Open channel discharge at Home Depot near East West Highway
9	PG-3	Drainage outfalls at Watts Branch off Southern Avenue SE
10	MC-1	Sligo Creek bed near Sligo Creek Parkway
11	MC-2	Anacostia Tributary Trail next to Sligo Creek
12	MC-3	Sligo Creek and Creek bed near Sligo Cabin Neighborhood Park



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Appendix U – Roadway and Non-Roadway Sites Map



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Appendix V – Firm Qualifications

Environmental Resources Planning, LLC (ER Planning) is the only private U.S. firm currently focusing exclusively on litter surveys and litter-related research. Field crews under our supervision have surveyed more than 21 million square feet of roadways and recreational areas in a number of states and cities throughout North America and for Keep America Beautiful (KAB), including the following litter surveys:

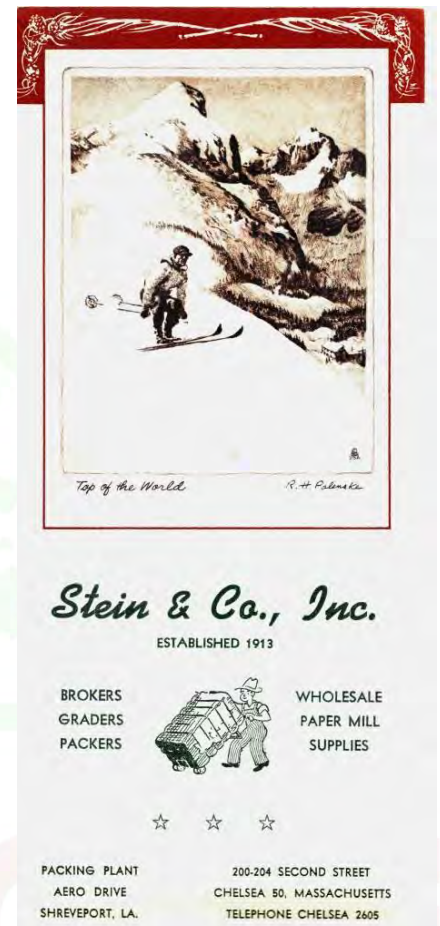
- Anacostia Statewide Litter Survey (2015)
- Rhode Island Litter Survey (2014)
- Texas Statewide Litter Survey (2013)
- Toronto, ON Citywide Litter Survey (2012)
- Oakland, CA Citywide Bag Litter Survey (2011-12)
- San Francisco, CA Citywide Bag Litter Survey (2011-12)
- Washington, DC Citywide Bag Litter Survey (2011-12)
- Maine Statewide Litter Survey (2010)
- New Hampshire Statewide Litter Survey (2010)
- Vermont Statewide Litter Survey (2010)
- KAB National Litter Survey and Cost Study (2008-09)
- KAB Community Appearance Index (2007-08)
- KAB Litter - Literature Review (2007)
- Georgia Statewide Litter Survey (2006)
- Tennessee Statewide Litter Survey (2006)
- Santa Monica, CA Citywide Beach Litter Surveys (2005)
- Malibu, CA Citywide Beach Litter Surveys (2005)
- New Jersey Statewide Litter Survey (2004)

The firm's roots date back more than 100 years when Mr. Stein's family opened their first recycling facility. His litter-related work began with a KAB affiliate project in 1986.

Mr. Stein's litter studies and research have been featured in *National Geographic* magazine, the *New York Times* and *Time* magazine as well as on *ABC's Good Morning America* and *NPR*.

He was invited, as a subject-matter expert, to participate in a study on community resilience and resource optimization conducted for the President.

Mr. Stein earned his B.Sc. Cum Laude in *Environmental Studies* from *Syracuse University* and *SUNY College of Environmental Science and Forestry* studying *Waste Management* and *Environmental Law* while interning with the NYS Department of Environmental Conservation. He also earned his M.Sc. in *Natural Resource Policy and Management* there. He was awarded a scholarship by New York SWANA for his Master's thesis research, examining the impacts of public policy intervention on maintaining



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sustainable recycling markets. He also began a doctorate-level program that focused on identifying underlying cultural influences on littering rates.

In addition, Mr. Stein has been active in numerous activities and writing related to litter and marine debris including, most recently:

- California State Water Board - Technical Assessment of Statewide Water Quality Plans to Control Stormwater Trash (2014)
- San Francisco Water Board - Presentation on Measuring Trash TMDL Compliance and Load Reductions (2013)
- Ocean Conservancy - Beach Litter Survey Methodology Enhancements (2011)
- National Litter Forum - Restoring Our Communities, organizer (2011)
- Keep America Beautiful - International Litter Research Forum (2007)
- Keep America Beautiful - Litter: Literature Review, lead author (2007)
- Potomac Watershed Initiative Trash Monitoring Protocol Subcommittee - survey design advisor, pro bono (2006-2007)
- **Ocean Conservancy's National Marine Debris Monitoring Program** - survey director for Chincoteague Island Site, pro bono (2006-2007)

Most recently, Mr. Stein was asked to serve as an advisor for Florida's 2014 Litter Prevention Program.

Other senior staff on this project includes:

Emilie Knapp, Assistant Project Manager, has helped plan all aspects of field survey work, supervised field crews, conducted data management and coordinated the site selection process for 10 litter surveys nationwide. In this role, she has surveyed more than 10 million square feet of roadways. She earned an A.A. in Business Management and subsequently a B.A.

Kristian Ferguson, Senior Consultant, has managed field surveys and assisted with analysis and cost studies for litter projects throughout the U.S. and Canada. He received his B.Sc. in Geography and, while **receiving his Master's Degree, he presented** a capstone seminar focusing on the relationship between litter and solid waste management.

Ron Visco, Project Statistician, holds a Ph.D. in Research Design and Statistics from Princeton University. Dr. Visco conducted the statistical analysis for the firm's litter-related projects in Anacostia, Maine, New Hampshire, Oakland, Rhode Island, San Francisco, Texas, Toronto, Vermont and Washington, DC.

Sonya Besteiro, **Field Surveyor, was Ocean Conservancy's Associate** Director of International Coastal Cleanup for 11 years. Previously, she was Director of Programs for Keep Texas Beautiful. She holds a B.A. in Business Administration.

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