UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Decision Rationale
Total Maximum Daily Loads
For Organics and Metals
In Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary

John A. Arnstead for
Jon M. Capacasa, Director
Water Protection Division

Date: *5/24/04*
Actually signed
5/24/05

Decision Rationale
District of Columbia
Total Maximum Daily Loads
Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary
For Organics and Metals

I. Introduction

The Clean Water Act (CWA) requires that Total Maximum Daily Loads (TMDLs) be developed for those water bodies that will not attain water quality standards after application of technology-based and other required controls. A TMDL sets the quantity of a pollutant that may be introduced into a waterbody without exceeding the applicable water quality standard. EPA's regulations define a TMDL as the sum of the wasteload allocations (WLAs) assigned to point sources, the load allocations (LAs) assigned to nonpoint sources and natural background, and a margin of safety.

This document sets forth the United States Environmental Protection Agency's (EPA) rationale for approving the TMDLs for organics and metals in Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary. These TMDLs were established to address impairment of water quality as identified in the District of Columbia's (DC) 1998 Section 303(d) list of impaired waters. The DC Department of Health, Environmental Health Administration, Bureau of Environmental Quality, Water Quality Division, submitted the *Final Total Maximum Daily Loads for Organics and Metals in Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary* dated August 2004 (TMDL Report) to EPA for final review which was received by EPA on August 24, 2004.

Based on this review, EPA determined that the following eight regulatory requirements have been met:

1. The TMDLs are designed to implement the applicable water quality standards,
2. The TMDLs include a total allowable load as well as individual waste load allocations and load allocations,
3. The TMDLs consider the impacts of background pollutant contributions,
4. The TMDLs consider critical environmental conditions,
5. The TMDLs consider seasonal environmental variations,
6. The TMDLs include a margin of safety,
7. There is reasonable assurance that the proposed TMDLs can be met, and
8. The TMDLs have been subject to public participation.

II. Summary

Table 1 presents the 1998 Section 303(d) listing information for the water quality-limited waters of the Potomac River tributaries in effect at the time the consent decree was filed. The District's 2002 Section 303(d) list added a dissolved oxygen (DO) impairment to Foundry Branch.

Table 1 - Section 303(d) Listing Information

1998 Section 303(d) List					
Segment No.	Waterbody	Pollutants of Concern	Priority	Ranking	Action Needed
19	Battery Kemble Creek	Bacteria	Low	18	Control Nonpoint Source (NPS) pollution
20	Foundry Branch	Metals and bacteria	Low	33	Control NPS pollution
31	Dalecarlia Tributary	Bacteria and Organics	Low	31	Control NPS pollution
2002 Section 303(d) List					
Listing Year	Waterbody	Pollutants of Concern	Priority Ranking	TMDL Establishment Date	
1998	Battery Kemble Creek	Bacteria	Low	September 2007	
1998	Foundry Branch	Metals and bacteria	Low	September 2007	
2002	Foundry Branch	DO	Medium	August 2008	
1998	Dalecarlia Tributary	Bacteria and Organics	Low	September 2007	

The TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards. The TMDL is a scientifically-based strategy which considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a margin of safety value. TMDLs may be revised in order to address new water quality data, better understanding of natural processes, refined modeling assumptions or analysis and/or reallocation.

III. Background

Potomac River Watershed and Tributaries

The Potomac River watershed covers 14,679 square miles in four states and the District of Columbia. The river is more than 380 miles long from its start in West Virginia to Point Lookout on the Chesapeake Bay.

The Potomac River provides 75 percent of the metropolitan Washington drinking water and all of the District's drinking water. The river also receives discharges from wastewater treatment plants, including the District's Blue Plains Plant and treatment plants for Arlington and Alexandria located just upstream of the DC/MD line. There are no drinking water intakes downstream of the District.

Battery Kemble Creek drains Battery Kemble Park in a majority parklands/forested watershed of 239 acres. Foundry Branch is largely enclosed in storm water pipe and resides in a an urbanized watershed made up of 80% residential and light commercial property. Daleclarlia Tributary has the largest watershed, measuring 1,111 acres, and stretches across the Maryland border. Three quarters of the watershed has been developed with suburban-type residential housing, the remainder is parkland.

Consent Decree

This organics and metals TMDL report was completed by the District to partially meet the fourth-year TMDL milestone commitments under the requirements of the 2000 TMDL lawsuit settlement of *Kingman Park Civic Association et al. v. EPA*, Civil Action No. 98-758 (D.D.C.), effective June 13, 2000, as modified March 25, 2003.

IV. Technical Approach

When models are used to develop TMDLs, the model selection depends on many factors, including but not limited to, the complexity of the system being modeled, available data, and impact of the pollutant loading. For example, the District used the Tidal Anacostia Model/Water Quality Analysis Simulation Program (TAM/WASP) Toxics Screening Level Model to develop the organics and metals TMDLs for the Upper and Lower Anacostia River mainstem because loading from these segments significantly impacted water quality. The District chose to use less complex models to develop the TMDLs for the Anacostia River tributaries partly because of the relative lack of data and because the overall impact of pollutant loadings from the individual tributaries of organics and metals on water uses is less significant that the impact of the mainstem loadings. An analogous approach was taken for the Potomac River tributaries. The TMDLs for each tributary employed the identical model used for the Anacostia tributaries organics and metals TMDLs in light of the similarities in hydrology and water quality data.

Overall, EPA finds that the District's selection of the model for these waterbodies is reasonable and appropriate as described in the following sections.

Anacostia River Tributary Modeling

The District utilized ICPRB's simple mass balance model, also designed for tributaries to the Anacostia River, to develop TMDLs for the Potomac River tributaries. The model is comprised of three sub-models, one of which is for organic pollutants and one for inorganic pollutants (metals).[1] These three sub-models predict daily water column concentrations of each pollutant in each of the Potomac River tributaries under current conditions and under TMDL conditions. A discussion of ICPRB's methodology is included in the TMDL Report as Appendix C.

The mass balance model treats each tributary as a "bathtub" which, on each day of the simulation period, receives a volume of water representing storm water runoff and a volume of water representing base flow from groundwater infiltration. Base flow and storm water are assumed to contain a pollutant load based on the pollutant concentrations used in the mainstem modeling. Little toxics data exists for the tributaries, and what does exist relates primarily to metals. In cases where samples were analyzed for organics, the detection level was frequently higher than the water quality standards. Table 2 details the groupings used for polyaromatic hydrocarbons (PAHs). All other chemicals were considered individually in the model except for polychlorinated biphenyls (PCBs), which were considered in total. No additional instream processes, such as sediment resuspension or decay, are simulated. EPA concurs that this is appropriate based on the amount of data available. Again, the Small Tributary Model does a fair job in simulating daily pollutant concentrations based on the available data.

Daily estimates of base flow and storm water volume for each tributary is based on ICPRB's Watts Branch HSPF model[2] and landuse information. The Watts Branch HSPF[3] model was calibrated using stream discharge data from the USGS gage 01658000 on Watts Branch near Minnesota Avenue which has been in operation since June 1992. The HSPF model provided daily runoff for the period of January 1, 1988, through December 31, 1990, by landuse. Each tributary's drainage area was divided into three representative landuses: (1) impervious, (2) urban pervious, and (3) forested pervious. Based on the assumption that tributaries have hydrologic properties similar to those of the Watts Branch drainage area, the flow for each day from each tributary was determined and the instream organics and metals concentrations were compared to the District's water quality criteria. EPA finds this modeling approach reasonable.

---

[1]The third sub-model models bacteria.

[2]Appendix B, ICPRB October 6, 2000.

[3]Hydrologic Simulation Program - Fortran

Table 2 - PAH Subgroupings

Constituent	Chemical Designation
Polynuclear aromatic hydrocarbons (PAH) Model	
Napthalene	PAH1 (2 and 3 ring PAHs)
2-methyl napthalene	
Acenapthylene	
Acenapthene	
Fluorene	
Phenanthrene	
Fluoranthene	PAH2 (4 ring PAHs)
Pyrene	
Benz[a]anthracene	
Chrysene	
Benzo[k]fluoranthene	PAH3 (5 and 6 ring PAHs)
Benzo[a]pyrene	
Perylene	
Indeno[1,2,3-c,d]pyrene	
Benzo[g,h,i]perylene	
Dibenz[a,h+ac]anthracene	

Because each tributary receives water discharged from the District's separate sewer system, tributaries' watershed boundaries were delineated using a combination of topographic information and sewer outfall tributary and watershed discharge data.

EPA believes the DC Small Tributaries TMDL Model produces reasonable results given the available information and that all reasonable efforts were made to secure available information.

V. Discussions of Regulatory Requirements

EPA has determined that these TMDLs are consistent with statutory and regulatory requirements and EPA policy and guidance. EPA's rationale for approval is set forth according to the regulatory requirements listed below.

The TMDL is the sum of the individual waste load allocations (WLAs) for point sources and the load allocations (LAs) for nonpoint sources and natural background and must include a margin of safety (MOS). The TMDL is commonly expressed as:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

where

WLA = waste load allocation
LA = load allocation
MOS = margin of safety

1. The TMDLs are designed to implement the applicable water quality standards.

The TMDL Report states that Battery Kemble Creek and Foundry Branch are on the District's 1998 Section 303(d) list of impaired waters for metals, and Dalecarlia Tributary is on for organics because the District's ambient monitoring program disclosed exceedances of the water quality standards.

In the TMDL Report, the District lists the Potomac River tributaries' beneficial water uses as well as the general and specific water quality criteria designed to protect those uses. The designated uses for Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary are:

A. Primary contact recreation,
B. Secondary contact recreation and aesthetic enjoyment,
C. Protection and propagation of fish, shellfish and wildlife, and
D. Protection of human health related to consumption of fish and shellfish.

Table 3 - DC's Water Quality Standards for Metals

Metals	Criteria for Classes (ug/L)		
	Class C		Class D
	Criteria Maximum	Criteria	
Arsenic - Dissolved	150.00	340.00	0.14
Copper - Dissolved	12.31	18.61	NA
Lead - Dissolved	2.79	71.63	NA
Zinc - Dissolved	113.29	124.07	NA

The water quality criteria for copper, lead, and zinc is hardness dependant. The criteria shown are based on a hardness of 110 mg/L as $CaCO_3$ from DC DOH monitoring data. It should be noted that the District's water quality regulations 49 D.C. REG. 3012; and 49 D.C. REG. 4854 require very careful reading and the Federal Register (60 FR 22,231) must be consulted to obtain the correct numerical values and units for hardness dependent criteria. The TMDL report's Table 2-2: Dissolved Metals Numerical Criteria, and notes, provided a complete explanation of the criteria.

The organic pollutant water quality criteria are found in the DC regulations at Section 1104.7, Table 3.

Table 4 - DC's Water Quality Standards for Organics

Organics	Criteria for Classes (ug/L)		
	Class C		Class D
	CCC	CMC	30-Day Average
Chlordane	0.004	2.4	0.00059
DDE	0.001	1.1	0.00059
DDD	0.001	1.1	0.00059
DDT	0.11	1.1	0.00059
Dieldrin	.00019	2.5	0.00014
Heptachlor Epoxide	0.0038	0.52	0.00011
PAH1	50.0	NA	1,4000.0
PAH2	400.0	NA	0.031
PAH3	NA	NA	0.31
Total PCBs	0.014	NA	0.00045

Within each PAH group, the most stringent water quality criterion was used as the criteria for each member of the group. Each group's constituents are shown in Table 4. For example, the Class D water quality standard for fluoranthene, pyrene, benz[a]anthracene, and chrysene are 370, 11000, 0.031, and 0.031 ug/L, respectively. Therefore, the most stringent of the individual standards, 0.031 ug/L is given in the TMDL report Table 2-3, and Table 4 above as the Class D standard for PAH2.

Because the EFDC model does not consider air deposition, the District estimated PCB air deposition using *Chesapeake Bay Basin Toxics Loading and Release Inventory*, May 1999, as their reference and their calculations are in Appendix D of the TMDL report. The TMDL report allocates approximately 5.6 percent of the instream PCB load to air deposition, and the remaining 94.4 percent to existing sources and requires a 99.67% reduction.

2. The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.

The TMDL report divides storm water discharges into the following categories: separate stormwater, direct runoff, and direct deposit. EPA guidance memorandum clarifies existing EPA regulatory requirements for establishing wasteload allocations (WLAs) for NPDES storm

water discharges in TMDLs approved or established by EPA.[4] Therefore, this document identifies WLAs for storm water discharges.

The key points established in the memorandum are:

- NPDES-regulated storm water discharges must be addressed by the wasteload allocation component of a TMDL.
- NPDES-regulated storm water discharges may not be addressed by the load allocation (LA) component of a TMDL.
- Storm water discharges from sources that are not currently subject to NPDES regulation may be addressed by the load allocation component of a TMDL.
- It may be reasonable to express allocations for NPDES-regulated storm water discharges from multiple point sources as a single categorical wasteload allocation when data and information are insufficient to assign each source or outfall individual WLAs.
- The wasteload allocations for NPDES-regulated municipal storm water discharge effluent limits should be expressed as best management practices.

The November 2002 memorandum does recognize that WLA/LA allocations may be fairly rudimentary because of data limitations. The District of Columbia divided Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary TMDLs into categories based on storm water (WLA) and direct runoff (LA). Therefore, the permitted storm water allocations were made based on the ratio of sewered areas to unsewered areas. Appendix A reports the TMDLs for stream load reductions for organics from existing loads.

3. The TMDLs consider the impacts of background pollutant contributions.

Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary's background pollutant loads are made up from inputs from the direct runoff, direct deposits, and separate storm water sewers.

4. The TMDLs consider critical environmental conditions.

The TMDL Report considers critical environmental conditions in Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary by evaluating average monthly loads for three years. The three years represent average flow, a wetter than average year, and a drier than average year.

At the Ronald Reagan National Airport, the average annual rainfall for the period of record, 1949 to 1998, is 38.95 inches.[5] Yearly totals vary, from 26.94 inches in 1965 to 51.97 inches in 1972. Individual events, often hurricanes, can be significant. Hurricane Agnes in 1972

[4]Memorandum *Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs*, from Robert H. Wayland, III, Director, Office of Wetlands, Oceans and Watersheds, and James A. Hanlon, Director, Office of Wastewater Management, to Water Division Directors, Regions 1 - 10, dated November 22, 2002.

[5]*Study Memorandum LTCP-3-2: Rainfall Conditions*, Draft, September 1999.

delivered approximately 10 inches of rain in the Washington, DC area. The District selected 1988 to 1990 as their representative rainfall years as shown:

Table 5 - Rainfall

Year	Annual Rainfall (inches)	Representing
1988	31.74	10 percentile, dry year
1989	50.32	90 percentile, wet year
1990	40.84	median, approx. 38 percentile

(LTCP-3-2, September 1999)

5. The TMDLs consider seasonal environmental variations.

The TMDL Report considers seasonal variations by modeling the watershed average monthly loads for three years.

6. The TMDLs include a margin of safety.

The Clean Water Act and federal regulations require TMDLs to include a margin of safety (MOS) to take into account any lack of knowledge concerning the relationship between effluent limitations and water quality. EPA guidance suggest two approaches to satisfy the MOS requirement. First, it can be met implicitly by using conservative model assumptions to develop the allocations. Alternately, it can be met explicitly by allocating a portion of the allowable load to the MOS.

The District has chosen to use an explicit margin of safety equal to one percent of the TMDL load.

7. There is reasonable assurance that the proposed TMDLs can be met.

Although the current District of Columbia MS4 (municipal separate storm sewer system) NPDES permit does not specifically list this TMDL because it was issued prior to establishing this TMDL, the MS4 promotes storm water load reductions and adherence with TMDL allocations.

8. The TMDLs have been subject to public participation.

DC public noticed a July 2004 version of these TMDLs with the comment period closing on August 9, 2004. The TMDL report was placed in the Martin Luther King Jr. Library and a public notice was published in the D.C. Register. In addition, EPA requested the District to use their e-mail list for the TMDL meetings to notify the interested parties of public comment period extensions. EPA believes all interested parties have had adequate time to comment on these TMDLs.

Comments were received from Earthjustice Legal Defense Fund. As part of DC's TMDL submittal, a response to comments document was submitted to EPA via e-mail.