Implementation Plan for the Middle Branch/Northwest Branch Trash TMDL in Baltimore City

STEPHANIE RAWLINGS-BLAKE
MAYOR

BALTIMORE CITY
DPW
DEPARTMENT OF PUBLIC WORKS
RUDOLPH S. CHOW, P. E.
DIRECTOR

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ACRONYMS

BMP – Best Management Practice

BWB – Blue Water Baltimore

CWA – Clean Water Act

DEPS - Baltimore County Department of Environmental Protection and Sustainability

DPW –Department of Public Works

EPA – U.S. Environmental Protection Agency

GIS – Geographic Information System

LA – Load Allocation

LBS – Pounds

MDE – Maryland Department of the Environment

MD DNR – Maryland Department of Natural Resources

MDP – Maryland Department of Planning

MOS – Margin of Safety

MS4 – Municipal Separate Storm Sewer System

NDPES – National Pollution Discharge Elimination System

PATMH – Patapsco River Mesohaline

SHA – State Highway Administration

SWAP – Small Watershed Action Plan

TMDL – Total Maximum Daily Load

WIP – Watershed Implementation Plan

WLA – Waste Load Allocation

WQMIS – Water Quality Monitoring and Inspections Station

YR – Year

DEFINITIONS

Best Management Practices (BMP): The practice or combination of practices that are determined to be the most effective, practicable means of preventing or reducing the amount of pollution generated by point and nonpoint sources to a level compatible with water quality goals. BMPs are defined in 40 CFR 122.2 as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States.

Nonpoint Source: Diffuse sources of pollution that are not otherwise channeled through a point source in the environment. These sources may be large or small, but they are generally numerous throughout a watershed. Nonpoint Sources include urban, agricultural, or industrial areas, roads, highways, construction sites, and recreational boating activities. Nonpoint Source pollution occurs year round when rainfall, snowmelt, irrigation, or any other source of water runs over land or through the ground, picks up pollutants from these numerous, diffuse sources and deposits them into rivers, lakes, and coastal waters.

Permittee: Any permittee or co-permittee of a stormwater permit.

Point Source: Any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, or conduit, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

Recyclable materials: Materials designated by the Department of Public Works for separate collection by the Department for processing and return to the market place in the form of raw materials or products. These include: non-food-contaminated paper and cardboard; emptied food containers made of aluminum, steel or tin; bottles and jars made of clear-, brown-, or green-colored glass; and appropriate grades of plastics.

Total Maximum Daily Load (TMDL): A TMDL for a given pollutant and waterbody is composed of the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background conditions. In addition, the TMDL must include a margin of safety (MOS) to account for uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody.

TMDL Target: Quantitative value used to measure whether the applicable water quality standard is being attained.

Trash: In this document, “trash” is man-made litter. For purposes of this TMDL, trash can be defined as point source (WLA) - small trash that could reasonably enter the MS4 through a street level storm drain system (like litter, bottles, and cigarette butts), and nonpoint source (LA) all other trash that is generally discharged by direct dumping (car bodies and parts, carpets, construction debris, and tires). Trash excludes organic materials like sediment and vegetation.

Wasteload allocation (WLA): The portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution

Water quality standards: Designates the uses to be protected (e.g., water supply, recreation, aquatic life) and the criteria for their protection (e.g., how much of a pollutant can enter a water body without impairing its designated uses).

EXECUTIVE SUMMARY

On January 5, 2015, the United States Environmental Protection Agency (EPA) approved the report entitled "*Total Maximum Daily Loads (TMDL) of Trash and Debris for the Middle Branch and Northwest Branch Portions of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment, Baltimore City and County, Maryland*". In compliance with the MS4 permit, this Baltimore City Trash TMDL Implementation Plan has been developed to present strategies to meet the Total Maximum Daily Load (TMDL) waste load allocations.

Specifically, this plan will provide the City basis to:

1. Meet TMDL Waste load Allocations (WLAs) approved by the Environmental Protection Agency (EPA).
2. Educate and involve residents, businesses, and stakeholder groups in achieving measurable water quality improvements.
3. Establish a reporting framework that will be used for annual reporting as required in the City's National Pollutant Discharge Elimination System (NPDES) MS4 Permit.
4. Identify necessary maintenance, adaptive management, staffing, and financial strategies to implement the WIP.

Baltimore: Existing Conditions and Challenges

The trash TMDL is only related to a portion of the City and Baltimore County, specifically the Middle Branch and the Northwest Branch of the Patapsco River. Therefore, the trash TMDL only affects the Gwynns Falls and Jones Falls watersheds, and a portion of the Baltimore Harbor watershed.

Unlike other pollutants regulated under existing TMDL programs which may have natural occurrences, trash is completely dependent on human population and subsequent behavior. The City is densely populated, with a large portion of rental or transient communities. The City is characterized by a high amount of impervious area (over 45%) with large public green space clustered along existing streams. The density of development, coupled with highly compacted clay soils increase runoff within the streets and streams, thereby increasing the potential to carry trash into the waterways. Vacant properties also attract illegal dumping within communities.

Many of the City's streams are conveyed through pipes, which, like much of the City's infrastructure, is over 60 years in age and failing. Additionally, the City is unable to manage and fund infrastructure improvements when approximately 14,000 City lots are vacant, and 19% of Baltimore households live below the poverty line.

Six Pillars of Practical Watershed Planning

In developing this plan, the City used EPA's "A – I criteria" for watershed assessments and MDE's *Guidance for Developing Stormwater Wasteload Allocation Implementation Plans for Trash / Debris Total Maximum Daily Loads* (MDE, 2014) to develop this Implementation Plan. Additionally, DPW developed the following "Six Pillars of Practical Watershed Planning" to guide the development of this Implementation Plan:

1. <u>Plan for more projects than you need</u>—Identify additional projects as a contingency for the original Implementation Plan. These additional projects may project structural practices to supplement the non-structural practices that have proven to be less effective than anticipated or were unable to be implemented due to resource limitations. The identification of additional projects can serve as an opportunity for engaging private partners in installation and/or funding.
2. <u>Plan for resources that will affect funding needs</u>—Many structural debris collection systems are not manufactured locally, so supply, transport and compatibility with existing storm drain systems will be a factor. Additionally, land acquisition and labor costs will be factored into the project selection.
3. <u>Plan to maintain</u> – No structural projects will be included in the Implementation Plan unless the resources to maintain the projects are also identified.

4. Plan to be part of a bigger picture – The schedule of implementation should incorporate other capital projects or public programs to effectively coordinate available resources and limit interruptions to the community. This pillar also applies to education and outreach strategies to avoid creating duplicitous or conflicting messaging and communications.
5. Plan for effective public participation – Education and outreach strategies should focus on meaningful engagement, so stakeholders can assist in the development of a trash reduction solution for the City's waterways. Effective public participation also means sustainable communication techniques.
6. Plan to adapt – Implementation Plans are not meant to remain on the shelf. These plans may be modified based on (a) Research and trends that may affect prioritization criteria; (b) Changes to regulations and legislation; and (c) Innovations in structural technologies.

Meeting our Goals

To meet the goal of 100% reduction of the WLA, the City will use a diverse approach throughout the City, including the following:

- Installing debris collection projects in-line and at the end of pipe to capture trash within public storm system;
- Employing a variety of operational programs, such as mechanical street sweeping, preventive inlet cleaning, and routine waterway cleaning; and
- Fostering partnerships to encourage litter reduction and increased recycling, coupled with an increase in environmental stewardship within the communities.

The City will employ a two-part, three-phase strategy to meet the WLA. The first part will employ projects and programs to capture trash as a stop gap measure. Project installation and program expansion will occur over a ten year period, with another 10 years of operations and data collection to validate trash loading rates. By FY 2035, the City expects to phase out some of the collection devices and decrease the level of program service.

The second part of the plan will be concurrent with the first, employing partnerships as a sustainable method for compliance with the trash TMDL. The initial 3-year phase will be to initiate education and outreach pilots, while creating and testing anti-litter campaigns. The pilot programs would be expanded over the next 6 years. After 10 years, the education and outreach programs would be modified based on data collected from surveys and collection data.

1 Introduction

On December 27, 2013, the Maryland Department of the Environment (MDE) reissued a National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit to the City of Baltimore. The MS4 Permit requires the City develop an implementation plan within one (1) year of the Trash TMDL's approval. Furthermore, the City's MS4 Permit requires the City to manage, implement, and enforce a stormwater management program in accordance with the Clean Water Act (CWA) and corresponding stormwater NPDES regulations, 40 CFR Part 122. The following conditions are required:

1. Effectively prohibit pollutants in stormwater discharges or other unauthorized discharges into the MS4 as necessary to comply with Maryland's receiving water quality standards;
2. Attain applicable waste load allocations (WLAs) for each established or approved Total Maximum Daily Load (TMDL) for each receiving water body, consistent with Title 33 of the U.S. Code (USC) §1342(p)(3)(B)(iii); 40 CFR §122.44(k)(2) and (3); and
3. Comply with all other provisions and requirements contained in this permit, and in plans and schedules developed in fulfillment of this permit.

On January 5, 2015, the United States Environmental Protection Agency (EPA) approved the report entitled "*Total Maximum Daily Loads (TMDL) of Trash and Debris for the Middle Branch and Northwest Branch Portions of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment, Baltimore City and County, Maryland*". TMDL is a regulatory term used in the U.S. Clean Water Act, describing a value of the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards. In this case, the pollutant in consideration is trash and debris.

The Trash TMDL is expressed as pounds of trash that must be captured, prevented from entering, or removed from the water body. While this TMDL includes upstream watersheds located in Baltimore County, the following Implementation Plan will be applicable only to those areas within Baltimore City. Compliance with the TMDL will also satisfy the narrative water quality standards for trash in Maryland. While this Implementation Plan includes measurable outcomes that meet both regulatory requirements and customer satisfaction expectations, it is not a plan to address the desire of zero trash in the waterway[1]. This Implementation Plan will, however, complement other waste reduction efforts in Baltimore City, including the Sustainability Plan; the Healthy Harbor Plan; and the Drive to 35% (Recycling) program.

Note that while the TMDL target area only covers a portion of the City, many of the Trash TMDL programs and partnerships are proposed for City-wide implementation and will benefit areas outside the TMDL watershed boundaries.

Baltimore City's Trash TMDL Implementation Plan is divided into ten (10) Sections and an Appendix:

1. Introduction –sets the stage for the Implementation Plan (IP) and outlines the various sections of the Plan.
2. Background –provides an overview of the TMDL, existing conditions, current initiatives, and other information that form the basis of decision-making.
3. Plans, Reports, and Surveys –summarizes the various plans, reports, and studies that were reviewed, analyzed, and referenced in making recommendations for the IP.
4. Current Trash Practices – trash collection and prevention practices being employed by DPW and others as of the writing of the IP.

[1] MDE, Trash TMDL, p. 37

5. Implementation Plan Development – includes an overview of the IP development schedule, gap analysis based on current practices, and methodologies that will be used to calculate Waste Load Allocation (WLA) reductions in Section 6.
6. Projects, Programs, and Partnerships – outlines the strategy for executing the Implementation Plan, with more detailed description of the various practices that will be implemented to meet the reduction goal.
7. Tracking and Reporting – includes the milestones schedule and other requirements for tracking progress of the IP.
8. Adaptive Management – the plan for evaluating and adjusting the implementation plan.
9. Financial Strategy – funding sources and strategies for financing the implementation and maintenance of the projects, programs, and partnerships.
10. Resources – list of resources, publications, and websites referenced.
11. Appendices – this section includes the Annual Trash TMDLs, Project Selection Criteria, and WLA Calculations.

2 Background

2.1 Regulatory Overview

MDE listed the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (PATMH) as impaired by trash and debris in 2008. Specifically, the listing was limited to the shoreline of the "Middle Branch from the mouth (Ferry Bar Park to the Harbor Hospital Center) extending westward and the Northwest Branch from the Hull Street Pier to Canton Waterfront Park" (MDE 2014). Subsequent trash monitoring studies were conducted by the City and Baltimore County in 2010 and 2011 to provide data for the Trash TMDL. The baseline loads and subsequent TMDL allocations are presented in the Final TMDL document (MDE 2014) and are split into two (2) types: 1) the Total Wasteload Allocation (WLA) from point sources, which includes any items small enough to have traveled through the storm sewer system; and 2) the Load Allocation (LA) from nonpoint sources, which includes larger items. There is also a 5% Margin of Safety (MOS) added to these values.

Point source baseline (WLA) loading rates for the City were established using the data collected between January and September 2011 at five (5) stormwater outfalls: two (2) within the Jones Falls watershed and three (3) within the Gwynns Falls watershed. No stations were sampled within the Baltimore Harbor watershed due to several factors, including: lack of accessibility, very high wet weather flow rates, and the limitation of significant sub-watershed sizes. The trash sampling data was normalized by inches of precipitation, based on the strong correlation between trash in the waterways and rainfall. Due to the limited number of stations and the overwhelmingly dominant type of land use (urban), MDE decided to combine data from all sites to produce a single urban land use loading rate for the City. Therefore, the urban land use loading rate is used for all acreage in the City, excluding the forested areas of Gwynns Falls and Jones Falls (which use Baltimore County's forest land use loading rate).

In establishing the non-point source baseline (LA) loading rate, only items that are considered too large to enter the stormwater system through street-level storm drains were counted. It is generally assumed that these larger items are intentionally and illegally dumped into the watershed. While it is understood that smaller items enter the storm sewer via street level storm drains and are transferred to the impaired shoreline, it is not as clear how larger dumped items are transported. While dumping is generally considered a land based problem, larger debris has the potential to be transferred into the stream system by rainfall or other means. Therefore, for the purpose of this TMDL, all nonpoint source loads, whether in Baltimore City or Baltimore County, have the same loading rate.

TMDLs quantify the pollutant load that can enter a water body during a specific length of time while ensuring the attainment and maintenance of water quality standards. Unlike other TMDLs, the Trash TMDL expresses the quantity of trash that must be removed, captured, or prevented from entering the water. The annual and daily baseline loads assigned for the City are shown in Table 1. The baseline loads were calculated as an average (because of high seasonal and annual variability) of the measured or estimated removal rate. Only the WLAs assigned to the City's MS4 permit will be used to determine the reduction goal for compliance with the TMDL, and therefore the City's MS4 permit. This amount does not include sources excluded from the City's MS4 permit, such as industrial permitted facilities and other private properties that are covered by existing stormwater permits. Additionally, any upstream practices that were already in place (e.g. street sweeping, volunteer clean-ups, trash nets, etc.) during the trash monitoring studies are inherently captured in this baseline rate. Therefore, the TMDL value to be removed is in addition to trash already being removed as of September 2011 (last date of the City's trash monitoring study).

The TMDL is composed of the sum of individual WLAs for point sources and LAs for nonpoint sources. In addition, the TMDL must include a Margin of Safety (MOS), implicitly or explicitly, to account for any uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody (WLA + LA + MOS).

(Appendix A). Under its MS4 Permit, the City is responsible for the WLA + (some percentage of the MOS)[2]. However, DPW anticipates that the practices identified in this document will also help to reduce loading from non-point sources, such as illegal dumping.

Table 1: Summary of Baseline Loads and TMDL for the City of Baltimore

Watershed	Annual WLA (lbs/yr)	Annual TMDL (lb / yr removed)	Daily WLA (lb / day)	Daily TMDL (lbs/day removed)
Baltimore Harbor	42,869.4	45,012.9	117.4	123.3
Gwynns Falls	93,519.3	98,195.3	256.2	269.0
Jones Falls	81,107.0	85,162.4	222.2	233.3
Total City	**217,495.7**	**228,370.6**	**595.8**	**625.6**

Note: TMDL = WLA x 5% (MOS)

2.2 Watershed Description

The PATMH is a tidal estuary, or embayment, located on the western shore of the Chesapeake Bay. The total watershed draining to PATMH covers 1,514 square kilometers (km2), or 374,040 acres, and spans Baltimore City, Carroll, Howard, Anne Arundel, and Baltimore Counties. Only two specific segments within the PATMH are listed as impaired for trash – the Middle Branch and the Northwest Branch. The TMDL assumed that the source of the trash causing the impairment was primarily generated in the upland watershed draining to the tidal shoreline of the Middle Branch and Northwest Branch. Therefore, the spatial extent of the TMDL included all areas directly draining to the impaired shoreline. This spatial extent included three Maryland 8-digit watersheds: Gwynns Falls, Jones Falls, and a portion of Baltimore Harbor. The 8-digit watersheds are shown in Figure 1. The spatial extent of the TMDL (TMDL boundary area) is shown in Figure 2. Approximately 60% of the entire area of Baltimore City is included in the Trash TMDL.

Although the impaired area receives drainage from both the City and Baltimore County, this Implementation Plan will only address those areas within Baltimore City. While the entire drainage area for the Baltimore Harbor watershed is within in the City, only 31.5% of the Gwynns Falls watershed (approximately 13,230 acres) and 67% of the Jones Falls watershed (approximately 24,790 acres) are located in Baltimore City[3]. All three watersheds are highly urbanized with a mixture of dense residential, commercial, institutions, and parks. Eleven percent (11%) of the Gwynns Falls watershed and 9% of the Jones Falls watershed are forested.

The Middle Branch of the PATMH drains a small amount of the Baltimore Harbor Watershed, with the majority of the drainage to the Middle Branch from the Gwynns Falls watershed, which includes the sub-watershed WS 263. The area surrounding the Middle Branch is primarily active or remnant industrial areas, including Carroll-Camden, Spring Garden and Westport, with very little land access to the water. Middle Branch Park provides the most access to the water, along with Swann Park and the Gwynns Falls Trail. Baltimore's major sports stadiums and the Casino are also located adjacent to the Middle Branch.

The shoreline of the Middle Branch tends to be naturalized and irregular, with vegetation, open shore, wetlands, and riprap. Similarly, where the Gwynns Falls meets the Middle Branch is a wide and has no outfall structure, unlike where the Jones Falls meets the Inner Harbor. The depth of the Middle Branch varies in depth from 1 to

[2] MS4 Permit, Part III, MDE, 2013 and Trash TMDL, MDE, 2015, p. 39
[3] Watershed Assessment, PB 2010

15 feet. In particular, the area north of the trestle bridge, known as Ridgely's Cove, is the shallowest part of the Middle Branch, with mudflats due to sedimentation. This can make cleaning the area difficult, since the City's harbor skimmers require at least 4 feet of draft, and therefore cannot effectively maneuver in shallow areas.

Additionally, the weak and variable tidal currents of the Middle Branch are generally not sufficient enough to move floatable trash into the main branch of the Patapsco River. Instead, trash accumulates on shorelines and wetlands, causing environmental damage and detracting from the aesthetics of the area.[4] The natural shoreline and coves tend to capture the trash, where it accumulates over time.

The Northwest Branch of the PATMH is the location of Baltimore City's Inner Harbor and Canton waterfront. It drains from the Baltimore Harbor Watershed, in particular the area known as the Harris Creek Watershed (WS 246), which extends as far north as Clifton Park. The remaining drainage is from the Jones Falls Watershed. The area surrounding the Northwest Branch includes some of the City's most built-up areas, such as the Downtown and Inner Harbor East, as well as waterfront residential and commercial. Unlike the Middle Branch, the Northwest Branch of the Patapsco is very accessible, with a waterfront promenade along most of the edge. Also unlike the Middle Branch, the shoreline of the Northwest Branch is primarily bulkheaded, with few areas of natural shoreline.

[4] Middle Branch of the Patapsco River, Trash Management Plan. Coastal Estuarine Hydrology & Hydraulics Engineers (2007)

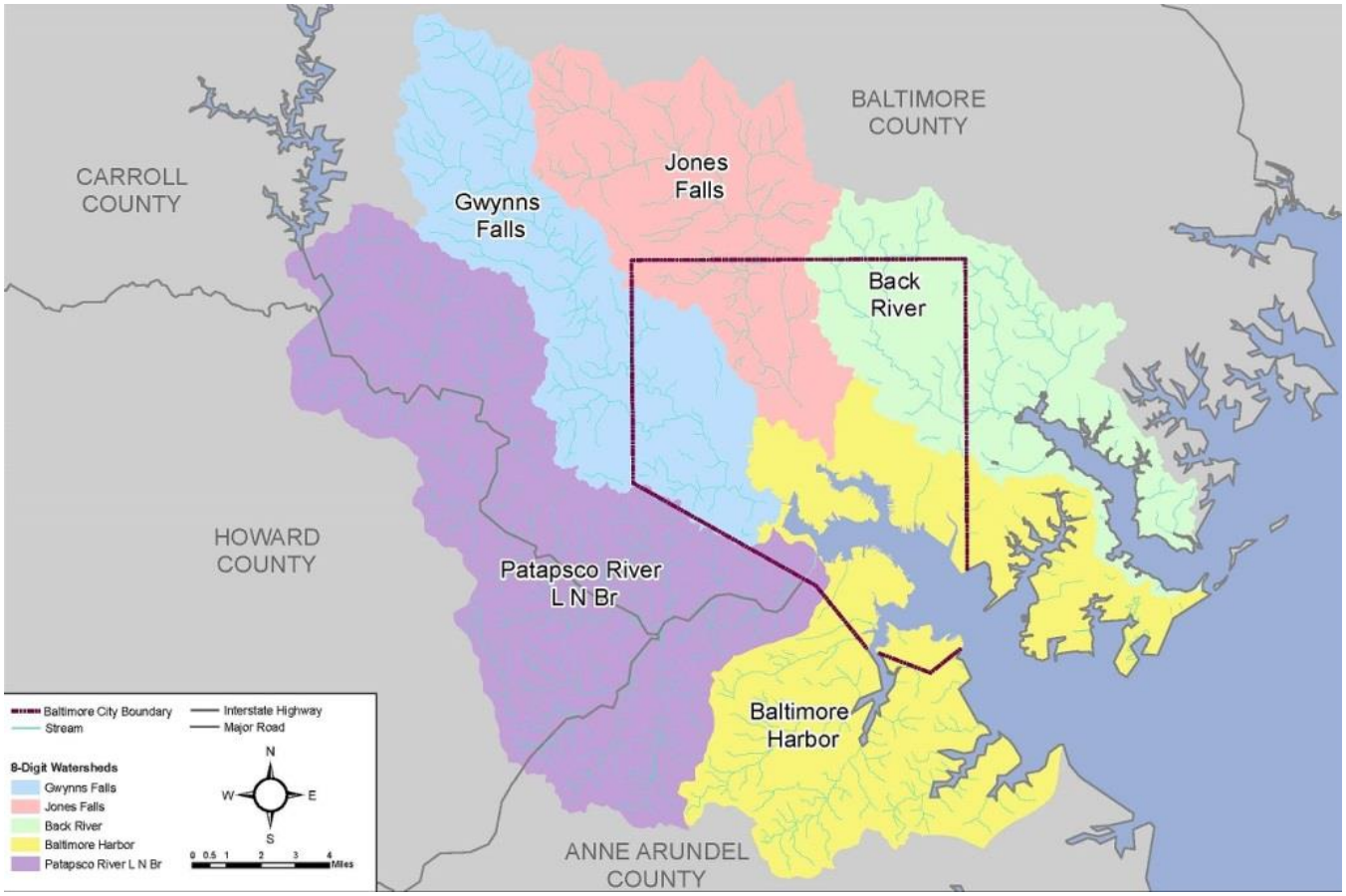

Figure 1*: 8-digit Watersheds (Source: Watershed Needs Assessment)*

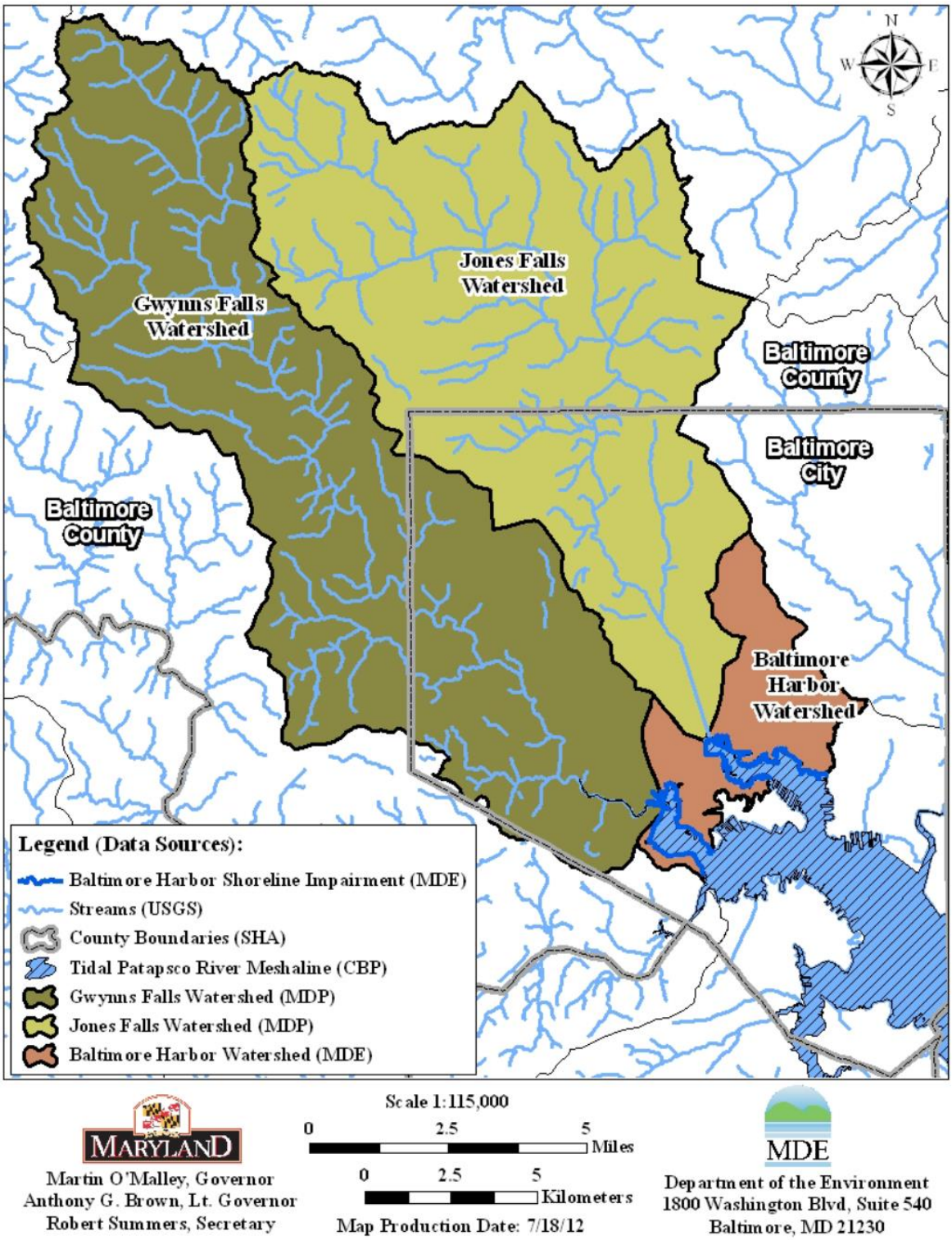

Figure 2*: TMDL Boundary Area (Source: MDE 2014)*

2.3 Existing Conditions

Trash is not a naturally occurring pollutant; it is the result of human behavior. Understanding Baltimore's neighborhood structure, population trends and homeownership, and infrastructure (man-made and natural) are important in the development of the Implementation Plan and the targeting of specific practices and locations.

2.3.1 Neighborhoods

Baltimore is known as a city of neighborhoods. Currently, there are about 245 neighborhoods throughout the city, some only a few blocks in size while others have tens of thousands of residents.[5] Baltimore's neighborhoods have been aggregated into Community Statistical Areas (CSAs) as a way to easily collect and track data. The Baltimore Neighborhood Indicators Alliance (BNIA) has identified 55 CSAs using clusters of Census Tracts that correspond to Baltimore's neighborhoods boundaries (Figure 3). Forty-two of the CSAs are located totally or partially in the TMDL area. For the purposes of this Implementation Plan, both the CSAs, as well as neighborhoods, will be referenced for targeting practices.[6]

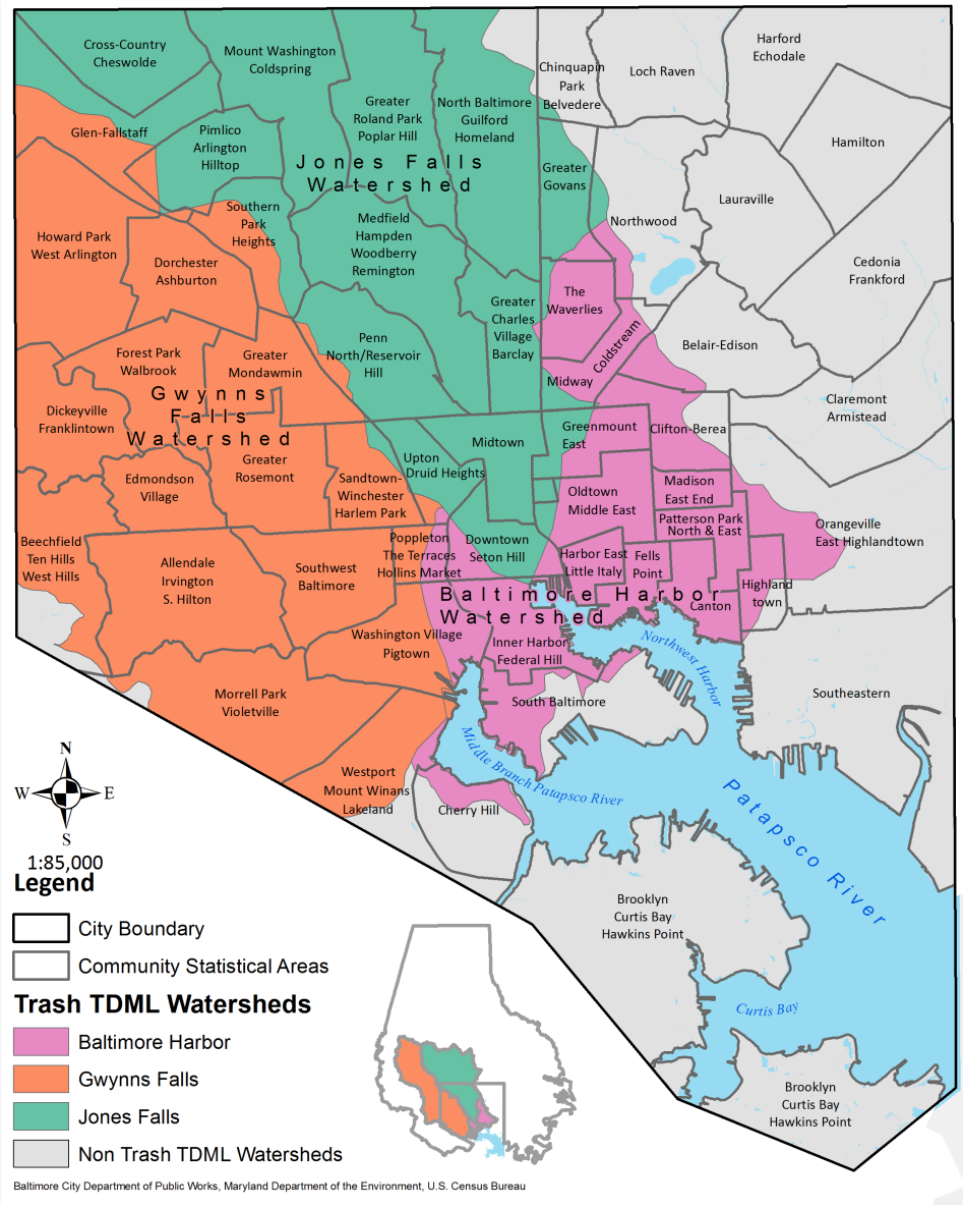

Figure 3: Map of CSA (BNIA, 2012)

[5] http://livebaltimore.com/neighborhoods/
[6] BNIA's Vital Signs 12 report, mapped according to the Community Statistical Areas.

2.3.2 Land Use

The City was founded and first populated along its harbor and the Jones Falls. As the city grew, it expanded outward and uphill, with industry filling in along the waterfront and the Jones Falls and Gwynns Falls stream valleys.

This pattern of growth and development is still evident today (Figure 4). The downtown (dark red and magenta) surrounds the Inner Harbor. Dense rowhouse neighborhoods (bright yellow) surround the downtown, extending to the northwest in Park Heights, to the north along the east side of York Road, and in Brooklyn/Curtis Bay and Cherry Hill in south Baltimore. Further out, less dense rowhouses and single family houses (pale yellow) can be found, including neighborhoods like Roland Park, Homeland, Mt. Washington, Hamilton, and Ten Hills.

Industrial areas (purple) are typically clustered around the outer harbor, the lower Gwynns Falls and Middle Branch areas in the southwest, and in east Baltimore near the Back River. Commercial corridors follow the arterial roads extending outward from the central downtown.

Several parks (green) are located along or adjacent to streams, including Leakin Park and Carroll Park (Gwynns Falls) and Druid Hill Park, Cylburn, and Stony Run (Jones Falls). The Middle Branch Park borders the Direct Harbor and mouth of the Lower North Branch of the Patapsco.

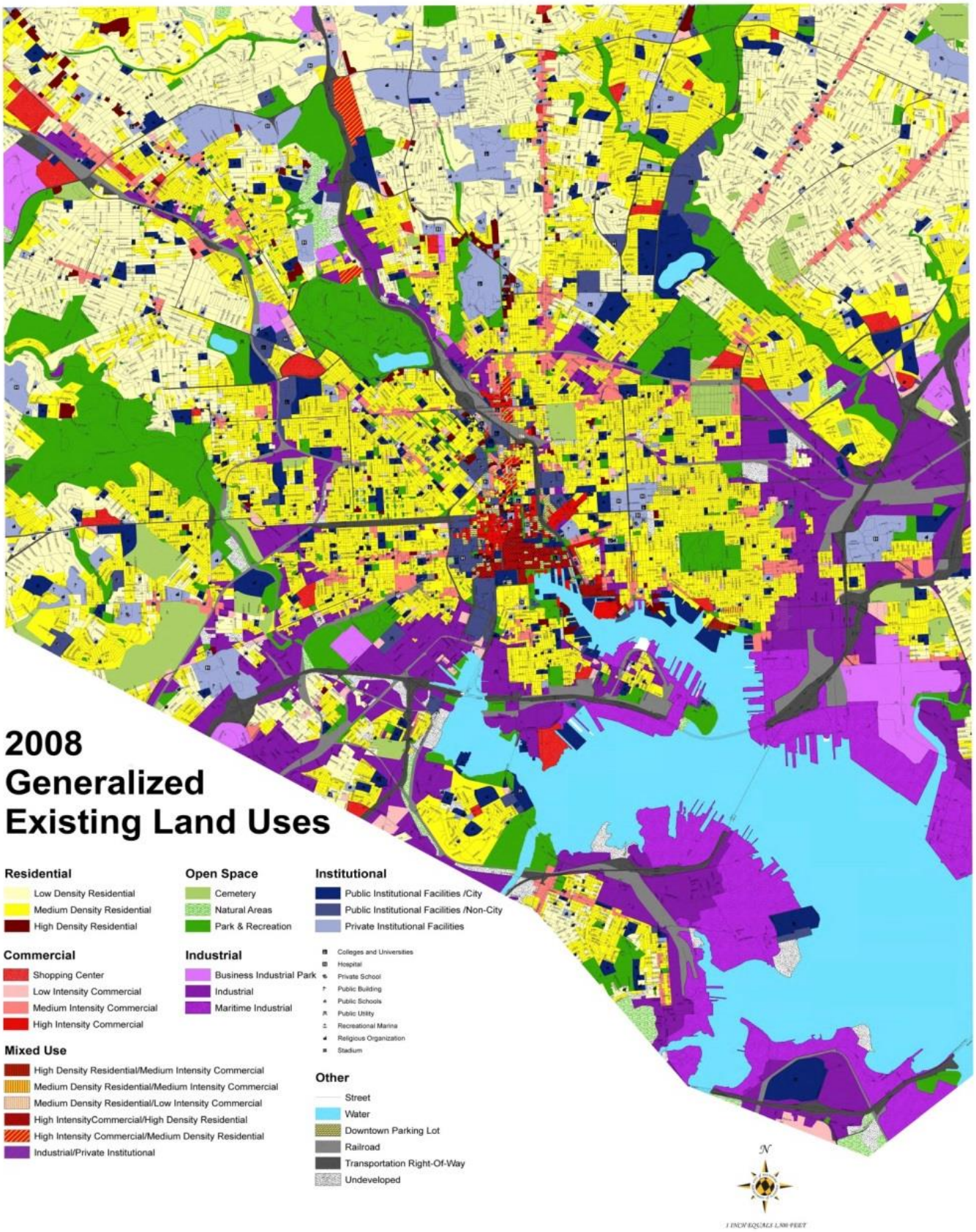

Figure 4: Map of Existing Land Use (Department of Planning, 2008)

2.3.3 Population Trends and Home Ownership

Baltimore is the largest city by population in Maryland and the fourth largest jurisdiction. In 2013, the population was estimated at 622,104[7], an increase of 1,143 people (0.2%) from 2010 census. African-Americans make up 63.3% of the population, followed by Caucasian (non-Hispanic) 28.3%, then Hispanic or Latino 4.6%. Hispanic and Latino residents are the fastest growing demographic.

In 2012, the rate of homeownership in Baltimore was 58%, with several neighborhoods in the TMDL Boundary Area having the lowest homeownership rates. The transient nature of renters often contributes to higher trash loadings due to insufficient education on proper trash disposal, lack of trash cans, or lack of space to properly maintain trash.

Additionally, it is estimated by Baltimore Housing that there are approximately 16,000 vacant buildings and 14,000 vacant lots in the City, with the highest concentration of vacant properties within the TMDL boundary (Figure 5). Vacant properties often are locations for illegal dumping of trash and larger debris, including contractors and unlicensed private haulers who do not want to pay a tipping fee to dump at a legal collection point.

2.3.4 Transportation Infrastructure

Buildings, parking lots, streets, and sidewalks in Baltimore City represent about 24,479 acres of impervious surface, with about 35% of this located within the public right-of-way. This includes:

- 2,000 miles of roadways
- 3,600 miles of sidewalks, curbing, and gutters
- 456 miles of alleys

The stormwater runoff from these impervious surfaces often washes litter and debris into the stormdrain system, especially in areas that have problems with litter and trash. In 2012, the rate of reported dirty streets and alleys (based on 3-1-1 Service Requests) increased from 65.3 per 1,000 residents to 70.5 per 1,000 residents. The areas reporting the most service requests for clogged storm drains coincide with the dirty street and alley map (Figure 6). These areas are predominantly within the TMDL boundary.

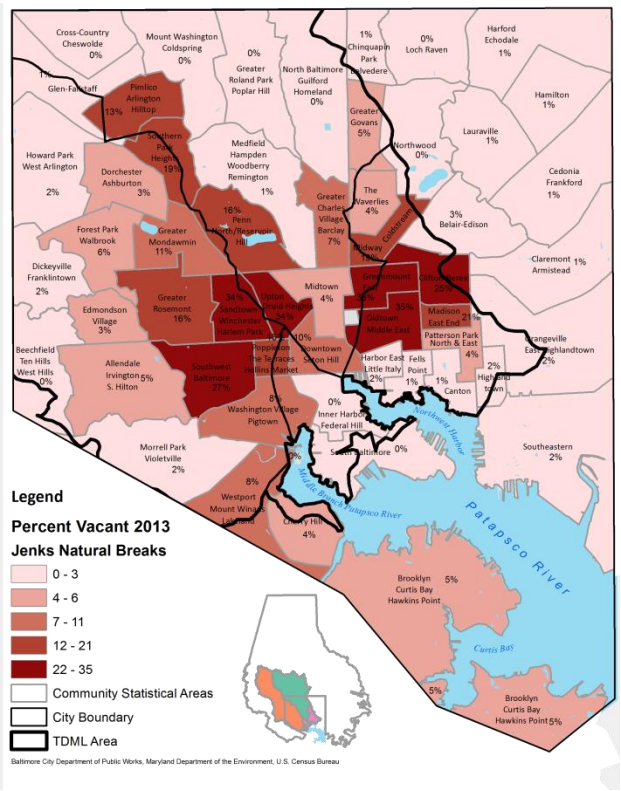

Figure 5: Map of Vacant Lots (BNIA, 2013)

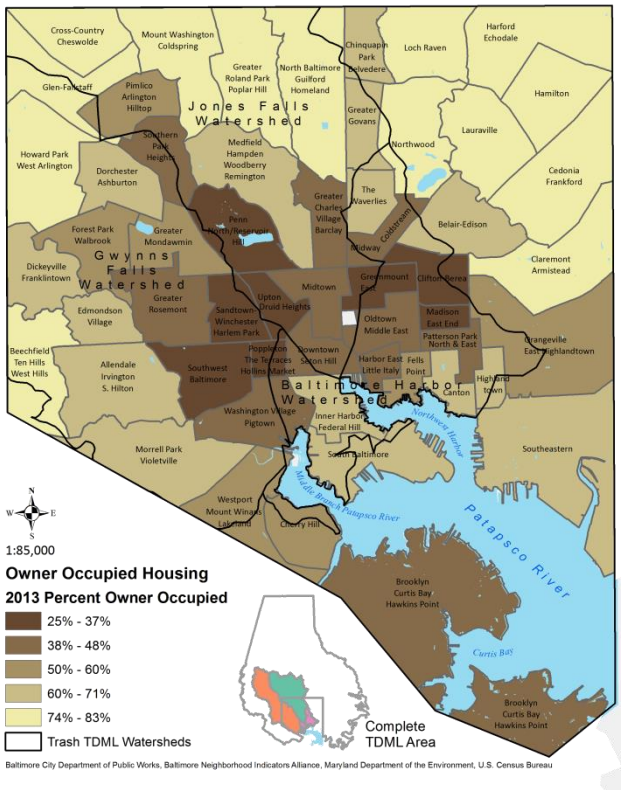

Figure 6: Map of Dirty Streets (BNIA, 2013)

[7] http://quickfacts.census.gov/qfd/states/24/24510.html

2.3.5 Streams

The City has about 116 miles of streams, the primary ones being the Jones Falls, Herring Run, and Gwynns Falls. About 66 miles of stream are located within the TMDL Boundary. Many of the streams are located within public parks, which increase the potential for public dumping. The flashy streams (streams that carry large volumes of water for short periods of times during storm events) also create the potential for trash that is transported during a storm to remain within the flood plain, as shown in Figure 7.

Figure 7: Examples of trash along coastlines streams and streams

Approximately 18.9 miles of coastline are located within TMDL boundary. This coastline is a mixture of public and private land, often stabilized by structural bulkheads. Like the streams, coastlines provide an opportunity for illegal dumping of large items (bulk trash, tires, auto parts, etc.) and contributions to the LA of the TMDL.

2.3.6 Drainage Infrastructure

2.3.6.1 Inlet Structures

The existing drainage infrastructure provides several opportunities for trash and litter to enter the streams. Approximately 34,700 inlets are located within the TMDL Boundary. There are two predominant inlet types: (1) curb and (2) grate. Curb inlets have a wide opening along the face of the curb. Grate inlets have an opening that is flush with the pavement and a set of steel bars that prevent large trash from entering into the inlet. Combination inlets have both curb and grate inlets located at the same location. The type and size of the inlet determines the type of practice that can be installed to capture trash at the street level.

The majority of these inlets were installed prior to 1950; about 5% of the inlets are undersized and no longer in accordance with the City's construction standards. Therefore, these inlets would not be suitable for the installation of trash collection practices. Additionally, the outflow pipes are flush with the floor of many inlet structures, prohibiting the use of trash collection devices within the inlet structure which require a sump condition (6 to 12 inches between the floor and the outflow pipe).

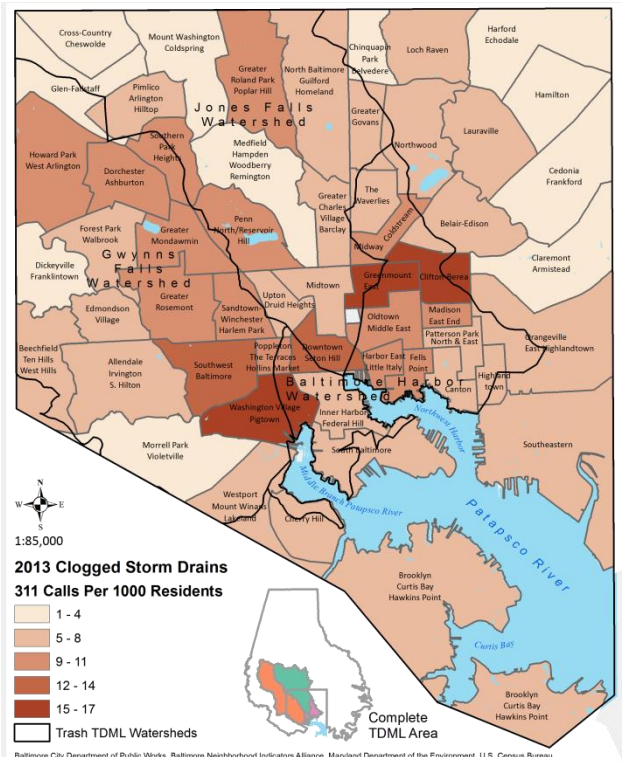

Figure 8: Map of Clogged Storm Drains (BNIA, 2012)

These conditions are highlighted in the 2014 study for the modified inlet project, in which only 38% of the inlets surveyed could be fitted with either an inlet screen or a catch basin insert.

Flooding within a roadway creates both traffic delays and potential property damage. Roadway flooding is dependent on the intensity of a storm (amount of water entering the street within a certain timeframe); the spacing/ location of storm inlets; the size of the storm inlets; and any obstructions (trash and debris) which may block the water from entering the storm inlets. The rate of clogged inlet service requests (Figure 8) is similar in pattern to the rate of dirty streets and alleys.

2.3.6.2 Pipes

Approximately 816 miles of storm drain pipes are located within the TMDL boundary. The pipe sizes range from 15 inches to 120 inches. The size of trash that may travel within the pipe is limited by the size of the inlet structures; however, some pipes connect streams so larger debris (full trash bags, auto parts, or empty refrigerators) may be transported through the pipes during heavy rain storms. Some of the pipes also carry historic streams, so base flow exists even during dry weather. The location, depth and size of pipes and the associated manholes determines the type of practice that can be installed to capture trash within the storm drain pipe system.

2.3.6.3 Outfalls

Approximately 1,135 of the storm drain outfall structures are located within the TMDL boundary. Outfall structures are the stabilized ending of a storm drain pipe and represent the location where any waste load actually enters the stream or waterway from the corresponding drainage area. Some of the outfall structures are located along the coastline of the Harbor and are subject to tidal influences, meaning that trash could be carried up into the pipe during high tide. The location and size of an outfall structure, plus vicinity to tidal waters, determines the type of practice that can be installed to capture trash at the end of the storm drain pipe system. A summary of the outfalls within the TMDL Boundary are shown in Table 2.

Table 2: Summary of Outfalls within TMDL Boundary

Watershed	Tidal	Non-Tidal	Total
Baltimore Harbor	112	0	112
Gwynns Falls	9	478	487
Jones Falls	20	516	536
Total	141	994	1,135

2.3.6.4 Floatable Trash Hot spots

The "trash" that is defined in the TMDL includes items that are not only small enough to fit into and pass through the City's storm drain system, but tend to float – plastic bottles, polystyrene containers, and plastic grocery bags are the primary culprits. In the 2007 Middle Branch Trash Management Plan, a visual inspection of 46 sampling locations found that bottles accounted for approximately 53% of the observed trash, Styrofoam for 34%, and wrappers/bags for 13%.[8] Similar results were documented by the Jones Falls Water Wheel: between May 2014 and July 2015, plastic bottles accounted for 27% of the items collected, polystyrene containers 35%, and grocery bags 14%.[9]

Floatable trash is not only carried into streams and the harbor by rain events, but also tends to accumulate in certain locations. These "hot spots" are caused by a variety of conditions – proximity to outfalls, stream dynamics, tidal conditions, shoreline vegetation and other obstructions. Figure 8 is a map from 2007 that shows density of trash along the shoreline in the Middle Branch – with red being the most trash and blue the least.

In the Spring 2015, DPW identified 12 trash hot spots along the Gwynns Falls and Jones Falls streams, as well as tributaries of these waterbodies (Figure 9). Of the locations identified, only one was noted for illegal dumping; the other locations had accumulations of bottles, Styrofoam containers, and plastic bags.

Figure 7: Trash Hot Spot; North Hilton and Edmondson

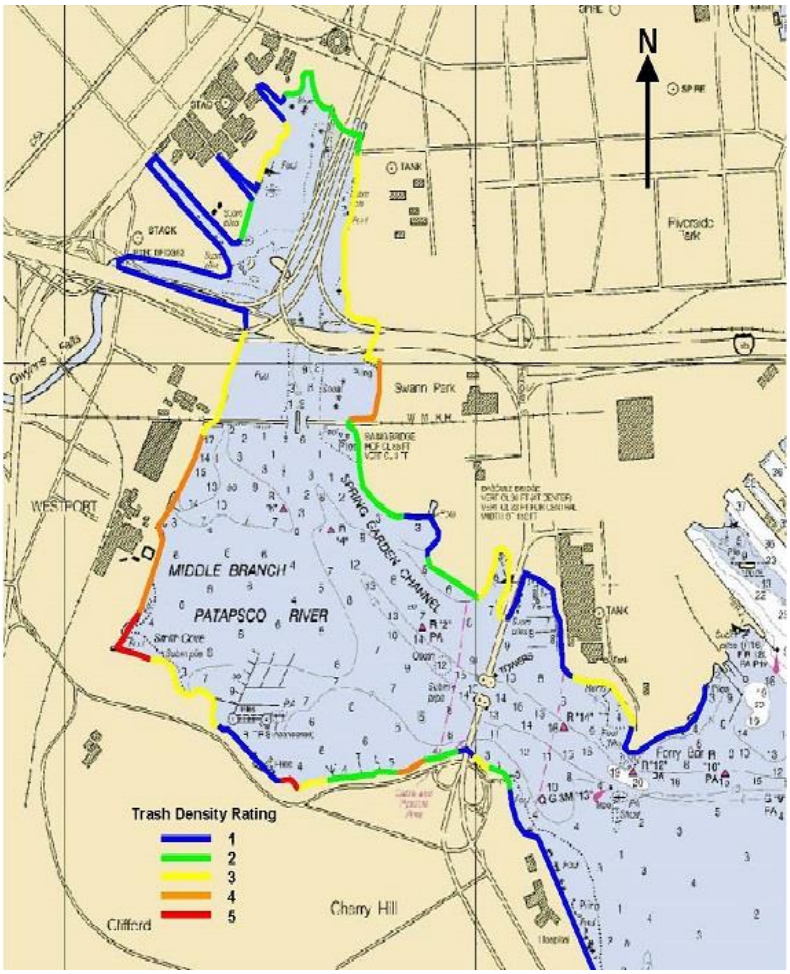

Figure 8: Trash Density Study of the Middle Branch (2007)

[8] Middle Branch Trash Management Plan p. 56

[9] Data from http://baltimorewaterfront.com/healthy-harbor/water-wheel/. The percentages do not include cigarette butts.

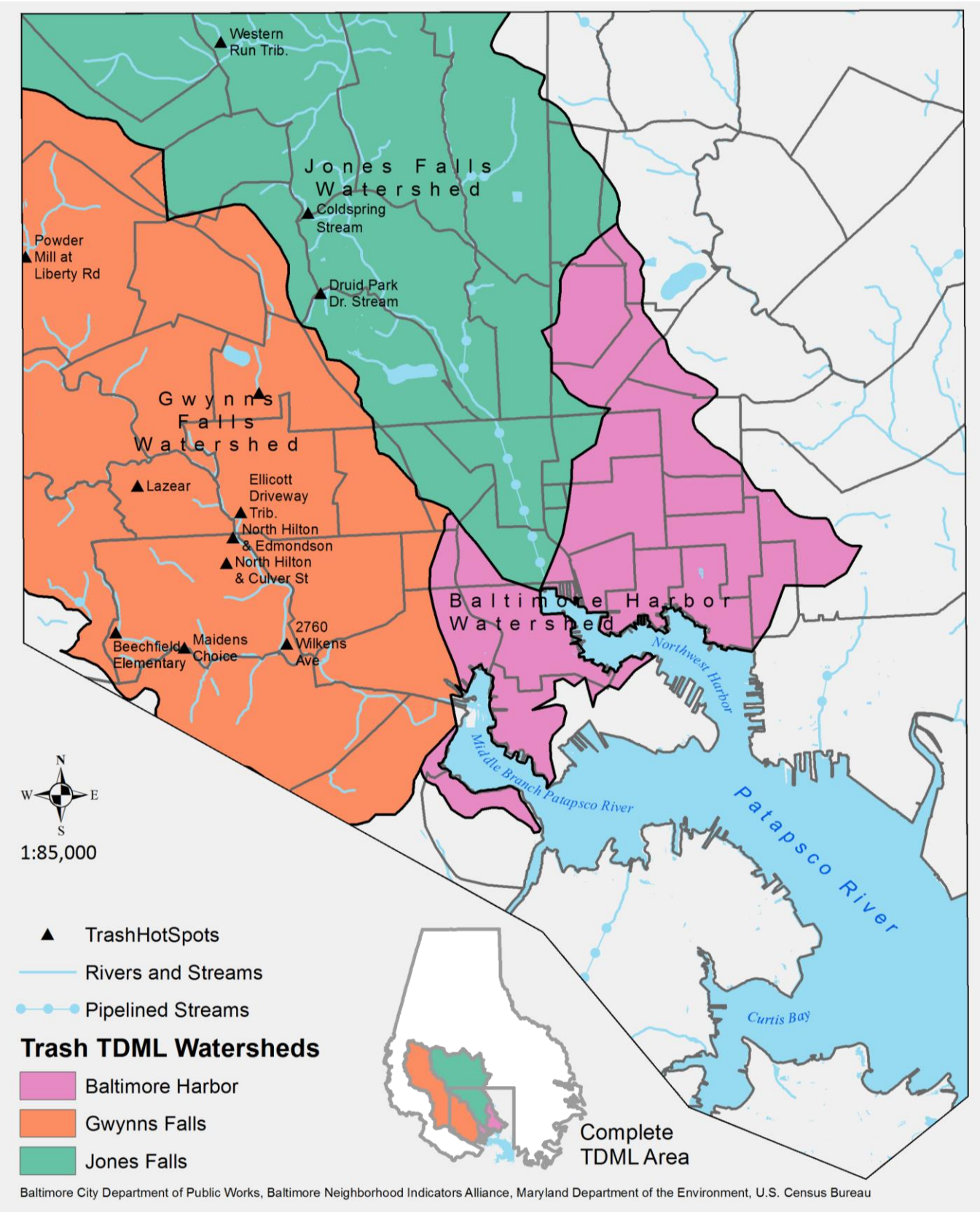

Figure 9: Stream Trash Hot Spots

2.4 Baltimore City Agencies

Executing and maintaining the elements of this Implementation Plan requires a collaborative effort among city agencies, local non-profits, community partners, and the private sector. This collaboration will focus on the planning, design, construction, implementation, and maintenance of projects and programs.

2.4.1 Department of Public Works

The Department of Public Works (DPW) is primarily responsible for the planning, implementation, maintenance, monitoring, and reporting related to the Trash TMDL. An organization chart of the DPW is shown in Figure 10. Further descriptions of the functions of DPW offices / divisions, related to the Trash TMDL, are as follows:

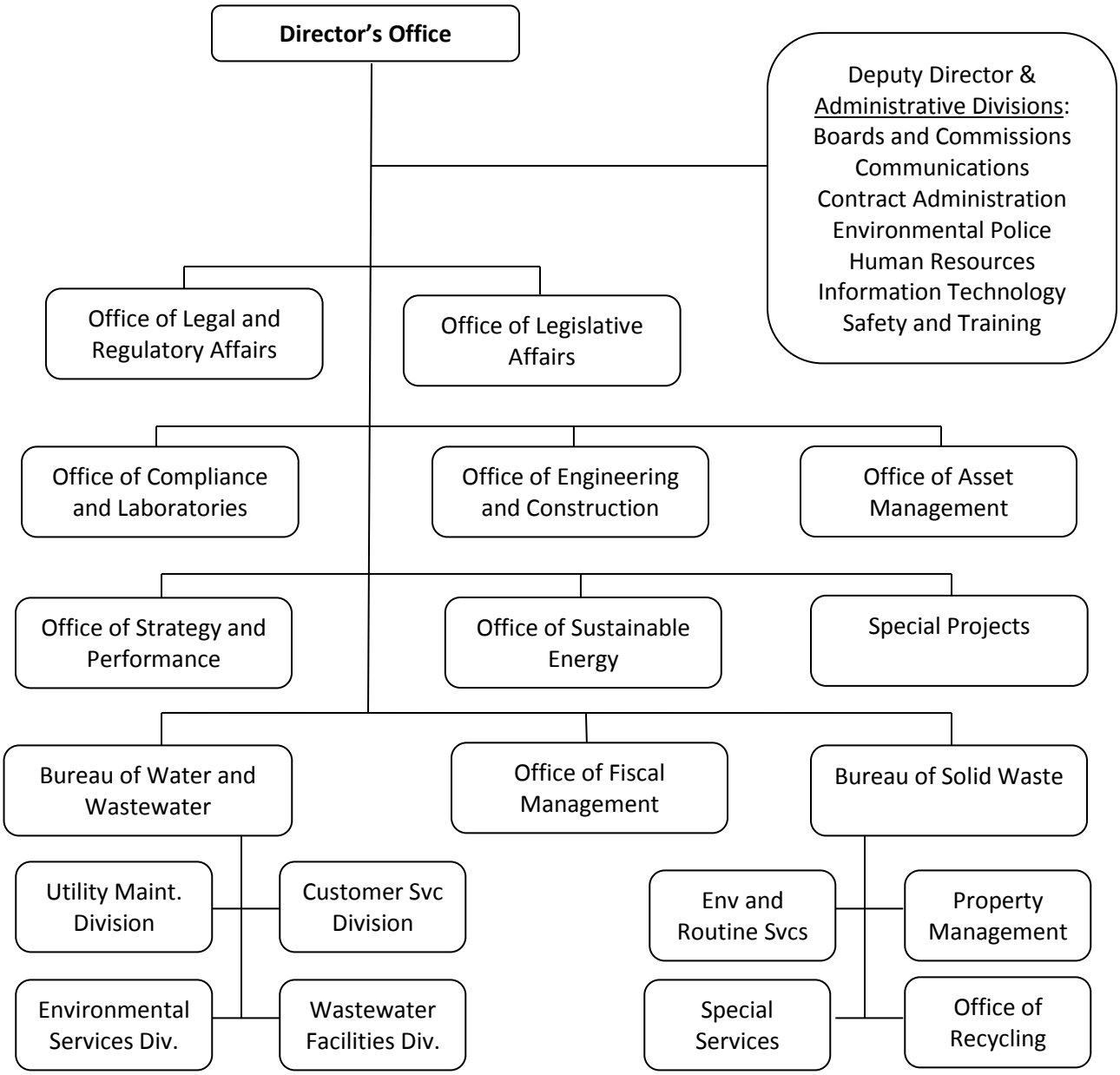

Figure 10: Organization Chart for Department of Public Works

Director of Public Works

- Final approval of proposed policy, financial planning, rate structure and budget recommendations related to DPW to be submitted to the Mayor and / or City Council for adoption
- Final approval of proposed Trash TMDL Implementation Plan other deliverables to be submitted to MDE for review and agreement
- Co-chair of the Healthy Harbor Steering Committee (with Waterfront Partnership of Baltimore) and the Growing Green Initiative (with the Department of Planning)
- Oversight of Communications and Community Affairs Office for outreach and education materials, including the management of the Cleanwaterbaltimore.org website

Office of Legal and Regulatory Affairs

- Oversees regulatory communications for the Trash TMDL
- Provides general policy guidance to implement the Trash TMDL
- Offers legal counsel on Trash TMDL obligations in coordination with the Law Department
- Reviews disclosure of records and response to public comments to ensure transparency throughout the TMDL implementation process

Office of Legislative Affairs

- Assists in shaping Department policy and programs, including trash and litter reduction strategies.
- Helps communicate the goals of the Trash TMDL Implementation Plan to legislators and policy framers.
- Serves as a liaison between the Department and other City agencies, elected officials, professional organizations, NGOs and community organizations, using these relationships to disseminate information about the Department's services and plans for trash reduction. Responds to trash-related and other issues, concerns, and questions raised by these individuals and groups.
- Directs and conducts the review, analysis and research of federal, State and local legislation, regulations and policies affecting Department services and responsibilities and implement legislative changes when needed.

Office of Compliance and Laboratories

- Point of contact for the Trash TMDL Implementation Plan
- Implementation Plan development and annual reporting for the MS4 permit
- Partnership coordination for grant funding, community engagement, education content, including the MD Stormwater Participation Events credit program
- Surface water quality monitoring - sampling and analysis

Office of Engineering and Construction

- Project delivery of proposed capital improvement projects
- Development of design standards and specifications for debris collection systems, as used in the City's capital projects
- Coordination of City and other utility capital improvement projects to neighborhood disturbance for the installation of debris collection projects
- Infrastructure inventory and condition assessment program

Office of Asset Management

- Maintenance of GIS information related to the public storm drain system and debris collection assets.

Office of Sustainable Energy

- Evaluation of existing and proposed projects and programs to reduce fuel and energy consumption
- Partnership coordination for grant funding, community engagement, education content, relating energy reduction with other environmental initiatives

Bureau of Water and Wastewater / Utility Maintenance Division

- Immediate response to repair and replace infrastructure as it relates to flooding and inlet cleaning
- Preventive inlet cleaning program
- Routine waterway maintenance and large debris collection system program

Office of Strategy and Performance

- Development of DPW's strategic plan to improve services which will support the Trash TMDL
- Facilitator of the Stormwater Advisory Committee

Bureau of Water and Wastewater/ Customer Service Division

- Assessment and collection of charges for water, wastewater and stormwater. Portions of the revenue from these billings provide funding for the operation and capital projects to support the Trash TMDL Implementation Plan

Bureau of Solid Waste / Environmental and Routine Services Division

- Collection of mixed refuse and recycling from residential properties, except in Downtown sector
- Management of the Pitch-In Program and the regular roll-off container operation
- Technical support for trash collection routing
- Operation of the eight citizen convenience centers
- Daily service of corner baskets
- Operation of mechanical street sweeping operations

Bureau of Solid Waste / Special Services Division

- Collection of mixed refuse and recyclables from the Downtown sector
- Collection of mixed refuse and recyclables from condominiums, public buildings, some businesses, and markets
- Operation of skimmer boats, booms, and bass boats for floatable debris collection in the Inner Harbor
- Management of the bulk trash collections
- Maintenance of city streets, footways, and alleys
- Management of special events collections

Bureau of Solid Waste / Property Management Division

- Cleaning and boarding of vacant buildings throughout the City, in coordination with DHCD
- Cleaning and mowing unsightly, vacant yards and lots

- Management of the City's rat eradication effort

Bureau of Solid Waste / Office of Recycling

- Management the City's recycling program
- Promotion and marketing of programs to maximize residential and commercial participation
- Evaluation of outreach programs
- Monitoring of recycling markets and trends

Office of Communications and Community Affairs

- Holding public information meetings for specific projects and/or initiatives
- Attending regularly scheduled community/neighborhood meetings
- Posting flyers door to door in targeted residential areas or noted problem areas
- Distributes informational material at places of worship, libraries, schools, neighborhood events, association meetings and business districts
- Organizes and participates in neighborhood and Mayoral clean-ups
- Conducts outreach and presentations to Baltimore City Public School students
- Facilitates walkthroughs to address solid waste issues (ie: dumping, rat abatement, clogged drains, etc)
- Works closely with engineering divisions on water and sewer construction projects and present the construction details during public meetings.
- Provides outreach via media and social media, including the Department of Public Works Facebook, Twitter, and Nextdoor accounts.
- Organizes and participates in DPW related events (ie: Dam Jam, Reservoir Day, Big Truck Day, etc)

2.4.2 Other City Agencies, Boards, and Commissions

Other City agencies will contribute to the projects, programs, and partnerships of the Implementation Plan. These agencies and their responsibilities include:

Department of Housing and Community Development (DHCD)

- Initial point of contact for service requests related to vacant property maintenance
- Authority to issue citations for violation of sanitation laws
- Distributes educational materials that outline the waste collection services provided by the City
- Management of the Vacants to Value Program

Department of Health

- Monitors the City's solid waste management system.
- Operates dead animal disposal program and nuisance pest control.
- Issues citations for excessive animal waste.

Department of Recreation and Parks

- Offers outdoor recreation programs in the Middle Branch and Inner Harbor, including canoeing, kayaking, boating and sailing.

Environmental Control Board (ECB)

- Establishes procedures for the issuance and enforcement of environmental citations for violations under the ECB's jurisdiction, procedures for the adjudication of these violations, and offers hearings for citations for failure to abate an order.
- Establishes the form and wording of environmental citations.
- Trains code enforcement personnel.
- Provides for qualified attorneys to act as Administrative Hearing Officers to conduct hearings on contested environmental citations.
- Prepares packets of evidence and transcripts of each appeal from the Administrative Hearing Officer's decisions to forward to a three Board member panel for review; then the panel makes recommendations to the full Board on the disposition of each appeal. The full Board votes on the appeal for the final decision from the ECB.
- Oversees a default process for nonpayment of fines for citations issued.

Baltimore Office of Sustainability (part of the Department of Planning)

- Partner in Clean Corps.
- Staffs the Commission on Sustainability, which:
  - Oversees the implementation of the Baltimore City Sustainability Plan.
  - Sponsored a Waste Work Group that focused on litter and trash reduction between 2014-2015

2.5 Non-Profit / Partner Organizations

Third party cooperating agencies and organizations are pivotal in achieving TMDL compliance. These entities (listed in alphabetical order) have technical expertise, resources, and organization structures that facilitate effective implementation of practices to address trash reduction.

Alliance for the Chesapeake Bay educates, trains, and advises all those with an interest in the health of the Chesapeake Bay. The Alliance sponsors conferences, organizes on-the-ground clean-ups and projects, and educates the public on restoration and pollution prevention, specifically Project Clean Stream.

Baltimore Community Foundation provides support to many of the City's sustainability efforts, including the Healthy Harbor Trash Work Group and the Sustainability Waste Work Group.

Baltimore Trash Talk is a grassroots initiative to reduce trash using social media, marketing + promotion, and events, like the 5 cent exchange program.

Blue Water Baltimore (BWB) uses community-based restoration, education, and advocacy to achieve clean water in Baltimore's rivers, streams, and harbor, so that citizens of the Baltimore region will enjoy a vibrant natural environment, livable neighborhoods, and a healthy, thriving Inner Harbor and Chesapeake Bay. BWB has several programs which focus on reducing trash, including Adopt-a-Stream, Project Clean Stream, and Storm Drain Art. They also organize other community events and Canoe n' Scoops during the year.

National Aquarium is a nonprofit aquatic education and conservation organization whose mission is to inspire conservation of the world's aquatic treasures. The National Aquarium provides education, school programs, and community engagement. The Aquarium Conservation Team (ACT!) organizes yearly shoreline and community

clean-ups. Current focus has been around Ft. McHenry and in Masonville Cove / Brooklyn (both areas are outside of the Trash TMDL drainage area).

Parks & People Foundation (PPF) is dedicated to supporting a wide range of recreational and educational opportunities; creating and sustaining beautiful, lively parks; and promoting a healthy natural environment for Baltimore City. PPF organizes community cleanups, with a focus on communities that are adjacent to the Middle Branch or within the Gwynns Falls watershed.

Trash Free Maryland (TFM) brings together organizations, businesses, and individuals committed to reducing trash in Maryland's environment. TFM seeks to prevent litter from happening in the first place, and focuses on policies to reduce the use of disposable bags and polystyrene, and to increase recycling of bottles, cans, and other materials. Trash Free Maryland is also engaged in the development and assessment of regulations aimed at reducing trash pollution.

Waterfront Partnership of Baltimore was created in 2005 to manage, promote and advocate on behalf of the waterfront. Waterfront Partnership provides programming, maintenance, and greening within their service area (currently bounded by the Rusty Scupper on the south and extending around the harbor to Bond Street Wharf). In 2010, the Waterfront Partnership created the Healthy Harbor Initiative and the subsequent Healthy Harbor Plan. The Waterfront Partnership also coordinates the Healthy Harbor Steering Committee, Healthy Harbor Trash Work Group and Trash Free Communities, as well as operating the Water Wheel.

Zero Litter is a grassroots initiative to implement a comprehensive citywide plan to address litter in Baltimore, focusing on legislation, grassroots action and education, social media, community events, and marketing.

2.6 Environmental Initiatives

The following are existing City initiatives and partnerships that DPW will continue working with to implement the Trash TMDL goals (Pillar #4: Plan to be part of the bigger picture):

2.6.1 Healthy Harbor Initiative / Plan

In 2010, the Waterfront Partnership of Baltimore unveiled its Healthy Harbor Initiative (HHI) with a goal of making the harbor swimmable and fishable by 2020. Included in the initiative are pilot projects to help improve water quality and help educate the public about the Harbor's health. The HHI is led by a Steering Committee, which is co-chaired by Baltimore City's Director of Public Works, and meets on a regular basis. The HHI also convenes a Trash Work Group to address harbor and neighborhood trash problems and clean-up efforts.

To reach the swimmable and fishable goal, the Waterfront Partnership commissioned the Healthy Harbor Plan. The plan was completed in 2011 by the Center for Watershed Protection and BioHabitats, with input from Baltimore City, Baltimore County, and Blue Water Baltimore. The plan serves as a guide for the Healthy Harbor Steering Committee in achieving the goal of creating a swimmable and fishable harbor.

The Healthy Harbor Plan includes a number of strategies for reducing trash in the harbor, including:

2. Develop a public outreach plan to reduce trash and litter and increase enforcement of existing litter and trash disposal regulations.
3. Support new legislation aimed at eliminating plastic bags and bottles.
4. Conduct a trash survey to identify high trash generation areas for targeting management actions and public outreach especially for developing Clean Water Community Plans.
5. Install green infrastructure and other volume control stormwater management practices to capture trash from stormwater runoff.
6. Increase implementation of practices that prevent trash from entering storm drains such as street sweeping and inlet grates.
7. Increase practices that capture trash at storm drain outfalls and waterways.

2.6.2 Healthy Harbor Trash Free Neighborhoods

This initiative is an evolution of the Clean Water Communities program that was a partnership between Blue Water Baltimore, Parks & People Foundation, and the Waterfront Partnership. In order to develop Clean Water Communities plans, trash and litter needed to be addressed. In September 2014, the Waterfront Partnership hired a community organizer to work with six neighborhoods to identify specific trash and litter issues, engage community leadership, provide education, and organize clean-up activities on targeted blocks, including an "alley make-over" project.

2.6.3 Vacants to Value (V2V)

This program, administered by the Department of Housing and Community Development, is a multi-pronged strategy for redeveloping vacant and abandoned properties. One of the strategies is to demolish severely distressed blocks. Rather than using scattered site demolition, a whole block approach is utilized, with the goal of demolishing clusters of vacant houses to create more useable tracts of land. This supports large-scale redevelopment efforts as well as provides opportunities for new green spaces. Strategic planning and post-demolition maintenance will decrease the potential for illegal dumping at vacant properties.

2.6.4 Growing Green Initiative

The Growing Green Initiative (GGi) evolved from the Vacants to Value program. The goal of GGi is to use sustainable, innovative, and cost-effective practices for stabilizing and holding land for redevelopment, and reusing vacant land to green neighborhoods, reduce stormwater runoff, grow food, and create community spaces. Reusing vacant land and having stewards of these spaces helps to reduce illegal dumping and litter.
To facilitate the implementation of GGi, a "Green Pattern Book" was created using funding and assistance from the Urban Waters Federal Partnership. The Green Pattern Book is a guide for the greening of vacant land by City agencies, NGOs, community-based organizations, and residents, and features eight green project types or patterns. One of the patterns, "Clean and Green", works with DPW's Property Management Division to provide proactive mowing to keep the lots clean.

2.6.5 Waste to Wealth (W2W)

The City throws away tons of valuable resources every day. Many of these resources could be captured and re-used as an engine of economic development, creating jobs and new products, supporting resident-led greening efforts, and revitalizing neighborhoods. The Waste to Wealth Program is designed to do this by targeting three high-value, primarily non-residential waste streams: food waste, construction and demolition waste, and urban wood waste. The City is exploring the establishment of a W2W Incubator with a sorting yard and addressing City operation and policy barriers to incentivizing private sector wood re-use businesses.

2.6.6 Baltimore Urban Waters Federal Partnership

The Urban Waters Federal Partnership was established in 2011 to reconnect urban communities with their waterways by improving coordination among federal agencies and collaborating with community-led

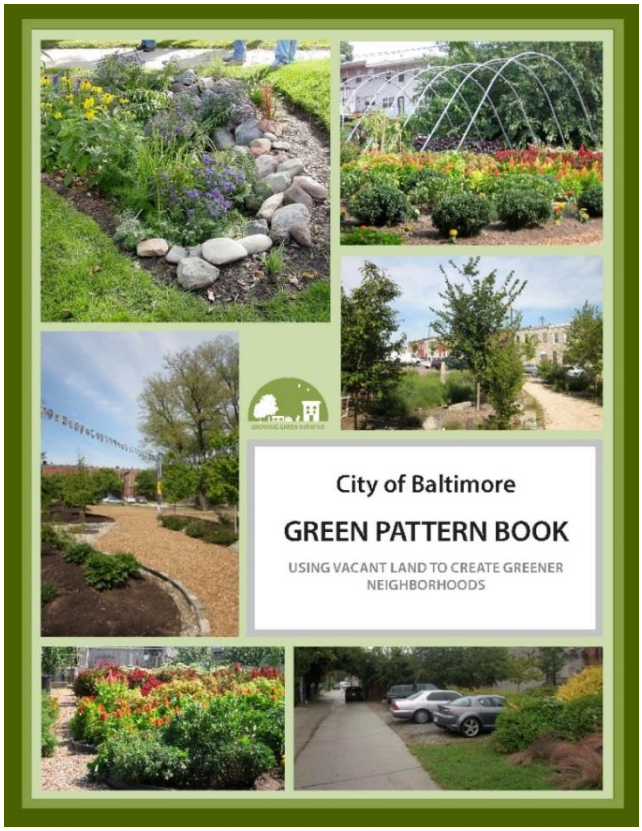

Figure 11: Cover of the Green Pattern Book, 2014 (Source: Baltimore City Department of Planning)

revitalization efforts to improve our Nation's water systems and promote their economic, environmental and social benefits. The Patapsco Watershed in Baltimore was one of the initial locations selected for this effort.

In Baltimore, the partnership includes the US Forest Service, EPA, and USGS at the Federal level, Maryland Department of the Environment, public agencies including the Department of Public Works, Planning, and TreeBaltimore, and local non-profits like Blue Water Baltimore, Civic Works, and the Parks & People Foundation. Improving water quality, including reducing trash, is a primary goal of the Partnership.

2.6.7 Baltimore Ecosystem Study (BES)

Baltimore Ecosystem Study is a long-term research program, funded by the National Science Foundation. The ecological knowledge created by BES supports educational and community-based activities, and interactions with the Baltimore community, primarily in the Gwynns Falls watershed. Recent research projects have focused on stewardship mapping and social marketing for environmental initiatives.

2.7 Baltimore County

As noted in the Introduction (p. 9), the Trash TMDL includes areas in Baltimore City and Baltimore County, specifically, the Gwynns Falls and Jones Falls watersheds. Because both of these streams initiate in the County and discharge into the Middle Branch and the Inner Harbor, it is important that the two jurisdictions work together to meet the TMDL.

For the past year Baltimore City DPW has been working in collaboration with the Baltimore County Department of Environmental Protection and Sustainability (DEPS) to develop their respective implementation plans. DEPS is responsible for developing the Implementation Plan to comply with Baltimore County's portion of the trash TMDL, in addition to monitoring compliance progress. The two agencies will continue to work together to develop consistent monitoring guidelines and schedules and to track progress (see Section 7.2).

3 Plans, Reports, and Surveys

The Trash TMDL Implementation Plan is not being developed from a blank slate. Several plans, studies, and initiatives that address trash and litter have been conducted over the years or are currently active. They form the basis for the various projects, programs, and partnerships outline in Section 6.

The following plans and studies were already cited in the Trash TMDL and are therefore not summarized in this document:

- Baltimore Harbor Trash Report (Moffatt and Nichol, 2006)
- Middle Branch Patapsco Trash Management Plan (Coastal Estuarine Hydrology & Hydraulics Engineers, 2007)
- Harris Creek Small Watershed Action Plan (CWP, 2010)
- State of Baltimore Harbor's Ecological and Human Health (Wicks, 2011)
- A Healthy Harbor Plan for Baltimore, MD (Waterfront Partnership of Baltimore, Inc. 2011)

Any plans, studies, and initiatives that were developed after 2011 or were not included in the initial development of the TMDL are included below.

3.1 Plans

3.1.1 Baltimore City Sustainability Plan (Baltimore Department of Planning, 2009)

Adopted in 2009, the plan lays out a broad, inclusive, and community-responsive agenda to complement Baltimore's existing Comprehensive Master Plan. It lays out 29 priority goals within seven theme chapters: Cleanliness, Pollution Prevention, Resource Conservation, Greening, Transportation, Education & Awareness and Green Economy. Several goals and strategy address trash reduction, including:[10]

- Educate residents and businesses about proper trash storage and disposal
- Expand existing programs to maximize public trash and recycling bin use
- Launch a public education campaign to change the public's attitude toward litter
- Issue every household a large municipal trash can
- Improve the enforcement of sanitation code and strengthen enforcement of dumping and litter laws
- Increase participation in community maintenance and stewardship efforts
- Distribute information on waste-reducing purchasing policies
- Develop and implement local legislation related to waste minimization
- Increase recycling opportunities throughout the City

3.1.2 10-Year Solid Waste Management Plan for 2013-2023 (DPW, 2014)

The intent of the Ten-Year Solid Waste Management Plan was to provide an accurate description of the City's solid waste management activities to the public and to comply with Maryland regulations. The Plan period covers 2013-2023 and is an update to the plan that was adopted by the Mayor and City Council in July 2002. The update was prepared in accordance with current state planning regulations (Code of Maryland Regulations, Title 26, Subtitle 03, Chapter 03, or COMAR 26.03.03) which requires the Plan to address waste management and recycling for a period of at least 10 years.

[10] For a fuller outline of recommendations, see Appendix XX.

Key issues addressed by the 10-Year Plan update include reducing waste, promoting sustainable solid waste operations, and ensuring the disposal system continues to serve the City's best interests. A significant part of the City's Ten-Year Solid Waste Management Plan involves the reduction of waste. The City of Baltimore plans to take the following actions to maximize waste prevention and reduction:

1. Poll City businesses to identify current waste reduction activities being practiced and publicize their strategies;
2. Incorporate waste prevention and reduction in all educational and outreach materials and activities of the Recycling Office of the Bureau of Solid Waste;
3. Continue to develop public service ads and educational messages about waste prevention and education with regional partners. Seek corporate sponsors to broadcast these messages as widely as possible;
4. Work with the Northeast Maryland Waste Disposal Authority to promote waste reduction strategies in the commercial sector through support of the business recycling forum, performance of waste audits, and providing training programs to businesses;
5. Expand the diversion of reusable items from the city's waste stream to charitable, non-profit organizations. Promote citizen donations to non-profit organizations;
6. Encourage owners/managers of multi-family dwellings and apartment complexes to provide recycling facilities (bins, dumpsters, etc.) for their tenants in compliance with new State regulations that become effective October 1, 2014; and
7. Investigate the need for a waste prevention/waste reduction committee, possibly as a part of the City's proposed Recycling Committee.

3.1.3 Drive to 35 (DPW 2013)

In 2012, House Bill 929 was passed requiring that all Maryland jurisdictions, including the City of Baltimore, recycle 35% of their municipal waste. In an effort to reach the State mandated 35% recycling rate, the Department of Public Works Office of Recycling instituted a campaign challenge in 2013 called "The Drive to 35: Baltimore's Race to Reach a 35% Recycling Rate". The Drive to 35 is an effort to raise recycling awareness among the citizens of Baltimore City to increase recycling tonnage to meet the State mandated goal of 35%. In 2015 the recycling rate was 25%.

3.1.4 Public Outreach Strategy for Trash and Litter Programs for the City of Baltimore (DPW, 2015)

The MS4 Permit requires Baltimore City to evaluate current trash and litter control efforts; develop strategies to reduce trash, floatables, and debris within those areas draining to the Middle Branch and Northwest Branch of the Patapsco River; and bolster public education. (Part IV.D.4). Based on the inventory of current and planned trash and reduction programs (see Section 2 Trash TMDL), as well as comments and recommendations made at the MS4 public meetings, six Sustainability Waste Workgroup meetings (including four "Community Conversations" on trash), and the Healthy Harbor Trash Work Group, the following three themes emerged:

A. <u>Public Education</u>
   In the various MS4 and Sustainability Commission public meetings, the need for a public education campaign was consistently raised. While the Department of Public Works has "Clean Up Baltimore", this was viewed as a slogan more than a campaign. Recommendations included:
   - Reducing trash and litter requires behavioral change. A non-stop, comprehensive campaign that works top down AND bottom up is needed.
   - Multiple and diverse message delivery methods are needed - media (advertising, social media, print), training for community members, peer-to-peer - with a consistent message that is capable of reaching different audiences.

- A public education campaign should bring together the work of the City, non-profit organizations, and community groups under one banner.
- Trash and litter education needs to be in the schools.
- Public education also needs to include information about how, where, and what to dispose.

B. Community Engagement and Support

As identified in the inventory, as well as the Sustainability Commission community meetings, non-profit groups and community members are actively engaged in community clean-ups, recycling programs, and reporting problems to 311; sometimes on their own and sometimes in partnership with or supported by DPW. In many cases community groups have found creative ways for addressing trash and litter – hiring local people with trucks for small hauling, engaging youth, giving out trash cans and recycling bins, and working with new residents and renters. Recommendations included:

- Provide a forum for community groups to come together with each other and DPW to share what is working as well as common issues (it was recognized that community groups could learn from each other, and that there were common issues across the City).
- Provide funding and incentives for community clean-up activities; the Stormwater Participation Credits encourages volunteer efforts, but many communities expressed the need for more practical assistance such as tools, gloves, trash bags, etc.
- Additional dumpsters, support services from DPW (bags, easier way to have trash collected at community clean-ups), and targeted block clean-ups with alley cleaning by the City.
- Evaluate the Municipal Trash Can and Neighborhood Corner Can programs to determine feasibility of expanding city-wide or to other neighborhoods.

C. Enforcement

It was recognized by many people that the City has local laws addressing trash and litter, but the perception is that these laws are not being uniformly enforced. Some communities have a good relationship with their Housing inspectors while others were frustrated with the enforcement system. Many citizens expressed the feeling that people were not being fined, or that citations were being issued but the problem dumping areas were not being cleaned (311 tracking). Issues and recommendations included:

- Evaluate and revise the process, tracking mechanisms, and available resources for the City's 311 service requests related to littering to decrease community frustration.
- Educate community members about the code enforcement process so that expectations are understood by third parties.

3.1.5 South Baltimore Gateway Master Plan (Baltimore Department of Planning, 2015)

The genesis for the South Baltimore Gateway (SBG) master plan was the Horseshoe Casino, which opened in 2014 on Russell Street just south of M&T Bank Stadium. The state law that authorized casino gaming requires a portion of gambling revenues to directly benefit the surrounding communities in the form of Local Impact Grant funds. The neighborhoods within the master plan area either border on or drain to the Middle Branch. This Plan offers a 20-year vision for the SBG Area as well as a detailed set of recommendations for short-, medium- and long-term actions. One of the Goals is "Environmental Sustainability" and includes as a strategy, "Reduce Litter Accumulation and Pollution on Land and in Waterways":

- Change behavior through media outreach and volunteer clean-up campaigns.
- Deploy additional sanitation crews to clean up communities.
- Launch pilot sanitation programs.

- Hire additional sanitation inspectors to improve enforcement or garbage disposal violations.
- Add cameras and one investigator to improve enforcement to stop illegal dumping.
- Add an additional attorney to enhance prosecution of sanitation and dumping violations.

3.2 Reports

3.2.1 Are You Going to Eat That? A Composting Pilot Case Study (Baltimore City Office of Sustainability 2012)

In the fall of 2011, the Baltimore Office of Sustainability coordinated an initiative to pilot a food waste recycling (composting) program in select elementary and middle schools in the Baltimore City Public School system (BCPS). While initially eight schools were selected, only five schools fully participated in the pilot. Waste Neutral, a food waste hauler, worked with the schools to customize the separation and disposal process since the infrastructure and dining process varies between each school.

In the five schools that successfully implemented a lasting composting project, most were able to reduce their dumpster volume by almost 50%; students were engaged via curriculum, practice and theory, and teachers were behind the project. Challenges included the materials cafeterias used, resistant teachers or janitorial staff, the unique challenges of specific school layouts, and original contact(s) leaving with no succession plan in place.

3.2.2 Clean Water Schools and Communities Project Interim Report (2013)

The Clean Water Schools and Communities Project (CWSCP) was an outreach and engagement strategy aimed at 1) increasing knowledge about water and trash, and 2) reducing litter. CWSCP focused on five Baltimore City Public Schools and their surrounding communities in 2013. Blue Water Baltimore and the Baltimore Office of Sustainability were the primary project partners, with support from the Waterfront Partnership of Baltimore. In addition to environmental education, storm drain stenciling, and hands-on projects, a Litter Perceptions Survey and Litter Audit was also conducted (see Resource section).

3.2.3 Toward a Greener Cleaner Baltimore: Perspectives of McElderry Park Residents and Community Partners on How to Reduce Trash (Grover & Saxton 2014)

The study was conducted by students in the Johns Hopkins Bloomberg School of Public Health in the east Baltimore neighborhood of McElderry Park. This report describes the results of interviews with residents, and representatives of various local organizations, to better understand the reasons for the problem, and options for reducing the amount of trash accumulating in the neighborhood. Recommendations included:

- More effort is needed to encourage landlords for make sure that tenants have access to trashcans and how to dispose of waste properly.
- Creative, non-text communications should be developed for people with less education. Modeling of appropriate behaviors by community sanitation champions should also be considered and developed.
- The current community led efforts to establish block leaders should be officially supported by the city in order to promote community enforcement and monitoring of proper trash disposal.
- Regulation of food packaging should be considered as one means to reduce generation of waste, thus reducing the burden of solid waste in low income communities.

3.3 Surveys and Public Comments

3.3.1 Baltimore Citizen Survey

The Baltimore Citizen Survey aims to identify trends in behavior and attitudes regarding quality of life indicators and City services. The survey is implemented yearly as part of the City's Outcome Budgeting, which is useful in tracking performance. The University of Baltimore's Schaefer Center for Public Policy conducts the survey. The

survey is conducted by phone in both English and Spanish, and lasts about 16 to 20 minutes. A representative sample of 1,800 Baltimore citizens respond to the survey.

Surveys questions are grouped by six priority outcomes. Trash and cleanliness is part of Outcome #6: A Cleaner and Healthier City. The following is a summary of results between 2011 and 2013[11]:

- The percentage of respondents who rated the cleanliness of their neighborhoods as either excellent or good was essentially the same in 2013 (59%) as it was in 2012 (57%). This is about the same percentage as those who had this opinion in 2009 and 2010.
- In a similar result to the last four years of the Citizen Survey, most respondents this year rated the cleanliness of the City as fair (47%), and the percentage that saw the cleanliness of the City as either excellent or good was essentially unchanged from 2012 and 2011 at 25%.
- Over half of respondents (57%) believed that trash removal was excellent or good, which is the same as in 2012 (57%). This is still below the level reported in 2009 (64%).
- More than half of respondents (57%) thought that curbside recycling service was excellent or good in comparison to 48% in 2012, 53% in 2011, 65% in 2010, and 57% in 2009.
- In 2009, 22% of respondents reported having no experience with curbside recycling, but that percentage fell to 14% in 2013 and was 13% in 2010, 2011, and 2012.
- There was a dramatic decrease in the percentage of respondents who felt that curbside recycling service was poor, down from 18% in 2012 to 9% in 2013. This is more in line with results from 2009 through 2011, when it ranged from 8% to 11%.

3.3.2 MS4 Public Meeting #1: Public Comments

In the Summer of 2014, DPW held four public meetings to discuss the MS4 WIP. The following are comments on trash and litter policy, enforcement, and education that were made at the first meeting:

Policy / Legislation

- Adopt City ordinances on unsolicited newspaper delivery, phonebook delivery, one time use Styrofoam food and drink containers, and plastic bags.
- Adopt a City ordinance that requires all recycling to be covered in a can or bin with a lid.
- Advocate for State bottle deposit bill and plastic bag bills.

Enforcement

- The City needs to enforce its current laws and ordinances.
- Centralized enforcement unit within DPW is needed (rather than with Housing).
- Community trash policing could be used to work with neighborhoods and inspectors to address trash problems; these positions would be paid for by the additional enforcement and fines.
- Improve the City's trash can collection system in commercial areas and at major bus stops.

Public Engagement and Education

- Public education is important that is directed at behavior change.
- Create a long-term public awareness campaign: TV, Radio, billboards, buses, bus shelters, grocery store bags, magazines, internet, and social media.
- Incorporate public education into the schools and curriculum.
- Provide educational material at festivals, community association meetings, and other public events.

[11] As of November 2015, the 2014 results were not available.

- Improve the "cleanwaterbaltimore" web site and make it the portal for sharing information and resources, including ways to make it more interactive.
- Use social media to ensure a more open, transparent, two-way dialogue with the public. More education needed for stormwater management – general public as well as City employees (ie connection between trash and water quality)
- Signage is needed for projects funded with stormwater fees

3.3.3 Sustainability Commission Waste Work Group: Community Meetings

In 2014 and 2015, the Sustainability Commission held four (4) community trash-talk meetings across Baltimore. Attendants included a diverse collection of communities, organizations, and city agencies, including DPW. The purpose of the meetings was to highlight and discuss various trash-reduction programs and projects underway, including community-based efforts, efforts within schools, recycling, and the Municipal Trash Can program. The meetings identified the following:

- The City has many good efforts underway;
- Some city and community pilots are very promising (eg. Municipal Trash Can program);
- Many organizations across the city share the same desire and purpose to clean up Baltimore;
- Individual community members want to help clean up Baltimore;
- There is shared consensus for the need for a public education campaign;
- A trash TMDL has been approved, which will help to focus activities;
- There is a 35 % recycling goal/mandate from the State
- There is a systemic behavioral problem in Baltimore regarding how people handle the trash;
- It is difficult to prosecute bad trash behavior;
- There are a lack of public education/behavior change incentives relating to waste;
- Significant taxpayer money is spent cleaning up trash; and
- Bulk trash is a huge problem.

The year-long effort culminated in a Town Hall meeting April 21 and included the following recommendations for reducing trash and litter:

<u>Goal 1 – Help Neighborhoods Help Themselves</u>

1.1 Create the Clean Up Baltimore Peer-to-Peer Network

1.2 Launch an anti-littering campaign on social media, City buses, and trashcans highlighting pride in our neighborhoods and City.

1.3 Increase participation in the Baltimore Green School program.

<u>Goal 2 – Make it Easier to Recycle and Dispose of Trash Properly</u>

2.1 Consider expansion of the City's municipal trashcan program to all neighborhoods after review of the results in two pilot neighborhoods, Mondawmin and Belair Edison.

2.2 Review feasibility of increasing the number of high-quality corner cans throughout the City at bus stops and other prime locations, including Big-belly Waste and Recycling Stations.

2.3 Support statewide solutions to reducing single-use plastic bags and provide resources so community organizations and businesses can distribute free reusable bags to neighbors and customers.

2.4 Support legislation for a statewide bottle deposit bill.

2.5 Increase residential recycling rates and increase options for recycling at all public city buildings and corner can locations.

Goal 3 – Improve Existing Systems to Achieve a Clean City

3.1 Explore policies to ensure single family and multi-family rental properties, and all parties, comply with trash regulations such as proper disposal, recycling, and notifications of trash and recycling pick up.

3.2 Require developers to provide a trash plan for approval at the Site Plan Review meetings with the Planning Department.

3.3 Work with Housing and Community Development's Code Enforcement Office, the Department of Public Works' Bureau of Solid Waste, and the Environmental Control Board to develop a more robust litter, trash and dumping code enforcement process.

3.4 Conduct monthly "Code Walks" with neighborhood associations and Code Enforcement Officers to identify problem areas for litter and dumping in order to achieve targeted enforcement.

3.3.4 Healthy Harbor Steering Committee

In May and June of 2015, stakeholder nonprofit organizations in Baltimore, on behalf of the Healthy Harbor Steering Committee, met separately and with representatives of Baltimore City and Baltimore County to develop a set of recommendations that they would like to see incorporated in the respective implementation plans for the Baltimore Harbor Trash TMDL. The groups involved were the Baltimore Sustainability Commission, Blue Water Baltimore, Chesapeake Bay Foundation, Clean Water Action, National Aquarium, Parks & People Foundation, Trash Free Maryland, and Waterfront Partnership of Baltimore.

The final recommendations for Baltimore City, which were provided to the Healthy Harbor Steering Committee on August 3, 2015, are:

1. Install trash interceptors at major outfalls;
2. Inlet screens at all appropriate storm drains;
3. Conduct ongoing ambient and MS4 trash data collection;
4. Apply social marketing methodology for upstream litter education and prevention tactics;
5. Install corner cans and recycling bins at all appropriate locations;
6. Expand the municipal can program;
7. Strengthen illegal dumping enforcement;
8. Provide local government support for statewide bag and bottle legislation; and
9. Ensure interagency coordination.

4 Current Trash Practices

In order to determine the types and effectiveness of trash reduction practices currently being used in the City, information gathered from various interviews and literature research was compiled and evaluated. The existing trash reduction practices are a combination of projects, programs, and partnerships which can be further categorized as (1) pollution prevention / source elimination and (2) cleanup / removal / collection (Table 3).

Table 3: Summary of Available Trash Reduction Practices

Pollution Prevention		• Education and outreach
		• Consumer trends:
		  ○ source reduction
		  ○ recycling
		  ○ material re-use (composting)
		• Individual scale (private) waste management
		  ○ Routine mixed refuse and recycling
		  ○ Municipal cans (DPW pilot)
		  ○ Recycling cans with lids (DPW)
		  ○ Private dumpsters
		• Enforcement
		  ○ From complaint based to proactive
		  ○ Illegal dumping
		• Property management / landlord
		• Public corner cans (MTA and DPW)
		• Legislation (state and local)
		  ○ Incentives (bottle bill)
		  ○ Removal or penalty(bag bill)
		  ○ Stray animal and pest management

Collection	**Street level**	• Mechanical street sweeping (DPW and Benefits Districts) • Mechanical alley sweeping (DPW) • Alley Cleaning (DPW) • Property management (DPW) • Community Cleanups (volunteer)

	Storm Drain / Waterway	• Inlet cleaning
		• Debris collection systems
		  ○ In-line net and sump systems
		  ○ End of pipe netting systems
		  ○ Water wheel
		• Stream Clean-ups
		  ○ Routine (DPW)
		  ○ Volunteer
		• Harbor Shoreline Clean-ups
		  ○ DPW-sponsored
		  ○ Volunteer
		• Skimmer Boats
		• Boom and bass boats

4.1 Pollution Prevention Practices

Pollution prevention practices are non-structural practices focused on shifting the public's approach and attitude toward littering. An inventory of current practices employed within the City is provided in the following sections. Many of these practices were initiated after 2011.

4.1.1 Education and Outreach

Clean Up Baltimore:
In 2013, DPW developed a trash outreach program that discouraged littering by broadcasting a public service announcement on City cable channel (CharmTV); creating trash can signs; and using mascots to encourage good sanitation habits. The public service announcement is also shown in public schools and other community outreach events.

School Education Programs / Events and Community Presentations
In 2012, DPW created several liaison positions to provide outreach to community groups and non-profits in the form of educational presentations; by participating in public meetings and cultural events; and by working with local schools.

Beginning in September 2013, DPW Community Liaisons initiated educational programs to public schools. The programs included information on trash reduction, recycling, rats, and storm drains, with the connection between these efforts and the health of the harbor. In 2014, twenty-four presentations were made at 11 different schools, with 1,041 students participating.

With the establishment of the Community Liaisons, DPW has increased its presence at City-wide events where they provide information on trash reduction, recycling, and water quality. These events include:

- Dam Jam
- Big Truck Day
- Baltimore Artscape
- Baltimore Book Festival
- Mayor's Back to School Fair
- Sustainability Town Hall Meeting

Websites and Social Media
Information on trash collection and recycling services, including collection days, acceptable waste materials, and current programs, is provided on DPW's website. A monthly "Re-News" e-newsletter is sent to all City employees and e-mailed to community associations by the Office of Communications and Community Affairs. DPW Facebook page, Twitter feed, and Nextdoor account are updated on a daily basis with reminders about street sweeping, recycling events, and other related information.

Storm Drain Art
Since 2012, Blue Water Baltimore (BWB) has worked with communities to stencil messages and images on storm drains. BWB oversees the application process, and then coordinates with DPW on the approval letter. BWB also provides training and materials (stencils and paint) to community groups.

4.1.2 Enforcement

Code Enforcement is the responsibility of the Department of Housing and Community Development (DHCD). Code enforcement consists of two components: Housing Inspectors who respond to complaints on a variety of issues, including vacant properties, high grass and weeds, and improper trash disposal of trash, and the Special Investigation Unit which responds to illegal dumping. The office also includes a Legal Section that litigates code violations and illegal dumping citations. In 2007, trash enforcement officers were transferred from DPW to DHCD, with the final consolidation of enforcement into DHCD occurring in 2009.

In addition to responding to complaints, DHCD has identified 50+ hotspots for illegal dumping that are monitored three (3) times per week, with 33 of these sites having some type of flashCAM camera. DHCD utilizes two (2) types of cameras, a QStar motion sensor digital camera and a surveillance camera that uses video. Although the QStar cameras are mobile and can be moved easily, they tend to work best for lower traffic areas like dead end streets or inner blocks.

Additionally, DHCD coordinates a combination of education and enforcement in areas with re-occurring "pile-ups" (locations that accumulate trash bags from nearby residents). Once an area is identified, Housing will share addresses for the surrounding blocks with DPW, which provides a mailer outlining proper trash disposal. DHCD then returns to the area approximately two (2) weeks later with Housing Inspectors to verify compliance and issue citations as needed. Educational material and information regarding code enforcement, how to report a violation, and telephone/email addresses for housing inspectors can be found on Baltimore Housing's web site.

4.1.3 Individual Scale Waste Management

Mixed Refuse and Recycling Collection

Residential mixed refuse collection is provided by the Bureau of Solid Waste's Routine Services Division to over 210,00 homes. Prior to July 2009, regular mixed refuse collection services were provided twice a week by the City to each location served. After July 2009, regular mixed refuse collection services have been provided once per week, and recycling collection services have been provided once per week by the City to each location served. This service change is referred to as One Plus One. An unlimited volume of recycling is accepted; maximum waste volume limit of mixed refuse reduced from 160 gallons of waste per address per week to 96 gallons; and service zones were rerouted. [12]

Pilot Municipal Can Program

In 2014, a pilot program was initiated that provided 64-gallon trash containers to 9,000 households in Belair-Edison and Greater Mondawmin communities. The wheeled receptacles have an attached, tight-fitting lid and were equipped with a tracking device to prevent theft. It was announced in August 2015 that the program would expand city-wide in 2016.

Styrofoam Recycling

Because styrofoam cannot be collected as part of the City's single-stream recycling program, DPW partnered with the Dart Container Corporation in 2012 to provide Styrofoam recycling at the Northwest Citizen's Convenience Center. In 2012, 5,600 lbs. of Styrofoam was collected. The number has risen each year with 8,841 lbs. collected in 2014.

Bulk Trash Collection Services

The City provides free bulk trash pick-up in 8 bulk trash collection zones that are serviced one day per month. Items that qualify for removal include furniture, appliances, and tires (without rims). [13]

Park Cleaning

The City's five major parks, Druid Hill, Leakin, Patterson, Carroll, and Clifton are cleaned on a weekly basis by the Special Services Division within the Bureau of Solid Waste. The Bureau assumed responsibility for this cleaning, as well as for all the smaller parks, from the Bureau of Recreation and Parks in January 2012.

4.1.3 Corner Baskets

DPW is responsible for servicing and maintaining approximately 1,650 public waste receptacles, which are primarily placed in bus stops, gateways to the city, and Business Districts. The program is part of the Routine Services Division; corner baskets are serviced twice a day, Monday through Saturday. The City does not typically

[12] 10 year Solid Waste Management Plan, page 31
[13] 10 Year Solid Waste Management Plan, 32

place corner baskets in residential neighborhoods because they lead to illegal dumping of household trash. The Baltimore City Code states that corner cans are to be used for litter, defined by size, and not for household trash.

In 2014, a neighborhood corner can pilot program was initiated in 5 communities (Greenmount West, Highlandtown, McElderry Park, Reservoir Hill, and Waverly). Two corner trash cans were installed in each neighborhood. Community members helped select the locations and provide outreach and monitoring as corner can stewards. The program is a partnership between DPW, Waterfront Partnership, and the Baltimore Community Foundation. The trash cans display educational signage, specifically designed for each of the locations in order to capture the unique attributes of the neighborhood. Each of the neighborhoods was assigned a trash captain to routinely monitor the cans to ensure that illegal dumping was not occurring.

“Gateway" cans get picked up once a week while cans deeper in the neighborhoods get picked up on their trash day (originally all cans were to be emptied twice a week). Because the trash is collected as part of regular routes, there are no specific trash totals for the neighborhood can pilot. However, residents completed weekly surveys of the condition of the cans and the area around the cans. Out of 252 surveys there were only 32 reports of the cans overflowing (13%). The litter index (based on a rating system of 1 (perfectly clean can) to 4 (overflowing) varied between 1 and 2.5 (monthly average). The debris around the cans was generally found to be litter reported as coming directly from the corner stores near the cans.

4.1.4 Citizen Drop-off Centers

There are eight (8) Citizen Drop-Off Centers located throughout Baltimore where citizens can drop off their bulk trash, mixed refuse, and recycling, for free. In 2011, the Northwest Citizen’s Convenience Center was renovated to allow an elevated drop-off area into large roll-off boxes and also includes a roll-off for polystyrene or Styrofoam recycling. A similar renovation is proposed for the Eastern Citizens Convenience Center. Further information of all of the Citizen Drop-Off Centers is provided in Table 4.

Table 4: Summary of Citizen Drop-Off Centers

Location	Materials Collected
Northwest Citizen's Convenience Center, 2840 Sisson Street	Bulk Trash; Debris; Recycling; Styrofoam Recycling; Scrap Tire; Electronic Recycling; Household Hazardous Waste
NW Transfer Station, 5030 Reisterstown Road	Bulk Trash; Debris; Recycling; Scrap Tire; Electronic Recycling
Eastern Citizens' Convenience Center, 6101 Bowleys Lane	Bulk Trash; Debris; Recycling; Scrap Tire; Electronic Recycling
Quarantine Rd. Sanitary Landfill-Convenience Citizen Drop-Off, 6100 Quarantine Road	Bulk Trash; Debris; Recycling; Scrap Tire; Electronic Recycling
Southwest Citizen's Convenience Center, 701 Reedbird Avenue	Bulk Trash; Debris; Recycling; Electronic Recycling
York Road Substation, 4325 York Road	Recycling
Lewin Substation, 4410 Lewin Avenue	Recycling
Calverton Road Substation, 239 N. Calverton Road	Recycling

4.1.5 Special Services

Street and Alley Cleaning

Service requests can be made to 311 for trash and illegal dumping on streets, alleys, and vacant lots. An average of 9.6 tons of materials were collected every day in 2014.[14]

Trash and Illegal Dumping Code Enforcement

Baltimore Housing is responsible for enforcing trash and litter laws (Article 23: Sanitation of the City Code). Inspectors provide citations and notices on various code violations, including improper trash disposal, dirty streets and alleys, and illegal dumping. Housing also has a legal division that prosecutes illegal dumping.

4.1.6 Dead Animals

The Division of Animal Control under the City's Department of Health is responsible for removing animal carcasses from public property. Animal carcasses are currently collected for disposal by private companies under contract with the City. In 2011, the City collected and sent to incineration approximately 59.75 tons of animal carcasses.

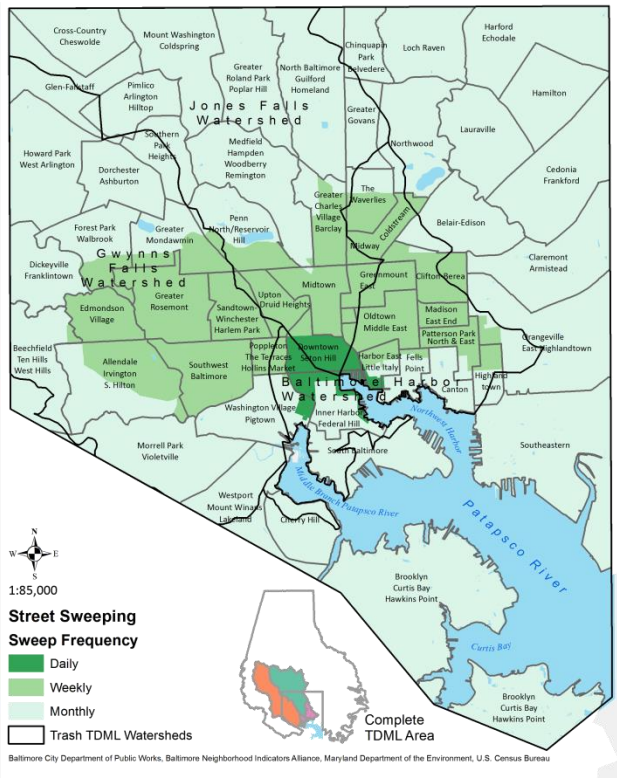

Figure 12: Mechanical Street Sweeping (DPW, 2014)

4.2 Collection at Street Level

Collection practices at the street level are structural and non-structural practices that collect trash within the gutter of the street or alley way. An inventory of current practices employed within the City is provided in the following sections. Many of these practices were initiated after 2011.

4.2.1 Mechanical Sweeping

The City's mechanical sweeping program, under the Bureau of Solid Waste, helps prevent debris from entering storm drains and the harbor. In 2011 7,161 tons of debris was collected by mechanical street sweeping. The street sweeping program expanded in April 2014 to include all city streets outside of the downtown and central area (Figure 12). Downtown and the Central Area are swept on a daily to weekly basis; the expanded areas are swept once a month. The increased mechanical sweeping operations serve more than 1,500 miles of streets each week. In August, 2014, fourteen neighborhoods were also selected to receive a pilot mechanical alley sweeping program. Alley sweeper operation follows trash collection day.

4.2.2 Community Clean-Ups

Mayor's Spring and Fall Cleanups

The Mayor's Cleanup is an event coordinated by DPW once in the spring and once in the fall, with individual neighborhoods organizing cleanups for their areas. DPW provides trash bags and, if available, dumpsters, to registered communities, and then collects the trash when the event is over. Volunteers at the Mayor's Cleanups have removed up to 20,000 tons of trash from Baltimore neighborhoods since 2000. Since 2014, oversight by DPW has ensured that these clean-ups are removing trash and debris from alleys, vacant lots, and streets, instead of serving as a way to clean out houses.

[14] This section refers to 3-1-1 Service Requests for Dirty Streets and Alleys.

Community Pitch-in Program
The Community Pitch-in is provided by DPW, but organized by individual community associations. DPW provides a dumpster and trash bags for the community cleanup event and picks up the dumpster at the end of the event.

Stormwater Credit Program
In FY2014, the City implemented a stormwater fee and subsequent credit program. Neighborhood trash cleanups are eligible for a MD Stormwater Participation Event credit, which provides credits for volunteer hours.

4.3 Collection within Storm Drain or Waterways

Collection practices within the storm drain or waterway are structural and non-structural practices that collect trash once it has entered the stormwater system. These include operations run and managed by the Baltimore City Department of Public Works, and by volunteer and agency-sponsored cleanups. An inventory of current practices employed within the City is provided in the following sections.

4.3.1 Inlet Cleaning

Inlet cleaning is performed as a response to complaints from the City's 3-1-1 system (service requests for choked inlets). In 2014, the Bureau of Water and Wastewater reported cleaning about 2,003 inlets.

4.3.2 Modified Inlets (Screens and catch basins) Pilot Project

In 2012 and 2014, fifteen (15) inlets were modified to include a screen and/or catch basin at the street level within the inlet structure. Inlet screens are structural devices that fit into the storm drain inlet along the curb. The screens have perforations that allow water to pass through but not litter. When there is a heavy rain event (greater than 1") the screens are designed to open so that flooding does not occur. Inserts are wire screens that fit within the storm drain catch basin (out of sight) and keeps trash that gets past the screens or the grates from going into the storm drain pipes. The screens were installed as a pilot program to determine challenges for installation and confirm compatibility of the screens with current DPW equipment.

4.3.3. In-line and End-of-Pipe Debris Collectors

DPW Debris Collection Systems
Prior to 2011, DPW installed debris collection systems at four locations:

- Gwynns Run: A floating net system was installed as part the installation of a wetland / pond system. The netting system was subsequently vandalized. During the trash monitoring studies, the Gwynns Run Debris Collector was not operational.
- Alluvion: A floating net system was installed at the outfall at the end of the Alluvion Street. The funnel and side curtains at the system were anticipated to cover approximately 2/3 of the channel depth. The system at this location is subject to tidal influence: trash floats back into the pipe at high tide.
- Briarcliff: A two-net in-line collection system was installed with horizontal bar screens to prevent bypassing. This system was constructed using a pre-cast vault. Initially, the waste collection amounts were high for this location, but have since reduced.
- Harris Creek: A floating net system was installed at the outfall of Lakewood Avenue. Similar to Alluvion, this system was subject to tidal influence and subsequently removed. A water wheel device, previously installed at Jones Falls in 2009, was re-located to Harris Creek; however, the tidal fluctuations also presented problems within the effectiveness of the collection device. That specific water wheel was removed in 2011.

New "Water Wheel" Trash Interceptor

In 2014, a new water wheel was installed by the Waterfront Partnership at the outfall of the Jones Falls, near Pier 5 in the Inner Harbor. The practice was implemented as a combination of public and private resources. This new water wheel included design improvements to the 2008 installation. These included an increased size and solar power generation. Permanent signage and social media have provided additional education elements to this practice.

3.3.4. Harbor Cleaning

The City employs a fleet of thirteen boats to collect approximately 400 tons of debris from the Harbor each year. The Marine Operations Section utilizes the boats to collect floating debris and trash in the water. The boats include four skimmer boats, six bass boats, one skiff, and two whalers.

3.3.5 Stream and Harbor Cleanups

Project Clean Stream

This is an annual stream and shoreline cleanup, sponsored by the Alliance for the Chesapeake Bay and coordinated by Blue Water Baltimore. The program culminates in a unified day of service when volunteers spend a few hours cleaning trash from parks, rivers and streams or otherwise improving their communities.[15] DPW collects the trash from the clean-up sites.

Canoe 'N Scoop

This is a volunteer program in which people canoe and kayak along the shoreline of Middle Branch collecting trash and debris. The program is a partnership between the Recreation and Parks, Blue Water Baltimore, and Parks & People. Beginning in 2014, the Canoe 'N Scoop events were eligible as MD Stormwater participation events.

Stormwater Credit Program

Similar to the community clean-ups, participants in volunteer stream and Harbor clean-up programs are eligible for credits on their stormwater fee.

[15] http://cleanstream.allianceforthebay.org/about/

5 Implementation Plan Development

The City utilized EPA's "A – I criteria" for watershed assessments and MDE's *Guidance for Developing Stormwater Wasteload Allocation Implementation Plans for Trash / Debris Total Maximum Daily Loads* (MDE, 2014) to develop this Implementation Plan. Additionally, DPW developed the following "Six Pillars of Practical Watershed Planning" to guide the development of this Implementation Plan:

7. **Plan for more projects than you need**—Identify additional projects as a contingency for the original Implementation Plan. These additional projects may project structural practices to supplement the non-structural practices that have proven to be less effective than anticipated or were unable to be implemented due to resource limitations. The identification of additional projects can serve as an opportunity for engaging private partners in installation and/or funding.
8. **Plan for resources that will affect funding needs**—Many structural debris collection systems are not manufactured locally, so supply, transport and compatibility with existing storm drain systems will be a factor. Additionally, land acquisition and labor costs will be factored into the project selection.
9. **Plan to maintain** – No structural projects will be included in the Implementation Plan, unless the resources to maintain the projects are also identified.
10. **Plan to be part of a bigger picture** – The schedule of implementation should incorporate other capital projects or public programs to effectively coordinate available resources and limit interruptions to the community. This pillar also applies to education and outreach strategies to avoid creating duplicitous or conflicting messaging and communications.
11. **Plan for effective public participation** – Education and outreach strategies should focus on meaningful engagement, so stakeholders can assist in the development of a trash reduction solution for the City's waterways. Effective public participation also means sustainable communication techniques.
12. **Plan to adapt –** Implementation Plans are not meant to remain on the shelf. These plans may be modified based on (a) Research and trends that may affect prioritization criteria; (b) Changes to regulations and legislation; and (c) Innovations in structural technologies.

5.1 Development Schedule and Public Comments

This Implementation Plan was intentionally written in phases to provide stakeholders with the opportunity to comment on the Plan at 30 and 75-percent draft completion. The schedule was also developed to coincide with Baltimore County's Implementation Plan development. The Plan's stakeholders include the Stormwater Advisory Committee (SWAC) and the Healthy Harbor Steering Committee (see recommendations Section 4.3.4). In November, the Implementation Plan was released for a 30-day public comment period.

5.2 Gap Analysis

The purpose of the gap analysis is to identify which currently employed trash reduction practices may be "counted" as part of the Implementation Plan, develop a methodology for WLA reduction calculations, and identify what "gap" remains to achieve the Trash TMDL's WLA reduction requirement.

Table 6 is an inventory of the practices described in Section 3. The Trash TMDL states that, "…any upstream practices that are already in place (e.g. street sweeping, volunteer clean-ups, trash nets, etc.) are inherently captured in this baseline rate."[16] Thus, the Table identifies trash reduction practices and projects that are captured in the 2011 baseline, and those that have been enhanced or initiated since 2011.[17]

[16] Trash TMDL, p. 30

[17] For enhanced services, only the enhancement above the 2011 baseline will be counted; for example street sweeping: 2015 lbs. collected – 2011 lbs. collected = TMDL reduction)

Table 6: Baseline / Enhanced / New Practices and Projects

Current Practice or Project	Included in the Baseline	Enhanced since 2011	Initiated since 2011
Pollution Prevention			
Clean Up Baltimore! Campaign			X
School Education Programs			X
Events and Community Presentations		X	
DPW Websites and Social Media		X	
Storm Drain Art			X
DHCD inspectors / Special Investigation Unit	X		
FlashCAM Cameras		X	
Mixed Refuse and Recycling Collection	X		
Pilot Municipal Can Program			X
Bulk Trash Collection Services	X		
Park Cleaning	X		
Corner Baskets	X		
Citizen Drop-off Centers	X		
Street and Alley Cleaning	X		
Trash and Illegal Dumping Code Enforcement		X	
Dead and Stray Animals	X		
Collection at Street Level			
Mechanical Street Sweeping		X	
Mayor's Spring and Fall Cleanups	X		
Community Pitch-in Program	X		
Stormwater Credit Program			X
Collection within Storm Drain or Waterway			
Inlet Cleaning (3-1-1 generated)	X		
Storm Drain Inlet Screens			X
DPW Debris Collection Systems	X		
"New" Water Wheel Trash Interceptor[18]			X
Harbor Skimmers and Booms	X		
Project Clean Stream	X		
Canoe 'n Scoop			X

[18] The new water wheel was installed in May, 2014 at the mouth of the Jones Falls in the Inner Harbor. In its first year it collected 205 tons of debris. Additionally, the Waterfront Partnership promotes the waterwheel with signage and via social media. However, w*hile the Water Wheel collects trash before it enters into the harbor, it has not been determined whether the Water Wheel can be counted above the baseline of the harbor skimmers and boom that was previously located at the mouth of the Jones Falls.*

5.2.1 Trash Removal Estimation Methodology

Studies on the efficiency and removal rate of various trash BMPs are limited (the Baltimore Harbor is only the third water body to have a Trash TMDL). In order to identify methodologies for trash load removal rates, best practices were researched from Los Angeles, the Anacostia watershed (including the District of Columbia, Prince George's County, and Montgomery County), the San Francisco Bay area, and other reports (see References).

In Baltimore City, trash is collected, weighed, and accounted for in several different ways. Many of the City's trash collection programs are conducted city-wide (like street sweeping), while others are specific to a location or neighborhood (community and stream clean ups). Additionally, collected trash is mixed with other materials, including organic debris and larger items like mattresses and tires. Finally, depending on the location, trash can be collected and weighed while wet, or have bottles and cans that are partially filled with liquids. The methodologies identified below attempt to account for these assumptions, as well as efficiencies in collection and services.

Table 7: Summary of Trash Removal Estimation Methodology

Activity	Methodology	Source of Methodology
Projects (DPW)		
Modified Inlets	Assumes that lbs collected will be included in street sweeping and proactive inlet cleaning	NA - part of street sweeping and inlet cleaning. The structural devices are proposed to improve efficiency of program.
In-line Debris Collection Systems – small system	Estimated trash load rate x 43% (efficiency) [Design] **OR** Total debris collected x 20% (accounts for wet weight) [Actual]	Trash TMDL; PB 30% Concept Report 2011; DC Trash TMDL WIP
In-line Debris Collection Systems – medium to large vault system	Estimated trash load rate x 65% (efficiency) [Design] **OR** Total debris collected x 20% (accounts for wet weight) [Actual]	Trash TMDL; PB 30% Concept Report 2011; DC Trash TMDL WIP
End-of-pipe Debris Collection Systems	Estimated trash load rate x 85% (efficiency) [Design] **OR** Total debris collected x 20% (accounts for wet weight) [Actual]	Trash TMDL; PB 30% Concept Report 2011; DC Trash TMDL WIP
Programs (DPW)		
City-wide Mechanical Street Sweeping and Alley Sweeping	(Lbs. street sweeping debris current year – Lbs. street sweeping debris 2011) x 57.7% (TMDL area/Total City area) x 8.9% trash	Baltimore County Trash TMDL 2015
Proactive Inlet Cleaning	Estimated trash load rate x 99% (efficiency) [Design] **OR** Total debris collected x 20% (accounts for wet weight) [Actual]	Trash TMDL; PB 30% Concept Report 2011; DC Trash TMDL WIP
Styrofoam Collection	Collection at the NW Citizen Drop-off Center (weight pounds)	Baltimore DPW

Partnerships		
Education: anti-litter campaigns	50% Total trash land use loading	Bacteria TMDL for Jones Falls and Gwynns Falls[19]
Education: School presentations	Baseline x 2%	Trash Load Reduction Methods SF Bay Area MS4s Technical Report 2012
Education: Events / community presentations	Baseline x 2%	Trash Load Reduction Methods SF Bay Area MS4s Technical Report 2012
Community Outreach	Program Awareness x Program Effectiveness x Willingness to Participate x AC x land use loading	PG County Trash TMDL WIP (based on entire TMDL area)
Storm Drain Art	Program Awareness x Program Effectiveness x Willingness to Participate x % storm drains in TMDL area	PG County Trash TMDL WIP
Community Clean-ups	Trash collected for events in TMDL area x 20% (accounts for some trash being debris or bottles with liquids)	DC Trash TMDL WIP
Enforcement: signage	Average lbs collected illegal dumping x TMDL WLA/LA ratio	PG County Trash TMDL WIP
Enforcement: training	Program Efficiency x Land Use loading	PG County Trash TMDL WIP
Enforcement: FlashCAM cameras	Land Use loading x MS4 WLA/LA ratio	PG County Trash TMDL WIP
Legislation: Bottle Bill	WLA x 80% reduction x 25% trash by weight	PG County Trash TMDL WIP
Legislation: Bag Bill	Total bags in streams x % stream miles in TMDL area x 50% reduction x .013 lbs (weight of a bag)	DC Trash TMDL WIP

[19] The development of this methodology draws a comparison from the Bacteria TMDLs prepared for the Jones Falls and Gwynns Falls, which state, "The domestic animal category includes sources from pets (e.g., dogs) and the maximum practicable reduction (MPR) = *75% is based on an estimated success of education and outreach programs (italics added)*." Page 44, Total Maximum Daily Loads of Fecal Bacteria for the Non-Tidal Gwynns Falls Basin in Baltimore City and Baltimore County, Maryland, MDE, 2006. The 50% is a conservative estimate based on the MPR estimate for education and outreach.

5.2.2 Gap Analysis / WLA Reduction

If current practices which were not performed during the baseline study were continued how close would that get the City toward meeting its WLA requirement?

By applying the methodologies listed in Table 7, it is projected that the resulting trash load reduction (449,409 lbs.) would nearly double the 100% baseline reduction required to meet the Trash TMDL.

Table 8: Gap Analysis

EXISTING PRACTICES	Methodology	WLA (lbs)
City-wide Mechanical Street Sweeping[20]	(Lbs. street sweeping debris current year – Lbs. street sweeping debris 2011) x 57.7% (TMDL area/Total City area) x 8.9% (percentage of trash in the debris collected)	424,484
Styrofoam Collection	Collection at the NW Citizen Drop-off Center (weight pounds)	8,841
DPW School Presentations	Baseline x 2%	4,567
DPW Events / Community Presentations	Baseline x 2%	4,567
Community Clean-ups (MD Stormwater Participation Events)[21]	Trash collected for events in TMDL area x 20% (accounts for some trash being debris or bottles with liquids)	6,200
Canoe 'n Scoop (Harbor Clean-ups)	Trash collected for events in TMDL area x 20% (accounts for some trash being debris or bottles with liquids)	750
TOTAL Existing		**449,409**
Trash TMDL WLA Reduction Goal		238,371
Remaining WLA		*(211,038)*

Does this mean that the City is done? We recognize that in order to keep trash out of our waterways, and more importantly reduce trash in a sustainable manner, that additional practices are needed, including structural devices, new programs, and anti-litter education, outreach, enforcement. This follows the first Pillar of Practical Watershed Planning – *Plan for More Than You Need*. Additionally, due to the uncertainties of the data and methodologies currently available, it is important to implement practices that allow us to best document and monitor reductions in trash. Baltimore City DPW will work with Baltimore County EPS to investigate future data collection methodologies that lead to more accurate measures of WLA reduction for the applicable actions.

[20] Based on 2015 projections. (22,588,000 lbs – 14,322,000) x .577 x .089

[21] Does NOT include BWB 2015 Project Clean Stream.

6 Projects, Programs, and Partnerships

> *A Clean City is a generally accepted standard of appearance which gives the impression to persons passing through an urban area that community pride has become synonymous with city pride. A clean city is not the total absence of debris or litter. A clean city will be recognizable by the effectiveness of its efforts to control litter through a variety of techniques.*[22]

This is the introductory paragraph to the BATAL (Baltimore Against Trash And Litter) Plan, written in 1979 by the Five Year Plan Committee appointed under Mayor William Donald Schaefer. The committee was tasked with developing a long range plan which would achieve a clean city. The BATAL Plan proposed numerous strategies and reforms, including public education, enforcement, legislation, and revised collection practices and technologies.

The BATAL Plan is one of many recommendations that have been developed over the years, and which are documented in Section 3. This plan, as well as the others, recognizes that reducing trash in our streets, neighborhoods, streams, and the harbor requires a comprehensive approach with a diversity of tactics. Achieving a clean city (or in this case meeting the 100% reduction requirement of the Trash TMDL) is a task that cannot be accomplished overnight, but requires a long-term, sustained effort.

6.1 Reducing Trash: Collection and Prevention

Because trash is a human-generated pollutant, reducing it will require preventative practices to help people dispose of trash properly, increase recycle, and stop littering. Changing these behaviors will require consistent education and outreach, supported by improved collection practices, enforcement, and legislation.

Baltimore City's Trash TMDL Implementation Plan employs a two-part, three-phase strategy to meet the WLA (Figure 13). Since changing behaviors is critical to the success of the plan, the implementation timeframe is a twenty-year period. The strategy, explained in more detail in sections 6.2 6.4, is as follows:

<u>Collection Practices as Stop Gap Measures</u>

1. Install structural practices at the street, in-line with pipes, and at end-of-pipes, with particular emphasis on the Middle Branch and Gwynns Falls watershed.
2. Continue and expand mechanical street and alley sweeping, preventative inlet cleaning, municipal cans, routine waterway cleaning, and other collection activities[23]

<u>Prevention as a sustainable method</u>

1. Develop and launch an anti-litter campaign
2. Continue and expand education and outreach activities
3. Continue and expand volunteer efforts
4. Improve enforcement of illegal dumping

[22] BATAL (Baltimore Against Trash And Litter) Plan. 1979. By the Committee for a "Five Year Plan for a Clean City". p.8.

[23] As noted in previously, practices that were in place during the development of the baseline load cannot be counted toward the WLA (Appendix A). However, DPW will continue to provide these services as part of its comprehensive trash and litter reduction effort, including Mixed Refuse Collection, Bulk Trash, Corner Baskets, Drop-off Centers, Inlet and Catch Basin Cleaning (3-1-1 response), Code enforcement (3-1-1 response), Park Trash Collection, Mayor's Spring and Fall Clean-ups, the Harbor Skimmer Boats and Booms, and the removal of dead animals.

Projects
- Modified inlets
- Debris collectors
  - Small in-line
  - Large in-line
  - Large end-of-pipe

Programs
- Mechanical street sweeping
- Alley sweeping
- Preventative inlet cleaning
- Routine waterway cleaning

Collection as a Stop Gap
- Phase I (FY 16 - 20): Begin installing projects, expand programs; Operate and collect data to validate loading rates
- Phase 2 (FY 21 - 25): Evaluate projects and programs, modify as needed.
- Phase 3: (FY 26 - 35) Initiate decrease / phase out service

Partnerships
- Education
- Outreach
- Volunteer efforts
- Enforcement

Prevention as a Sustainable Method
- Phase I (FY16 - 20): Initiate pilots, create and launch campaign
- Phase 2 (FY19 - 25): Evaluate programs, expand / modify as needed.
- Phase 3 (FY26 - 35): Modify and repeat

Figure 13: Summary of TMDL Implementation Plan

6.1.1 Collection as a Stop Gap

The City cannot rely on collection alone to meet its 100% baseline load reduction. However, it is important to make initial progress on reducing trash by installing structural practices (projects) and providing collection services (programs). Projects and programs are operated by DPW and funded by the stormwater utility and/or the General Fund. They not only have specific data (weight of trash collected) to verify the TMDL compliance but also are the responsibility of a single agency to operate and evaluate.

Collection as a stop gap, whether on neighborhood streets, within the storm drain system, or in waterways, will be implemented in three (3) Phases:

Phase 1 (FY 16 - 20): Install initial projects, expand programs. Structural BMPs like storm drain inlet screens, in-line debris collectors, and end-of-pipe collection systems have proven successful in places like Los Angeles and Washington, DC. In Phase 1, Baltimore will:

- Install approximately 400 storm drain inlet screens and inserts in FY16
- Install a large vault, in-line trash interceptor at Bush Street in FY 17
- Study options for the repair or replacement of the Alluvion and Gwynns Run trash interceptors
- Install additional projects, such as in collection devices

Several existing DPW programs identified in the Gap Analysis (Section 5) have shown to be successful in reducing the amount of trash that enters into the harbor. These will be continued if not expanded, including:

- Mechanical Street and Alley Cleaning

- Preventative Inlet Cleaning
- Routine Waterways Collection
- Municipal Trash Cans

While collection offers an opportunity to document quantifiable (weight) data toward the WLA reduction goal, current data on what amount/percentage of trash makes up collected debris is not fully known. During Phase 1, DPW will conduct monitoring studies in conjunction with Baltimore County Department of Environmental Protection and Sustainability on trash loads for various collection practices such as mechanical street and alley sweeping, inlet cleaning, and trash intercepts. The projects and programs will also be monitored to validate loading rates and efficiencies.

Phase 2 (FY 21 - 25): Evaluate projects and programs, modify as needed. DPW will continue to operate the projects and programs implemented in Phase 1. Using the data collected in Phase 1, loading rates will be adjusted as needed to reflect a more accurate accounting of litter and trash removal rates and efficiencies.

Phase 3: (FY 26 - 35) Initiate phase out/ decrease level of service. As behaviors change, and people stop littering and dispose of their trash properly, the amount of trash in streets and waterways should also decrease. As part of the adaptive management process, the need for additional structural practices will be evaluated, as well as reductions in service to adjust for a decrease in trash and litter.

6.1.2 Prevention as a Sustainable Method

Public education and outreach is an essential strategy to achieve the long-term, sustained prevention of trash entering our streams and waterways. For decades, Baltimore City has provided various education and outreach efforts, which have ranged from simple pamphlets to day-long events. Whereas DPW is the responsible party for implementing and providing projects and programs, public education and outreach requires partnerships to be effective. Partnerships involve voluntarily actions and/or cooperation by State, federal, private, non-profits, and community groups and residents, and can be both structural and non-structural practices.[24]

Phase 1 (FY16 - 20): Continue practices, initiate pilots and create campaign. Since 2011, DPW has initiated several education and outreach practices, including school presentations, participation in City-wide events and civic meetings, and initiating an incentive program for community clean-ups. These practices will be continued and evaluated for effectiveness, including:

- DPW digital and social media outreach
- DPW School education programs
- DPW events and community presentations
- MD Stormwater Participation Event credits
- Canoe ‘n Scoops / volunteer clean-ups along the Middle Branch

Programs like the Baltimore Clean Corps will also be launched in collaboration with the Mayor’s Office, the Office of Sustainability, Baltimore Housing, and the Environmental Control Board.

Finally, DPW will work with outside stakeholders to develop and launch an anti-littering marketing campaign. While meant to be city-wide, neighborhoods or areas within the Trash TMDL will be targeted for pilot efforts.

Phase 2 (FY21 – 25): Expand/ modify as needed. Prevention practices will be monitored and evaluated on a regular basis to determine which education, outreach, and enforcement actions should be modified, established, or eliminated.

[24] Note that the Bush Street and Smith Cove Debris Interceptors include State / MPA funding. While an example of a partnership, they are listed in the Project section.

Phase 3 (FY26 - 35): Modify and repeat. Prevention practices will continue to be monitored and evaluated to determine which education, outreach, enforcement, and legislative actions should be modified, established, or eliminated.

Table 8: Summary of Projects, Programs and Partnerships

PRACTICES TO CONTINUE and/or EXPAND	
Programs	
	City-wide Mechanical Street + Alley Sweeping
	Styrofoam Collection
Outreach and Education	
	DPW School Presentations
	DPW Events / Community Presentations
	Community Clean-ups (MD Stormwater Participation Events)
	Harbor Clean-ups (Canoe 'n Scoop)
	Storm Drain Art
Enforcement[25]	
	FlashCAM Cameras

PROPOSED PRACTICES	
Projects	
	Modified Inlets
	In-line Debris Collection Systems
	End-of-pipe Debris Collection Systems
Programs	
	Proactive Inlet Cleaning
	Routine Waterway Cleaning
Outreach and Education	
	Anti-Litter Campaign
	• Clean Corps Baltimore
	• Municipal Can Program
	• Marketing and PR
Enforcement[26]	
	Small Haulers
	Educational material
	Enforcement Week / Month

[25] In the context of this Implementation Plan, Enforcement will address Load Allocations (LA). This may change as adaptive management and monitoring are implemented.

[26] See Footnote 23.

6.2 Projects

Projects are structural practices which include capital improvement projects that result in a definable asset for the agency. DPW will either be the lead for the installation of these projects and/or work in collaboration with other city agencies to provide capital funding.

6.2.1 Modified Inlets

In the Spring of 2016, approximately 414 inlets will be installed with screens and inserts in five neighborhoods; McElderry Park, Oliver, Baltimore-Linwood, Franklin Square, and Carrollton Ridge. This is an expansion of the pilot installation in 2014 and 2015. The neighborhoods were selected based on the 3-1-1 service requests for choked inlets and trash (Figure 6 and 8). This first phase of the modified inlet project will allow the City to gauge community reactions to trash being prevented from entering inlets. Modified inlets have been proven to be effective practices for keeping trash out of the storm drain system and out of waterways. Baltimore is patterning its program on Los Angeles, which installed 32,000 screens in high trash areas and saw a 60% reduction in their baseline trash load.

The installation of additional modified inlets has been identified in the FY16-21 Capital Improvement Program (CIP) Schedule. DPW will use the Project Selection criteria described in Section 5 to determine where to locate new modified inlets after installation is complete within the five (5) neighborhoods discussed above.

6.2.2 Debris Collectors

Debris collectors may be installed in-line within the storm sewer system or at the end of the pipe. The removal efficiency is based on the size and type of device, plus the location within the drainage area. A debris collection system located in the upper portion of a drainage area would have a smaller contributing area and therefore a smaller trash loading, but that smaller loading allows a wider variety of devices which could be used. Table 9 summarized the design elements were used as a preliminary analysis of selection criteria:

Table 9: Summary of Debris Collection Design Elements

Type	Devices per project	Typical drainage area (acres)	Removal efficiency	Est. installation costs	Est. annual maintenance costs
Small debris collection	8	75	43%	$1.9 M	$135 K
In-line vault	1	300	65%	$1.8 M	$205 K
End of pipe net	1	800	85%	$1.0 M	$284 K

Plans are in development for a large vault, in-line trash interceptor at Bush Street and Carroll Park. The project is a joint venture between Baltimore City and the Maryland Port Administration. A similar system is proposed for Smith Cove near Waterview Avenue on the southern edge of the Middle Branch (see Appendix B).

Additionally, as part of each stream restoration project in the MS4 WIP, an assessment will be done to determine the feasibility of installing in-line or end of pipe collection systems.

6.3 Programs

Programs are non-structural practices which include City-supported services and operations that range address both pollution prevention and collection.

6.3.1 Mechanical Street and Alley Sweeping

As noted in section 4.2.1, the City's mechanical street sweeping program was expanded in 2014. Additionally, a mechanical alley sweeping program was piloted in fourteen (14) neighborhoods in 2014. In 2011, 74,048 miles

were swept and 7,161 tons of debris collected. Totals for 2015, as of the end of June, were 5,647 tons. debris collected – this projects to be approximately 11,294 tons collected by the end of the year. Since this is an enhanced practice, only those lbs collected above the 2011 totals will be counted (i.e. 2015 lbs – 2011 lbs. = TMDL reduction). See Table xx.

6.3.2 Preventative Inlet Cleaning

In 2016, the City will initiate a preventive inlet cleaning program in conjunction with the modified inlet project (Section 3.3.2). In addition to proactively cleaning the 400+ inlets that will receive a storm drain screen and/or catch basin, DPW will clean other inlets in the neighborhoods, totaling approximately 1,100 inlets. The catch basins will be cleaned and inspected on a monthly basis by Stormdrain Utility Maintenance. Inspection will also occur after major storm events (1" rainfall or greater over 12 hour period). Finally, a Standard Operating Procedure (SOP) is in place to identify whether an inlet should be cleaned after each inspection (if trash and debris may cause flooding, if 40% of inlet perforations are blocked, or if 40% or more of an insert is full. The SOP also establishes cleaning standards for inlets subject to inspection (e.g. no trash or debris immediately in front of the screen; no trash in the insert or connector pipe).

6.3.3 Routine Waterways Cleaning

For the past 15 years, the City has studied the conditions of natural streams. Approximately 60% of Baltimore's streams are highly degraded along the main stem, with eroding banks, collapsing outfalls, and exposed sewer lines. The eroded streams have increased the amount of organic debris (tree trunks and branches) entering the streams. The organic debris, coupled with trash, compromise the capacity of the stream channels and pose a flooding risk. In the past, the City has cleaned waterways sporadically (every 3 to 10 years), usually as a response to flooding complaints/ concerns. By 2017, the City will initiate a routine waterways cleaning program to decrease potential flooding. The cleaning program will target 5 locations along the Gwynns Falls and Jones Falls, such as the drift catcher at the 26th Street bridge.

6.3.4 Styrofoam Recycling

In both the Middle Branch Trash Management study (2007) and the data collected by the Water Wheel, Styrofoam and polystyrene containers, are one of the main types of trash found in the harbor and along the shoreline. The City will continue its partnership with the DART Corporation to collect Styrofoam at the Northwest Citizen's Convenience Center. This is also an opportunity to incorporate education about proper Styrofoam disposal by the Recycling Office.

Figure 14: Mechanical Street Sweeper Truck

6.4 Pollution Prevention

Because trash is a human-generated pollutant, changing human behavior is key to any reduction strategy. The City cannot reduce the amount of trash entering waterways through collection practices alone. Encouraging the proper disposal of trash – through education, volunteer activities, enforcement, and legislation, are needed in order to meet the Trash TMDL requirements.

The terms education and outreach appear interchangeable when engaging the public. Typically, education is related to the message content and format, with passive message delivery and a goal of having the audience to learn about the topic and possibly begin to care. Outreach is related to a more active message delivery (dependent on person-to-person communication and engagement) and a goal of having the audience transition from caring about the topic to actively participating with the proposed solution. This relationship is illustrated in Figure 15.

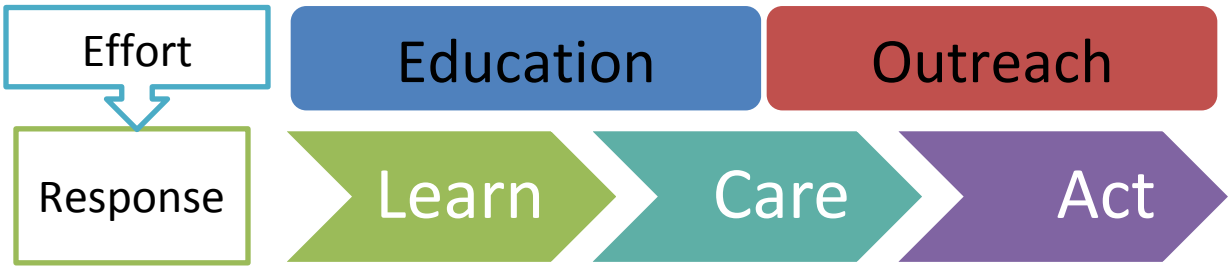

Figure 15: Relationship of Education and Outreach

The "Learn" response consists of the audience becoming aware and understanding the message. The "Care" response includes developing an interest, seeking more information, becoming an ambassador or messenger, participating in a meeting / survey, and reporting problems on 3-1-1 system. The "Act" response requires a larger effort to physically perform an activity which will meet the goal of the message.

Both education and outreach have the components of audience, message, and messenger. Outreach is dependent on person-to-person communication and engagement. Outreach efforts will utilize the pollution prevention messages and information developed with the anti-littering campaign and social media, and incorporated into the various presentations, events, and outreach activities, as well as incentive tools.

6.4.1 Anti-Litter Campaign

In the recommendations made by the Sustainability Commission Waste Group (2015), the Healthy Harbor Steering Committee (2015), and comments at several MS4 public meetings (2014), the need for an anti-litter campaign marketing campaign that was more robust and active than "Clean Up Baltimore" was identified. Additionally, one of the action items in Baltimore City's 10 Year Solid-Waste Plan is:

> *The City will continue to educate citizens with regards to sanitation and recycling through outreach efforts. Mayor Rawlings-Blake has tasked the Department of Public Works to develop a program that will resonate with the citizenry in the manner that the Schaefer administration's "Trash Ball" campaign did.*

In 2015 the Department of Public Works identified "create an anti-litter campaign" as a priority tactic in its strategy for encouraging recycling, waste reduction, and reuse. DPW will assemble a working group made up of agency representatives and outside stakeholders to develop a single, comprehensive campaign. This will allow City services, non-profit organizations, and community groups to support the litter reduction efforts without a series of confusing (and potentially competitive) messages or programs.

6.4.1.1 Clean Corps Baltimore

Launched in October 2015, this Mayoral initiative a collaboration between the Mayor's Office, government agencies (Office of Sustainability, DPW, Baltimore Housing, and the Environmental Control Board), and non-profit partners including Baltimore Green Works and the Waterfront Partnership. Modeled after the successful Baltimore Energy Challenge, the program utilizes the core principles of community based social marketing and peer-to- peer networking to engage, educate, and motivate residents, businesses, schools, and neighborhoods to change their behavior towards litter, trash, and proper waste disposal. In its inaugural year, Clean Corps will provide training, educational material, services, and resources to eighteen neighborhoods across Baltimore.

Clean Corps is an opportunity to test messaging and education, and will incorporate other pollution prevention methods such as social media, volunteer activities and incentives. Included will be a "Clean City" resource guide. This will be patterned after a resource guide developed by the Patterson Park Neighborhood Association. The bi-lingual guide provides information on a variety of trash issues, including proper disposal of trash, recycling, and illegal dumping. DPW and Baltimore Housing were involved in the development of this guide, and will explore how it can be adapted for other communities across the city.

6.4.1.2 Municipal Cans

In August 2015, Mayor Stephanie Rawlings-Blake announced a city-wide expansion of the municipal can pilot program (see Section 4.1.3). Beginning in 2016, approximately 210,000 64-gallon cans for mixed refuse collection will be distributed to residential households that are currently eligible for trash collection in Baltimore City. The pilot program demonstrated that the municipal cans helped residents improve containment of household waste, a key factor in reducing litter and keeping neighborhoods cleaner.

Prior to the delivery of the pilot program's municipal cans, a trash can survey was conducted analyzing trash can usage. Based on this survey, 68.5% of residents in the pilot area were using trash cans prior to receiving municipal trash cans; however, 31% of the residents in the Mondawmin area were using can without lids and 40% had no cans at all. In Belair Edision, 30% of the residents used cans without lids and 23% had no cans. Cans with tight-fitting lids not only prevent rodents from climbing inside and getting at their desired food sources, they also prevent trash from falling or blowing out of the can.

6.4.1.3 Anti-Littering Marketing Campaign

It is recognized that a marketing and advertising campaign will need to be developed to complement and support Clean Corps and the Municipal Can program. An ad campaign needs to be more than simply raising awareness; it needs to change behaviors. Emphasis will be placed on social marketing tools to develop and implement the campaign. Social marketing is a process that applies marketing principles and techniques to influence target audience behaviors that also benefit society. The City will work with other partners to develop a marketing campaign and pilot it in the Clean Corps located within the TMDL study area.

6.4.2 Digital and Social Media (DPW)

Since the baseline study, DPW has increased its digital and social media presence. In 2012, DPW launched the Clean Water Baltimore website, which provides information on various stormwater related topics. In 2013, DPW launched its Facebook page and Twitter account, and in 2015 became the first City agency in Baltimore to partner with Nextdoor, a free, private social network for neighborhoods. The Communications Division daily posts and tweets announcements, reminders, and other information related to DPW; often these are trash related, such as reminders about street sweeping, collections changes, or recycling events.

The Communications Office will continue to use its various media platforms to push out anti-littering and trash reduction messages, including:

- Explore and test the best methods for promoting pollution prevention messages on a regular basis. Because DPW uses social media to provide information on a variety of topics, it is important to make sure anti-littering and trash reduction messages do not get lost among the other competing messages.
- Revise the DPW and Clean Water Baltimore websites, in particular incorporate trash and litter reduction messaging and other information. As part of DPW's strategic planning effort, these websites will be assessed by people within and outside the department), including the Stormwater Advisory Committee.
- Coordinate digital and social media with the anti-litter campaign. As part of the campaign, incorporate existing DPW media, as well as potential new media, to target behaviors and audiences.

DPW's social media will support and promote the efforts of Clean Corps and the Municipal Can Program, as well as other trash reduction and collection practices. The anti-littering marketing campaign will work closely with DPW's Communications Office and, once developed and launched, will fold DPW's social media into the anti-litter marketing campaign.

6.4.3 School Education Programs (Community Liaison presentations)

DPW Community Liaisons will continue their outreach to schools in Baltimore City, with the goal of increasing the number of students participating, in particular at schools within the TMDL area. Additional partners will include the Baltimore City Public School System, Baltimore Office of Sustainability, and the Environmental Control Board. As with DPW's social media, educational outreach will be folded into a broader anti-littering campaign once it is developed.

6.4.4 Events / Community presentations

DPW will continue participating in these events as well as new events to reach different audiences. Educational and promotional material developed as part of the anti-littering campaign will be incorporated at these events.

Figure 15: DPW Community Liaisons at a City Festival

6.4.5 Volunteer Efforts / Incentives

Meeting the trash reduction goal of the Baltimore Harbor Trash TMDL will require resources from all levels of government, non-profit groups, private businesses, institutions, and residents. While a majority of the trash reduction strategies listed in the Implementation Plan are led by DPW, volunteer efforts have been and are expected to continue being an important part of reducing the trash and litter in our streets and waterways.

As identified in Section 4, many of the volunteer efforts currently taking place in Baltimore City were in existence during the baseline study and cannot be counted toward the WLA, including the Mayor's Spring and Fall Clean-ups, Community Pitch-ins, Blue Water Baltimore's Adopt-a-Stream Program, and Project Clean Stream. However, the following two programs can be counted and expanded if possible.

6.4.5.1 MD Stormwater Participation Events

With the creation of the stormwater fee, several credit programs were enacted as incentives for people to reduce polluted stormwater runoff and reduce their stormwater fee. One of the programs is the MD Stormwater Participation Event, a hands-on credit program coordinated by DPW to improve water quality. Community, stream, and harbor clean-ups all qualify as MD Stormwater Participation Events. In 2014, 53 community clean-ups were held, as well as 2 registered stream clean-ups. 35,300 pounds of trash and debris was collected by events located within the TMDL watershed.

In order to increase the number of clean-up events, DPW will provide additional outreach to community groups as well as explore ways for improving the crediting process to encourage more participation.

6.4.5.2 Canoe 'N Scoop / other Middle Branch volunteer clean-ups

Collecting trash from the Middle Branch can be challenging due to the shallow depth of the water and the amount of shoreline vegetation, which traps and holds floating debris like plastic bottles and bags. The Canoe 'n Scoop program run by the Department of Recreation and Parks has proven to be successful in both collecting shoreline trash and educating students and residents on the problem of trash in the Middle Branch waterways. In 2014, six Canoe 'N Scoops were registered as MD Stormwater Participation Events, collecting 5,075 pounds of trash (The total amount of trash collected is not known, since not all Canoe 'n Scoops register as MD Stormwater Participation Events).

DPW will partner with Recreation and Parks to explore what resources and data collection processes are needed to continue the program and collect and monitor the trash removal data.

6.4.5.3 Storm Drain Art

DPW will continue to work with Blue Water Baltimore to coordinate approval for stenciling messages and images on storm drains. DPW will also track the location and geography of these inlets, which will assist in education and outreach efforts.

Figure 16: Community clean-up in Franklin Square

6.5 Enforcement[27]

Enforcing existing codes is an important tool for preventing pollution. This needs to happen at the individual trash management level as well as illegal dumping. While many of the practices currently employed by Baltimore Housing have been in practice since 2011, the following program enhancements are proposed:

6.5.1 Expanded FlashCAM program

In 2011, Baltimore Housing had 10 Q-star FlashCAMs in operation. This number has increased to 17 Q-star FLASHcams and 13 Sun Surveillance (video). Because these cameras are mobile, they have proven effective in being able to be moved to various hotspots throughout the city to photograph, identify, and thus prosecute people illegally dumping.

6.5.2 Explore policies regarding small hauler tipping fees

Illegal dumping occurs when individuals do not know how to properly discard materials or do not want to pay tipping fees to dispose of waste. Dumping can also occur when items are turned away from a transfer station for being too bulky, or when bins are full and haulers do not want to wait the 30 minutes while bins are swapped. Instead of taking the items to a landfill or another drop-off center, individuals find a location that they consider to be hidden and dispose of the items.

Baltimore Housing and DPW will work together to assess the tipping fees charged to small haulers to determine if there are policy changes needed that will be an incentive for discouraging illegal dumping.

6.5.3 Education

Reporting illegal dumping can be confusing to residents. Sometimes what should be a dirty street and alley service request is reported as illegal dumping, which slows the process to remedy the problem. Also, residents do not always understand the differing roles and responsibilities of Housing Code Enforcement, DPW, and the Environmental Control Board, which can hinder the proper reporting of trash disposal problems.

The Clean City Guide referenced in Section 6.4.1.1 includes information about code enforcement and illegal dumping. DPW and Baltimore Housing were involved in the development of this guide, and will explore how it can be adapted for other communities across the city. Additionally, education and training on code enforcement will be incorporated into the Clean Corps program.

6.5.4 Enforcement Week / Month

In the Washington, D.C. area, Litter Enforcement Month was initiated as Litter Enforcement Week by the Alice Ferguson Foundation, the National Park Service, and the Metropolitan Washington Council of Governments (MWCOG) in 2008. In 2011, at the suggestion of MWCOG, the week-long event was extended to a month in order to allow for better education of both the public and enforcement officers.

The mission of Litter Enforcement Month is to raise awareness of litter, illegal dumping, and related crimes; the laws associated with them, and their social and environmental effects on communities, economy, and the Potomac River.[28] This program can serve as a model for Baltimore City.

DPW will work with Baltimore Housing, other agencies, NGOs, and community groups to explore the creation of a Code Enforcement Week and/or Month. This effort will be coordinated with Clean Corps, the anti-litter campaign, social media, and other outreach efforts.

[27] For the purposes of this Implementation Plan, enforcement primarily addresses illegal dumping, which is considered a Load Allocation (LA). Because of this, it is not counted as part of the WLA reduction, since an efficiency will need to be developed.

[28] http://fergusonfoundation.org/trash-free-potomac-watershed-initiative/litter-enforcement/litter-enforcement-month/

7 Tracking and Reporting

7.1 Milestone Schedule

To promote continual progress, the following milestone schedule was developed based on EPA's accountability framework for restoring the Chesapeake Bay, which requires states to identify milestones to be reached in two-year increments. The City's Trash TMDL Milestones (Table 15) are categorized as projects and programs. The milestones only reflect the projects and programs that City agencies have committed as part of this Implementation Plan. Partnerships are not included in this Milestone Schedule.

Table 15: Milestones Schedule

Schedule	Description
FY16 - 20	**Phase 1: Continue programs / Begin Project Installation / Launch Anti-Littering Campaign**
FY16	Continue the following programs: • City-wide Mechanical Street Sweeping • Styrofoam Collection • DPW Digital / Social Media • DPW School Presentations • DPW Events / Community Presentations • Stormwater participation event clean-ups / Canoe 'n Scoops • FLASH Cam program • Storm Drain Art
FY16	Launch Clean Corps
FY16	Install Phase 1 of modified inlets / Begin proactive inlet cleaning
FY16 – FY17	Implement Municipal Can Program
FY16 – FY17	Develop anti-littering marketing campaign
FY16 - FY17	Work with Baltimore County to develop monitoring program
FY16 – FY17	Explore ways to expand / enhance Canoe 'n Scoop and other harbor clean-ups
FY16 – FY18	Prepare feasibility studies for in-line / end-of-pipe debris collectors based on project selection criteria
FY17	Install Bush Street Debris Collector
FY17	Initiate Routine Waterways Cleaning Program
FY17	Evaluate Modified Inlet / Proactive Inlet Cleaning program
FY17	Explore ways to improve Enforcement, including small hauler policies, education, and possible Enforcement Week / Month.
FY 17 – 18	Launch Clean Corps Anti-Litter marketing campaign
FY18	Study options for the repair and/or replacement of Alluvion and Gwynns Run Debris Collectors
FY19	Install Smith Cove Debris Collector (by MPA)
FY20	Initiate Phase 2 of Modified Inlets installation and debris collection systems

Schedule	Description
FY20	Evaluate Baseline TMDL
FY21 - 25	**Phase 2: Evaluate Projects, Programs and Prevention / Modify and Expand as Needed**
FY21 – FY25	Continue to evaluate projects, programs, and prevention practices and modify / expand / initiate as needed
FY25	Evaluate Baseline TMDL
FY26 - 35	**Phase 3: Modify and Repeat Prevention / Initiate Decrease and/or Phase out Services**
FY26 – FY35	Continue to evaluate projects, programs, and prevention to determine what practices to: • Modify • Expand • Add • Eliminate / reduce services
FY31	Evaluate Baseline TMDL
FY35	**Meet TMDL WLA Goal**

7.2 Monitoring

Because trash is a new and emerging pollutant in the TMDL program, limited data is available. While this document uses the best available information, it also recognizes that further study will be needed to determine the measurable effect on load reductions.

In the first year of the Plan, Baltimore City will work with Baltimore County to develop a joint monitoring program and protocols that follow the Guidance developed by MDE.[29] A starting point for the monitoring will be the locations identified in the baseline assessment. Additionally, new practices that are proposed (storm drain inlet screens and debris collectors), as well as the outfalls below them, will serve as new monitoring points. Finally, the use of evaluations and visual surveys will be explored in neighborhoods where different practices or programs are being implemented.

7.3 Regulatory Reporting

The City will report progress of the trash TMDL compliance as part of the MS4 Annual Report, as well as data collected from monitoring. The Program and Project Milestones will also be updated as per the development of 2-Year Milestones as part of the Phase II WIP.

[29] MDE Trash Guidance Monitoring
http://www.mde.state.md.us/programs/water/tmdl/datacenter/pages/tmdlstormwaterimplementation.aspx

8 Adaptive Management

Sound implementation strategies require ongoing assessment and adaptation to respond to changing conditions, new technologies, and lessons learned. These principle will be the basis of the plan that will be used when benchmarks are not met and the projected funding is inadequate. (Pillar #6: Plan to adapt)

Adaptive management requires monitoring a variety of measures to determine whether progress is being made towards meeting the Trash TMDL. Ultimately, it is the in-stream water quality and the loading limits with respect to the TMDLs that determine the success of implementation; however, there are many interim measures that can also be correlated to success, which are worth pursuing.

It may be difficult to tease out the effectiveness of individual pollution reduction practices in terms of pollution load reductions, but the cumulative monitoring and tracking that occurs throughout this process will provide insight into the overall effectiveness of the City's implementation strategy. In addition to continued monitoring and assessment, the City will report its results on an annual basis as part of the MS4 Permit Annual Report. The MS4 Permit requires annual reporting of the following:

- The status of implementing the components of the stormwater management program that are established as permit conditions;
- A narrative summary describing the results and analyses of data, including monitoring data that is accumulated throughout the reporting year;
- Expenditures for the reporting period and the proposed budget for the upcoming year;
- A summary describing the number and nature of enforcement actions, inspections, and public education programs;
- The identification of water quality improvements and documentation of progress toward meeting applicable WLAs developed under EPA approved TMDLs; and
- The identification of any proposed changes to the City's program when WLAs are not being met.

The City will build upon annual reporting that has historically occurred to meet permit requirements and will supplement this reporting with tracking table summaries that quantify implementation activities for the range of strategies pursued during that year so that the following can be incorporated and evaluated:

- Adherence to the project and program implementation schedule (Appendix A and B)
- Meeting milestones
- New technology and innovation practices
- Changes to any stormwater laws, rules and regulations
- Resource availability
- Monitoring results

As described in the Public Outreach section, the Stormwater Advisory Committee will review the Trash TMDL Annual Report and the adaptive management plan on an annual basis. Any changes to the WIP as a result of adaptive management will be shared through the Stormwater Advisory Committee members and on www.cleanwaterbaltimore.org.

9 Financial Strategy

The projects, programs, and partnerships listed in the Implementation Plan will be funded by a combination of General Funds, Stormwater Utility Funds, and private dollars. Table 16 outlines the funding sources for the particular practices:

Table 16: Funding Sources

PRACTICES TO CONTINUE and/or EXPAND		FUNDING SOURCE
Programs		
	City-wide Mechanical Street + Alley Sweeping	General Funds + Stormwater Utility Fund
	Styrofoam Collection	DART Corporation
Outreach and Education		
	DPW School Presentations	General Funds (DPW)
	DPW Events / Community Presentations	General Funds (DPW) + Stormwater Utility Funds
	Community Clean-ups (MD Stormwater Participation Events)	Stormwater Utility Funds + volunteers
	Harbor Clean-ups (Canoe 'n Scoop)	Other Sources[30]
	Storm Drain Art	Other Sources[31]
Enforcement		
	FlashCAM Cameras	General Funds (Baltimore Housing)

PROPOSED PRACTICES		
Projects		
	Modified Inlets	Stormwater Utility Funds (CIP)
	In-line Debris Collection Systems	Stormwater Utility Funds (CIP) + MPA[32]
	End-of-pipe Debris Collection Systems	Stormwater Utility Funds (CIP)
Programs		
	Proactive Inlet Cleaning	Stormwater Utility Fund
	Routine Waterway Cleaning	Stormwater Utility Funds
Outreach and Education		
	Anti-Litter Campaign	
	• Clean Corps Baltimore	General Funds + Other Sources
	• Municipal Can Program	General Funds (DPW)
	• Marketing and PR	Other Sources
Enforcement		
	Small Haulers	NA
	Educational material	Other Sources
	Enforcement Week / Month	Other Sources

[30] Currently the Canoe 'n Scoop program is funded through the Department of Recreation and Parks. Support is provided by Blue Water Baltimore and Parks & People Foundation.
[31] Funding provided by grants secured by Blue Water Baltimore, with approval coordination provided by DPW.
[32] As of 2015 the Maryland Port Administration (MPA) is providing partial funding for the Bush Street and Smith Cove debris collectors.

In order to be sustainable, the Anti-Litter Campaign will need to be a public-private partnership. The particular funding source will depend on the particular component. The first two years of Clean Corps will be funded by General Funds, with additional staffing provided by the Office of Sustainability and the Environmental Control Board, and in-kind match by local non-profits participating in the program. The anti-littering marketing campaign is an opportunity to leverage corporate, private and foundation funding for advertising.

Additionally, enforcement practices like education and the initiation of an Enforcement Month / Week is an opportunity non-profit, business and community partners to provide funding and in-kind resources.

Critical to the success of the Implementation Plan is monitoring and tracking. It is expected that this will be developed and conducted in-house by DPW staff. These positions are funded by a combination of General Funds and Stormwater Utility Fund, depending on the staff and division.

To facilitate the public-private partnership, DPW's Watershed Planning + Partnership Section will be hiring a Grant Procurement Officer in FY16. One of the responsibilities of this position is to identify and apply for grants to support various DPW initiatives and plans. This person will work with other agencies and partners to secure outside funds for practices not covered by General Funds or Stormwater Utility Funds solely.

Finally, DPW will work with partners to enhance its Stormwater participation Event credit program as an incentive for community clean-ups. Currently, people need to volunteer a minimum of eight (8) hours to be eligible to receive a $10 credit on their stormwater bill. DPW will continue to work with communities, NGO partners and the Stormwater Advisory Committee to make the participation credit easier to understand and use, including working closely with the Clean Corps program and exploring options like "Adopt-an-Inlet" to support the modified inlet program.

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Appendices

Appendix A: Annual Trash TMDLs

WLA (lbs/yr removed)		LA (lbs/yr removed)	MOS (5%)	TMDL (lbs/yr removed)
Baltimore Harbor Watershed				
Baltimore City: Phase I MS4	42,869.4	2,912.6	2,378.4	49,946.6
Baltimore City: Other Point Sources	1,786.2			
Total WLA Baltimore Harbor	**44,655.6**			
Gwynns Falls Watershed				
Baltimore City: Phase I MS4	93,519.3	21,271.1	9,717.4	204,065.0
Baltimore City: Other Point Sources	2,892.3			
Baltimore County: Phase I MS4	72,831.6			
Baltimore County: Other Point Sources	1,533.3			
State Highway Administration	2,300.0			
Total WLA Gwynns Falls	**173,076.5**			
Jones Falls Watershed				
Baltimore City: Phase I MS4	81,107.0	19,013.8	7,453.4	156,520.4
Baltimore City: Other Point Sources	1,655.2			
Baltimore County: Phase I MS4	43,399.4			
Baltimore County: Other Point Sources	472.9			
State Highway Administration	1,418.7			
Total WLA Jones Falls	**130,053.2**			
TOTAL	**347,785.3**	43,197.5	19,549.2	410,532.0

Appendix B: Project Selection Criteria

Project selection criteria was developed to consider design elements beyond the typical implementation costs and expected collection amount. The City developed project selection criteria to prioritize which capital projects would be implemented as a part of this Plan. These criteria will be used to evaluate any future proposed projects. The project selection criteria (and maximum available points) are as follows:

- Total debris collected (max. 20 points): the amount of trash anticipated to be captured by the device, estimated using the MDE designated trash loading rate and contributing drainage area. This criterion considers the interception of trash loadings by other upstream devices.
- Normalized collection costs (max. 18 points): the total costs for design, construction and maintenance over 20 years, normalized as the cost per amount collected.
- Hot spots in stream (max. 12 points): proximity to known areas of trash accumulation (hot spots).
- Routine flooding (max. 10 points): proximity to known areas of street flooding.
- CSR Dirty Street (max. 8 points): primary rating of contributing drainage areas, as defined by BNIA.
- Vacant property (max 8 points): primary rating of contributing drainage areas, as defined by BNIA.
- Dependency (max. 6 points): level of dependency on other City agencies and / or other property owners for construction and maintenance.
- Potential for vandalism (max. 6 points): estimated potential that the device may be vandalized.
- Education opportunity (max. 4 points): potential for education or collaboration
- Stream restoration (max. 4 points): proximity to stream restoration projects
- Visible debris (max. 2 points): potential for the device or captured debris to be visible to the public
- Alternative funding (max. 2 points): potential for funding, other than stormwater fee.

Appendix C: WLA Reductions Based on Recommended Practices

Activity		Methodology	Trash Removed (LBS/YR)	Source of Methodology
Projects (DPW)				
Modified Inlets	Phase 1: Install 414 modified inlets	Assumes that lbs collected will be included in street sweeping and proactive inlet cleaning	**NA**	NA – will be counted as part of street sweeping and inlet cleaning
	Phase 2 – 3: Number of modified inlets TBD			
In-line Debris Collection Systems	Bush Street	Total trash x 65% x 20% (accounts for wet weight and debris)	**11,180**	Trash TMDL; PB 30% Concept Report 2011
		43 tons x 2,000 lbs x 65% x 20%		
In-line Debris Collection Systems	Smith Cove (MPA)	Total trash x 65% x 20% (accounts for wet weight and debris)	**5,460**	Trash TMDL; PB 30% Concept Report 2011
		21 tons x 2,000 lbs x 65% x 20% (assumes drainage area 1/2 Bush Street)		
Small In-line Debris Collection Systems	Other	Total trash x 43% x 20% (accounts for wet weight and debris)	**TBD**	Trash TMDL; PB 30% Concept Report 2011
End-of-Pipe Debris Collection Systems	Other	Total trash x 85%x 20% (accounts for wet weight and debris)	**TBD**	Trash TMDL; PB 30% Concept Report 2011
Programs (DPW)				
City-wide Mechanical Street Sweeping (includes mechanical alley sweeping)		(Lbs. street sweeping debris current year – Lbs. street sweeping debris 2011) x 57.7% (TMDL area/Total City area) x 8.9% (percentage of trash in the debris collected)	**424,484**	Baltimore County Trash TMDL (2015)
		22,588,000 lbs. – 14,322,000 lbs. x 57.7% x 8.9% (2015 projection)		

Activity		Methodology	Trash Removed (LBS/YR)	Source of Methodology
Proactive Inlet Cleaning		Total trash x efficiency x 20% (accounts for wet weight and debris) 150,000 lbs (projected) x 20%	**30,000**[33]	Same as debris collectors
Styrofoam Collection		Collection at the NW Citizen Drop-off Center (weight pounds)	**8,800**	Baltimore DPW
Routine Waterways Cleaning		TBD	**TBD**	TBD
Partnerships				
DPW School presentations		Baseline x 2% 228,370.6 x .02 = 4,567 lbs/yr	**4,567**	Trash Load Reduction Methods SF Bay Area MS4s Technical Report 2012
DPW Events / community presentations		Baseline x 2% 228,370.6 x .02 = 4,567 lbs/yr	**4,567**	Trash Load Reduction Methods SF Bay Area MS4s Technical Report 2012
Anti-Litter Campaign • Clean Corps • Municipal Can Program • Marketing + PR Campaign		50% x WLA 50% x 238,371	**119,195**[34]	Gwynns Falls and Jones Falls Bacteria TMDL 2006
MD Stormwater Participation Event	Community Clean-ups	LBS. Trash collected for events in TMDL area x 20% (accounts for some trash being debris or bottles with liquids) 1,550 bags trash x 25 lb/bag x 20%	**7,750**[35]	DC Trash TMDL WIP

[33] Assumes total after the installation of Phases 1 – 3 of the modified inlet project.
[34] Assumes full implementation of the anti-littering campaign
[35] 2015 projections. Does not include Project Clean Stream. Future year totals are projected to be greater.

Activity		Methodology	Trash Removed (LBS/YR)	Source of Methodology
MD Stormwater Participation Event	Canoe 'n Scoops / Harbor clean-ups	LBS. Trash collected for events in TMDL area x 20% (accounts for some trash being debris or bottles with liquids)	**750**[36]	DC Trash TMDL WIP
		150 bags trash x 25 lb/bag x 20%		
Enforcement[37]	FLASHCams	TBD	**TBD**	TBD
Enforcement	Changes to small hauler policies	TBD	**TBD**	TBD
Enforcement	Education	TBD	**TBD**	TBD
Enforcement	Enforcement Month / Week	TBD	**TBD**	TBD

[36] 2015 projections. Future year totals are projected to be greater.
[37] Enforcement is primarily Load Allocation (LA). WLA reductions will need to be determined.