Anacostia River Fecal Coliform Bacteria TMDL

Source Document:	MDE (Maryland Department of the Environment). 2006. Total Maximum Daily Loads of Fecal Bacteria for the Anacostia River Basin in Montgomery and Prince George's Counties, Maryland FINAL. Document Version November 3, 2008.
Water Body Type:	Tidal and non-tidal stream reaches of the Anacostia River in Maryland
Pollutant:	Fecal coliform bacteria
Designated Uses:	Water Contact Recreation, Protection of Aquatic Life, Public Drinking Water Supply, Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting, Recreational Trout Waters, Natural Trout Waters, Northeast Branch (NEB) (Upper Beaverdam Creek – High Quality)
Size of Watershed:	127 square miles (combined watersheds)
Water Quality Standards:	Freshwater: *E. coli*: 126 MPN / 100 mL Enterococci: 33 MPN / 100 mL Marine Water: Enterococci: 35 MPN / 100 mL
Indicators:	*Enterococcus* used for the Total Maximum Daily Load (TMDL)
Analytical Approach:	Flow duration curve with bacterial source tracking used to determine proportional contributions from sources.
Date Approved:	Approved March 2007

Introduction

This TMDL was developed to address the fecal coliform impairment in the tidal and non-tidal portions of the Anacostia River watershed (Figure 1) in Maryland and is designed to achieve attainment of the primary water contact recreation use. This fact sheet provides summary data related to the TMDL and includes specific information related to allocations made for Prince George's County, Maryland, regulated stormwater sources.

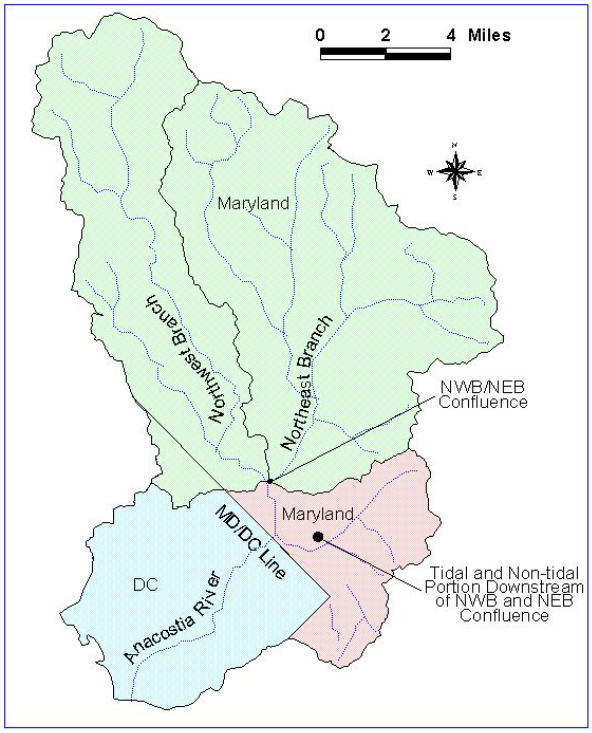

Figure 1. Anacostia River watershed
Source: MDE 2006.

Problem Identification and Basis for Listing

The listing was based on a comparison of the criterion value (33 MPN *Enterococcus*) with calculated annual and seasonal steady state geometric means for different flow strata. The steady state condition is defined as "unbiased sampling targeting average flow conditions and/or equally sampling or providing for unbiased sampling of high and low flows" and is determined through monitoring design or statistical analysis (MDE 2006). In the case of this TMDL, the monitoring was

routine (i.e., it did not stratify monitoring such that samples collected were proportional to the duration of time the watershed experiences low, mid, and high flows). The assessment process involved separating monitoring data into flow categories to calculate the steady state geometric mean with respect to flow regimes. Data were then compared to criteria and the impairment assessment was made.

Applicable Data

TMDL analysis was performed using historical data from the 5-year period preceding the TMDL. A specific data solicitation was made in 2003 to support the TMDL development.

Sources

Typical sources that contribute bacteria in the watershed including wildlife and domestic animals via nonpoint loading from land surfaces, and humans via septic systems, sanitary sewer overflows and municipal wastewater treatment plants, as well as livestock.

There is no separate accounting for federal lands in this TMDL.

Technical Approach

The baseline loadings and allowable loads were determined using a load duration curve with flow from U.S. Geological Survey daily flow monitoring data and bacteria monitoring data (six stations with one year of data). A multiple antibiotic resistance analysis methodology was used to determine the relative proportion of source categories: domestic (pets and human associated animals); human (human waste); livestock (agricultural related animals); and wildlife (mammals and waterfowl).

The allowable load within the non-tidal watershed upstream of the confluence is determined by first estimating a baseline load from current monitoring data. This baseline load is estimated using a long-term geometric mean and weighting factors from the flow duration curve. The TMDL for fecal bacteria entering the non-tidal Anacostia River upstream of the confluence is established after considering six different hydrological conditions:

- High-flow and low-flow annual conditions
- High-flow and low-flow seasonal conditions (the period between May 1 and September 30 when water contact recreation is more prevalent)
- 30-day high-flow
- 30-day low-flow conditions to be protective of DC waters designated uses (The District of Columbia's TMDL used a 30-day moving geometric mean.)

The TMDL for the Anacostia River area downstream of the confluence was estimated by subtracting the upstream non-tidal area allowable load from the total allowable load derived from the District's TMDL.

Allocations

As described under the technical approach description, analysis for the TMDL was performed separately for two regions in the watershed: The region upstream of the confluence of the NEB and Northwest Branch (NWB) and the region downstream of the confluence.

Practicable Reduction Targets

The analysis includes a step by which maximum practicable reduction (MPR) targets were first identified and scenarios representing MPR situations were evaluated to see if standards were met. None of the watersheds upstream of the NWB and NEB meet water quality standards based on MPRs in the practicable reduction target scenario. Therefore, the allocations represent scenarios with reductions higher than MPR.

Upstream Region

For the upstream region, allocations were made for the subbasins draining to each of six water quality monitoring stations in the unit of billion MPN/day and source distributions identified based on the bacteria source tracking results and analysis of flow strata.

Downstream Region

Allocations for the area below the confluence of the NEB and NWB were made by calculating the difference between the allocation assigned to Maryland in the District's Anacostia River bacteria TMDL and the allocated load at the confluence of the NEB and NWB as calculated for the upstream portion.

Baseline Loads and Reductions

The TMDL report provides a baseline, TMDL, and percent reduction at the six monitoring stations for the TOTAL load for the upstream region (Table 1).

Table 1. Upstream region enterococci TMDL

Station	Baseline	TMDL	% Reduction
	(billion MPN/day)		
BED0001	473	42	91
INC0030	163	20	88
PNT0001	545	68	87
NEB0002sub	259	53	79
NWA0135	478	57	88
NWA0002sub	318	70	78
Total	2,236	310	86

Source: MDE 2006.

Only TMDL loads are presented for the downstream region (Table 2).

Table 2. Downstream region enterococci TMDL

Region	TMDL	LA	WLA-PS	WLA-MS4
	(billion MPN/day)			
Downstream	47	16	0	31

Source: MDE 2006.
Note: LA = load allocation; WLA = wasteload allocation; PS = point source; MS4 = municipal separate storm sewer system.

MS4 Allocations

The TMDL provides a single municipal separate storm sewer system (MS4) load allocation to each county. The MS4 allocation for the County is listed in Table 3.

Table 3. Prince George's County MS4 enterococci allocations

Station	County MS4 Load (billion MPN/day)
Upstream Region	
BED0001	9
INC0030	9
PNT0001	15
NEB0002sub	34
NWA0002sub	17
Downstream Region	
Area between confluence and DC line	31

Source: MDE 2006.

Bacteria Source Tracking Source Contributions

Bacteria source tracking results identified the relative proportion for which contributing sources are responsible in the upstream portion and in the downstream portion (Table 4).

Table 4. Bacteria source tracking results

Station	Pets	Human	Livestock	Wildlife
	Percent			
Upstream Region				
BED0001	45	15	9	32
INC0030	30	23	13	33
PNT0001	29	23	7	41
NEB0002sub	24	9	28	38
NWA0002sub	31	17	8	44
Downstream Region				
Entire area	21.1	22.2	0.3	56.5

Source: MDE 2006.

Loading Rate Analysis

To develop the TMDL for the downstream region, a loading rate analysis was also performed which resulted in an estimated loading rate for both regions of 3.7 billion MPN fecal coliform/acre/year. Conversion to *Enterococcus* produces a loading rate of 47.2 billion enterococcus MPN/day.

References

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