

# STANDARDIZING ANACOSTIA WATERSHED TRASH TMDL/MS4 REDUCTIONS

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Metropolitan Washington  
Council of Governments

# What is Trash?

- As defined by the Anacostia River Watershed Trash TMDL Workgroup and the Metropolitan Washington Council of Governments, trash is:  
*All improperly discarded waste material, including, but not limited to, convenience food, beverage, and other product packages or containers constructed of steel, aluminum, glass, paper, plastic, and other natural and synthetic materials thrown or deposited on the land or water.*



Photo credit: Anacostia  
Watershed Society



Metropolitan Washington  
Council of Governments

# How Is It Different?

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- No numerical water quality criteria exist for trash
  - No set maximum load
  - Assessment is largely visual
- Most TMDLs are written in terms of the load that can be added to a waterbody
- This trash TMDL was written in terms of the negative – how much trash must be removed or prevented from entering the waterbody
- Anacostia Trash TMDL target = 100% removal or capture of the baseline trash load
- TMDL = baseline trash load

# What is the Baseline Load?

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- Baseline load is defined as:

*The annual trash load calculated from storm drain, CSO, and instream monitoring data. The baseline represents the typical annual load.*

$$\text{Baseline} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS}$$

- Instream and stormwater outfall monitoring were used to determine the nonpoint source and point source baseline loads respectively
- For this presentation, we are only dealing with the portion of the baseline load associated with the Phase I MS4



# MS4 Permits and the Trash TMDL

- Trash is a priority pollutant
- MS4 permits require trash monitoring
- Monitoring must differentiate between MS4 (point source) and non-MS4 (non-point source) items
- MS4 permit only requires jurisdictions to account for MS4 (point source) reductions

MS4 Items (WLA)			
Plastic Bags	Plastic Bottles	Glass Bottles	Aluminum Cans
Styrofoam	Paper	Cardboard	Food Packaging
Toiletries			

# MS4 Permits and the Trash TMDL

Non-MS4 Items (LA)			
Quart Oil Containers	Tires	Wooden Pallets	Oil Filters
Bricks	Metal	Antifreeze Containers	Concrete
Shopping Carts	Large Car Parts	Small Car Parts	Batteries
Lumber	Appliances	Sporting Goods	Cloth/Clothes/Carpet
Misc. Construction Materials	Misc. Items		

“In establishing the nonpoint source baseline loading rate, only items that are generally considered too large to move through the sewer system were counted. That distinction is consistent with the methodology for determining the baseline nonpoint source load in the District. Table 20 summarizes the trash types considered part of the nonpoint source load.” -TMDL

# Jurisdictional Requirements

- Phase I MS4 Reduction Requirements
  - DC = 103,188 lbs/yr
  - Montgomery County = 228,683 lbs/yr
  - Prince George's = 170,628 lbs/yr
- Small portion of the total baseline reduction as required by the TMDL

	D.C.	P.G.	M.C.
2015	----	35% (60,000 lbs)	41% (93,760 lbs)
2017	100% (103,188 lbs)	73% (125,000 lbs)	65% (148,644 lbs)
2018	----	100% (170,628 lbs)	----
2020	----	----	89% (203,528 lbs)
2025	----	----	100% (228,683 lbs)



# Trash TMDL Petition

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- October 8, 2015
- 9 Organizations
- Sent to District Department of Energy & Environment and Maryland Department of Environment
- Major Comments
  - Baseline loading calculations/methodology
  - Want a traditional TMDL set at zero
  - Reductions not “real”
  - Jurisdictions not calculating reductions in same way
  - Concern of what happens when implementation goals met





# Jurisdictions' Response to Petition

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- ATRW meeting on January 11<sup>th</sup>, 2016 with petitioners
- Both jurisdictions thank the petitioners for their work and recognize their concerns, but will not be revising the trash TMDL
  - Jurisdictions committed to goal of reducing trash
  - Time better spent improving implementation
  - ATRW – comprehensive review of practices currently (or expected to) being implemented to meet TMDL
  - Standardizing reduction metrics across jurisdictions, basing them on “real”, empirically-driven equations



# Anacostia Trash Reduction Workgroup

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- COG leading the ATRW, participation by DOEE, PGDOE, MCDEP
- Reviewing each jurisdiction's Watershed Implementation Plans\*, MS4 permits, MS4 annual reports to compile list of implemented and/or potential reductions
- Identify reductions that all jurisdictions could be using
  - Volunteer stream clean-ups
  - Legislation (i.e. plastic bag bans, foam bans)
  - Street sweeping
  - Education/outreach
  - Structural (i.e. trash traps)



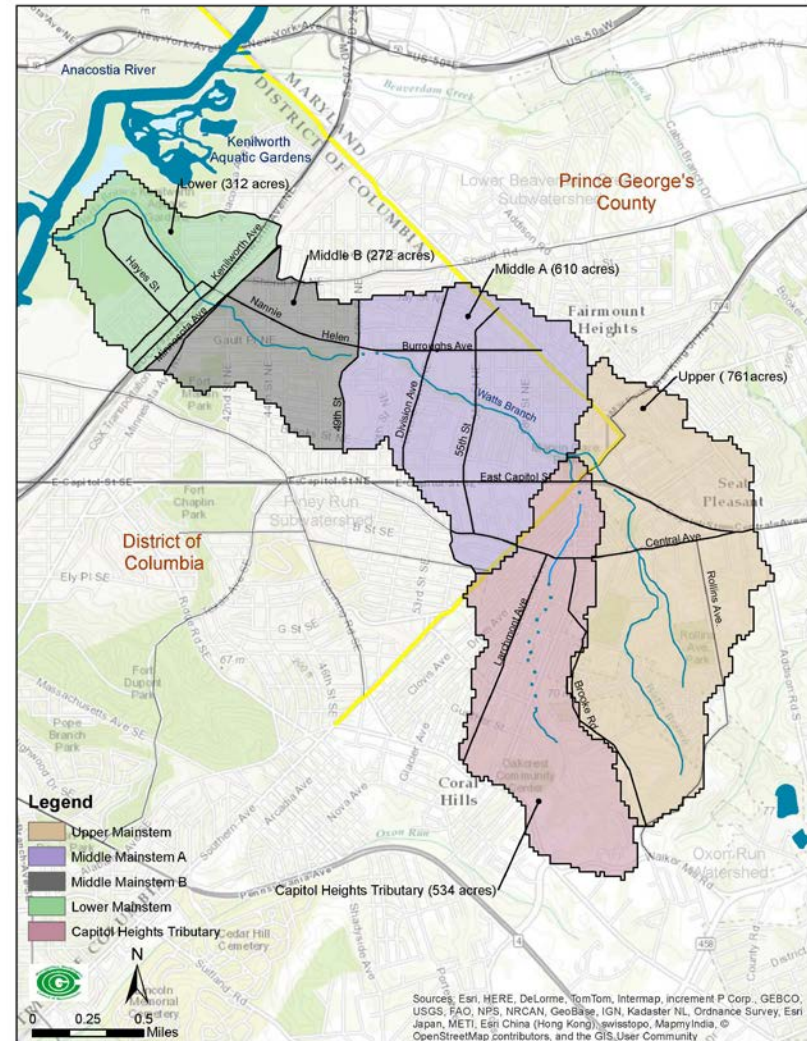
# Volunteer Stream Clean-ups

- Reduction Factors to Consider
  1. Weight of a typical bag
  2. % of that watershed that's in that jurisdiction
  3. MS4 allocation
  4. Wet weight of plastic bottles, glass bottles, aluminum cans



# Volunteer Stream Clean-ups

1. Weight of typical bag
  - Standard of 25 pounds, supported by literature
2. Percent of watershed within that jurisdiction
  - COG recommends to remove this reduction



# Volunteer Stream Clean-ups

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## 3. MS4 allocation

- TMDL: WLA (point source items coming through storm sewers) vs. items specified as LA (nonpoint source, generally bulk items)
- However, there are LA items that volunteers are picking up (sports equipment, clothing, quart oil containers, miscellaneous)
- Need to account for those non-MS4 items in a bag



# Volunteer Stream Clean-ups

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## 3. MS4 allocation

- Same equation across all 3 jurisdictions, but different numbers for WLA and LA in TMDL
- $MS4 \text{ allocation} = WLA / (WLA + LA)$
- DC MS4 allocation = 0.41
- PG MS4 allocation = 0.43
- MC MS4 allocation = 0.74



# Volunteer Stream Clean-ups

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4. Plastic bottle, glass bottle, aluminum can wet weight reduction
  - Account for liquid contents in containers
  - DC using an 80% reduction
  - PG using a 28% reduction
  - What do we do?

## Use Monitoring Data!



# Volunteer Stream Clean-ups

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4. Plastic bottle, glass bottle, aluminum can wet weight reduction
  - COG's stream monitoring protocols mimic volunteer clean-ups
  - Total number of plastic bottles vs. total number of items
  - Total weight of plastic bottles vs. total weight of items



Table 1: Preliminary "Full" Plastic Bottle Percent Weight per 25 lb Bag (Volunteer Stream Cleanups)

--DRAFT--

Row #	Plastic Bottle Calculations	MC	PG	Formula
1	% total items that are Plastic Bottles	17.31%	11.78%	Empirical
2	% of total weight that are Plastic Bottles	14.57%	7.99%	Empirical
3	Weight of "empty" Plastic Bottles in a typical trash bag (25 lb)*	3.64	2.00	Row 2 * 25 lbs
<b>Total # of Plastic Bottles (2012-2015)</b>				
4	Total # of Plastic Bottles (2012-2015)	1210	678	Empirical
<b>Total weight of Plastic Bottles in grams (2012-2015)</b>				
5	Total weight of Plastic Bottles in grams (2012-2015)	46,325	46,466	Empirical
6	Avg. weight of an "empty" Plastic Bottle (g)*	38.29	68.53	<u>Row 5</u> Row 4
7	Avg. weight of an "empty" Plastic Bottle (lb)* [convert g to lb]	0.08	0.15	<u>Row 6</u> 453.59
8	Average of MC and PG			
<b>Assumption: "Average" Plastic Bottle Volume</b>				
9	Assumption: "Average" Plastic Bottle Volume	20 oz	20 oz	Assumption
10	Weight of 20oz liquid (lb)	1.25	1.25	<u>12</u> 16
11	Weight of "full" Plastic Bottle (lb)	1.33	1.40	Row 7 + Row 10
<b># of "empty" Plastic Bottle in typical trash bag*</b>				
12	# of "empty" Plastic Bottle in typical trash bag*	43.16	13.22	<u>Row 3</u> Row 7
<b>Assumption: % of Plastic Bottle in bag that are actually full</b>				
13	Assumption: % of Plastic Bottle in bag that are actually full	25.00%	25.00%	Assumption
14	# Plastic Bottles that are full	11	3	Row 12 * Row 13
<b>Amount of liquid in those "20 oz" Plastic Bottles (lb)</b>				
15	Amount of liquid in those "20 oz" Plastic Bottles (lb)	13.49	4.13	Row 10 * Row 14
<b>Total weight of full + "empty" Plastic Bottles in a 25 lb. bag</b>				
16	Total weight of full + "empty" Plastic Bottles in a 25 lb. bag	17.13	6.13	Row 3 + Row 15
<b>Percentage of a 25 lb bag that is liquid in Plastic Bottles</b>				
17	Percentage of a 25 lb bag that is liquid in Plastic Bottles	53.94%	16.53%	<u>Row 15</u> 25 lbs
<b>Conversion: What to multiply total trash bag weight by in order to reduce by liquid in Plastic Bottles</b>				
18	Conversion: What to multiply total trash bag weight by in order to reduce by liquid in Plastic Bottles	46.06%	83.47%	1 - Row 17
Average		64.77%		

- Version 1
- Plastic bottles
- Questions to bring to members

1. Does this even make sense?

Yes

2. Do we combine the datasets from both counties?

Yes

3. Are you comfortable with assumptions?

Sort of...

4. How can we collect data to go from assumption to empirical?

Earth Day!



# Volunteer Stream Clean-ups

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4. Plastic bottle, glass bottle, aluminum can wet weight reduction
  - Earth Day volunteer clean-ups
  - 1 in each jurisdiction led by COG staff, 1 in each jurisdiction led by government staff
  - What questions do we need to answer?
    1. What is the volume of the “average” plastic bottle found in a volunteer’s bag?
    2. What proportion of the “average” plastic bottle is filled with liquid?



# Volunteer Stream Clean-ups

- Earth Day Volunteer Clean-ups
- 8 events
- 4,415 plastic bottles
- Every bottle categorized by its volume
  - Total volume = 71,600 oz
  - Average volume = 16.22 oz
- Every bottle by proportion of full: 0, 25, 50, 75, 100%
  - Total volume liquid = 1,376 oz
  - Avg. proportion of full = 1.9%



Table 1: Preliminary "Full" Plastic Bottle Percent Weight per 25 lb Bag (Volunteer Stream Cleanups)

--DRAFT--

Row #	Plastic Bottle Calculations	MC	PG	Combined	Formula
1	% total items that are Plastic Bottles	17.31%	11.78%	14.82%	Empirical
2	% of total weight that are Plastic Bottles	14.57%	7.99%	10.31%	Empirical
3	Weight of "empty" Plastic Bottles in a typical trash bag (25 lb)*	3.64	2.00	2.58	Row 2 * 25 lbs
<b>Summary</b>					
4	Total # of Plastic Bottles (2012-2015)	1210	678	1888	Empirical
5	Total weight of Plastic Bottles in grams (2012-2015)	46,325	46,466	92,791	Empirical
6	Avg. weight of an "empty" Plastic Bottle (g)*	38.29	68.53	49.15	<u>Row 5</u> Row 4
7	Avg. weight of an "empty" Plastic Bottle (lb)* [convert g to lb]	0.08	0.15	0.11	<u>Row 6</u> 453.59
<b>Assumptions</b>					
8	Assumption: "Average" Plastic Bottle Volume	20 oz	20 oz	16.22 oz	Empirical
9	Weight of 20oz liquid (lb)	1.25	1.25	1.01	<u>16.22</u> 16
10	Weight of "full" Plastic Bottle (lb)	1.33	1.40	1.12	Row 7 + Row 9
<b>Calculations</b>					
11	# of "empty" Plastic Bottle in typical trash bag*	43.16	13.22	23.79	<u>Row 3</u> Row 7
12	Assumption: % of Plastic Bottle in bag that are actually full	25.00%	25.00%	1.90%	Empirical
13	# Plastic Bottles that are full	11	3	0.45	Row 11 * Row 12
14	Amount of liquid in those "20 oz" Plastic Bottles (lb)	13.49	4.13	0.46	Row 9 * Row 13
15	Total weight of full + "empty" Plastic Bottles in a 25 lb. bag	17.13	6.13	3.04	Row 3 + Row 14
<b>Final Results</b>					
16	Percentage of a 25 lb bag that is liquid in Plastic Bottles	53.94%	16.53%	1.83%	<u>Row 14</u> 25 lbs
17	Conversion: What to multiply total trash bag weight by in order to reduce by liquid in Plastic Bottles	46.06%	83.47%	98.17%	1 - Row 16
				<b>Combined</b>	<b>98.17%</b>

- Version 1
  - Percentage of 25 lb. bag that is liquid in plastic bottles = 16.53
- Final version
  - Percentage of 25 lb. bag that is liquid in plastic bottles = 1.83

# Volunteer Stream Clean-ups

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- Glass bottles
  - Much smaller % of number/weight of total items
  - Even with assumptions, percentage of liquid in glass bottles is 3.13
  - Conservative
- Aluminum Cans
  - Much smaller % of number/weight of total items
  - Even with assumptions, percentage of sediment in aluminum cans is 3.34
  - Conservative



# Volunteer Stream Clean-ups

- The whole shebang!

	District of Columbia	Prince George's County	Montgomery County
Average weight of a plastic bag	25 lbs.	25 lbs.	25 lbs.
% of watershed in that jurisdiction	Removed	Removed	Removed
MS4 allocation	0.45	0.43	0.74
Wet weight reduction	0.917	0.917	0.917
Overall Equation	$25 * 0.45 * 0.917 = 10.32$ lbs. can be counted	$25 * 0.43 * 0.917 = 9.86$ lbs. can be counted	$25 * 0.74 * 0.917 = 16.96$ lbs. can be counted

# Volunteer Stream Clean-ups

- Status of approval

	District of Columbia	Prince George's County	Montgomery County
Average weight of a plastic bag	Approved	Approved	Approved
% of watershed in that jurisdiction (remove)	Approved	Approved	Approved
MS4 allocation	Approved	Under consideration	Approved
Wet weight reduction	Approved	Approved	Approved

# Trash Traps

- No need for 25 pound bag
- Removing % of watershed within that jurisdiction
  - Justification: if you're paying for it, take credit for it
- MS4 allocation of 0.45 (DC) would not be used.
- Wet weight reduction would not be used because grantees empty containers before weighing
- For future interjurisdictional traps, credit may be shared



Watts Branch Litter Trap, photo credit:  
<http://stormwatersystems.com/bandalong-litter-trap/>





# Next Steps

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- ATRW
  - Convene with the petitioners
  - Finalize and approve metric for traps
  - Work through additional reductions
    - Plastic bags
    - Styrofoam
    - Street sweeping
    - Education and outreach
- Jurisdictions
  - MDE/EPA approval for use of new metrics

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