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

Decision Rationale
Total Maximum Daily Loads
Oxon Run
For Organics, Metals and Bacteria

Approved

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Jon M. Capacasa, Director
Water Protection Division

Date: ___________________

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Total Maximum Daily Loads
Anacostia River Watershed
For Organics, Metals, and Bacteria
Executive Summary
December 15, 2004

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. The Environmental Protection Agency's (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 (MOS). The TMDL is commonly expressed as:

$$TMDL = WLAs + LAs + MOS$$

This document sets forth EPA's rationale for approving the TMDLs for organics, metals, and bacteria in Oxon Run. These TMDLs were established to address impairment of water quality as identified in the District of Columbia's (DC's) 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 load for Organics, Metals and Bacteria* dated December 2004 (TMDL Report) to EPA for final review, which was received by EPA, on December 7, 2004.

Background

The Oxon Run Watershed covers 12.4 square miles throughout the District of Columbia and Maryland. The total length of Oxon Run itself is approximately 6.8 miles with an impaired segment of 2.9 miles located completely within the District. Although the District's portion of the Oxon Run Watershed is heavily urbanized, it maintains parcels of forested land and open space.

History and Use of the Tidal Anacostia Model/Water Quality Simulation Program (TAM/WASP)

The Interstate Commission on the Potomac River Basin (ICPRB) constructed a simple mass balance model to estimate tributary organic and metal loads. The model treats each tributary as a "bathtub" where the daily base flow and storm water loads are reduced until instream water quality standards are met.

Additionally, a variety of methods are used to simulate daily input flows and loads, including use of a HSPF[1] model for the Watts Branch sub-watershed.

Tables containing the TMDLs, WLAs, LAs, and percent reductions are in Appendix A of this decision rationale.

Discussions of Regulatory Requirements

EPA has determined that these TMDLs are consistent with statutory and regulatory requirements and EPA policy and guidance. 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 Oxon Run stream segment in effect at the time the consent decree was filed. No additional impairments have been added in subsequent lists

Table 1 - Section 303(d) Listing Information

1998 Section 303(d) List					
Segment No.	Waterbody	Pollutants of Concern	Priority	Ranking	Action Needed
12.	Oxon Run	Organics, Metals and Bacteria	Medium	12	Upstream and Nonpoint Source (NPS) pollution

[1]Hydrologic Simulation Program - Fortran

III. Background

Oxon Run Watershed

Oxon Run is a tributary to the Potomac River. The Oxon Run Watershed is approximately 7,906 acres, or 12.4 square miles. The mainstem extends approximately 6.8 miles from its headwaters in Prince George's County to the downstream end at the District/Maryland boundary—flowing into the southeastern section of the District before crossing back over the Maryland State line, and discharging into the Potomac River. The length of the impaired segment, located within the District, is approximately 2.9 miles. Approximately 26 percent of the watershed is located in the District; the remainder of the Oxon Run Watershed is located in Maryland.

Most of the Oxon Run segment located in the District is a concrete-lined trapezoidal channel approximately 50 feet wide and 112 feet deep with the exception of two reaches where the natural streambed has remained intact. Most of Oxon Run's tributaries are piped to the mainstem while numerous storm water pipes discharge to the predominantly canalized reach.

The District's portion of Oxon Run Watershed is heavily developed as shown in Table 2.

Table 2 - Percent Landuse in the Oxon Run Watershed

	Water/ Wetland	Developed Lands	Urban Recreational & Transitional	Forest	Agriculture
District of Columbia	1.0	79.2	5.1	14.8	0
Maryland	0.2	63.9	10.0	25.8	0.1

(USGS, 2002)

There are two National Pollutant Discharge System (NPDES) permitted discharges in the Oxon Run Watershed. The first is theWashington Metropolitan Area Transit Authority (NPDES Permit # DC0000337), which monitors flow, as well as suspended solids, pH, and oil and grease in its effluent. However, the Washington Metropolitan Area Transit Authority is not required to monitor effluent fecal coliform, metals, or organics concentrations, and is not considered a significant source of these pollutants. The second permitted discharge is the District of Columbia's Municipal Separate Storm Sewer System (MS4, NPDES Permit #DC0000221). Based on available GIS data, approximately 85% of the District's portion of the Oxon Run Watershed is located in the storm sewer areas.

As part of the formulation of the DC Washington Water and Sewer Authority Long-Term Control Plan (LTCP, 2002), a statistical analysis of the rainfall records from Ronald Reagan National Airport was performed. The analysis identified a dry year, a wet year, and an average rainfall year, identified as the consecutive years 1988, 1989, 1990. The flow for these representative years was used in the modeling for the TMDLs. The average flow based on the United States Geological Survey (USGS) gage at Sherrill Drive (USGS 01648000) is presented for the representative years in Table 3.

Table 3: Total Precipitation and Average Flow Data

Year	Total Precipitation (in)	Days of Precipitation	Average Flow in Rock Creek (cfs)
1988	31.7	107	56.6
1989	50.3	128	81.8
1990	40.8	127	77.9

(LTCP)

Consent Decree

These organics and metals TMDLs were 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. Fourth-year milestones also include the development of fecal coliform bacteria TMDLs for C&O Canal and Tidal Basin, and various organics, and pH TMDLs for Washington Ship Channel and Tidal Basin.

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 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 and the minimum data requirements were generally satisfied. 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 Oxon Run Watershed. The TMDLs for Oxon Run employed the identical model used for the Anacostia tributaries organics and metals TMDLs in light of the similarities between it and Watts Branch in hydrology and water quality data. The DC Small Tributaries model simulates pollutant loadings using data to estimate base flow and storm flow constituent concentrations, and uses the Watts Branch Hydrologic Simulation Program – FORTRAN (HSPF) model developed by ICPRB to estimate storm and base flow input volumes. 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 Oxon Run. The model is comprised of three sub-models, one of which is for organic pollutants and one for inorganic pollutants (metals).[2] These three sub-models predict daily water column concentrations of each pollutant in Oxon Run 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 pollutant concentrations used in the mainstem modeling. Little toxics data exists for Oxon Run, and what does exist is derived from fish tissue sampling.

Table 4 - 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	

[2]The third sub-model models bacteria.

Table 4 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[3] and landuse information. The Watts Branch HSPF[4] 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 Oxon Run has hydrologic properties similar to those of the Watts Branch drainage area, and using data collected between 1990 and 2002, the flow for each day from Oxon Run was determined and the instream organics, metals, and bacteria concentrations were compared to the District's water quality criteria. EPA finds this modeling approach reasonable.

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 WLAs for point sources and the LAs for nonpoint sources and natural background and must include a MOS. The TMDL is commonly expressed as:

$$TMDL = \sum WLAs + \sum LAs + MOS \text{ (+ upstream loads)}$$

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 indicates that the chemicals of concern within the Oxon Run in the District's 1998 Section 303(d) list of impaired waters were derived in response to U.S. Fish and Wildlife Service analysis of fish tissue and sediment analysis performed by the Academy of

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

[4] Hydrologic Simulation Program - Fortran

Natural Sciences of Philadelphia's Patrick Center for Environmental Research. These tests were performed for the Anacostia River.

In the TMDL report, the District lists Oxon Run's beneficial water uses as well as the general and specific water quality criteria designed to protect those uses. The designated uses for Oxon Run are:

a. Primary contact recreation.
b. Secondary contact recreation and aesthetic enjoyment.
c. Protection and propagation of fish, shellfish and wildlife.
d. Protection of human health related to consumption of fish and shellfish.

The majority of the Oxon Run Watershed lies in Maryland. Therefore, consistent with the CWA, the Oxon Run waters crossing the DC/Maryland border must meet the District's water quality standards at the border.

Table 5 - 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 Department of Health 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 6 - 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 6 above as the Class D standard for PAH2.

Maryland's Code of Maryland Regulations 26.08.02.03-2, Numerical Criteria for Toxic Substances in Surface Waters, Table 1, Toxic Substances Criteria for Ambient Surface Waters–Inorganic Substances, list Maryland's criteria. Copper, lead, and zinc numerical values are noted to be increased or decreased by hardness or pH. Although the regulations do not include the hardness equations to determine site specific criteria, Maryland Department of Environment indicated that they use the same equations as the District. Therefore, Maryland's metals criteria is the same as the District's with one exception. Maryland bases its arsenic fish consumption criteria on a 10^{-5} risk level instead of the District's more conservative 10^{-6} risk level, Maryland's 41 ug/L vs. the District's 0.14 mg/L for arsenic. Maryland will need to ensure Oxon Run's instream arsenic concentration at the District's border is no greater than 0.14 ug/L.

The District includes more organics in its water quality standards than does Maryland and uses the more conservative 10^{-6} risk level for many of the pollutants Class D uses. Maryland will need to ensure Oxon Run's instream organic pollutant concentrations do not exceed the District's water quality standards at the DC/Maryland border.

Table 7 - Maryland's Water Quality Standards for Organics

Organics	Criteria for Classes		
	CCC Four-Day Average - ug/L	CMC One-Hour Average - ug/L	Fish Consumption 30-Day Average - ug/L (Risk Level 10^{-5})
Chlordane	0.0043	2.4	0.0022
DDE	NA	NA	0.0059
DDD	NA	NA	0.0084
DDT	NA	NA	0.0059
Dieldrin	0.0056	0.24	0.0014
Heptachlor Epoxide	0.0038	0.52	0.0011
PAH1	NA	NA	1,4000.0
PAH2	NA	NA	370.0
PAH3	NA	NA	0.49
Total PCBs	0.014	NA	0.0017

Table 8 - DC's Water Quality Standards for Bacteria

Fecal Coliform - No./100 ml		
District of Columbia*		
Class of Use	A	B
Bacteriological		
Fecal coliform - maximum 30-day geometric mean for 5 samples	200	1,000

*49 D.C. REG. 3012; and 49 D.C. REG.4854

The TMDL Report specifically identifies the 200 MPN/100 ml and the water quality criterion to be met.

The Small Tributary Model calculated load reductions which would achieve water quality standards. As discussed in Section IV, the Small Tributary Model is a simple mass balance model which only considers the estimated loads entering the tributary each day. Because the 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 A of the TMDL report. The TMDL report allocates approximately 21 percent of the instream PCB load to air deposition, and the remaining 79 percent to existing sources and requires a 99.9% 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 sewer, nonpoint sources, and upstream loads. EPA guidance memorandum clarifies existing EPA regulatory requirements for establishing wasteload allocations (WLAs) for storm water discharges in TMDLs approved or established by EPA.[5] This document identifies WLAs for storm water discharges, and makes the following key points:

- 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 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 November 2002 memorandum does recognize that WLA/LA allocations may be fairly rudimentary because of data limitations. In conformance with this EPA guidance memorandum, the District of Columbia equated separate sewer category to WLA and the nonpoint source category to LA. Therefore, the permitted storm water allocations were made based on the ratio of sewered areas to unsewered areas. Oxon Run's drainage area includes the sewershed areas as estimated from sewer maps. The District divided stream's TMDLs into WLAs and LAs based on an estimated ratio of sewered to unsewered areas.

Appendix A reports the TMDLs for tributary load reductions for organics, metals, and bacteria from existing loads. Metal concentrations are expressed in the form of total metals even though the water quality standards for the metals addressed by these TMDLs are expressed as the dissolved fraction. To determine attainment of the water quality standards, only the dissolved output concentrations were evaluated.

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

All of Maryland's pollutant loads are "background" to the District's portion of the Oxon Run Watershed. Maryland's contribution to the pollutant loads has been estimated based on available information. It should be noted that Maryland currently lists Oxon Run as impaired by biological, nutrients, and sediments and will develop TMDLs.

4. The TMDLs consider critical environmental conditions.

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[5]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.

The TMDL Report adequately considers critical environmental conditions by modeling the watershed using daily simulations for three years. The three years represent average rainfall in the Oxon Run Watershed, a wetter than average year, and a drier than average year.

5. The TMDLs consider seasonal environmental variations.

The TMDL report adequately considers seasonal variations by modeling the watershed using daily simulations for three years with seasonal data as appropriate.

6. The TMDLs include a margin of safety.

The CWA and Federal regulations require TMDLs to include a 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 NPDES MS4 (municipal separate storm sewer system) permit does not specifically list this Oxon Run TMDL because the MS4 was issued prior to establishing this TMDL, the MS4 promotes storm water load reductions. The MS4's authority will provide future regulatory authority to require storm water load reductions, providing reasonable assurance that the TMDLs will be implemented. Additionally, the District of Columbia Nonpoint Source Control Program has plans to implement projects in the Oxon Run watershed.

For this TMDL, the dominant source of PCBs to the Oxon Run Watershed is nonpoint sources. These sources emanate from legacy use in the form of atmospheric deposition, historic spills, land applications, and sediment contamination. These sources may originate in locally, in the surrounding region, the United States, and/or globally, but are expected decrease over time.

8. The TMDLs have been subject to public participation.

DC public noticed an October 2004 version of these TMDLs with the comment period closing on November 1, 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.