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

Ms. Cathy Curran Myers
Deputy Secretary for Water Management
Pennsylvania Department of Environmental Protection
Rachel Carson State Office Building
P.O. Box 2063
Harrisburg, PA 17105-2063

Dear Ms. Myers:

The U.S. Environmental Protection Agency (EPA) Region III is establishing Total Maximum Daily Loads (TMDLs) for sediments and nutrients for the impaired segments of the Wissahickon Creek watershed. These TMDLs were established in accordance with Section 303(d)(1)(c) and (2) of the Clean Water Act to address impairments of water quality as identified on Pennsylvania's 1996, 1998, and 2002 Section 303(d) lists. These segments were listed for their failure to attain the aquatic life use.

In accordance with Federal regulations at 40 CFR §130.7, a TMDL must comply with the following requirements: (1) designed to attain and maintain the applicable water quality standards, (2) include a total allowable loading and as appropriate, wasteload allocations (WLAs) for point sources and load allocations for nonpoint sources, (3) consider the impacts of background pollutant contributions, (4) take critical stream conditions into account (the conditions when water quality is most likely to be violated), (5) consider seasonal variations, (6) include a margin of safety (which accounts for uncertainties in the relationship between pollutant loads and instream water quality), (7) consider reasonable assurance that the TMDL can be met and (8) be subject to public participation. The TMDLs for the Wissahickon Creek watershed satisfied each of these requirements. A copy of the TMDL Report has been included with this letter.

Following the establishment of these TMDLs, Pennsylvania is required to incorporate these TMDLs into Pennsylvania's Water Quality Management Plan pursuant to 40 CFR § 130.7(d)(2). As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL WLA pursuant to 40 CFR §122.44 (d)(1)(vii)(B). Please submit all such permits to EPA for review as per EPA's letter dated October 1, 1998.

If you have any questions or comments concerning this letter, please do not hesitate to contact Mrs. Evelyn Macknight at (215) 814-5717.

Sincerely,

/s/ 10-9-03

Jon M. Capacasa, Director
Water Protection Division

Enclosures

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

Total Maximum Daily Load
For Sediment and Nutrients
Wissahickon Creek Watershed

__/s/ ____________
Jon M. Capacasa, Director
Water Protection Division

Date: __10-09-03______

Nutrient and Siltation TMDL Development for Wissahickon Creek, Pennsylvania

Final Report

October 2003

U.S. Environmental Protection Agency
Region 3
1650 Arch Street
Philadelphia, Pennsylvania

Table of Contents

List of Tables

List of Figures

Executive Summary

The Wissahickon Creek drains approximately 64 square miles and extends 24.1 miles in a southeasterly direction through lower Montgomery and northwestern Philadelphia Counties. The Wissahickon Creek is designated for trout stocking, and is subject to all water quality criteria specific to this designated use and those defined for general statewide water uses including aquatic life, water supply, and recreation. As a result of biological investigations conducted by the Pennsylvania Department of Environmental Protection (PA DEP) that identified observed impacts on aquatic life and exceedances of applicable dissolved oxygen (DO) criteria, much of the Wissahickon Creek basin has been listed on the State's 303(d) list of impaired waters. The watershed is heavily impacted by urbanization and is listed as impaired due to problems associated with elevated nutrient levels, siltation, low dissolved oxygen concentrations, chlorine, water/flow variability, oil and grease, and pathogens. These TMDLs were developed to address impairments due to nutrients, siltation, and low dissolved oxygen levels. These were the impairments identified on Pennsylvania's 1996 Section 303(d) List. Future TMDLs will be required to address the chlorine and oil and grease impairments.

The Environmental Protection Agency Region III (EPA) establishes these Total Maximum Daily Loads (TMDLs) for the Wissahickon Creek basin to address those stream segments impaired as a result of excess nutrients and siltation. To address nutrient impairments, TMDLs have been established for ammonia nitrogen (NH3-N), nitrate-nitrite nitrogen (NO3+NO2-N), ortho phosphate (ortho PO4), and carbonaceous biochemical oxygen demand (CBOD) in order to attain and maintain applicable Water Quality Standards (WQS). There are presently no numeric criteria for nutrients or siltation defined by WQS for these streams. As a result, consideration was given to all biological indicators and stressors identified in previous biological assessments of the Wissahickon Creek basin. In order to achieve and maintain that aquatic life use EPA determined the endpoint for the nutrient TMDL based on the link between nutrient concentrations, DO concentrations, and biological activity in the streams. Of the components of instream biological activity, only DO has a numeric criteria for protection of aquatic life in stream segments of the Wissahickon Creek basin. As a result, the nutrient TMDL endpoint is based on achieving and maintaining both the minimum and minimum daily average DO criteria for the critical period associated with trout stocking. For siltation impaired stream segments, TMDLs have been established based on target load endpoints estimated from a reference unimpaired watershed.

As part of the nutrient TMDLs, EPA has allocated specific amounts of NH3-N, NO3+NO2-N, orho PO4, and CBOD to certain point and nonpoint sources necessary to restore and maintain applicable WQS for DO. These TMDLs recommend that five facilities have their National Pollution Discharge Elimination System (NPDES) permits modified when next reissued to reduce the amounts of pollutants that may be discharged. The nutrient TMDL and WLAs reported herein are contingent on the assumption that NPDES permits for Ambler Borough (PA0026603), Abington Township (PA0026867), Borough of North Wales (PA0022586), Upper Gwynedd Township (PA0023256),

and the Township of Upper Dublin (PA0029441) are amended to increase the effluent DO concentrations to a minimum of 7.0 mg/L.

TMDLs were determined for each of the most stringent applicable DO criteria necessary to provide aquatic life use protection as follows: Trout Stocking (February 15 to July 31) and Warm Water Fishes (remainder of year). For each DO criterion and impaired stream segment of Wissahickon Creek, EPA allocated waste load allocations (WLAs) for all point sources and load allocations (LAs) for all nonpoint sources as part of the TMDLs. The following tables summarize the total WLAs and LAs allocated to address nutrient impairments for each stream segment of the Wissahickon Creek basin included in the State's 303(d) list.

TMDL summary by stream segment for the Wissahickon Creek basin - Trout Stocking (February 15 to July 31)

Sum of Waste Load Allocations					
Segment Name	Segment ID	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4 (lbs/day)
Wissahickon Creek	971218-1345-ACE	258.846	38.513	1057.952	96.224
Wissahickon Creek	971209-1430-ACE	0.000	0.000	0.000	0.000
Wissahickon Creek	971209-0930-ACE	1.034	0.202	0.321	0.046
Wissahickon Creek	971222-0930-ACE	543.402	81.466	1657.755	254.221
Wissahickon Creek	971222-1130-ACE	0.000	0.000	0.000	0.000
Lorraine Run	971215-1000-ACE	0.118	0.022	0.052	0.006
Sandy Run	971215-1133-ACE	244.684	23.571	986.281	60.511
Pine Run	971215-1300-ACE	0.000	0.000	0.000	0.000
Pine Run	971215-1303-ACE	116.740	20.572	335.664	13.266
Trewellyn Creek	971217-1145-ACE	0.000	0.000	0.000	0.000

Sum of Load Allocations					
Segment Name	Segment ID	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4 (lbs/day)
Wissahickon Creek	971218-1345-ACE	0.670	0.011	0.457	1.215
Wissahickon Creek	971209-1430-ACE	832.692	101.270	4065.812	402.456
Wissahickon Creek	971209-0930-ACE	1058.705	131.464	4121.076	413.614
Wissahickon Creek	971222-0930-ACE	159.364	20.025	1033.639	90.568
Wissahickon Creek	971222-1130-ACE	222.733	33.223	1050.113	95.465
Lorraine Run	971215-1000-ACE	123.732	1.344	134.480	1.949
Sandy Run	971215-1133-ACE	110.735	19.379	336.908	13.127
Pine Run	971215-1300-ACE	1.181	0.040	0.986	0.100
Pine Run	971215-1303-ACE	1.181	0.040	0.986	0.100
Trewellyn Creek	971217-1145-ACE	1.922	0.049	0.162	0.029

TMDL summary by stream segment for the Wissahickon Creek basin - Warm Water Fishes (August 1 to February 14)

Sum of Waste Load Allocations					
Segment Name	Segment ID	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4 (lbs/day)
Wissahickon Creek	971218-1345-ACE	445.052	86.405	1051.573	170.411
Wissahickon Creek	971209-1430-ACE	0.000	0.000	0.000	0.000
Wissahickon Creek	971209-0930-ACE	1.034	0.202	0.321	0.046
Wissahickon Creek	971222-0930-ACE	543.402	81.466	1646.820	254.221
Wissahickon Creek	971222-1130-ACE	0.000	0.000	0.000	0.000
Lorraine Run	971215-1000-ACE	0.118	0.022	0.052	0.006
Sandy Run	971215-1133-ACE	326.145	65.235	986.281	150.935
Pine Run	971215-1300-ACE	0.000	0.000	0.000	0.000
Pine Run	971215-1303-ACE	137.319	22.868	300.307	21.062
Trewellyn Creek	971217-1145-ACE	0.000	0.000	0.000	0.000
Sum of Load Allocations					
Segment Name	Segment ID	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4 (lbs/day)
Wissahickon Creek	971218-1345-ACE	0.000	0.000	0.000	0.000
Wissahickon Creek	971209-1430-ACE	973.035	167.356	4031.623	559.839
Wissahickon Creek	971209-0930-ACE	1239.972	206.190	4080.025	575.352
Wissahickon Creek	971222-0930-ACE	278.761	58.710	1032.974	159.435
Wissahickon Creek	971222-1130-ACE	383.300	77.696	1045.820	167.137
Lorraine Run	971215-1000-ACE	123.732	1.344	134.480	1.949
Sandy Run	971215-1133-ACE	130.034	21.600	301.853	20.805
Pine Run	971215-1300-ACE	1.181	0.040	0.986	0.100
Pine Run	971215-1303-ACE	1.181	0.040	0.986	0.100
Trewellyn Creek	971217-1145-ACE	1.922	0.049	0.162	0.029

To determine siltation endpoints adequate to protect the aquatic life uses discussed above, EPA used the reference watershed approach, the Wissahickon Creek and reference watersheds were matched. A reference watershed is selected as similar to the target watershed but meets applicable WQS. EPA used a watershed model to simulate the sediment loads from different sources. The sediment loads calculated for the reference watersheds were used as endpoints for the impaired watersheds. TMDLs were then developed for the impaired watersheds based on the endpoints. Summaries of the siltation TMDLs, WLAs, and LAs are provided in the following tables for each of the five modeled subwatersheds and stream segments of the Wissahickon Creek basin included on the 303(d) list as impaired. WLAs were provided for all point sources in the basin, including all MS4 stormwater permits for each municipality. For each MS4, WLAs were assigned to all contributions of siltation from both overland runoff and streambank erosion. .

Note that in the tables, the WLA is presented in two different ways. In order to meet the reference watershed sediment loads that were determined to be the TMDL endpoints for each of the five modeled subwatersheds, the loads from NPDES dischargers were multiplied by the sediment delivery ratio (SDR) in each of the respective watersheds. This resulted in accounting for transport losses of the sediment from the dischargers as it travels through the watershed. The WLA (SDR applied) represents the sediment load from dischargers at the mouth of the watershed after the SDR has been applied. The WLA (SDR not applied) represents the sediment load at the "end of pipe" for each of the dischargers and was based on the permitted flow and TSS concentrations (which were converted to lbs/yr).

The draft TMDL report (public noticed June 2003) reported loads attributed to streambank erosion that were estimated using a simple routine available in AVGWLF. Although this application was used in previous applications, the difference in sizes of the Wissahickon Creek and reference watershed did not provide comparable loads for analysis. Following review of the application of this routine as a result of public comments, a more-detailed methodology was determined necessary to: (1) more-accurately estimate sediment loads attributed to streambank erosion using a process-based approach and (2) provide a reasonable and comparable measure for TMDL development using the reference watershed approach. The new methodology applied provides an analysis that considers site-specific, field-verified information in conjunction with generally accepted and applied, dynamic, process-based algorithms for determining streambank erosion characteristics and impacts.

The streambank erosion simulation module employed the algorithm used in the Annualized Agricultural Nonpoint Source Model (AnnAGNPS) model (Theurer and Bingner, 2000). Sediment transport/routing and streambank erosion simulation were performed using three particle size classes (clay, silt, and sand). For each subwatershed channel segment, the incoming sediment load is the total of local sources plus the loading from upstream subwatersheds . If the incoming load was greater than the downstream segment's transport capacity, the sediment deposition algorithm was used to determine the transported load. If the incoming load was less than or equal to the segment's transport capacity the sediment discharge at the outlet of the reach was less than or equal to the sediment transport capacity for an erodible channel. Sediment transport capacity is specific to the magnitude of flow. Therefore, the capacity for each particle size was calculated for each increment of the streamflow hydrograph. EPA changed the sediment loadings to correspond to the more accurate transport capacity which was based upon particle size, flow magnitude, and stream bank stability. Additional information on this approach can be found in Section 3.0 of the Modeling Report for Wissahickon Creek, Pennsylvania Siltation TMDL Development.

TMDLs for impaired watersheds within subwatershed 1

Subwatershed	LA (lbs/yr)	WLA (SDR not applied)* (lbs/yr)	WLA (SDR applied)* (lbs/yr)	MOS (lbs/yr)	TMDL (lbs/yr)
971217-1430-ACE	0.00	132472.14	132472.14	13523.44	145995.58

North Wales Tributary					
971218-1045-ACE Wissahickon Creek	0.00	232627.14	232627.14	23977.92	256605.06
971218-1345-ACE Wissahickon Creek	0.00	832826.33	343101.57	23269.82	366371.39
981015-1100-ACE Tributary Upstream of North Wales Tributary	0.00	104064.32	104064.32	9938.99	114003.31
TOTAL	**0.00**	**1301989.93**	**812265.17**	**70710.17**	**882975.34**

*See explanation in above paragraph

TMDLs for impaired watersheds within subwatershed 2

Subwatershed	LA (lbs/yr)	WLA (SDR not applied)* (lbs/yr)	WLA (SDR applied)* (lbs/yr)	MOS (lbs/yr)	TMDL (lbs/yr)
971216-1415-ACE Rose Valley Tributary	0.00	812,868.14	307,981.49	18,834.77	326,816.25
971217-1015-ACE Willow-Run East	0.00	157,663.24	157,663.24	11,976.98	169,640.22
971217-1145-ACE Trewellyn Creek	0.00	177,794.61	177,794.61	15,424.21	193,218.82
971222-0930-ACE Wissahickon Creek	0.00	220,671.91	220,671.91	17,766.70	238,438.61
971222-1130-ACE Wissahickon Creek	0.00	115,823.55	115,823.55	13,152.62	128,976.17
Upstream Load**	132,446.30	0.00	0.00	0.00	132,446.30
TOTAL	**132,446.30**	**1,484,821.45**	**979,934.79**	**77,155.28**	**1,189,536.38**

*See explanation in above paragraph

**Upstream load includes the TMDL load from subwatershed 1

TMDLs for impaired watersheds within subwatershed 3

Subwatershed	LA	WLA (SDR not applied)	WLA (SDR applied)	MOS	TMDL
971215-1133-ACE Sandy Run	0.00	590,668.53	293,476.35	17,264.19	310,740.53
971215-1300-ACE Pine Run	0.00	129,773.35	129,773.35	9,773.98	139,547.34
971215-1303-ACE Pine Run	0.00	182,899.94	99,467.99	6,648.62	106,116.61
TOTAL	**0.00**	**903,341.82**	**522,717.69**	**33,686.79**	**556,404.48**

*See explanation in above paragraph

TMDLs for impaired watersheds within subwatershed 4

Subwatershed	LA (lbs/yr)	WLA (SDR not applied)* (lbs/yr)	WLA (SDR applied)* (lbs/yr)	MOS (lbs/yr)	TMDL (lbs/yr)

971208-1000-ACE Wises Mill Tributary	0.00	13,828.33	13,828.33	1,379.47	15,207.80
971209-0930-ACE Wissahickon Creek	0.00	202,378.54	201,010.76	16,283.52	42,189.97
971211-1300-ACE Paper Mill Run	0.00	64,552.66	64,552.66	6,301.52	70,854.18
971215-1000-ACE Lorraine Run	0.00	897,469.23	189,501.11	5,094.41	194,595.52
971215-1130-ACE Tributary Downstream of Sandy Run	0.00	89,456.59	89,456.59	8,216.71	97,673.30
Upstream Load**	202,221.19	0.00	0.00	0.00	202,221.19
TOTAL	**202,221.19**	**1,267,685.35**	**558,349.45**	**37,275.63**	**797,846.27**

*See explanation in above paragraph

**Upstream load includes the TMDL load from subwatersheds 2 and 3

TMDLs for impaired watersheds within subwatershed 5

Subwatershed	LA (lbs/yr)	WLA (lbs/yr)	MOS (lbs/yr)	TMDL (lbs/yr)
971208-1235-ACE Valley Road Tributary	0.00	27,913.47	2,073.29	29,986.76
971208-1430-ACE Monoshone Creek	0.00	60,137.76	4,848.89	64,986.65
971209-1200-ACE Creshiem Creek	0.00	105,882.10	8,343.44	114,225.54
971209-1430-ACE Wissahickon Creek	0.00	139,955.17	10,915.42	150,870.59
971208-1000-ACE Wises Mill Tributary	0.00	45,843.44	3,307.20	49,150.63
Upstream Load*	147,601.56	0.00	0.00	147,601.56
TOTAL	**147,601.56**	**379,731.93**	**29,488.24**	**556,821.73**

*Upstream load includes the TMDL load from subwatershed 4

Table A-1. 303(d) listed waterbodies in the Wissahickon Creek basin for nutrients

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Wissahickon Creek	971218-1345-ACE	844	3.09	0	1	Municipal Point Source; Urban Runoff/Storm Sewers	Medium
Wissahickon Creek	971209-1430-ACE	844	6.24	0	1	Municipal Point Source; Urban Runoff/Storm Sewers	Medium
Wissahickon Creek	971209-0930-ACE	844	6.04	0	1	Municipal Point Source; Urban Runoff/Storm Sewers	Medium
Wissahickon Creek	971222-0930-ACE	844	1.83	0	1	Municipal Point Source; Urban Runoff/Storm Sewers	Medium
Wissahickon Creek	971222-1130-ACE	844	3.12	0	1	Municipal Point Source; Urban Runoff/Storm Sewers	Medium
Lorraine Run	971215-1000-ACE	856	2.22	0	1	Urban Runoff/Storm Sewers	Medium
Sandy Run	971215-1133-ACE	859	6.14	0	1	Municipal Point Source; Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1303-ACE	860	3.51	0	1	Municipal Point Source; Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	861	0.62	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	862	2.43	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	863	0.49	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	864	0.52	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	865	0.93	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	866	1.48	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	867	0.53	0	1	Urban Runoff/Storm Sewers	Medium

Pine Run	971215-1300-ACE	868	0.42	0	1	Urban Runoff/Storm Sewers	Medium
Sandy Run*	971215-1133-ACE	869	0.73	0	1	Urban Runoff/Storm Sewers	Medium
Sandy Run	971215-1300-ACE	870	0.42	0	1	Urban Runoff/Storm Sewers	Medium
Trewellyn Creek	971217-1145-ACE	886	3.27	0	1	Urban Runoff/Storm Sewers	Medium
Trewellyn Creek	971217-1145-ACE	887	1.03	0	1	Urban Runoff/Storm Sewers	Medium
Trewellyn Creek	971217-1145-ACE	888	0.61	0	1	Urban Runoff/Storm Sewers	Medium
Trewellyn Creek	971217-1145-ACE	889	0.65	0	1	Urban Runoff/Storm Sewers	Medium
Trewellyn Creek	971217-1145-ACE	890	0.42	0	1	Urban Runoff/Storm Sewers	Medium

*Segment 869 is a small millrace and not actually a trib to Sandy Run. PA DEP stated that 869 may be removed from list due to insignificance.

Table A-2. 303(d) listed waterbodies in the Wissahickon Creek basin for siltation

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Wissahickon Creek	971209-0930-ACE	844	6.04	0	1	Urban Runoff/Storm Sewers	Medium
Wissahickon Creek	971209-1430-ACE	844	6.24	0	1	Urban Runoff/Storm Sewers	Medium
Wissahickon Creek	971218-1045-ACE	844	4.02	0	1	Urban Runoff/Storm Sewers	Medium
Wissahickon Creek	971218-1345-ACE	844	3.09	0	1	Urban Runoff/Storm Sewers	Medium
Wissahickon Creek	971222-0930-ACE	844	1.83	0	1	Urban Runoff/Storm Sewers	Medium
Wissahickon Creek	971222-1130-ACE	844	3.12	0	1	Urban Runoff/Storm Sewers	Medium
Monoshone Creek	971208-1430-ACE	845	0.48	0	1	Urban Runoff/Storm Sewers	Medium
Cresheim Creek	971209-1200-ACE	846	0.99	0	1	Urban Runoff/Storm Sewers	Medium

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Valley Road Tributary	971208-1235-ACE	847	1.32	0	1	Urban Runoff/Storm Sewers	Medium
Cresheim Creek	971209-1200-ACE	848	1.68	0	1	Urban Runoff/Storm Sewers	Medium
Cresheim Creek	971209-1200-ACE	849	0.21	0	1	Urban Runoff/Storm Sewers	Medium
Cresheim Creek	971209-1200-ACE	850	0.44	0	1	Urban Runoff/Storm Sewers	Medium
Wises Mill Tributary	971208-1000-ACE	851	0.83	0	1	Urban Runoff/Storm Sewers	Medium
Wises Mill Tributary	971208-1000-ACE	852	0.6	0	1	Urban Runoff/Storm Sewers	Medium
Wises Mill Tributary	971208-1000-ACE	853	0.86	0	1	Urban Runoff/Storm Sewers	Medium
Paper Mill Run	971211-1300-ACE	854	2.31	0	1	Urban Runoff/Storm Sewers	Medium
Paper Mill Run	971211-1300-ACE	855	1.26	0	1	Urban Runoff/Storm Sewers	Medium
Lorraine Run	971215-1000-ACE	856	2.22	0	1	Surface Mining	Medium
Tributary Downstream of Sandy Run	971215-1130-ACE	857	2.5	0	1	Urban Runoff/Storm Sewers	Medium
Tributary Downstream of Sandy Run	971215-1130-ACE	858	0.93	0	1	Urban Runoff/Storm Sewers	Medium
Sandy Run	971215-1133-ACE	859	6.14	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1303-ACE	860	3.51	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	861	0.62	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	862	2.43	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	863	0.49	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	864	0.52	0	1	Urban Runoff/Storm Sewers	Medium

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Pine Run	971215-1300-ACE	865	0.93	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	866	1.48	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	867	0.53	0	1	Urban Runoff/Storm Sewers	Medium
Pine Run	971215-1300-ACE	868	0.42	0	1	Urban Runoff/Storm Sewers	Medium
Sandy Run*	971215-1133-ACE	869	0.73	0	1	Urban Runoff/Storm Sewers	Medium
Sandy Run	971215-1300-ACE	870	0.42	0	1	Urban Runoff/Storm Sewers	Medium
Tributary Downstream of Rose Valley Tributary	971216-1415-ACE	873	0.92	0	1	Urban Runoff/Storm Sewers	Medium
Tributary Downstream of Rose Valley Tributary	971216-1415-ACE	877	2.44	0	1	Urban Runoff/Storm Sewers	Medium
Rose Valley Tributary	971216-1415-ACE	878	2.64	0	1	Urban Runoff/Storm Sewers	Medium
Rose Valley Tributary	971216-1415-ACE	879	1.73	0	1	Urban Runoff/Storm Sewers	Medium
Rose Valley Tributary	971216-1415-ACE	880	0.27	0	1	Urban Runoff/Storm Sewers	Medium
Tributary Upstream of Rose Valley Tributary	971216-1415-ACE	881	0.85	0	1	Urban Runoff/Storm Sewers	Medium
Tributary Downstream of Willow Run - East	971217-1015-ACE	882	0.95	0	1	Urban Runoff/Storm Sewers	Medium
Tributary Downstream of Willow Run - East	971217-1015-ACE	884	1.42	0	1	Urban Runoff/Storm Sewers	Medium
Willow Run - East	971217-1015-ACE	885	2.11	0	1	Urban Runoff/Storm Sewers	Medium
Trewellyn Creek	971217-1145-ACE	886	3.27	0	1	Urban Runoff/Storm Sewers	Medium

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Trewellyn Creek	971217-1145-ACE	887	1.03	0	1	Urban Runoff/Storm Sewers	Medium
Trewellyn Creek	971217-1145-ACE	888	0.61	0	1	Urban Runoff/Storm Sewers	Medium
Trewellyn Creek	971217-1145-ACE	889	0.65	0	1	Urban Runoff/Storm Sewers	Medium
Trewellyn Creek	971217-1145-ACE	890	0.42	0	1	Urban Runoff/Storm Sewers	Medium
North Wales Tributary	971217-1430-ACE	891	2.07	0	1	Urban Runoff/Storm Sewers	Medium
Tributary Upstream of North Wales Tributary	971217-1430-ACE	892	0.37	0	1	Urban Runoff/Storm Sewers	Medium
Tributary Upstream of North Wales Tributary	981015-1100-ACE	894	0.34	0	1	Habitat Modification	Medium
Tributary Upstream of North Wales Tributary	981015-1100-ACE	895	0.38	0	1	Habitat Modification	Medium
Tributary Upstream of North Wales Tributary	981015-1100-ACE	896	0.46	0	1	Habitat Modification	Medium
Tributary Upstream of North Wales Tributary	981015-1100-ACE	897	0.19	0	1	Habitat Modification	Medium

*Segment 869 is a millrace and not actually a tributary to Sandy Run. May be removed from list.

Table A-3. 303(d) listed waterbodies in the Wissahickon Creek basin for habitat alterations

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Wissahickon Creek	971218-1045-ACE	844	4.02	0	1	Habitat Modification	Low
Monoshone Creek	971208-1430-ACE	845	0.48	0	1	Habitat Modification	Low
Valley Road Tributary	971208-1235-ACE	847	1.32	0	1	Habitat Modification	Low
Wises Mill Tributary	971208-1000-ACE	851	0.83	0	1	Habitat Modification	Low
Wises Mill Tributary	971208-1000-ACE	852	0.6	0	1	Habitat Modification	Low
Wises Mill Tributary	971208-1000-ACE	853	0.86	0	1	Habitat Modification	Low

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Paper Mill Run	971211-1300-ACE	854	2.31	0	1	Habitat Modification	Low
Paper Mill Run	971211-1300-ACE	855	1.26	0	1	Habitat Modification	Low
Lorraine Run	971215-1000-ACE	856	2.22	0	1	Habitat Modification	Low
Tributary Downstream of Sandy Run	971215-1130-ACE	857	2.5	0	1	Habitat Modification	Low
Tributary Downstream of Sandy Run	971215-1130-ACE	858	0.93	0	1	Habitat Modification	Low
Sandy Run	971215-1133-ACE	859	6.14	0	1	Habitat Modification	Low
Pine Run	971215-1303-ACE	860	3.51	0	1	Habitat Modification	Low
Pine Run	971215-1300-ACE	861	0.62	0	1	Habitat Modification	Low
Pine Run	971215-1300-ACE	862	2.43	0	1	Habitat Modification	Low
Pine Run	971215-1300-ACE	863	0.49	0	1	Habitat Modification	Low
Pine Run	971215-1300-ACE	864	0.52	0	1	Habitat Modification	Low
Pine Run	971215-1300-ACE	865	0.93	0	1	Habitat Modification	Low
Pine Run	971215-1300-ACE	866	1.48	0	1	Habitat Modification	Low
Pine Run	971215-1300-ACE	867	0.53	0	1	Habitat Modification	Low
Pine Run	971215-1300-ACE	868	0.42	0	1	Habitat Modification	Low
Sandy Run*	971215-1133-ACE	869	0.73	0	1	Habitat Modification	Low
Sandy Run	971215-1300-ACE	870	0.42	0	1	Habitat Modification	Low
Tributary Downstream of Rose Valley Tributary	971216-1415-ACE	873	0.92	0	1	Habitat Modification	Low
Tributary Downstream of Rose Valley Tributary	971216-1415-ACE	877	2.44	0	1	Habitat Modification	Low
Rose Valley Tributary	971216-1415-ACE	878	2.64	0	1	Habitat Modification	Low
Rose Valley Tributary	971216-1415-ACE	879	1.73	0	1	Habitat Modification	Low
Rose Valley Tributary	971216-1415-ACE	880	0.27	0	1	Habitat Modification	Low
Tributary Upstream of Rose Valley Tributary	971216-1415-ACE	881	0.85	0	1	Habitat Modification	Low

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority

* Segment 869 is a millrace and not actually a tributary to Sandy Run. May be removed from list.

Table A-4. 303(d) listed waterbodies in the Wissahickon Creek Basin for water/flow variability

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Wissahickon Creek	971209-0930-ACE	844	6.04	0	1	Urban Runoff/Storm Sewers	Low
Wissahickon Creek	971209-1430-ACE	844	6.24	0	1	Urban Runoff/Storm Sewers	Low
Wissahickon Creek	971218-1045-ACE	844	4.02	0	1	Urban Runoff/Storm Sewers; Other	Low
Wissahickon Creek	971218-1345-ACE	844	3.09	0	1	Urban Runoff/Storm Sewers; Other	Low
Wissahickon Creek	971222-0930-ACE	844	1.83	0	1	Urban Runoff/Storm Sewers	Low
Wissahickon Creek	971222-1130-ACE	844	3.12	0	1	Urban Runoff/Storm Sewers; Other	Low
Monoshone Creek	971208-1430-ACE	845	0.48	0	1	Urban Runoff/Storm Sewers	Low
Cresheim Creek	971209-1200-ACE	846	0.99	0	1	Urban Runoff/Storm Sewers	Low
Valley Road Tributary	971208-1235-ACE	847	1.32	0	1	Urban Runoff/Storm Sewers	Low
Cresheim Creek	971209-1200-ACE	848	1.68	0	1	Urban Runoff/Storm Sewers	Low
Cresheim Creek	971209-1200-ACE	849	0.21	0	1	Urban Runoff/Storm Sewers	Low
Cresheim Creek	971209-1200-ACE	850	0.44	0	1	Urban Runoff/Storm Sewers	Low
Wises Mill Tributary	971208-1000-ACE	851	0.83	0	1	Urban Runoff/Storm Sewers	Low
Wises Mill Tributary	971208-1000-ACE	852	0.6	0	1	Urban Runoff/Storm Sewers	Low

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Wises Mill Tributary	971208-1000-ACE	853	0.86	0	1	Urban Runoff/Storm Sewers	Low
Paper Mill Run	971211-1300-ACE	854	2.31	0	1	Urban Runoff/Storm Sewers	Low
Paper Mill Run	971211-1300-ACE	855	1.26	0	1	Urban Runoff/Storm Sewers	Low
Lorraine Run	971215-1000-ACE	856	2.22	0	1	Surface Mining	Low
Tributary Downstream of Sandy Run	971215-1130-ACE	857	2.5	0	1	Urban Runoff/Storm Sewers; Other	Low
Tributary Downstream of Sandy Run	971215-1130-ACE	858	0.93	0	1	Urban Runoff/Storm Sewers; Other	Low
Sandy Run	971215-1133-ACE	859	6.14	0	1	Urban Runoff/Storm Sewers; Other	Low
Pine Run	971215-1303-ACE	860	3.51	0	1	Urban Runoff/Storm Sewers	Low
Pine Run	971215-1300-ACE	861	0.62	0	1	Urban Runoff/Storm Sewers	Low
Pine Run	971215-1300-ACE	862	2.43	0	1	Urban Runoff/Storm Sewers	Low
Pine Run	971215-1300-ACE	863	0.49	0	1	Urban Runoff/Storm Sewers	Low
Pine Run	971215-1300-ACE	864	0.52	0	1	Urban Runoff/Storm Sewers	Low
Pine Run	971215-1300-ACE	865	0.93	0	1	Urban Runoff/Storm Sewers	Low
Pine Run	971215-1300-ACE	866	1.48	0	1	Urban Runoff/Storm Sewers	Low
Pine Run	971215-1300-ACE	867	0.53	0	1	Urban Runoff/Storm Sewers	Low
Pine Run	971215-1300-ACE	868	0.42	0	1	Urban Runoff/Storm Sewers	Low

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Sandy Run*	971215-1133-ACE	869	0.73	0	1	Urban Runoff/Storm Sewers; Other	Low
Sandy Run	971215-1300-ACE	870	0.42	0	1	Urban Runoff/Storm Sewers	Low
Tributary Downstream of Rose Valley Tributary	971216-1415-ACE	873	0.92	0	1	Urban Runoff/Storm Sewers	Low
Tributary Downstream of Rose Valley Tributary	971216-1415-ACE	877	2.44	0	1	Urban Runoff/Storm Sewers	Low
Rose Valley Tributary	971216-1415-ACE	878	2.64	0	1	Urban Runoff/Storm Sewers	Low
Rose Valley Tributary	971216-1415-ACE	879	1.73	0	1	Urban Runoff/Storm Sewers	Low
Rose Valley Tributary	971216-1415-ACE	880	0.27	0	1	Urban Runoff/Storm Sewers	Low
Tributary Upstream of Rose Valley Tributary	971216-1415-ACE	881	0.85	0	1	Urban Runoff/Storm Sewers	Low
Tributary Downstream of Willow Run - East	971217-1015-ACE	882	0.95	0	1	Urban Runoff/Storm Sewers; Other	Low
Tributary Downstream of Willow Run - East	971217-1015-ACE	884	1.42	0	1	Urban Runoff/Storm Sewers; Other	Low
Willow Run - East	971217-1015-ACE	885	2.11	0	1	Urban Runoff/Storm Sewers; Other	Low
Trewellyn Creek	971217-1145-ACE	886	3.27	0	1	Urban Runoff/Storm Sewers	Low
Trewellyn Creek	971217-1145-ACE	887	1.03	0	1	Urban Runoff/Storm Sewers	Low
Trewellyn Creek	971217-1145-ACE	888	0.61	0	1	Urban Runoff/Storm Sewers	Low
Trewellyn Creek	971217-1145-ACE	889	0.65	0	1	Urban Runoff/Storm Sewers	Low

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Trewellyn Creek	971217-1145-ACE	890	0.42	0	1	Urban Runoff/Storm Sewers	Low
North Wales Tributary	971217-1430-ACE	891	2.07	0	1	Urban Runoff/Storm Sewers; Other	Low
Tributary Upstream of North Wales Tributary	971217-1430-ACE	892	0.37	0	1	Urban Runoff/Storm Sewers; Other	Low
Tributary Upstream of North Wales Tributary	981015-1100-ACE	894	0.34	0	1	Urban Runoff/Storm Sewers; Other	Low
Tributary Upstream of North Wales Tributary	981015-1100-ACE	895	0.38	0	1	Urban Runoff/Storm Sewers; Other	Low
Tributary Upstream of North Wales Tributary	981015-1100-ACE	896	0.46	0	1	Urban Runoff/Storm Sewers; Other	Low
Tributary Upstream of North Wales Tributary	981015-1100-ACE	897	0.19	0	1	Urban Runoff/Storm Sewers; Other	Low

* Segment 869 is a millrace and not actually a tributary to Sandy Run. May be removed from list.

Table A-5. 303(d) listed waterbodies in the Wissahickon Creek basin for low DO/organic enrichment

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Monoshone Creek	971208-1430-ACE	845	0.48	0	1	Urban Runoff/Storm Sewers	Medium
Valley Road Tributary	971208-1235-ACE	847	1.32	0	1	Urban Runoff/Storm Sewers	Medium

Table A-6. 303(d) listed waterbodies in the Wissahickon Creek basin for pathogens

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Monoshone Creek	971208-1430-ACE	845	0.48	1	0	Urban Runoff/Storm Sewers	High
Valley Road Tributary	971208-1235-ACE	847	1.32	1	0	Urban Runoff/Storm Sewers	High

Table A-7. 303(d) listed waterbodies in the Wissahickon Creek basin for chlorine

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Pine Run**	971215-1303-ACE	860	0.6*	0	1	Municipal Point Source	High

* Section of segment downstream of STP

** PA DEP plans to delist; additional sampling/documentation may be needed.

Table A-8. 303(d) listed waterbodies in the Wissahickon Creek basin for oil and grease

Segment Name	Segment ID	Stream Code	Miles Affected	Human Health	Aquatic Life	Source	TMDL Priority
Valley Road Tributary*	971208-1235-ACE	847	1.32	0	1	Urban Runoff/Storm Sewers	Medium

*As a result of 9/24/01 resurvey of stream, PA DEP plans to delist but may require additional sampling/documentation.

Location: Wissahickon at Mouth
Pollutant: NO3-N (mg/L)
Data from: 1/18/1990 to 7/13/2001 (123 Observations)

Flow Range	# Obs	Flow (cfs)			Concentration (mg/l)		
Percentile	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
0-10	13	25.308	16.000	32.000	5.47	3.84	7.89
10-20	12	34.750	33.000	36.000	4.67	2.49	6.50
20-30	12	41.667	37.000	45.000	4.83	2.77	6.28
30-40	12	48.167	46.000	51.000	4.92	3.13	7.46
40-50	13	54.692	51.000	58.000	4.96	3.81	7.00
50-60	12	63.667	60.000	68.000	4.22	2.15	5.20
60-70	12	72.750	68.000	79.000	4.10	1.63	5.53
70-80	12	82.917	79.000	87.000	3.96	1.89	5.79
80-90	12	113.167	87.000	156.000	3.92	2.02	6.59
90-100	13	327.154	157.000	751.000	2.79	1.08	4.82

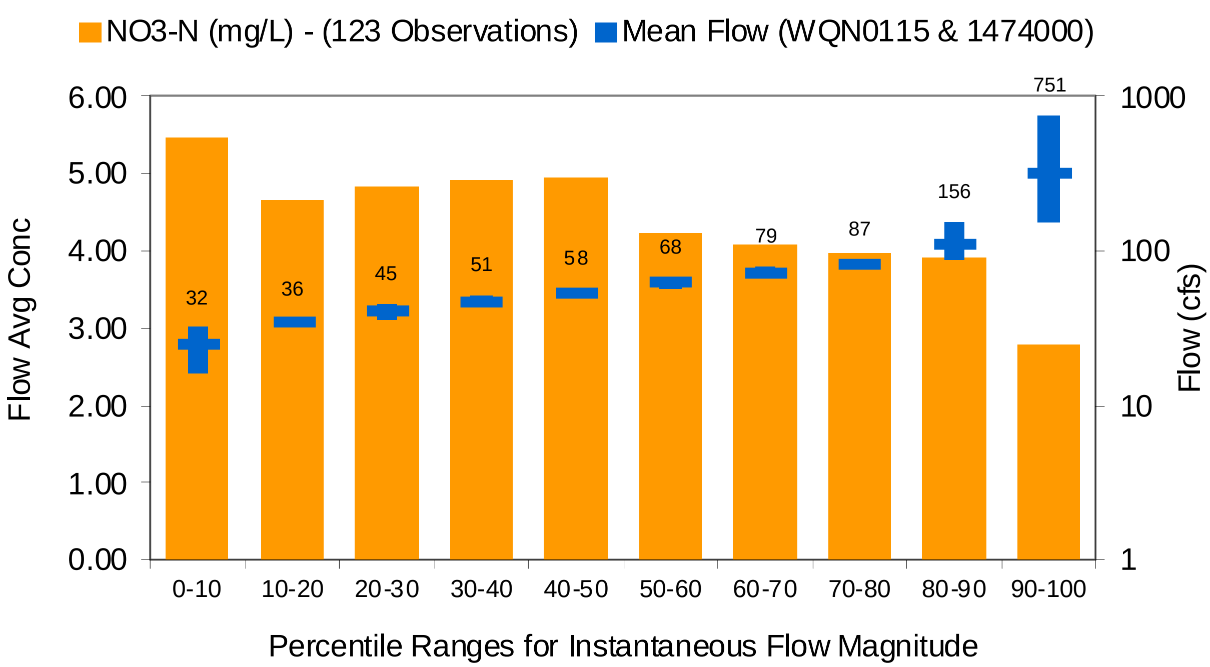

Figure B-1. Nitrate levels vs. streamflow magnitudes

Location: Wissahickon at Mouth
Pollutant: NO3-N (mg/L)
Data from: 1/18/1990 to 7/13/2001 (123 Observations)

Time Period	# Obs	Flow (cfs)			Concentration (mg/l)		
Month	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
January	11	100.909	48.000	235.000	3.86	2.76	6.48
February	11	99.636	52.000	198.000	3.49	1.64	5.71
March	11	199.909	55.000	751.000	3.15	1.47	5.49
April	10	85.200	48.000	139.000	3.73	2.02	5.97
May	11	63.545	44.000	99.000	4.57	3.62	5.52
June	10	52.500	31.000	84.000	4.58	3.00	7.89
July	11	47.818	24.000	156.000	4.17	2.59	5.56
August	9	43.222	16.000	66.000	4.16	2.15	6.29
September	9	40.778	16.000	64.000	4.96	3.37	7.00
October	11	102.636	22.000	479.000	4.70	2.77	6.50
November	9	127.889	34.000	704.000	2.13	1.08	6.03
December	10	73.500	27.000	270.000	4.44	2.02	6.59

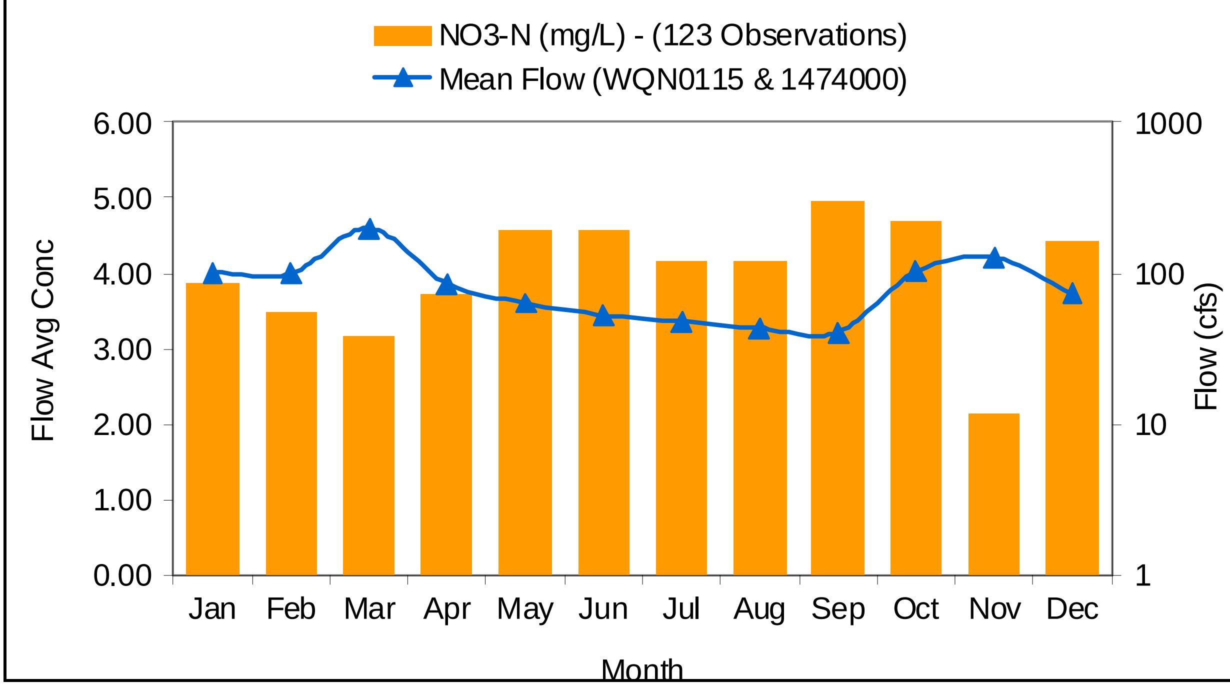

Figure B-2. Average nitrate levels and mean flow per month

Location: Wissahickon at Mouth
Pollutant: TP (mg/L)
Data from: 1/18/1990 to 7/26/2001 (123 Observations)

Flow Range	# Obs	Flow (cfs)			Concentration (mg/l)		
Percentile	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
0-10	13	25.308	16.000	33.000	1.04	0.65	1.76
10-20	12	35.083	33.000	37.000	0.72	0.02	1.38
20-30	12	42.250	37.000	45.000	0.85	0.56	1.32
30-40	12	48.083	46.000	51.000	0.80	0.41	1.14
40-50	13	53.692	51.000	56.000	0.76	0.48	1.76
50-60	12	60.750	57.000	65.000	0.68	0.37	1.00
60-70	12	69.833	66.000	74.000	0.56	0.28	0.93
70-80	12	82.417	75.000	90.000	0.48	0.28	0.77
80-90	12	110.417	92.000	139.000	0.44	0.23	0.72
90-100	13	289.462	140.000	751.000	0.43	0.11	0.80

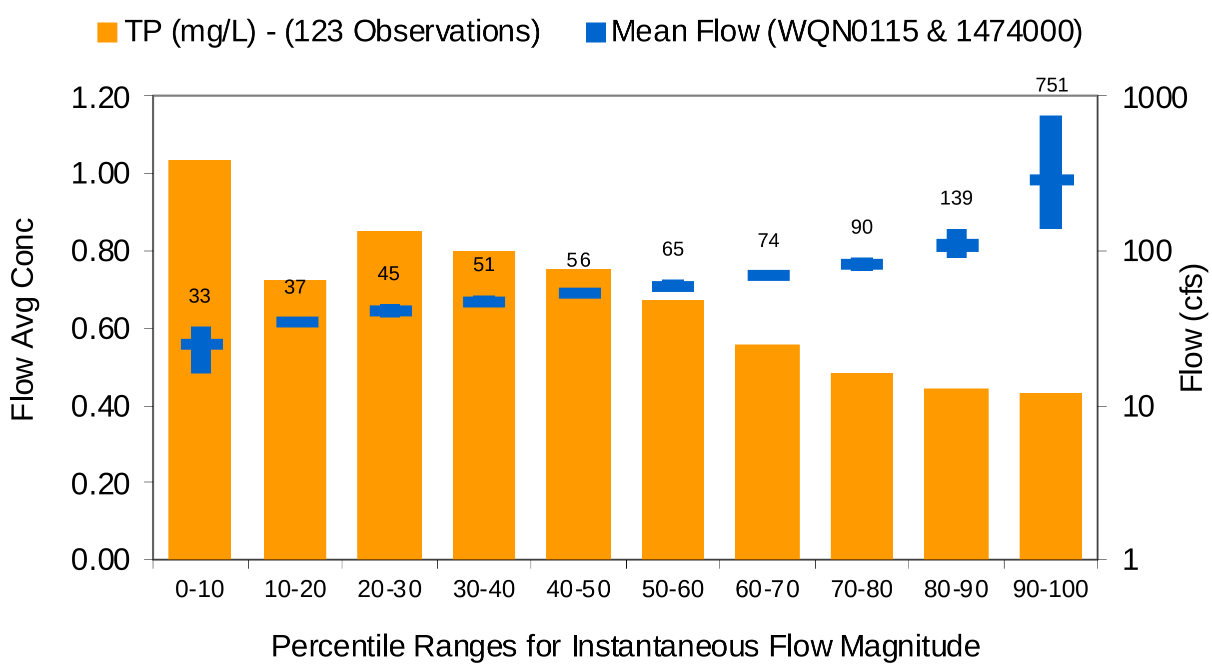

Figure B-3. Total phosphorus levels vs. streamflow magnitudes

Location: Wissahickon at Mouth
Pollutant: TP (mg/L)
Data from: 1/18/1990 to 7/26/2001 (123 Observations)

Time Period	# Obs	Flow (cfs)			Concentration (mg/l)		
Month	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
January	11	84.364	48.000	170.000	0.53	0.30	1.76
February	11	94.818	60.000	196.000	0.45	0.22	0.75
March	12	163.000	55.000	751.000	0.39	0.27	0.77
April	9	85.111	48.000	139.000	0.48	0.28	1.10
May	12	62.750	44.000	99.000	0.64	0.28	1.32
June	9	50.000	31.000	84.000	0.69	0.41	1.14
July	12	52.917	21.000	156.000	0.71	0.02	1.25
August	8	41.000	16.000	66.000	0.75	0.52	1.34
September	10	41.400	16.000	64.000	0.76	0.45	1.20
October	11	99.818	22.000	479.000	0.55	0.38	1.14
November	9	126.444	34.000	704.000	0.78	0.52	1.38
December	9	74.111	27.000	270.000	0.48	0.11	1.76

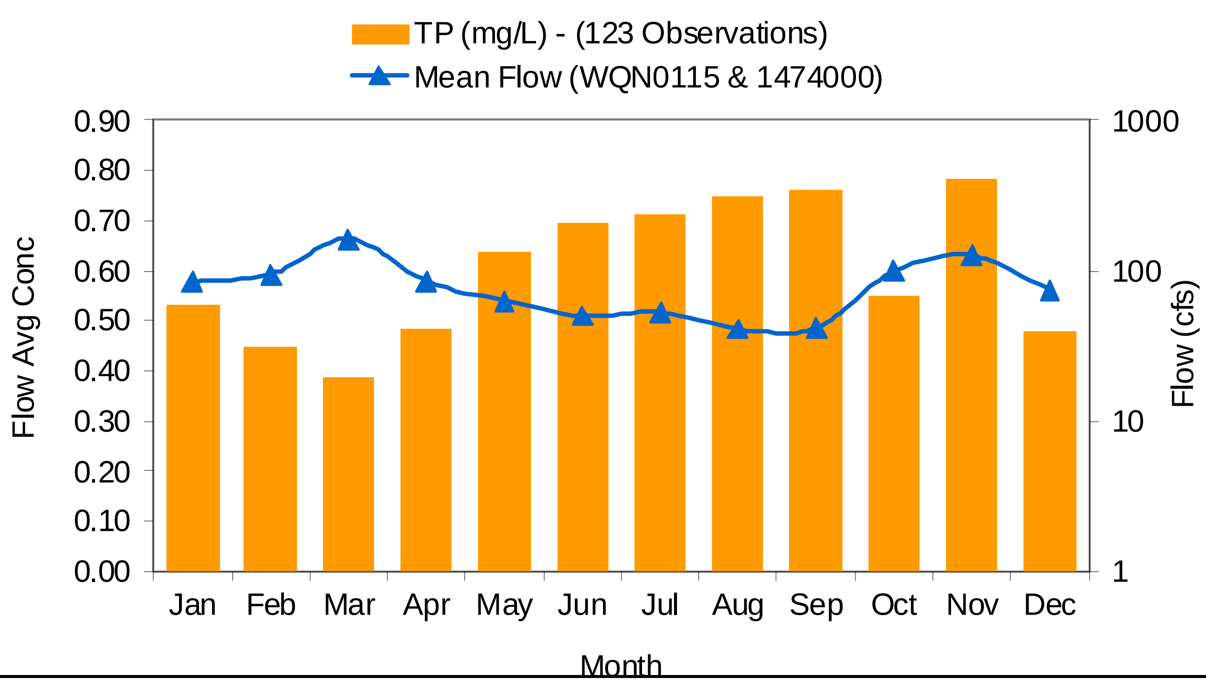

Figure B-4. Average total phosphorus levels and mean flow per month

Location: Wissahickon at Mouth
Pollutant: TSS (mg/L)
Data from: 1/18/1990 to 7/16/2001 (103 Observations)

Flow Range	# Obs	Flow (cfs)			Concentration (mg/l)		
Percentile	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
0-10	11	2.000	2.000	2.000	56.18	23.00	162.00
10-20	10	2.000	2.000	2.000	62.90	16.00	157.00
20-30	10	2.000	2.000	2.000	134.80	55.00	479.00
30-40	11	2.000	2.000	2.000	51.00	35.00	80.00
40-50	10	2.600	2.000	4.000	71.19	36.00	232.00
50-60	10	4.800	4.000	6.000	65.44	22.00	177.00
60-70	10	7.800	6.000	10.000	65.38	16.00	112.00
70-80	11	11.182	10.000	14.000	66.68	27.00	170.00
80-90	9	14.222	14.000	16.000	90.91	21.00	196.00
90-100	11	56.273	16.000	303.000	473.50	24.00	751.00

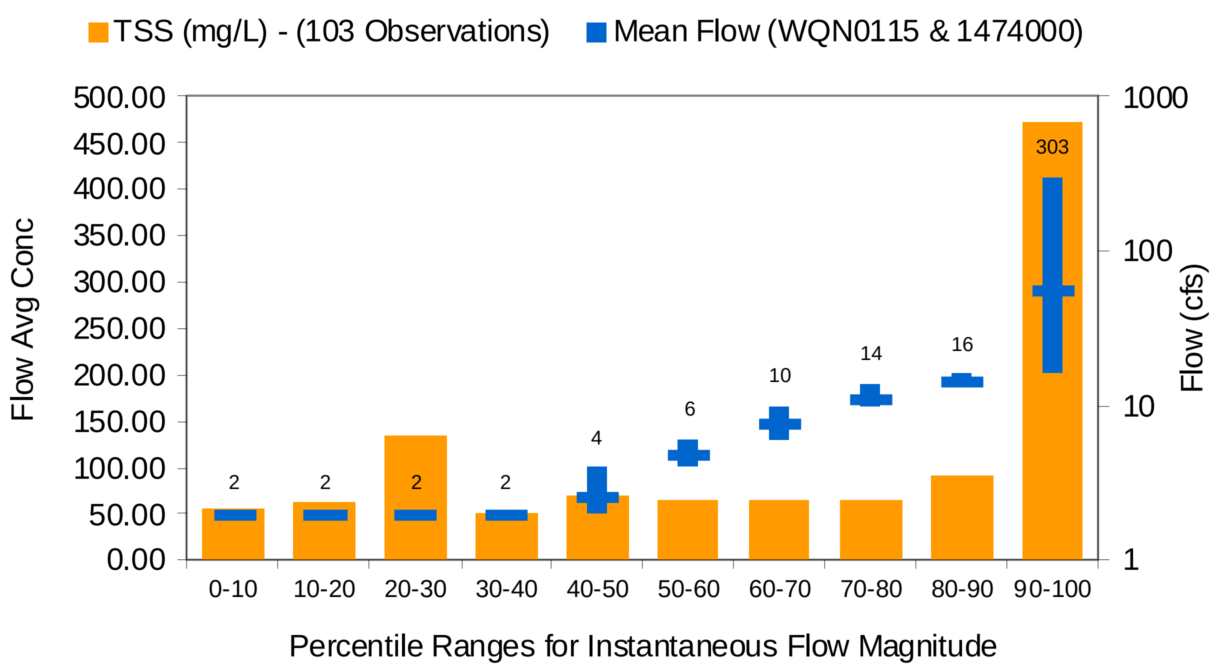

Figure B-5. Total suspended solids levels vs. streamflow magnitudes

Location: Wissahickon at Mouth
Pollutant: TSS (mg/L)
Data from: 1/18/1990 to 7/16/2001 (103 Observations)

Time Period	# Obs	Flow (cfs)			Concentration (mg/l)		
Month	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
January	8	3.875	2.000	14.000	115.71	51.00	170.00
February	9	7.333	2.000	18.000	127.67	52.00	196.00
March	9	15.333	2.000	70.000	438.52	55.00	751.00
April	7	12.143	2.000	52.000	118.54	49.00	139.00
May	11	8.364	2.000	28.000	67.85	44.00	99.00
June	9	5.222	2.000	18.000	59.53	31.00	84.00
July	10	10.500	2.000	40.000	76.91	21.00	156.00
August	8	6.250	2.000	20.000	42.56	16.00	66.00
September	7	4.429	2.000	11.000	37.48	16.00	64.00
October	9	7.444	2.000	16.000	113.19	22.00	479.00
November	7	50.143	2.000	303.000	617.04	35.00	704.00
December	9	4.778	2.000	10.000	50.30	27.00	270.00

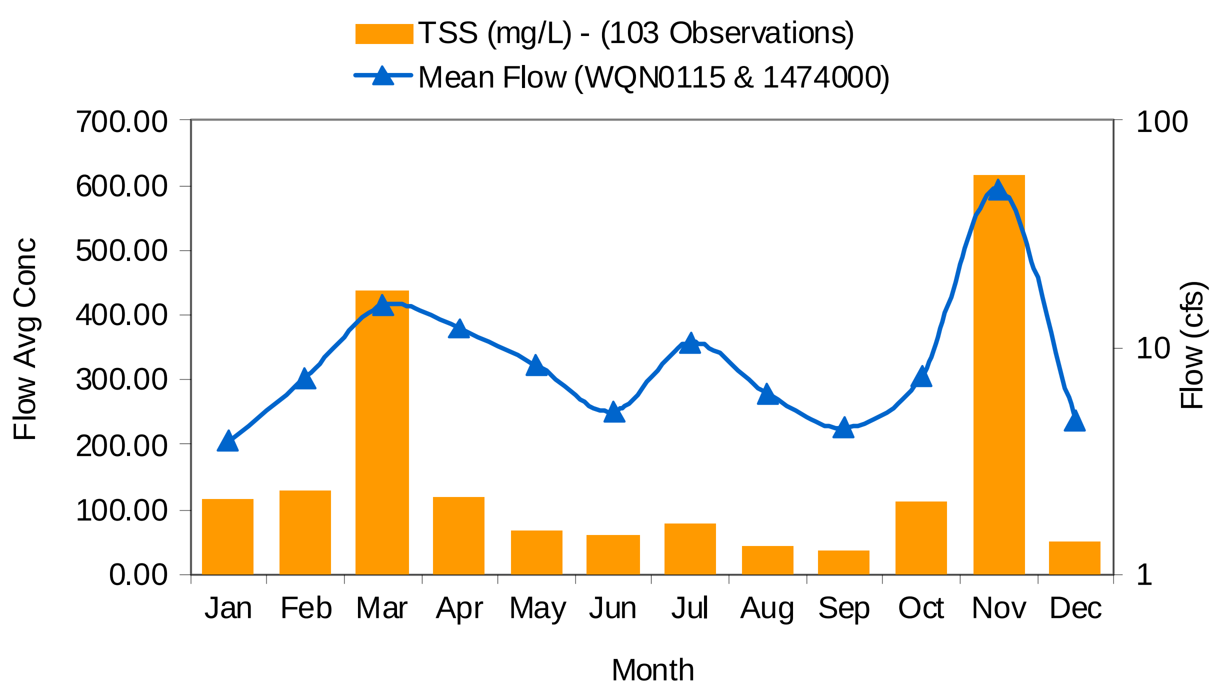

Figure B-6. Average total suspended solids levels and mean flow per month

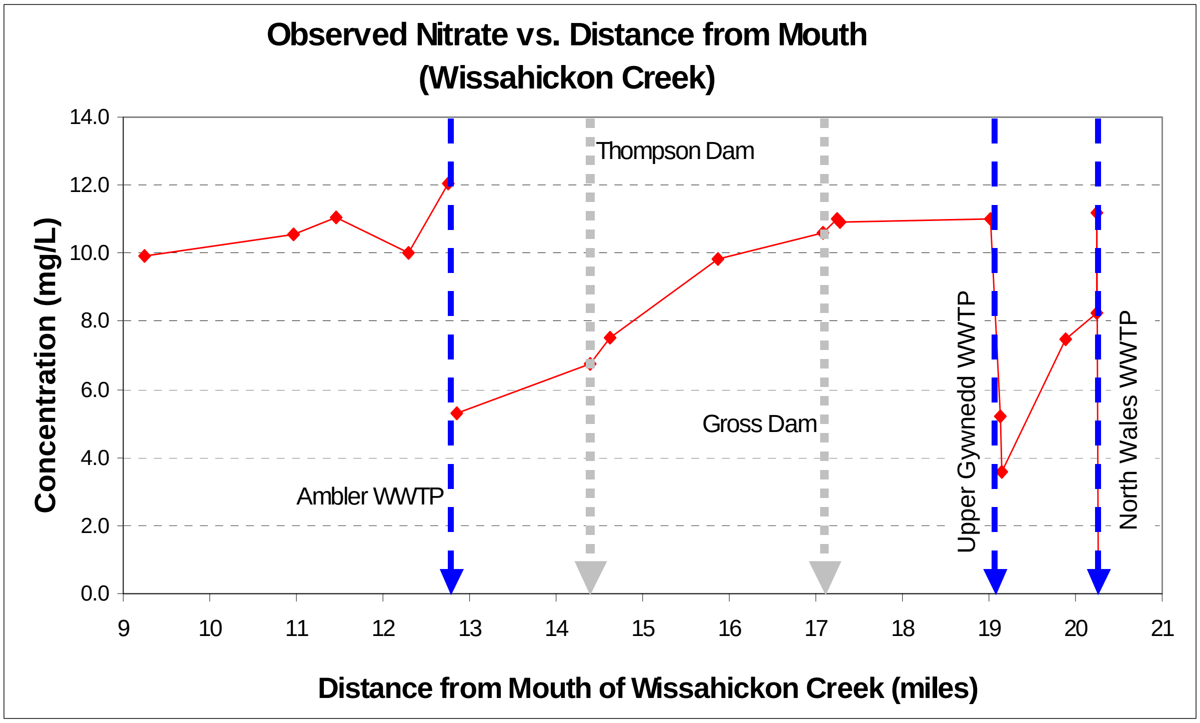

Figure C-1. Nitrate concentrations in Wissahickon Creek (Summer 2002)

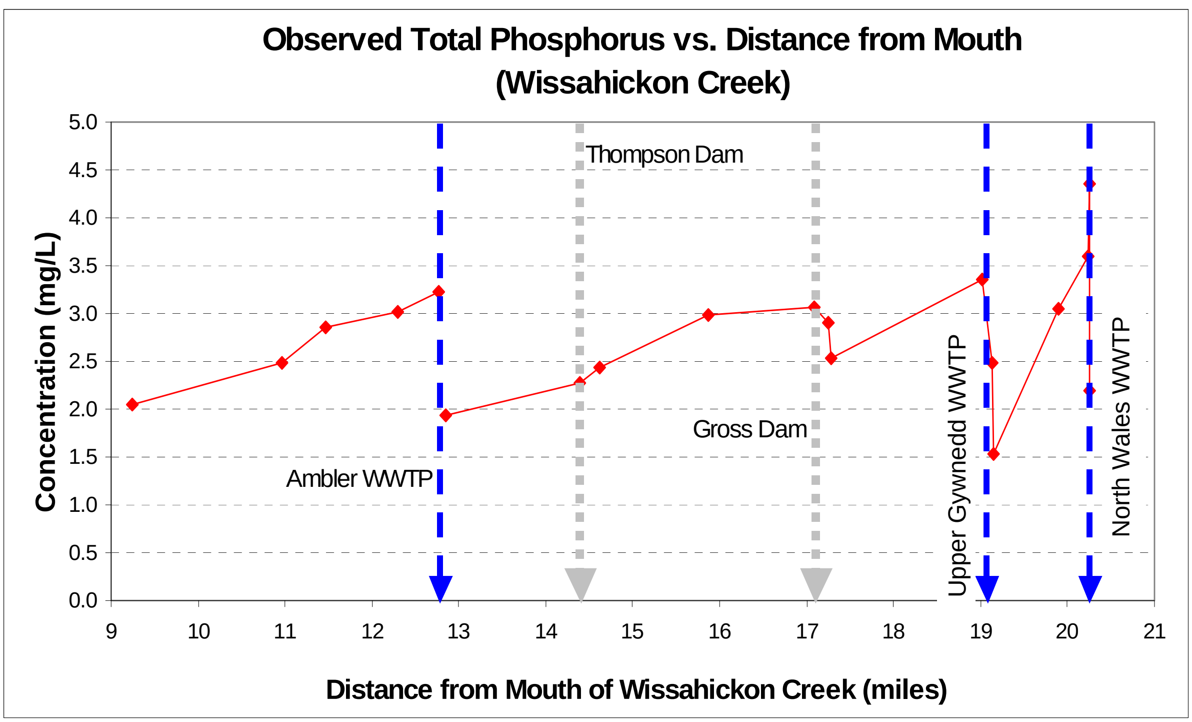

Figure C-2. Total phosphorus concentrations in Wissahickon Creek (Summer 2002)

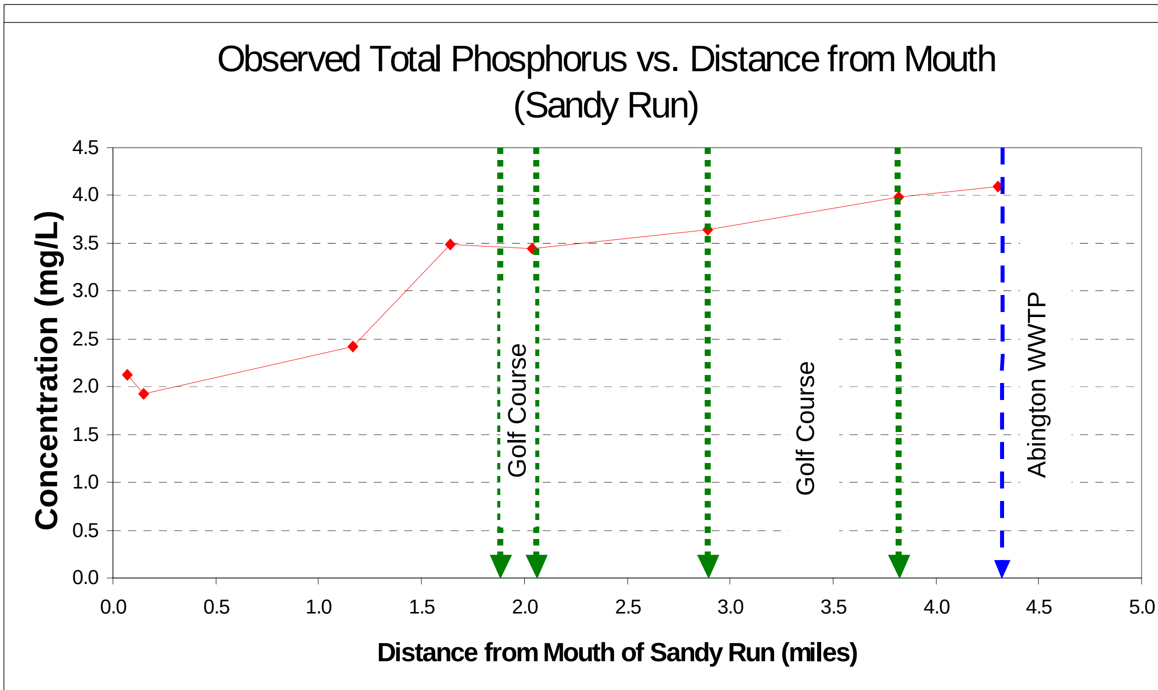

Figure C-5. Total phosphorus concentrations in Sandy Run (Summer 2002)

Figure C-3. Dissolved oxygen concentrations in Wissahickon Creek (Summer 2002)

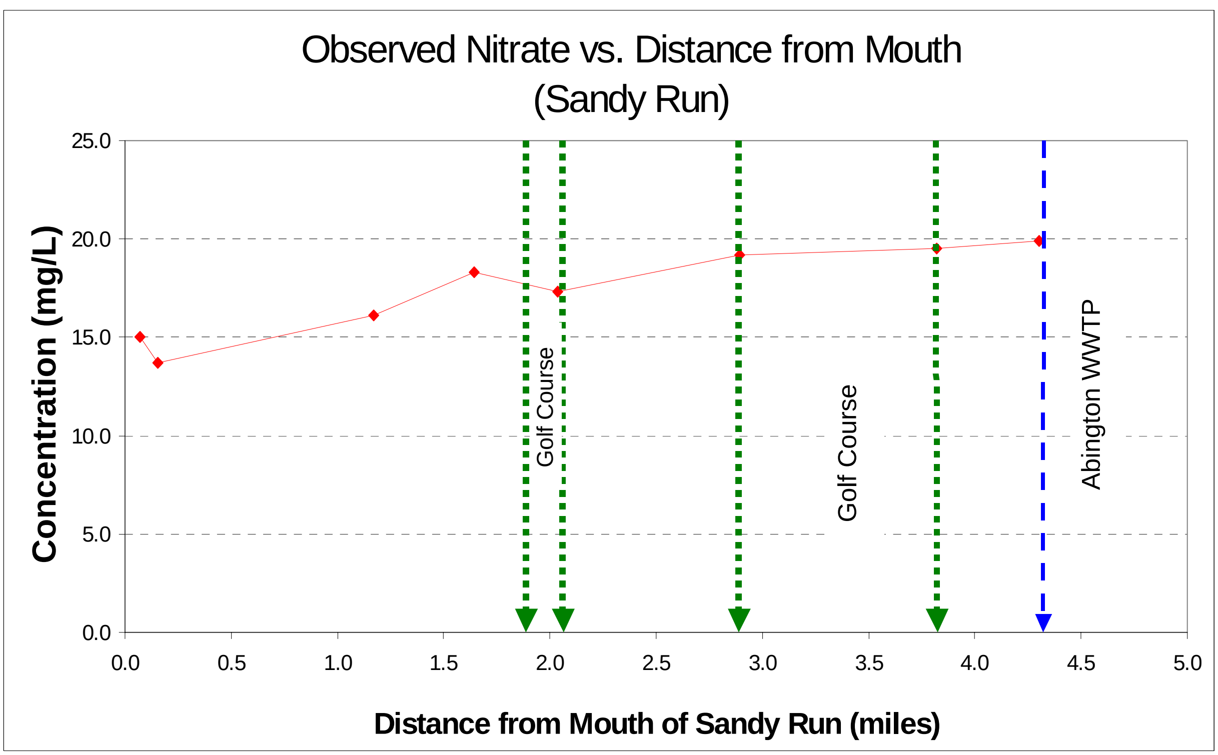

Figure C-4. Nitrate concentrations in Sandy Run (Summer 2002)

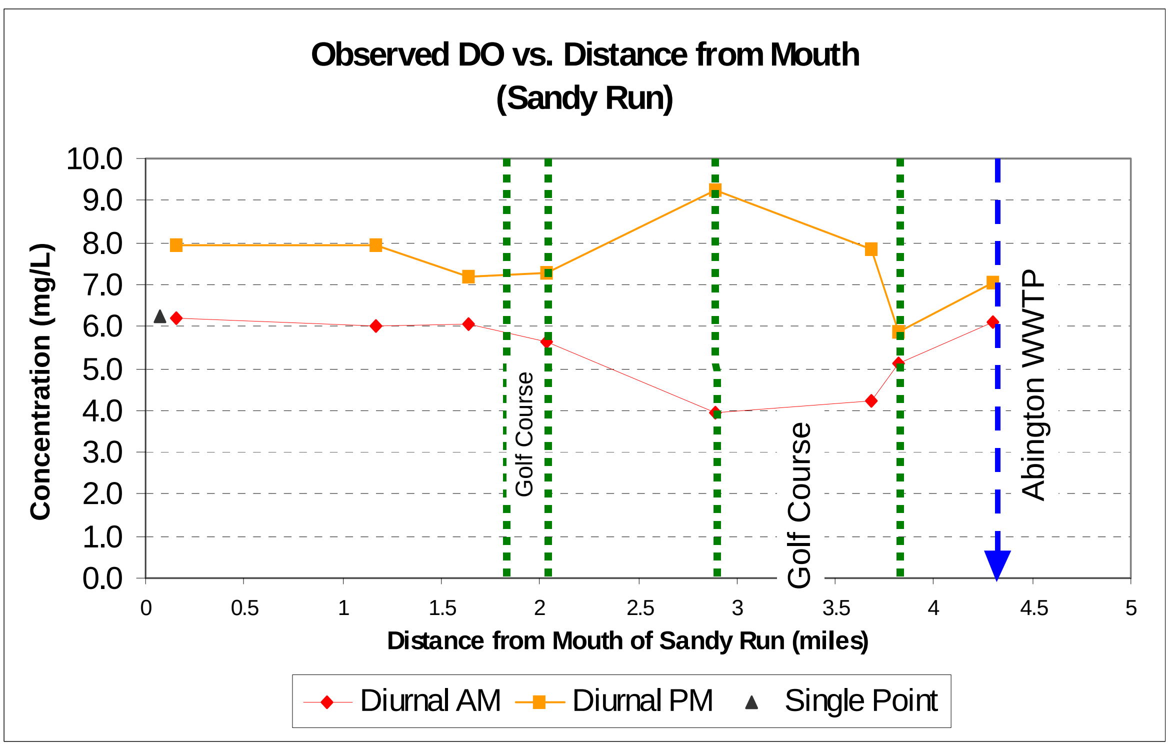

Figure C-6. Dissolved oxygen concentrations in Sandy Run (Summer 2002)

During the public comment period several commenters requested specific allocation options and stream conditions be considered by the Environmental Protection Agency (EPA). In response to those comments, EPA has applied the model under varying conditions and considerations. This Appendix presents the results of the additional analysis based on comments received. All of the comparison runs shown in this Appendix are based on meeting the state water quality standard for trout stocking fishes of 5 mg/L daily minimum and 6 mg/L daily average.

I. Impacts of Varying Flows from Loraine Run and Coorson's Quarry

Loraine Run receives flow from Coorson's Quarry. The present National Pollutant Discharge Elimination System (NPDES) permit for the quarry provides for a maximum flow and a minimum flow, 8 CFS and 0.5 CFS respectively. The allocation runs for the Wissahickon Creek watershed were based on the higher flow of 8 CFS coming from the quarry. There were concerns from a few of the commenters that a reduced flow from Coorson's Quarry would adversely impact the assimilative capacity of the Wissahickon Creek and therefore the Wissahickon Creek would not meet the dissolved oxygen standards based on the allowable loads from this TMDL. In order to determine if a reduced flow, one that would equal the lower flow allowed by the existing NPDES permit, would have an impact on the allocations assigned to the five significant point sources, EPA determined, using the water quality model, the allocations to the point sources necessary to meet water quality standards if the flow from the quarry were 0.5 CFS, the minimum allowed by the NPDES permit. Lorraine Run discharges to the Wissahickon Creek below the area of projected minimum dissolved oxygen at the TMDL design conditions and therefore has little or no impact on the allowable waste load allocations. The table below provides the comparison of the allocations under the two quarry flows.

Table D.1 - Impact of Varying Flow from Coorson's Quarry

WWTP ->	*North Wales*		*Upper Gwynedd*		*Ambler*		*Abington*		*Upper Dublin*	
Quarry -> flow	8 CFS	0.5 CFS	8 CFS	0.5 CFS	8 CFS	0.5 CFS	8 CFS	0.5 CFS	8 CFS	0.5 CFS
DO (mg/L)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
CBOD5 (mg/L)	3.00	3.00	5.00	5.00	10.00	10.00	7.50	7.50	12.75	12.75
NH3-N (mg/L)	0.50	0.50	0.74	0.74	1.50	1.50	0.72	0.72	2.25	2.25
NO3+NO2-N (mg/L)	15.15	15.15	17.64	17.64	36.40	36.40	25.92	25.92	38.57	38.57
ortho PO4-P (mg/L)	1.41	1.41	1.59	1.59	4.53	4.53	1.53	1.53	1.85	1.85

II. Impacts of Varying Effluent Dissolved Oxygen Concentrations

Existing permitted effluent minimum dissolved oxygen values range from 5 mg/l to 6 mg/l depending on the facility. The allocations presented in this TMDL report are based on an effluent dissolved oxygen minimum daily concentration of 7 mg/l. This concentration was chosen for the allocation runs based on numerous discussions with representatives of several of the municipal facilities.

In order to determine the impact of varying effluent dissolved oxygen concentrations, EPA performed modeling analysis assuming effluent dissolved oxygen concentrations from the five point sources of 6 mg/l, 7.5 mg/l, 7.75 mg/l and 8.0 mg/l. The following tables present the results of those analysis. It can be seen that as the effluent dissolved oxygen concentrations increase the allowable concentrations of the pollutants also increase slightly.

Table D-2 - Allocations at Effluent DO of 6.0 mg/L

	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin
DO (mg/L)	6.0	6.0	6.0	6.0	6.0
CBOD5 (mg/L)	0.50	2.00	10.00	2.80	5.25
NH3-N (mg/L)	0.13	0.45	1.50	0.52	1.25
NO3+NO2-N (mg/L)	15.15	20.08	30.50	30.27	36.71
ortho PO4-P (mg/L)	0.47	1.11	4.68	1.39	1.64

Table D-3 - Allocations at Effluent DO of 7.0 mg/L

	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin
DO (mg/L)	7.0	7.0	7.0	7.0	7.0
CBOD5 (mg/L)	3.00	5.00	10.00	7.50	12.75
NH3-N (mg/L)	0.50	0.74	1.50	0.72	2.25
NO3+NO2-N (mg/L)	15.15	17.64	36.40	25.92	38.57
ortho PO4-P (mg/L)	1.41	1.59	4.53	1.53	1.85

Table D-4 - Allocations at Effluent DO of 7.5 mg/L

	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin
DO (mg/L)	7.5	7.5	7.5	7.5	7.5
CBOD5 (mg/L)	3.60	5.40	10.00	8.20	13.50
NH3-N (mg/L)	0.60	0.74	1.50	1.32	2.30
NO3+NO2-N (mg/L)	21.21	19.06	30.30	30.27	32.84
ortho PO4-P (mg/L)	1.55	1.71	4.68	2.92	1.96

Table D-5 - Allocations at Effluent DO of 7.75 mg/L

	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin
DO (mg/L)	7.75	7.75	7.75	7.75	7.75
CBOD5 (mg/L)	3.90	5.50	10.00	8.30	13.65
NH3-N (mg/L)	0.65	0.77	1.50	1.32	2.30
NO3+NO2-N (mg/L)	21.21	19.06	30.30	30.27	32.84
ortho PO4-P (mg/L)	1.64	1.75	4.68	2.92	1.96

Table D-6 - Allocations at Effluent DO of 8.0 mg/L

	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin
DO (mg/L)	8.0	8.0	8.0	8.0	8.0
CBOD5 (mg/L)	4.10	5.70	10.00	8.70	13.80
NH3-N (mg/L)	0.73	0.81	1.50	1.40	2.33
NO3+NO2-N (mg/L)	21.21	19.06	30.30	30.27	32.84
ortho PO4-P (mg/L)	1.74	1.79	4.68	3.15	1.98

III. Projected Impairments at Existing Permitted Flows and Concentrations

The water quality model was used to project the impairment in the Wissahickon Creek watershed when the five municipal facilities are built out and discharging at the levels that they are permitted to discharge. The model was used to determine the areas of the creek that will not meet the state water quality criteria for dissolved oxygen (for a trout stocking use) of 5 mg/l daily minimum and 6 mg/l daily average. Table D-7 shows the effluent concentrations that were used for this analysis. The effluent flows are those that are allowed by the existing permit, the CBOD5, ammonia and effluent dissolved oxygen concentrations are those in required by the existing permit and, since nitrite-nitrate and phosphorus are not now permit limitations, the concentrations used are based on data collected by the facilities in 2002. The Table also shows the impact on the creek’s dissolved oxygen, shown as percent of stream miles not meeting the state water quality standards. Figure D-1 shows the stream locations were the dissolved oxygen standard would not be met.

Table D-7 - Stream Miles Impaired at Permit Conditions

	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin	% Impaired for DO	
						Min DO of 5 mg/L	Ave DO of 6 mg/L
DO (mg/L)	6.0	6.0	6.0	6.0	6.0	45 percent of the stream miles in the Wissahickon Creek impaired	53 percent of the stream miles in the Wissahickon Creek Impaired
CBOD5 (mg/L)	10.00	10.00	10.00	10.00	15.00		
NH3-N (mg/L)	2.50	1.80	1.50	2.00	2.50		
NO3+NO2-N (mg/L)	15.15	12.60	18.20	21.60	20.30		
ortho PO4-P (mg/L)	4.69	3.12	4.53	3.82	2.94		

Figure D-1: Locations of Stream Standards Violations under Existing Permitted Conditions

IV. Control of Phosphorus to Reduce Nuisance Algal Growth

There was interest by Pennsylvania Department of Environmental Protection (DEP) to evaluate the impacts reducing phosphorus on not only the allocations for the other pollutants based on a dissolved oxygen standard but also on the in stream phosphorus concentration. The focus of this TMDL has been on the protection of aquatic life by assuring that the state's water quality standard for dissolved oxygen is met. However, DEP has also indicated that control of nutrients may also be necessary to address other potential uses by humans by reducing nuisance algal growths. Control of nuisance algal growth may require in stream concentrations of phosphorus below that which is necessary in order to meet the dissolved oxygen standards. EPA agrees that the control of nutrients to assure that the dissolved oxygen concentration in the receiving waters may not be sufficient to adequately control algae at below nuisance levels. Because this TMDL has focused on the need to protect the dissolved oxygen levels in the Wissahickon and its tributaries, no site-specific data was collected to determine the levels of phosphorus in stream that would be necessary to control the growth of algae beyond the dissolved oxygen consideration. In addition, no target concentrations of phosphorus are available to EPA to include these considerations in the determination of this TMDL.

The determination of target phosphorus in stream concentrations for the purpose of establishing a TMDL solely for algae control is difficult. Researchers involved in other TMDL studies[1] have estimated that in-stream concentrations of soluble phosphorus could range from as low as 1 to 4 ug/L (Spokane River) to above 100 ug/l (Tualatin River). For the Tualatin River, researchers found that a noticeable reduction in algal growth occurred at 100 ug/L phosphorus and at approximately 50 ug/L phosphorus, low growth conditions prevailed. These numbers do not represent instantaneous or daily maximums and are not comparable to those in-stream concentrations reported in the TMDL. In-stream concentrations contained in the TMDL correspond to a "worst case" scenario (i.e. extreme low flows) and are artificially inflated in relation to the in-stream concentrations in the studies cited above. The phosphorus target developed for the Tualatin River study, for example, was to be applied as a monthly mean from May 1 to October 1 and takes into account the full spectrum of flow regimes over that period. Therefore, periods of high flows and dilution are included in the Tualatin River study, whereas, the TMDL in-stream concentration is for a point in time where dilution is almost non-existent. Because in-stream phosphorus targets are not set under conditions consistent with TMDL design conditions, literature in-stream phosphorus numbers purported to limit algal growth are of no use for TMDL comparisons. Phosphorus indicators (TMDL endpoints) are not easy to implement in rivers and streams, particularly in fast-flowing, gravel or cobble bed streams which are impaired more by attached algae than free-floating algae, as is the case in the Wissahickon Creek. The

---

[1] "Protocol for Developing Nutrient TMDLs - First Edition", EPA 841-B-89-007, November 1999.

relationship between phosphorus concentration and plant growth is not as well established in these systems.

EPA believes that the TMDL presented in this report is sufficient to attain and maintain the dissolved oxygen standards for the Wissahickon Creek and its tributaries under the critical low flow design conditions. However, following implementation of this TMDL and evaluation of stream conditions, additional nutrient removal by the significant sources may be necessary in order to reduce the algal growth in the stream to below nuisance levels. There are options available in order to address this issue if necessary. Phosphorus indicators (TMDL endpoints) are not easy to implement in rivers and streams, particularly in fast-flowing, gravel or cobble bed streams which are impaired more by attached algae than free-floating algae, as is the case in the Wissahickon Creek. The relationship between phosphorus concentration and plant growth is not as well established in these systems. One option would be to determine the end point (the level of algal growth that would be below the nuisance level threshold) that would adequately interpret the state=s narrative water quality standard and then conduct appropriate studies to determine the in stream levels of phosphorus necessary to maintain that interpretation level. For instance, the state could choose chlorophyl “a”, periphyton biomass or transparency as end points. As an example, if a chlorophyl “a” concentration is selected as the applicable end point, then algal growth studies could be conducted to determine the concentrations of phosphorus that would achieve the given end point.

Another option would be to determine the end point visually. With this approach**,** the treatment facilities would construct and meet the load requirements of the dissolved oxygen TMDL. Following this, observations would be made during the appropriate season to determine if algae is still present at undesirable levels. If these observations showed that algal growth is still an issue, then the significant sources of phosphorus would be required to further reduce the loading of phosphorus to the stream. This process could be repeated, as necessary.

As an example, the dissolved oxygen TMDL requires effluent phosphorus concentrations of from 1.4 mg/L to 4.68 mg/L for the five significant point sources. Each facility could be required to meet these phosphorus concentrations within a given time period, after which stream observations would be made. In this example, if the observations show that algal growth is still significant, additional nutrients must be removed from the system. The point sources could be required to remove phosphorus down to a lower level, for example, 1 mg/L. This iterative process could continue reducing the phosphorus levels in the effluent until the algal growth has been reduced to acceptable levels.

A third option would be to build to meet the phosphorus requirements of the dissolved oxygen TMDL. The second stage of nutrient control would then occur after the state has adopted nutrient water quality standards, which is scheduled for 2007. At that time no interpretation of the state’s water quality standard would be necessary.

A fourth option to consider is the application of technology limits and water quality-based limits based on the TMDL, for phosphorus for all five of the significant point sources. According to PADEP guidance "Final Implementation Guidance for Section 95.9 Phosphorus Discharges to Free Flowing Streams" (document number 391-2000-018), 1997, technology-based limits for phosphorus will be imposed where excessive nutrients are suspected to be a problem. Other approaches could be used at a later time to determine if further controls are necessary to reduce the algal growth to below nuisance levels.

Although EPA firmly stands behind the TMDL load reductions necessary to attain and maintain the dissolved oxygen water quality standards, EPA also believes that further study is needed on the Wissahickon Creek to better determine the phosphorus reductions necessary to control nuisance algal growth. Since no algal growth studies have been performed on the Wissahickon Creek, as noted above, the determination of the phosphorus concentration that would create a low, non-nuisance growth condition is not known.

Regionalized Treatment

The TMDL did not consider the possibility of regionalization, or combining several municipals' wasterwater for treatment at one common facility . Because of the distances between facilities, it did not appear to be a likely alternative. However, there was a request to combine the flows of North Wales and Upper Gwynedd Township at the Upper Gwynedd facility. Table D-9 below shows the allocations associated with this combined treatment at Upper Gwynedd.

Table D-9: Allocations with Flows for North Wales Directed to Upper Gwynedd

WWTP	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin
CBOD5 (mg/L)	NA	4.40	10.00	7.50	12.75
NH3-N (mg/L)	NA	0.65	1.50	0.72	2.25
NO3-NO2 (mg/L)	NA	19.93	29.90	30.27	36.71
ORTHO-PO4	NA	1.61	4.68	1.85	1.45

V. Effluent Flows During Design Low Flow Conditions

Several commenters were concerned that the allocation process used permitted design flows. It was argued that the design flows would never be met during dry weather conditions and that a lessor flow should be used as representative of dry conditions. It was believed that EPA's assumption that maximum flows at all facilities would occur at the same time during dry weather was a very conservative approach. EPA used PADEP's guidance, "Chapter 3 -

Development of Water Quality Based Effluent Limitations, October 1997) as the basis for use of the design effluent flow. This guidance states that "For sewage discharges, Q_w should be the design flow for the treatment facilities...". EPA evaluated this concern by obtaining effluent flows for several facilities during the extreme dry weather conditions during the summer of 2002, determining ratios of those dry weather flows with reported wet weather flows and used those ratios to adjust the design flows for the allocation process. For facilities where flows could not be obtained, similar ratios were used as were calculated for those facilities where flow data was readily available. Table D-10 shows the ratios used for each facility. Table D-11 shows the allocations resulting from this reduced dry weather flow.

As can be seen from Table D-11, the allocations are more stringent at these reduced effluent flows. These reduced loadings are required because when the discharger flows are reduced the water depth in the upper reaches become less resulting in reduced reareation and greater algal impacts. Because the effluent flows are a major part of the entire stream flows, any changes in the effluent flow and quality will have a significant impact on in stream conditions.

Table D-10: Design Flow Dry Weather Flow Ratios

	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin
Design Flow (MGD)	0.835	5.7	6.5	3.91	1.1
Dry Flow (MGD)	0.638	4.2	4.3	3.52	0.8
Ratio	0.764	0.732	0.660	0.900	0.764

Table D-11: Allocations with Reduced Flows at Dry Weather

	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin
CBOD (mg/L)	2.0	3.9	10.0	6.5	11.7
NH3 (mg/L)	0.5	0.63	1.5	0.74	2.25
NO3-NO2 (mg/L)	15.15	20.66	33.94	36.32	36.71
Ortho - PO4 (mg/L)	1.41	1.82	24.68	1.85	1.45

VI. Consideration of Seasonal Stream Flows

As a result of public concerns raised in comments to the draft TMDL report for Wissahickon Creek, EPA performed a sensitivity analysis to assess the impacts to the waste load allocations with 7 day 10 year low flows (7Q10) flows calculated specifically for each season of the TMDL. The following were the 7Q10 flows calculated at the mouth of Wissahickon Creek (USGS gage 01474000) for the two seasons considered by the TMDL:

Trout Stocking (June-July):20.83 cfs
Warm Water Fishes (Aug-Sept)17.77 cfs

Both these 7Q10 flows are greater than the 16.3 cfs (based on all historical data at United States Geological Survey (USGS) gage 01474000) used in TMDL analysis. Although the critical flow for TMDL analysis was based on the 7Q10, adjustments were necessary to account for special considerations for the Wissahickon Creek. As discussed in the *Modeling Report for Wissahickon Creek, Pennsylvania, Nutrient TMDL Development* (hereafter referred to as Modeling Report), the flow budget for Wissahickon Creek critical flow had to account for special circumstances including:

- Combined STP design flows (27.96) exceeded the 7Q10
- Average discharge from Coorson's Quarry of 12.5 cfs
- Too low flow in headwaters resulted in model instability

As a result of these limitations, a special methodology was required for configuration of critical low-flow conditions. This methodology was reported in the Modeling Report. The resulting critical flow included:

- 7Q10 baseflow (without point source contributions)
- All STP design flows as allowed in their respective NPDES permits and required by the TMDL to ensure protection of the stream under the most critical conditions
- Average discharge from Coorson's Quarry of 12.5 cfs
- Minimum flows at headwaters to prevent model instability

The resulting critical flow for TMDL analysis was 42.52 cfs at the mouth of Wissahickon Creek. Calculation of the 7Q10 baseflow (1.4 cfs) was based on average STP discharge flows of summer 2002. Performing a similar calculation using the Trout Stocking and Warm Water Fishes seasonal 7Q10 flows results in a background flow of 5.93 cfs and 2.87 cfs, respectively. However, the calculation of the background 7Q10 did not consider the historic flow from Coorson's Quarry. Since the historical flows from Coorson's Quarry were not available for the period of streamflow record used for calculation of the 7Q10, the quarry's contributions to the streamflow could not be distinguished from the natural baseflow. As a result, quarry discharge flows were added to the 7Q10 baseflow for the critical low-flow period. Although, sensitivity analysis showed that contributions from Coorson's Quarry did not impact the TMDL due to the fact that critical stream segments associated with low DO were in upstream portions of the watershed. Once the low DO was remedied in those upstream portions through load reductions resulting from the TMDL, problems in the lower portions were improved regardless of the extra dilution provided by Coorson's Quarry.

The critical low-flow period was based on the best assumptions determined necessary to establish a TMDL that considered design flows from dischargers (with combined flows exceeding the 7Q10), quarry flows without a detailed record for comparison with streamflows for 7Q10 analysis, and model limitations. Any additional flow from seasonal considerations of 7Q10 conditions would require other special considerations regarding the contribution of quarry flows to this variation. It is possible that the additional 1.5 to 4.5 cfs resulting from recalculation of seasonal 7Q10 flows is the result of variations of quarry flows.

Moreover, with the flow budget based on the flow distribution observed in summer 2002, the majority of contributions to the Wissahickon baseflow during low-flow periods are in the bottom portions of the watershed that were insensitive to TMDL results (controlled by low dissolved oxygen in upstream stream segments). In other words, following distribution of the additional 1.5 to 4.5 cfs throughout the watershed, little additional flow is provided in the headwaters to impact TMDL results. Recall that headwater flow were raised slightly for the original critical flow period to prevent model instabilities resulting from too little flow. A slight raise in headwater background flows will unlikely be much greater than the values of these already-raised flows.

In conclusion, it is our judgement that recalculation of the 7Q10 flow based on seasonal considerations will have little impact on the TMDL. Without a full understanding of the contributions of the multiple contributors of flow during such refined periods (i.e., variation in quarry flows and STP dischargers), it is difficult to determine the flow budget without making gross assumptions. Therefore, given the amount of data available, the current estimation of the 7Q10 flow used in calculation of the TMDL is determined sufficient in ensuring the protection of Wissahickon Creek under critical low-flow conditions

VII. Use of a Seasonal Temperature Value

Comments received on the draft TMDLs showed a concern that seasonal temperature values were not used in establishing the TMDL. EPA used design temperatures of 20 degrees centigrade and 23 degrees centigrade for the trout stocking and warm water fishes use designation periods. EPA evaluated historical temperature data for the critical periods of each use designation (June and July for trout and August through September for warm water) and used the PADEP recommended 90 percentile temperature ("Implementation Guidance for Determining Water Quality Based Point Source Effluent Limitations", December 1985). This analysis resulted in seasonal stream temperatures for trout stocking period and warm water fishes period of 26.3 degrees centigrade and 24.5 degrees centigrade respectively. Allocations established for the trout stocking period using the temperature of 26.3 degrees are presented below in Table D-12. As can be seen the allocations are slightly more stringent than the final allocations presented in the main body of this report. The allocations for the warm water fishes period using the seasonal temperature of 24.5 degrees shows the same decrease. These allocations are not presented here.

Table D-12: Allocations at Seasonal Temperatures - Trout Stocking

	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin
DO (mg/L)	7.0	7.0	7.0	7.0	7.0
CBOD (mg/L)	2.0	3.0	9.7	4.5	9.75
NH3-N (mg/L)	0.38	0.56	1.5	0.62	2.0
NO2-NO3 (mg/L)	15.15	20.08	30.5	30.27	36.71
Orho-P (mg/L)	1.41	1.71	4.68	1.85	1.45

VIII. Summary of Seasonal Considerations

There was concern that EPA used very conservative assumptions by not taking various seasonal characteristics (a lower effluent flow, varying stream flow for different months, seasonal temperatures, etc) into consideration when the allocations were developed. As can be seen from above, more detailed analysis of the seasonal data that was available (with some assumptions for the effluent flows for several facilities) actually resulted in more stringent effluent limits. EPA however, is confident that the allocations, along with any margin of safety included in the modeling, presented in the final TMDL report are sufficient attain and maintain existing water quality standards of dissolved oxygen. However, it is recommended that future stream analysis be conducted following application of the final allocations to assure that standards are being met and that additional treatment, for the dissolved oxygen standards, is not required.

Consideration of Water Supply Issues in the Development of the Nutrient TMDL

Pennsylvania's water quality standards implementation regulations include a statement on water quality protection requirements. See Pennsylvania Code, Title 25, Environmental Protection , Chapter 96. Subsection 96.3(d) states that "As an exception to subsection (c), the water quality criteria for total dissolved solids, nitrite-nitrate, phenolics and flouride established for the protection of potable water supply shall be met at least 99% of the time at the point of all existing or planned surface potable water supply withdrawals unless otherwise specified in this title." Chapter 93 of Title 25 sets the water quality criteria for nitrite-nitrate concentration for a potable water supply at 10 mg/L. These requirements formed the basis for the development of the nutrient TMDLs for the Wissahickon Creek watershed.

There are no known surface potable water supplies nor planned surface potable water supplies in the the Wissahickon Creek watershed. However, during low flow periods, a significant portion (up to approximately 27%) of the water intake at the City of Philadelphia's (the City) Queen Lane water supply intake on the Schuylkill River is water from the Wissahickon Creek. The City's intake is on the Schuylkill River approximately 0.5 miles below the confluence with the Wissahickon Creek and on the bank of the same side of the Schuylkill River as the Wissahickon Creek. The above cited Pennsylvania regulation requires that potable water supplies be protected from high levels of nitrite-nitrates. There is no indication in these regulations that the intake must be on the specific stream in order to limit the nitrite-nitrates for the specific stream. Rather the protection goes to the intake location.

Based on the above noted requirements in the Pennsylvania regulations, EPA considered the need to protection the City's Queen Lane water supply intake from high levels of nitrite-nitrates. In considering this protection, EPA developed nitrite-nitrate concentrations necessary at the mouth of the Wissahickon Creek in order to assure that the 10 mg/l NO2-NO3 requirement of the Pennsylvania water quality standards is met at the City's intake after mixing with the Schuylkill River water at the intake.

Because the City's water intake consists of a mixture of Schuylkill and Wissahickon water, a mass balance approach was used to determine the NO2-NO3 concentration required at the mouth of the Wissahickon. Water quality data was evaluated for the Schuylkill River and several NO2-NO3 concentrations were determined; the mean August concentration, the maximum August concentration, and the mean concentration at the lowest 10 percentile of streamflows (low flow). A mass balance approach was then used to determine the concentration of NO2-NO3 at the mouth of the Wissahickon Creek necessary to meet the 10 mg/L NO2-NO3 requirement from the state's standards. This was done for two scenarios; one with 27% of the Wissahickon Creek water mixing with the Schuylkill River at the intake and the other with 16% of the Wissahickon Creek water. Table J-1 below shows the concentration necessary at the mouth of the Creek for each case. EPA has considered a margin of safety in this analysis and has set the concentration necessary to meet the state potable water supply requirement of 10 mg/l to 19 mg/L at the end of creek. The allocations presented in Section 4 of the TMDL report reflect these results.

Table E-1 NO2-NO3 Concentrations at the Mouth of the Wissahickon Creek to meet the State Potable Water Supply Criteria at 27% Wissahickon Flow Contribution

	Schuylkill River NO2-NO3 concentrations (mg/L)	NO2-NO3 Concentration at City Intake (mg/L)	NO2-NO3 concentration at mouth of Wissahickon (mg/L)
Assuming 27% of the Intake is Wissahickon Creek Water			
August mean Conc	**3.1**	**8.74**	**24**
August max Conc	**3.8**	**9.25**	**24**
Lowest 10% flow conc - mean	**3.6**	**9.11**	**24**
Lowest 10% flow conc - maximum	**4.8**	**9.98**	**24**
Assuming 16% of the Intake is Wissahickon Creek Water			
August mean Conc	**3.1**	**8.2**	**35**
August max Conc	**3.8**	**8.79**	**35**
Lowest 10% flow conc - mean	**3.6**	**8.62**	**35**
Lowest 10% flow conc - maximum	**4.8**	**9.63**	**35**

Table F-1. TMDL Summary for Trewellyn Creek (Segment 971217-1145-ACE)
Trout Stocking DO Criteria; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	1.922	0.049	0.162	0.029

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
None														
Total Waste Load Allocations							0.000	0.000	0.000	0.000				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Backgound	0.30	1.19	0.03	0.10	0.02	1.922	0.049	0.162	0.029	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						1.922	0.049	0.162	0.029				

Table F-2. TMDL Summary for Pine Run (Segment 971215-1300-ACE)
Trout Stocking DO Criteria; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	1.181	0.040	0.986	0.100

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
None														
Total Waste Load Allocations							0.000	0.000	0.000	0.000				

Load Allocations

Source/Upstream Stream Segmen	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Background	0.18	1.20	0.04	1.00	0.10	1.1813	0.0398	0.9855	0.0995	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						1.181	0.040	0.986	0.100				

Table F-3. TMDL Summary for Pine Run (Segment 971215-1303-ACE)
Trout Stocking DO Criteria; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	117.921	20.611	336.649	13.366

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
Upper Dublin Township	PA0029441	1.70	12.77	2.25	36.71	1.45	116.740	20.572	335.664	13.266	14.9%	10.0%	-90.0%	36.9%
Total Waste Load Allocations							116.740	20.572	335.664	13.266				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Pine Run (971215-1300-ACE)	0.18	1.20	0.04	1.00	0.10	1.181	0.040	0.986	0.100	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						1.181	0.040	0.986	0.100				

A - Calculated from NPDES permit limit
B - Calculated from average of summer 2002 monitoring

Table F-4. TMDL Summary for Sandy Run (Segment 971215-1133-ACE)
Trout Stocking DO Criteria; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	355.419	42.951	1323.189	73.638

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
Abington Township	PA0026867	6.05	7.50	0.72	30.27	1.85	243.979	23.433	984.961	60.291	25.0%	64.0%	0.0%	60.0%
Valley Green Corporate Center	PA0053074	0.013	10.04	1.97	18.78	3.13	0.705	0.139	1.320	0.220	0.0%	0.0%	0.0%	0.0%
Total Waste Load Allocations							244.684	23.571	986.281	60.511				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Background	0.11	2.94	0.07	1.98	0.20	1.675	0.040	1.130	0.113	0.0%	0.0%	0.0%	0.0%
Pine Run (971215-1303-ACE)	1.87	10.83	1.92	33.33	1.29	109.059	19.340	335.779	13.014	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						110.735	19.379	336.908	13.127				

A - Calculated from NPDES permit limit
B - Calculated from average of summer 2002 monitoring

Table F-5. TMDL Summary for Lorraine Run (Segment 971215-1000-ACE)
Trout Stocking DO Criteria; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	123.850	1.366	134.532	1.955

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
Sayers, David & Marie	PA0057631	0.0008	9.99	2.24	4.98	0.52	0.042	0.010	0.021	0.002	0.0%	0.0%	0.0%	0.0%
Murray SRSTP	PA0053210	0.0008	9.90	0.52	0.99	0.52	0.042	0.002	0.004	0.002	0.0%	0.0%	0.0%	0.0%
Harris, Albert & Cynthia	PA0051012	0.0006	10.04	2.98	8.00	0.53	0.034	0.010	0.027	0.002	0.0%	0.0%	0.0%	0.0%
Total Waste Load Allocations							0.118	0.022	0.052	0.006				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Coorson's Quarry	12.50	1.84	0.02	2.00	0.03	123.732	1.344	134.480	1.949	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						123.732	1.344	134.480	1.949				

A - Calculated from NPDES permit limit
B - Calculated from average of summer 2002 monitoring

Table F-7. TMDL Summary for Wissahickon Creek (Segment 971222-1130-ACE)
Trout Stocking DO Criteria; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	222.733	33.223	1050.113	95.465

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
None														
Total Waste Load Allocations							0.000	0.000	0.000	0.000				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Wissahickon Creek (971218-1345-ACE)	10.19	4.04	0.61	19.15	1.74	221.275	33.174	1049.951	95.449	0.0%	0.0%	0.0%	0.0%
Trewellyn Creek (971217-1145-ACE)	0.30	0.90	0.03	0.10	0.01	1.458	0.049	0.162	0.016	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						222.733	33.223	1050.113	95.465				

Table F-6. TMDL Summary for Wissahickon Creek (Segment 971218-1345-ACE)
Trout Stocking DO Criteria; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	259.516	38.524	1058.409	97.439

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
North Wales Boro	PA0022586	1.29	3.00	0.50	15.16	1.41	20.828	3.470	105.160	9.771	70.0%	80.0%	0.0%	70.0%
Upper Gwynedd Townshi	PA0023256	8.82	5.00	0.74	20.08	1.82	237.196	35.010	952.755	86.408	50.0%	59.0%	-38.0%	49.0%
Bruce K. Entwisle	PA0057576	0.001	9.92	2.97	1.00	0.49	0.059	0.018	0.006	0.003	0.0%	0.0%	0.0%	0.0%
Merck & Company, Inc.	PA0053538	0.03	5.01	0.10	0.20	0.27	0.763	0.015	0.031	0.042	0.0%	0.0%	0.0%	0.0%
Total Waste Load Allocations							258.846	38.513	1057.952	96.224				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Backgound assumed as release from Merck & Company, Inc. and received a WLA	0.10	1.26	0.02	0.86	2.28	0.670	0.011	0.457	1.215	0.0	0.0	0.0	0.0
Total Load Allocations						0.670	0.011	0.457	1.215				

A - Calculated from NPDES permit limit
B - Calculated from average of summer 2002 monitoring

Table F-8. TMDL Summary for Wissahickon Creek (Segment 971209-1430-ACE)
Trout Stocking DO Criteria; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	832.692	101.270	4065.812	402.456

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	TMDL Percent Reduction NH3-N	TMDL Percent Reduction NO3+NO2-N	TMDL Percent Reduction Ortho PO4-P
None														
Total Waste Load Allocations							0.000	0.000	0.000	0.000				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	TMDL Percent Reduction NH3-N	TMDL Percent Reduction NO3+NO2-N	TMDL Percent Reduction Ortho PO4-P
Wissahickon Creek (971209-0930-ACE	41.61	3.67	0.45	18.16	1.80	821.472	100.613	4065.208	402.160	0.0%	0.0%	0.0%	0.0%
Background	1.70	1.23	0.07	0.07	0.03	11.220	0.657	0.604	0.296	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						832.692	101.270	4065.812	402.456				

Table F-9. TMDL Summary for Wissahickon Creek (Segment 971209-0930-ACE)
Trout Stocking DO Criteria; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	1059.738	131.667	4121.397	413.660

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
Ambler Borough Water Department	PA0052515	0.027	5.30	0.11	0.21	0.28	0.763	0.015	0.031	0.040	0.0%	0.0%	0.0%	0.0%
PA Historical & Museum Commission	PA0055387	0.002	24.98	20.00	30.13	0.52	0.212	0.169	0.255	0.004	0.0%	0.0%	0.0%	0.0%
Fishbone, David	PA0054577	0.001	9.99	2.97	5.94	0.37	0.059	0.018	0.035	0.002	0.0%	0.0%	0.0%	0.0%
Total Waste Load Allocations							1.034	0.202	0.321	0.046				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Wissahickon Creek (971222-0930-ACE	20.53	6.02	0.87	24.27	3.10	664.184	96.606	2679.987	342.270	0.0%	0.0%	0.0%	0.0%
Sandy Run (971215-1133-ACE)	8.00	6.49	0.78	30.38	1.63	279.099	33.493	1306.670	70.028	0.0%	0.0%	0.0%	0.0%
Lorraine Run (971215-1000-ACE)	12.51	1.72	0.02	2.00	0.02	115.422	1.366	134.419	1.315	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						1058.705	131.464	4121.076	413.614				

A - Calculated from NPDES permit limit
B - Calculated from average of summer 2002 monitoring

Table F-10. TMDL Summary for Wissahickon Creek (Segment 971222-0930-ACE)
Trout Stocking DO Criteria; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	702.766	101.491	2691.394	344.789

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
Ambler Boro	PA0026603	10.10	10.00	1.50	30.52	4.68	543.402	81.466	1657.755	254.221	0.0%	0.0%	-51.1%	0.0%
Total Waste Load Allocations							543.402	81.466	1657.755	254.221				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Wissahickon Creek (971222-1130-ACE	10.45	2.84	0.36	18.39	1.61	159.364	20.025	1033.639	90.568	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						159.364	20.025	1033.639	90.568				

A - Calculated from NPDES permit limit
B - Calculated from average of summer 2002 monitoring

Table F-11. TMDL Summary for Trewellyn Creek (Segment 971217-1145-ACE)
Warm Water Fish; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	1.922	0.049	0.162	0.029

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
None														
Total Waste Load Allocations							0.000	0.000	0.000	0.000				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Backgound	0.30	1.19	0.03	0.10	0.02	1.922	0.049	0.162	0.029	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						1.922	0.049	0.162	0.029				

Table F-12. TMDL Summary for Pine Run (Segment 971215-1300-ACE)
Warm Water Fish; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	1.181	0.040	0.986	0.100

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
None														
Total Waste Load Allocations							0.000	0.000	0.000	0.000				

Load Allocations

Source/Upstream Stream Segmen	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Background	0.18	1.20	0.04	1.00	0.10	1.181	0.040	0.986	0.100	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						1.181	0.040	0.986	0.100				

Table F-13. TMDL Summary for Pine Run (Segment 971215-1303-ACE)
Warm Water Fish; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	138.501	22.907	301.293	21.161

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
Upper Dublin Township	PA0029441	1.70	15.00	2.50	32.85	2.30	137.319	22.868	300.307	21.062	0.0%	0.0%	-70.0%	0.0%
Total Waste Load Allocations							137.319	22.868	300.307	21.062				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Pine Run (971215-1300-ACE)	0.18	1.20	0.04	1.00	0.10	1.181	0.040	0.986	0.100	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						1.181	0.040	0.986	0.100				

A - Calculated from NPDES permit limit
B - Calculated from average of summer 2002 monitoring

Table F-14. TMDL Summary for Sandy Run (Segment 971215-1133-ACE)
Warm Water Fish; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	456.179	86.835	1288.134	171.741

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
Abington Township	PA0026867	6.05	10.00	2.00	30.27	4.63	325.439	65.097	984.961	150.715	0.0%	0.0%	0.0%	0.0%
Valley Green Corporate Center	PA0053074	0.013	10.04	1.97	18.78	3.13	0.705	0.139	1.320	0.220	0.0%	0.0%	0.0%	0.0%
Total Waste Load Allocations							326.145	65.235	986.281	150.935				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Background	0.11	2.94	0.07	1.98	0.20	1.675	0.040	1.130	0.113	0.0%	0.0%	0.0%	0.0%
Pine Run (971215-1303-ACE)	1.87	12.74	2.14	29.85	2.05	128.358	21.560	300.724	20.692	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						130.034	21.600	301.853	20.805				

Table F-15. TMDL Summary for Lorraine Run (Segment 971215-1000-ACE)
Warm Water Fish; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	123.850	1.366	134.532	1.955

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
Sayers, David & Marie	PA0057631	0.0008	9.99	2.24	4.98	0.52	0.042	0.010	0.021	0.002	0.0%	0.0%	0.0%	0.0%
Murray SRSTP	PA0053210	0.0008	9.90	0.52	0.99	0.52	0.042	0.002	0.004	0.002	0.0%	0.0%	0.0%	0.0%
Harris, Albert & Cynthia	PA0051012	0.0006	10.04	2.98	8.00	0.53	0.034	0.010	0.027	0.002	0.0%	0.0%	0.0%	0.0%
Total Waste Load Allocations							0.118	0.022	0.052	0.006				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Coorson's Quarry	12.50	1.84	0.02	2.00	0.03	123.732	1.344	134.480	1.949	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						123.732	1.344	134.480	1.949				

Table F-16. TMDL Summary for Wissahickon Creek (Segment 971218-1345-ACE)
Warm Water Fish; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	445.052	86.405	1051.573	170.411

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
North Wales Boro	PA0022586	1.29	5.90	1.37	21.22	2.40	40.940	9.540	147.201	16.619	41.0%	45.0%	-40.0%	49.0%
Upper Gwynedd Townshi	PA0023256	8.82	8.50	1.62	19.05	3.22	403.383	76.837	903.908	152.574	15.0%	10.0%	-30.9%	9.9%
Bruce K. Entwisle	PA0057576	0.001	9.92	2.97	1.00	0.49	0.059	0.018	0.006	0.003	0.0%	0.0%	0.0%	0.0%
Merck & Company, Inc.	PA0053538	0.10	1.26	0.02	0.86	2.28	0.670	0.011	0.457	1.215	0.0%	0.0%	0.0%	0.0%
Total Waste Load Allocations							445.052	86.405	1051.573	170.411				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Backgound assumed as release from Merck & Company, Inc. and received a WLA													
Total Load Allocations						0.000	0.000	0.000	0.000				

A - Calculated from NPDES permit limit
B - Calculated from average of summer 2002 monitoring

Table F-17. TMDL Summary for Wissahickon Creek (Segment 971222-1130-ACE)
Warm Water Fish; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	383.300	77.696	1045.820	167.137

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
None														
Total Waste Load Allocations							0.000	0.000	0.000	0.000				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Wissahickon Creek (971218-1345-ACE)	10.19	6.97	1.42	19.07	3.05	381.841	77.647	1045.658	167.121	0.0%	0.0%	0.0%	0.0%
Trewellyn Creek (971217-1145-ACE)	0.30	0.90	0.03	0.10	0.01	1.458	0.049	0.162	0.016	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						383.300	77.696	1045.820	167.137				

Table F-18. TMDL Summary for Wissahickon Creek (Segment 971209-1430-ACE)
Warm Water Fish; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	973.035	167.356	4031.623	559.839

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
None														
Total Waste Load Allocations							0.000	0.000	0.000	0.000				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Wissahickon Creek (971209-0930-ACE	41.61	4.30	0.74	18.01	2.50	961.815	166.699	4031.019	559.543	0.0%	0.0%	0.0%	0.0%
Background	1.70	1.23	0.07	0.07	0.03	11.220	0.657	0.604	0.296	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						973.035	167.356	4031.623	559.839				

Table F-19. TMDL Summary for Wissahickon Creek (Segment 971209-0930-ACE)
Warm Water Fish; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	1241.005	206.392	4080.346	575.398

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
Ambler Borough Water Department	PA0052515	0.027	5.30	0.11	0.21	0.28	0.763	0.015	0.031	0.040	0.0%	0.0%	0.0%	0.0%
PA Historical & Museum Commission	PA0055387	0.002	24.98	20.00	30.13	0.52	0.212	0.169	0.255	0.004	0.0%	0.0%	0.0%	0.0%
Fishbone, David	PA0054577	0.001	9.99	2.97	5.94	0.37	0.059	0.018	0.035	0.002	0.0%	0.0%	0.0%	0.0%
Total Waste Load Allocations							1.034	0.202	0.321	0.046				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Wissahickon Creek (971222-0930-ACE	20.53	6.94	1.20	24.18	3.71	766.495	132.607	2670.026	409.898	0.0%	0.0%	0.0%	0.0%
Sandy Run (971215-1133-ACE)	8.00	8.32	1.68	29.65	3.82	358.055	72.217	1275.580	164.139	0.0%	0.0%	0.0%	0.0%
Lorraine Run (971215-1000-ACE)	12.51	1.72	0.02	2.00	0.02	115.422	1.366	134.419	1.315	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						1239.972	206.190	4080.025	575.352				

A - Calculated from NPDES permit limit
B - Calculated from average of summer 2002 monitoring

Table F-20. TMDL Summary for Wissahickon Creek (Segment 971222-0930-ACE)
Warm Water Fish; Major Discharge DO = 7.0 mg/L

	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
TMDL =	822.163	140.176	2679.794	413.656

Waste Load Allocations

Name	NPDES	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
Ambler Boro	PA0026603	10.10	10.00	1.50	30.31	4.68	543.402	81.466	1646.820	254.221	0.0%	0.0%	-50.1%	0.0%
Total Waste Load Allocations							543.402	81.466	1646.820	254.221				

Load Allocations

Source/Upstream Stream Segment	Flow (cfs)	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)	TMDL Percent Reduction CBOD5	NH3-N	NO3+NO2-N	Ortho PO4-P
Wissahickon Creek (971222-1130-ACE	10.45	4.96	1.04	18.38	2.84	278.761	58.710	1032.974	159.435	0.0%	0.0%	0.0%	0.0%
Total Load Allocations						278.761	58.710	1032.974	159.435				

A - Calculated from NPDES permit limit
B - Calculated from average of summer 2002 monitoring

SUBWATERSHED 1

Table G-1. Sediment TMDL at the mouth of subwatershed 1 (including listed segments 971217-1430-ACE, 971218-1045-ACE, 971218-1345-ACE, and 981015-1100-ACE)

TMDL (lbs/year)	MOS (lbs/yr)	WLA (lbs/yr)*	LA (lbs/yr)
882,975.34	70,710.17	812,265.17	0.00

* The WLA includes the collective load from point sources at the mouth of subwatershed 1 after the sediment delivery ratio of 0.18 was applied to account for transport losses

Table G-2. Wasteload allocations for streambank erosion in Segment 971217-1430-ACE in subwatershed 1

Township (MS4)	Average Annual Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Lower Gwynedd	1,567.40	815.05	48%
Stream Bank Erosion Montgomery	86.23	44.84	48%
Stream Bank Erosion North Wales	1,171.75	609.31	48%
Stream Bank Erosion Upper Gwynedd	21,679.83	11,273.51	48%
Stream Bank Erosion Worcester	436.23	226.84	48%
Total Streambank Wasteload Allocations		12,969.55	

Table G-3. Wasteload allocations for overland load in Segment 971217-1430-ACE in subwatershed 1

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
LOWER GWYNEDD	NA	NA	7,389.53	5,898.02	20%
MONTGOMERY	NA	NA	741.08	635.18	14%
NORTH WALES	NA	NA	7,469.23	5,641.32	24%
UPPER GWYNEDD	NA	NA	119,513.95	105,123.72	12%
WORCESTER	NA	NA	2,536.80	2,204.35	13%
Total Overland Wasteload Allocations				119,502.59	

Table G-4. Wasteload allocations for streambank erosion in Segment 971218-1045-ACE in subwatershed 1

Township (MS4)	Average Annual Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Lansdale	9,947.58	5,172.74	48%
Stream Bank Erosion Montgomery	8,971.63	4,665.25	48%
Stream Bank Erosion North Wales	518.47	269.61	48%
Stream Bank Erosion Upper Gwynedd	24,785.08	12,888.24	48%
Total Streambank Wasteload Allocations		22,995.83	

Table G-5. Wasteload allocations for overland load in Segment 971218-1045-ACE in subwatershed 1

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
LANSDALE	NA	NA	59,405.11	46,291.24	22%
MONTGOMERY	NA	NA	46,135.80	36,788.89	20%
NORTH WALES	NA	NA	3,228.73	2,438.38	24%
UPPER GWYNEDD	NA	NA	148,147.25	124,112.81	16%
Total Overland Wasteload Allocations				209,631.31	

Table G-6. Wasteload allocations for streambank erosion in Segment 971218-1345-ACE in subwatershed 1

Township (MS4)	Average Annual Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Lower Gwynedd	14,721.02	7,654.93	48%
Stream Bank Erosion Montgomery	5.09	2.65	48%
Stream Bank Erosion North Wales	5,178.30	2,692.72	48%
Stream Bank Erosion Upper Gwynedd	16,618.37	8,641.55	48%
Stream Bank Erosion Whitpain	5,407.20	2,811.75	48%
Stream Bank Erosion Worcester	986.83	513.15	48%
Total Streambank Wasteload Allocations		22,316.74	

Table G-7. Wasteload allocations for overland load in Segment 971218-1345-ACE in subwatershed 1

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PA0022586 North Wales Boro	1.29	30	13,734.74	13,734.74	0.0
PA0023256 Upper Gwynedd Township	8.82	30	93,758.14	93,758.14	0.0
PA0057576 Single Family Residence STP	0.001	20	7.68	7.68	0.0
LOWER GWYNEDD	NA	NA	51,863.42	47,386.24	9%
MONTGOMERY	NA	NA	30.98	23.36	25%
NORTH WALES	NA	NA	30,480.81	23,151.61	24%
UPPER GWYNEDD	NA	NA	108,377.71	92,938.24	14%
WHITPAIN	NA	NA	48,349.46	42,379.10	12%
WORCESTER	NA	NA	8,108.04	7,405.72	9%
Total Overland Wasteload Allocations				320,784.83	

Table G-8. Wasteload allocations for streambank erosion in Segment 981015-1100-ACE in subwatershed 1

Township (MS4)	Average Annual Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Lansdale	84.79	44.09	48%
Stream Bank Erosion Montgomery	7,127.74	3,706.42	48%
Stream Bank Erosion North Wales	1,546.25	804.05	48%
Stream Bank Erosion Upper Gwynedd	9,571.82	4,977.34	48%
Total Streambank Wasteload Allocations		9,531.91	

Table G-9. Wasteload allocations for overland load in Segment 981015-1100-ACE in subwatershed 1

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
LANSDALE	NA	NA	890.86	824.36	7%
MONTGOMERY	NA	NA	51,155.12	43,312.86	15%
NORTH WALES	NA	NA	8,891.83	6,724.56	24%
UPPER GWYNEDD	NA	NA	52,495.24	43,670.63	17%
Total Overland Wasteload Allocations				94,532.41	

SUBWATERSHED 2

Table G-10. Sediment TMDL at the mouth of subwatershed 2 (including listed segments 971216-1415-ACE, 971217-1015-ACE, 971217-1145-ACE, 971222-0930-ACE, and 971222-1130-ACE)

TMDL (lbs/year)	WLA (lbs/year)	LA (lbs/year)	MOS (lbs/year)
1,189,536.38	979,934.80	119,223.73	77,155.28

*The WLA includes the collective load from the point sources at the mouth of subwatershed 2 after the sediment deliver ratio of 0.15 was applied to account for transport losses

Table G-11. Wasteload allocations for streambank erosion in Segment 971216-1415-ACE in subwatershed 2

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Ambler	10,348.78	5,381.36	48%
Stream Bank Erosion Lower Gwynedd	14,595.75	7,589.79	48%
Stream Bank Erosion Upper Dublin	64,654.09	33,620.13	48%
Stream Bank Erosion Whitpain	647.72	336.81	48%
Total Streambank Wasteload Allocations		46,928.09	

Table G-12. Wasteload allocations for overland load in Segment 971216-1415-ACE in subwatershed 2

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PA0026603 Ambler Boro	10.06	30	89,097.64	89,097.64	0.0
AMBLER	NA	NA	43,498.58	18,702.62	57%
LOWER GWYNEDD	NA	NA	43,230.19	23,270.36	46%
UPPER DUBLIN	NA	NA	228,481.81	127,682.72	44%
WHITPAIN	NA	NA	3,129.69	2,299.34	27%
Total Overland Wasteload Allocations				261,052.67	

Table G-13. Wasteload allocations for streambank erosion in Segment 971217-1015-ACE in subwatershed 2

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Lower Gwynedd	56,245.42	29,247.62	48%
Stream Bank Erosion Whitpain	1,143.80	594.78	48%
Total Streambank Wasteload Allocations		29,842.39	

Table G-14. Wasteload allocations for overland load in Segment 971217-1015-ACE in subwatershed 2

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
LOWER GWYNEDD	NA	NA	205,686.80	126,547.70	38%
WHITPAIN	NA	NA	1,890.83	1,273.62	33%
Total Overland Wasteload Allocations				127,821.32	

Table G-15. Wasteload allocations for streambank erosion in Segment 971217-1145-ACE in subwatershed 2

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction

Stream Bank Erosion Horsham	2,134.18	1,109.77	48%
Stream Bank Erosion Lower Gwynedd	62,201.28	32,344.67	48%
Stream Bank Erosion Montgomery	9,216.10	4,792.37	48%
Stream Bank Erosion Upper Gwynedd	354.47	184.32	48%
Total Streambank Wasteload Allocations		38,431.13	

Table G-16. Wasteload allocations for overland load in Segment 971217-1145-ACE in subwatershed 2

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
HORSHAM	NA	NA	4,441.70	1,981.54	55%
LOWER GWYNEDD	NA	NA	221,631.92	119,454.79	46%
MONTGOMERY	NA	NA	37,314.21	17,064.25	54%
UPPER GWYNEDD	NA	NA	1,859.90	863.00	54%
Total Overland Wasteload Allocations				139,363.58	

Table G-17. Wasteload allocations for streambank erosion in Segment 971222-0930-ACE in subwatershed 2

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Ambler	7,344.50	3,819.14	48%
Stream Bank Erosion Upper Dublin	10,214.60	5,311.59	48%
Stream Bank Erosion Whitemarsh	14,814.11	7,703.34	48%
Stream Bank Erosion Whitpain	52,758.24	27,434.29	48%
Total Streambank Wasteload Allocations		44,268.35	

Table G-18. Wasteload allocations for overland load in Segment 971222-0930-ACE in subwatershed2

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
AMBLER	NA	NA	30,238.40	13,524.82	55%
UPPER DUBLIN	NA	NA	18,839.31	10,071.09	47%
WHITEMARSH	NA	NA	28,740.87	21,265.90	26%
WHITPAIN	NA	NA	206,639.52	131,542.49	36%
Total Overland Wasteload Allocations				176,404.30	

Table G-19. Wasteload allocations for streambank erosion in Segment 971222-1130-ACE in subwatershed 2

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Ambler	281.21	146.22	48%
Stream Bank Erosion Lower Gwynedd	18,914.96	9,835.78	48%
Stream Bank Erosion Montgomery	37.00	19.24	48%
Stream Bank Erosion Upper Gwynedd	7.40	3.85	48%
Stream Bank Erosion Whitpain	43,779.69	22,765.44	48%
Total Streambank Wasteload Allocations		32,770.53	

Table G-20. Wasteload allocations for overland load in Segment 971222-1130-ACE in subwatershed 2

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
AMBLER	NA	NA	1,271.52	615.80	52%
LOWER GWYNEDD	NA	NA	45,708.78	27,315.39	40%

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
MONTGOMERY	NA	NA	173.07	73.04	58%
UPPER GWYNEDD	NA	NA	38.52	16.26	58%
WHITPAIN			82,482.51	55,031.94	33%
Total Overland Wasteload Allocations				83,052.41	

Table G-21. Sediment load from contributing upstream watersheds (subwatershed 1)

Contributing Watersheds (loads subject to estimated sediment delivery ratio)	Annual Average Load (lbs/year)	Sediment Delivery Ratio	Load Delivered from Stream (lbs/year)	LA (avg. annual) (lbs/year)	% Reduction
Subwatershed 1	772017.83	0.15	115,802.67	115,802.67	0.0
Total Load Allocations				115,802.67	

SUBWATERSHED 3

Table G-22. Sediment TMDL at the mouth of subwatershed 3 (including 971215-1133-ACE, 971215-1300-ACE, and 971215-1303-ACE)

TMDL (lbs/year)	WLA (lbs/year)*	LA (lbs/year)	MOS (lbs/year)
556,404.49	522,717.70	0.00	33,686.79

*The WLA includes the collective load from the point sources at the mouth of subwatershed 3 after the sediment delivery ratio of 0.17 was applied to account for transport losses

Table G-23. Wasteload allocations for streambank erosion in Segment 971215-1133-ACE in subwatershed 3

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Abington	119,671.74	39,491.67	67%
Stream Bank Erosion Springfield	10,766.03	3,552.79	67%
Stream Bank Erosion Upper Dublin	66,516.63	21,950.49	67%
Stream Bank Erosion Upper Moreland	733.25	241.97	67%
Stream Bank Erosion Whitemarsh	22,067.46	7,282.26	67%
Total Streambank Wasteload Allocations		72,519.19	

Table G-24. Wasteoad allocations for overland load in Segment 971215-1133-ACE in subwatershed 3

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PA0053074 Valley Green Corporate Center	0.01	30	128.94	128.94	0.0
PA0026867 Abington Township	6.05	30	60,741.75	60,741.75	0.0
ABINGTON	NA	NA	322,843.59	80,931.24	75%
SPRINGFIELD	NA	NA	20,485.97	8,689.68	58%
UPPER DUBLIN	NA	NA	148,090.18	46,209.80	69%
UPPER MORELAND	NA	NA	594.75	198.12	67%
WHITEMARSH	NA	NA	51,578.67	24,057.31	53%
Total Overland Wasteload Allocations				220,956.84	

Table G-25. Wasteload allocations for streambank erosion in Segment 971215-1300-ACE in subwatershed 3

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Abington	69.89	23.06	67%
Stream Bank Erosion Horsham	198.02	65.35	67%
Stream Bank Erosion Upper Dublin	123,772.67	40,844.98	67%
Stream Bank Erosion Upper Moreland	372.74	123.00	67%
Total Streambank Wasteload Allocations		41,056.40	

Table G-26. Wasteoad allocations for overland load in Segment 971215-1300-ACE in subwatershed 3

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
ABINGTON	NA	NA	240.87	57.81	76%
HORSHAM	NA	NA	504.37	125.79	75%
UPPER DUBLIN	NA	NA	288,873.69	88,238.73	69%
UPPER MORELAND	NA	NA	706.60	294.67	58%
Total Overland Wasteload Allocations				88,717.00	

Table G-27. Wasteload allocations for streambank erosion in Segment 971215-1303-ACE in subwatershed 3

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Horsham	279.04	92.08	67%
Stream Bank Erosion Upper Dublin	83,666.22	27,609.85	67%
Stream Bank Erosion Whitemarsh	685.98	226.37	67%
Total Streambank Wasteload Allocations		27,928.31	

Table G-28. Wasteload allocations for overland load Segment 971215-1303-ACE in subwatershed 3

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PA0029441 Upper Dublin Township	1.70	30	17,088.47	17,088.47	0.0
HORSHAM	NA	NA	818.36	181.18	78%
UPPER DUBLIN	NA	NA	178,810.55	53,748.51	70%
WHITEMARSH	NA	NA	1,083.81	521.79	52%
Total Overland WastelLoad Allocations				71,539.96	

SUBWATERSHED 4

Table G-29. TMDL for subwatershed 4 (including listed segments 971208-1000-ACE, 971209-0930-ACE, 971211-1300-ACE, 971215-1000-ACE, and 971215-1130-ACE)

TMDL (lbs/year)	WLA (lbs/year)	LA (lbs/year)	MOS (lbs/year)
797,846.28	558,349.46	187,098.74	37,275.63

*The WLA includes the collective load from the point sources at the mouth of subwatershed 4 after the sediment delivery ratio of 0.17 was applied to account for transport losses

Table G-30. Wasteload allocations for streambank erosion in Segment 971208-1000-ACE in subwatershed 4

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Philadelphia	2,308.39	1,985.22	14%
Stream Bank Erosion Springfield	551.90	474.64	14%
Stream Bank Erosion Whitemarsh	451.13	387.97	14%
Total Streambank Wasteload Allocations		2,847.82	

Table G-31. Wasteload allocations for overland load in Segment 971208-1000-ACE in subwatershed 4

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
SPRINGFIELD	NA	NA	11,673.78	5,594.50	52%
WHITEMARSH	NA	NA	10,785.84	4,862.15	55%
PHILADELPHIA	NA	NA	681.79	490.15	28%
Total Overland Wasteload Allocations				10,946.80	

Table G-32. Wasteload allocations for streambank erosion in Segment 971209-0930-ACE in subwatershed 4

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Philadelphia	4,237.05	3,643.87	14%
Stream Bank Erosion Springfield	4,859.44	4,179.12	14%
Stream Bank Erosion Upper Dublin	857.42	737.38	14%
Stream Bank Erosion Upper Moreland	2.18	1.87	14%
Stream Bank Erosion Whitemarsh	29,224.13	25,132.75	14%
Stream Bank Erosion Whitpain	60.93	52.40	14%
Total Streambank Wasteload Allocations		33,747.40	

Table G-33. Wasteload allocations for overland load in Segment 971209-0930-ACE in subwatershed 4

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PA0052515 Ambler Borough Water Department	0.026	30	260.99	260.99	0.0
PA0054577 Single Family Residence STP	0.001	10	3.62	3.62	0.0
PA0055387 Pennsylvania Historical & Museum Commission	0.002	30	15.53	15.53	0.0
PHILADELPHIA	NA	NA	41,747.44	9,377.01	78%
SPRINGFIELD	NA	NA	71,283.21	20,500.21	71%
UPPER DUBLIN	NA	NA	15,784.23	2,831.14	82%

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
UPPER MORELAND	NA	NA	1.93	1.93	--
WHITEMARSH	NA	NA	369,947.77	133,822.67	64%
WHITPAIN	NA	NA	904.90	183.56	80%
Total Overland Wasteload Allocations				166,996.67	

Table G-34. Wasteload allocations for streambank erosion in Segment 971211-1300-ACE in subwatershed 4

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Cheltenham	472.83	406.63	14%
Stream Bank Erosion Philadelphia	928.22	798.27	14%
Stream Bank Erosion Springfield	13,727.21	11,805.40	14%
Total Streambank Wasteload Allocations		13,010.30	

Table G-35. Wasteload allocations for overland load in Segment 971211-1300-ACE in subwatershed 4

NPDES/Township	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
CHELTENHAM	NA	NA	6,470.29	1,219.93	81%
PHILADELPHIA	NA	NA	14,142.99	3,535.16	75%
SPRINGFIELD	NA	NA	232,477.57	46,634.55	80%
Total Overland Wasteload Allocations				51,389.64	

Table G-36. Wasteload allocations for streambank erosion in Segment 971215-1000-ACE in subwatershed 4

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Whitemarsh	11,791.78	10,140.93	14%
Stream Bank Erosion Whitpain	1,340.22	1,152.59	14%
Total Streambank Wasteload Allocations		11,293.52	

Table G-37. Wasteload allocations for overland load in Segment 971215-1000-ACE in subwatershed 4

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PA0051012 Single Family Residence STP	0.001	10	2.07	2.07	0.0
PA0057631 Single Family Residence STP	0.001	20	5.18	5.18	0.0
PA0053210 Single Family Residence STP	0.001	20	5.18	5.18	0.0
PA0012904 Highway Materials, Inc.	12.378	35	144,993.09	144,993.09	0.0
WHITEMARSH	NA	NA	73,191.25	30,438.87	58%
WHITPAIN	NA	NA	14,379.55	3,415.20	76%
Total Overland Wasteload Allocations				178,859.58	

Table G-38. Wasteload allocations for streambank erosion in Segment 971215-1130-ACE in subwatershed 4

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Abington	1,862.83	1,602.03	14%
Stream Bank Erosion Cheltenham	1,285.46	1,105.50	14%
Stream Bank Erosion Springfield	15,168.47	13,044.89	14%
Stream Bank Erosion Upper Dublin	1,222.28	1,051.16	14%
Stream Bank Erosion Whitemarsh	187.37	161.14	14%
Total Streambank Wasteload Allocations		16,964.72	

Table G-39. Wasteload allocations for overland load in Segment 971215-1130-ACE in subwatershed 4

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
ABINGTON	NA	NA	39,454.10	6,807.63	83%
CHELTENHAM	NA	NA	14,079.17	3,229.08	77%
SPRINGFIELD	NA	NA	269,920.19	57,003.18	79%
UPPER DUBLIN	NA	NA	27,218.89	4,700.11	83%
WHITEMARSH	NA	NA	2,750.43	552.70	80%
Total Overland Wasteload Allocations				72,292.99	

Table G-40. Sediment load from contributing upstream watersheds (subwatersheds 2 and 3)

Subwatersheds	Annual Average Load (lbs/year)	Sediment Delivery Ratio	Load Delivered from Stream (lbs/year)	LA (avg. annual) (lbs/year)	% Reduction
Subwatersheds 2 and 3	1,693,111.66	0.17	287,828.98	287,828.98	0.0
Total Load Allocations				**287,828.98**	

Subwatershed 5

Table G-41. TMDL for subwatershed 5 (including listed segments 971208-1235-ACE, 971208-1430-ACE, 971209-1200-ACE, 971209-1430-ACE, and 971208-1000-ACE

TMDL (lbs/year)	WLA (lbs/year)	LA (lbs/year)	MOS (lbs/year)
531,715.46	379,731.93	122,495.29	29,488.24

*The WLA includes the collective load from the point sources at the mouth of subwatershed 5 after the sediment delivery ratio of 0.185 was applied to account for transport losses

Table G-42. Wasteload allocations for streambank erosion in Segment 971208-1235-ACE in subwatershed 5

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Philadelphia	9,318.36	8,013.79	14%
Total Streambank Wasteload Allocations		8,013.79	

Table G-43. Wasteload allocations for overland load in Segment 971208-1235-ACE in subwatershed 5

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PHILADELPHIA	NA	NA	146,430.90	19,900.46	86%
Total Overland Wasteload Allocations				19,900.46	

Table G-44. Wasteload allocations for streambank erosion in Segment 971208-1430-ACE in subwatershed 5

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Philadelphia	21,790.41	18,739.75	14%
Total Streambank Wasteload Allocations		18,739.75	

Table G-45. Wasteload allocations for overland load in Segment 971208-1430-ACE in subwatershed 5

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PHILADELPHIA	NA	NA	301,527.00	41,397.39	86%
Total Overland Wasteload Allocations				41,397.39	

Table G-46. Wasteload allocations for streambank erosion in Segment 971209-1200-ACE in subwatershed 5

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Philadelphia	31,341.93	26,954.06	14%
Stream Bank Erosion Springfield	6,154.62	5,292.98	14%
Total Streambank Wasteload Allocations		32,247.03	

Table G-47. Wasteload allocations for overland load in Segment 971209-1200-ACE in subwatershed 5

NPDES/Township (MS4)	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PHILADELPHIA	NA	NA	347,579.42	60,260.58	83%
SPRINGFIELD	NA	NA	94,612.08	13,375.19	86%
Total Overland Wasteload Allocations				73,635.77	

Table G-48. Wasteload allocations for streambank erosion in Segment 971209-1430-ACE in subwatershed 5

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Philadelphia	49,040.71	42,175.01	14%
Stream Bank Erosion Springfield	13.34	11.48	14%
Total Streambank Wasteload Allocations		42,186.48	

Table G-49. Wasteload allocations for overland load in Segment 971209-1430-ACE in subwatershed 5

NPDES/Township	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PHILADELPHIA	NA	NA	396,967.30	97,737.44	75%
SPRINGFIELD	NA	NA	64.68	6.19	90%
Total Overland Wasteload Allocations				97,753.99	

Table G-50. Wasteload allocations for streambank erosion in Segment 971208-1000-ACE in subwatershed 5

Township (MS4)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
Stream Bank Erosion Philadelphia	14,861.94	12,781.27	14%
Total Streambank Wasteload Allocations		12,781.27	

Table G-51. Wasteload allocations for overland load in Segment 971208-1000-ACE in subwatershed 5

NPDES/Township	Flow (cfs)	TSS (mg/L)	Annual Average Load (lbs/year)	WLA (avg. annual) (lbs/year)	% Reduction
PHILADELPHIA	NA	NA	164,786.62	33,061.54	80%
Total Overland Wasteload Allocations				33,061.54	

Table G-52. Sediment load from contributing upstream watersheds (subwatershed 4)

Subwatersheds	Annual Average Load (lbs/year)	Sediment Delivery Ratio	Load Delivered from Stream (lbs/year)	LA (avg. annual) (lbs/year)	% Reduction
Subwatershed 4	1,014,276.65	0.185	187,641.18	187,641.18	0.0
Total Load Allocations				187,641.18	

Table G-53. Wasteload allocations for overland loads by landuse for municipalities (MS4s)

Township	Listed Segment	WLAs by Landuse (lbs/yr)								
		Low-Intensity Residential	High-Intensity Residential	Hay/ Pasture	Row Crops	Coniferous Forest	Mixed Forest	Deciduous Forest	Transitional	TOTAL
ABINGTON	971215-1133-ACE	63,676.55	6,862.41	3,762.89	3,784.34	49.61	441.86	2,353.58	0.00	80,931.24
	971215-1300-ACE	57.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.81
	971215-1130-ACE	5,967.68	605.08	28.38	30.49	1.28	8.56	166.16	0.00	6,807.63
AMBLER	971216-1415-ACE	12,621.19	5,482.43	106.00	335.34	0.61	33.11	123.94	0.00	18,702.62
	971222-0930-ACE	6,681.59	5,521.05	0.00	1,207.22	0.00	6.99	107.96	0.00	13,524.82
	971222-1130-ACE	308.87	169.88	0.00	134.14	0.00	0.87	2.04	0.00	615.80
CHELTENHAM	971211-1300-ACE	1,026.29	14.18	0.00	0.00	19.15	19.27	141.04	0.00	1,219.93
	971215-1130-ACE	1,853.02	241.09	104.07	182.94	103.40	51.38	374.82	335.11	3,245.83
HORSHAM	971217-1145-ACE	813.30	982.87	53.42	0.00	21.92	36.70	73.33	0.00	1,981.54
	971215-1300-ACE	86.71	19.46	15.23	0.00	0.00	1.26	3.12	0.00	125.79
	971215-1303-ACE	77.26	68.28	0.00	34.09	0.00	0.00	1.56	0.00	181.18
LANSDALE	971218-1045-ACE	33,560.81	6,633.75	905.34	4,846.94	3.48	132.18	208.74	0.00	46,291.24
	981015-1100-ACE	110.39	93.43	0.00	618.76	0.00	1.77	0.00	0.00	824.36
LOWER GWYNEDD	971216-1415-ACE	13,353.09	1,219.66	1,282.57	6,639.72	34.70	317.99	422.62	0.00	23,270.36
	971217-1015-ACE	44,036.14	13,743.61	5,718.67	60,830.57	59.66	597.66	1,561.39	0.00	126,547.70
	971217-1145-ACE	70,741.24	3,858.67	1,474.33	40,509.00	95.57	759.31	2,016.67	0.00	119,454.79
	971222-1130-ACE	12,858.78	570.31	1,185.87	11,334.47	59.05	337.28	969.63	0.00	27,315.39
	971217-1430-ACE	4,571.55	0.00	57.30	1,134.39	3.48	43.22	88.08	0.00	5,898.02
	971218-1345-ACE	12,998.65	724.09	1,111.62	30,319.18	59.91	372.58	1,800.20	0.00	47,386.24
MONTGOMERY	971217-1145-ACE	6,994.42	7,790.15	224.35	1,944.97	1.22	23.59	85.56	0.00	17,064.25
	971222-1130-ACE	48.77	24.27	0.00	0.00	0.00	0.00	0.00	0.00	73.04
	971217-1430-ACE	165.24	159.35	0.00	309.38	0.00	0.00	1.21	0.00	635.18
	971218-1045-ACE	26,390.87	2,257.80	366.72	7,115.73	17.42	181.85	458.50	0.00	36,788.89
	971218-1345-ACE	0.00	23.36	0.00	0.00	0.00	0.00	0.00	0.00	23.36
	981015-1100-ACE	10,652.82	13,384.03	401.10	18,665.89	7.66	37.26	164.09	0.00	43,312.86
NORTH WALES	971217-1430-ACE	5,397.73	204.88	11.46	0.00	0.00	7.94	19.31	0.00	5,641.32
	971218-1045-ACE	2,399.17	23.28	0.00	0.00	0.00	2.66	13.27	0.00	2,438.38
	971218-1345-ACE	15,620.46	6,843.84	114.60	412.51	2.79	31.94	125.48	0.00	23,151.61
	981015-1100-ACE	5,988.76	654.02	11.46	0.00	0.70	17.74	51.88	0.00	6,724.56
PHILADELPHIA	971208-1000-ACE	24.58	3.73	0.00	61.19	3.69	4.76	392.21	0.00	490.15
	971209-0930-ACE	5,901.16	496.36	444.68	609.81	178.71	264.40	1,481.90	0.00	9,377.01
	971211-1300-ACE	1,805.51	113.45	179.76	1,189.14	35.74	39.61	171.95	0.00	3,535.16
	971208-1235-ACE	11,101.05	3,056.66	929.97	2,668.77	53.03	53.66	2,037.32	0.00	19,900.46
	971208-1430-ACE	25,730.25	4,600.78	833.36	1,697.37	155.36	527.30	7,852.97	0.00	41,397.39
	971209-1200-ACE	28,552.49	4,374.96	2,150.19	6,451.94	618.72	1,014.59	17,097.70	0.00	60,260.58

Township	Listed Segment	WLAs by Landuse (lbs/yr)								
		Low-Intensity Residential	High-Intensity Residential	Hay/ Pasture	Row Crops	Coniferous Forest	Mixed Forest	Deciduous Forest	Transitional	TOTAL
	971209-1430-ACE	26,984.54	4,469.14	8,779.68	15,182.69	945.03	1,843.44	39,152.15	380.77	97,737.44
	971208-1000-ACE	11,173.80	2,801.30	930.81	7,822.20	33.47	196.43	10,103.52	0.00	33,061.54
SPRINGFIELD	971208-1000-ACE	509.96	37.34	301.91	3,915.91	55.35	95.21	678.82	0.00	5,594.50
	971209-0930-ACE	7,754.18	1,262.16	2,980.27	7,592.19	57.44	237.64	616.33	0.00	20,500.21
	971211-1300-ACE	34,437.68	1,857.79	2,715.36	4,116.25	343.38	560.91	2,046.07	557.11	46,634.55
	971215-1130-ACE	38,913.44	2,486.51	7,133.73	3,262.51	187.64	523.44	1,551.46	2,944.75	57,003.48
	971215-1133-ACE	2,206.37	477.98	3,123.04	1,704.66	19.17	104.78	332.89	720.78	8,689.68
	971209-1200-ACE	7,941.48	1,374.69	1,098.47	1,530.97	90.35	105.82	1,233.42	0.00	13,375.19
	971209-1430-ACE	3.07	3.13	0.00	0.00	0.00	0.00	0.00	0.00	6.19
UPPER DUBLIN	971216-1415-ACE	65,708.28	7,885.53	6,105.47	45,337.89	77.92	853.79	1,713.84	0.00	127,682.72
	971222-0930-ACE	5,673.66	728.05	138.89	2,682.72	38.35	155.53	653.89	0.00	10,071.09
	971215-1133-ACE	27,661.58	2,019.22	12,065.62	2,216.05	82.31	718.34	1,446.68	0.00	46,209.80
	971215-1300-ACE	39,541.32	10,194.43	14,107.02	20,183.14	105.95	1,156.41	2,950.47	0.00	88,238.73
	971215-1303-ACE	20,279.70	8,051.59	3,290.62	18,171.64	190.05	551.69	3,213.22	0.00	53,748.51
	971209-0930-ACE	2,394.67	189.09	0.00	91.47	5.11	40.68	110.13	0.00	2,831.14
	971215-1130-ACE	4,295.21	189.09	85.15	30.49	5.11	13.92	81.15	0.00	4,700.11
UPPER GWYNEDD	971217-1145-ACE	715.71	12.13	0.00	134.14	0.00	0.00	1.02	0.00	863.00
	971222-1130-ACE	16.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.26
	971217-1430-ACE	39,849.57	4,257.04	928.26	57,853.95	38.32	381.90	1,814.68	0.00	105,123.72
	971218-1045-ACE	48,341.90	25,324.63	2,727.48	46,200.66	18.11	257.26	1,242.77	0.00	124,112.81
	971218-1345-ACE	27,515.19	19,807.43	928.26	43,622.50	13.24	85.16	966.46	0.00	92,938.24
	981015-1100-ACE	19,760.15	7,287.64	584.46	15,262.72	6.27	125.08	644.31	0.00	43,670.63
UPPER MORELAND	971215-1133-ACE	125.25	0.00	0.00	0.00	6.77	10.10	56.00	0.00	198.12
	971215-1300-ACE	105.98	4.86	137.11	34.09	0.00	12.62	0.00	0.00	294.67
	971209-0930-ACE	0.00	0.00	0.00	0.00	0.00	0.00	1.93	0.00	1.93
WHITEMARSH	971208-1000-ACE	405.51	235.25	123.51	3,426.42	9.84	73.31	588.31	0.00	4,862.15
	971209-0930-ACE	29,914.41	2,458.14	14,030.94	39,485.46	524.64	1,763.01	8,427.72	37,218.35	133,822.67
	971215-1000-ACE	5,245.47	1,711.25	7,398.65	10,946.16	109.78	597.31	4,430.25	0.00	30,438.87
	971215-1130-ACE	323.09	127.63	0.00	60.98	0.00	4.28	36.71	0.00	552.70
	971222-0930-ACE	5,299.75	157.74	3,055.49	11,602.74	49.31	326.79	774.07	0.00	21,265.90
	971215-1133-ACE	3,613.06	1,692.43	1,767.19	3,238.85	63.14	119.93	1,039.12	12,523.58	24,057.31
	971215-1303-ACE	48.29	0.00	0.00	409.12	1.09	2.52	60.77	0.00	521.79
WHITPAIN	971218-1345-ACE	1,738.67	16,560.69	550.08	23,512.84	0.00	3.55	13.27	0.00	42,379.10
	971216-1415-ACE	243.97	362.28	0.00	1,676.70	0.00	5.23	11.18	0.00	2,299.34
	971217-1015-ACE	390.13	60.49	478.33	268.27	0.00	12.23	64.17	0.00	1,273.62
	971222-0930-ACE	52,753.69	2,074.95	5,534.07	69,079.92	66.35	470.09	1,563.42	0.00	131,542.49

Township	Listed Segment	WLAs by Landuse (lbs/yr)								
		Low-Intensity Residential	High-Intensity Residential	Hay/ Pasture	Row Crops	Coniferous Forest	Mixed Forest	Deciduous Forest	Transitional	TOTAL
	971222-1130-ACE	19,556.40	485.37	10,053.20	21,729.99	130.27	1,065.13	2,011.57	0.00	55,031.94
	971209-0930-ACE	142.54	0.00	28.38	0.00	1.28	7.49	3.86	0.00	183.56
	971215-1000-ACE	2,166.61	0.00	766.36	0.00	22.98	132.73	326.52	0.00	3,415.20
WORCESTER	971217-1430-ACE	1,018.96	0.00	11.46	1,134.39	2.09	9.70	27.75	0.00	2,204.35
	971218-1345-ACE	2,152.64	0.00	22.92	5,156.32	0.70	7.98	65.15	0.00	7,405.72

Table G-54. Wasteload allocations for streambank erosion for municipalities (MS4s)

Municipality	Watershed	WLA (lbs/year)
ABINGTON	971215-1130-ACE	1,602.04
ABINGTON	971215-1133-ACE	39,491.67
ABINGTON	971215-1300-ACE	23.06
AMBLER	971216-1415-ACE	5,381.36
AMBLER	971222-0930-ACE	3,819.14
AMBLER	971222-1130-ACE	146.23
CHELTENHAM	971211-1300-ACE	406.63
CHELTENHAM	971215-1130-ACE	1,105.50
HORSHAM	971215-1300-ACE	65.35
HORSHAM	971215-1303-ACE	92.08
HORSHAM	971217-1145-ACE	1,109.77
LANSDALE	971218-1045-ACE	5,172.74
LANSDALE	981015-1100-ACE	44.09
LOWER GWYNEDD	971216-1415-ACE	7,589.79
LOWER GWYNEDD	971217-1015-ACE	29,247.62
LOWER GWYNEDD	971217-1145-ACE	32,344.67
LOWER GWYNEDD	971217-1430-ACE	815.05
LOWER GWYNEDD	971218-1345-ACE	7,654.93
LOWER GWYNEDD	971222-1130-ACE	9,835.78
MONTGOMERY	971217-1145-ACE	4,792.37
MONTGOMERY	971217-1430-ACE	44.84
MONTGOMERY	971218-1045-ACE	4,665.25
MONTGOMERY	971218-1345-ACE	2.65
MONTGOMERY	971222-1130-ACE	19.24
MONTGOMERY	981015-1100-ACE	3,706.42
NORTH WALES	971217-1430-ACE	609.31
NORTH WALES	971218-1045-ACE	269.61
NORTH WALES	971218-1345-ACE	2,692.72
NORTH WALES	981015-1100-ACE	804.05
PHILADELPHIA	971208-1000-ACE	1,985.22
PHILADELPHIA	971208-1000-ACE	12,781.27
PHILADELPHIA	971208-1235-ACE	8,013.79
PHILADELPHIA	971208-1430-ACE	18,739.75
PHILADELPHIA	971209-0930-ACE	3,643.87
PHILADELPHIA	971209-1200-ACE	26,954.06
PHILADELPHIA	971209-1430-ACE	42,175.01
PHILADELPHIA	971211-1300-ACE	798.27
SPRINGFIELD	971208-1000-ACE	474.64
SPRINGFIELD	971209-0930-ACE	4,179.12
SPRINGFIELD	971209-1200-ACE	5,292.98
SPRINGFIELD	971209-1430-ACE	11.48
SPRINGFIELD	971211-1300-ACE	11,805.40
SPRINGFIELD	971215-1130-ACE	13,044.89
SPRINGFIELD	971215-1133-ACE	3,552.79
UPPER DUBLIN	971209-0930-ACE	737.38
UPPER DUBLIN	971215-1130-ACE	1,051.16
UPPER DUBLIN	971215-1133-ACE	21,950.49
UPPER DUBLIN	971215-1300-ACE	40,844.98
UPPER DUBLIN	971215-1303-ACE	27,609.85
UPPER DUBLIN	971216-1415-ACE	33,620.13
UPPER DUBLIN	971222-0930-ACE	5,311.59

Municipality	Watershed	WLA (lbs/year)
UPPER GWYNEDD	971217-1145-ACE	184.32
UPPER GWYNEDD	971217-1430-ACE	11,273.51
UPPER GWYNEDD	971218-1045-ACE	12,888.24
UPPER GWYNEDD	971218-1345-ACE	8,641.55
UPPER GWYNEDD	971222-1130-ACE	3.85
UPPER GWYNEDD	981015-1100-ACE	4,977.34
UPPER MORELAND	971209-0930-ACE	1.87
UPPER MORELAND	971215-1133-ACE	241.97
UPPER MORELAND	971215-1300-ACE	123.00
WHITEMARSH	971208-1000-ACE	387.97
WHITEMARSH	971209-0930-ACE	25,132.75
WHITEMARSH	971215-1000-ACE	10,140.93
WHITEMARSH	971215-1130-ACE	161.14
WHITEMARSH	971215-1133-ACE	7,282.26
WHITEMARSH	971215-1303-ACE	226.37
WHITEMARSH	971222-0930-ACE	7,703.34
WHITPAIN	971209-0930-ACE	52.40
WHITPAIN	971215-1000-ACE	1,152.59
WHITPAIN	971216-1415-ACE	336.81
WHITPAIN	971217-1015-ACE	594.78
WHITPAIN	971218-1345-ACE	2,811.75
WHITPAIN	971222-0930-ACE	27,434.29
WHITPAIN	971222-1130-ACE	22,765.44
WORCESTER	971217-1430-ACE	226.84
WORCESTER	971218-1345-ACE	513.15

Appendix H

EXECUTIVE SUMMARY
COMPREHENSIVE STORMWATER MANAGEMENT POLICY
DOCUMENT NUMBER: 392-0300-002

At the 15 water forums held throughout the Commonwealth in 2001, stormwater management was a consistent issue identified by the forum participants. In addition, stormwater management is a priority issue identified in the Environmental Futures Planning process throughout the 34 watershed planning areas within the Commonwealth. Stormwater runoff has also been identified as one of the top three causes of water quality impairment in the Department's Clean Water Act Section 303(d) listing process. Finally, DEP must implement the federal Clean Water Act Phase II NPDES stormwater permit program by December 2002.

In response to the forums, the Environmental Futures Planning process, stream impairment listings and federal program requirements, on October 27, 2001, the Department published a proposed comprehensive stormwater management policy to more fully integrate post construction stormwater planning requirements, emphasizing the use of ground water infiltration and volume and rate control best management practices (BMPs), into the existing and proposed NPDES permitting programs and the Stormwater Management Act ("Act 167") Planning Program. Specifically, the Department proposed the following:

- The consistent application of existing legal requirements to protect water quality in all stormwater programs, including the protection and maintenance of existing uses and the physical, chemical and biological characteristics of surface waters.

- The integration of the municipally implemented Act 167 stormwater management programs into the NPDES permitting process for urbanized areas requiring Municipal Separate Storm Sewer System (MS4) NPDES Permits for Stormwater Discharges.

- The integration of consistent post construction stormwater management planning processes emphasizing, and sometimes requiring, water quality and quantity infiltration and volume and rate control BMPs into the permit process for NPDES Stormwater Discharges Associated with Construction Activity.

- The use of a Chapter 91 Water Quality Management Part II Permit to ensure the maintenance and operation of the post construction stormwater BMPs after the earth disturbance activities are completed.

More than 600 comments were received from 234 individuals and organizations during the public comment period on the draft policy. Comments ranged from strong support to strong opposition. The major comments focused on the following areas:

Use of existing authority: Many commentators support the use of exiting authority. Others object to portions of the policy asserting that the Department should instead undertake a formal rulemaking subject to public review and comment, as well as review and approval by the Environmental Quality Board and the Independent Regulatory Review Commission.

Use of the Part II WQM permit for post construction stormwater: While many commentators generally support this approach, there are numerous requests for more clarification on the administration of this proposed permit requirement. Others question the legal authority for the permit. A few commentators suggest the existing NPDES permit process should be used because it is already in place and also provides federal EPA oversight.

Best Management Practice Manual: Many commentators suggest that the Department develop a technical manual accompanied by training to ensure consistent program administration and implementation.

Consistency with the Department's Antidegradation Policy: Many commentators suggest that the use of current regulations prohibiting degradation of existing uses of waterways needs to be emphasized and clarified.

Funding and Staffing: Some commentators question the absence of an analysis relative to the costs of implementing the suggested BMPs. Many commentators express concerns relative to costs and staffing within the Department and County Conservation Districts to support the implementation of the policy. Commentators also request clarification regarding various funding resources such as PennVEST and Act 167 to support the policy.

Science, Foundation, and Technical Feasibility for the Policy: Many commentators raise concerns that the objectives stated in the policy relative to infiltration BMPs, and groundwater recharge were not fully developed, practical or in some cases feasible. Some commentators question the Department's scientific foundation for the development of the policy while many other commentators clearly believe that streams have been severely impacted by poor or inadequate stormwater management practices and support the proposed policy.

Compensation (mitigation) for stormwater impacts: Several commentators question the proposed compensation option for sites in EV wetlands where infiltration cannot be achieved. Some express concerns that compensation provides a way out for persons affected by the policy and may be abused. Others are concerned about the lack of guidance in determining how someone compensates for potential impacts.

Expand the Policy: Many commentators suggest that the requirement to infiltrate stormwater should be expanded to all waterways regardless of their designated or existing use. Many are concerned that waters other than special protection receive no or limited protection under the proposed policy.

SUMMARY OF RELATED ACTIONS

Since announcement of the Proposed Comprehensive Stormwater Management Policy in October 2001, the Department has proposed, revised or otherwise finalized the following related documents:

- Renewal of NPDES Stormwater Construction General Permit (5 acres or greater)
- Proposed NPDES Stormwater Construction General Permit (1-5 acres)
- Proposed MS4 General Permit

- Renewal of NPDES Industrial General Permit
- Revised Act 167 Model Ordinance
- EPA has approved funding to support the development of a Post Construction Stormwater Technical BMP Manual

SUMMARY OF THE FINAL POLICY

The final policy sets forth the Department's general framework for implementing its stormwater management programs, using existing legal authority. In particular, the policy promotes and integrates the following into the Department's existing stormwater management programs:

- A clarification of the application of existing antidegradation provisions in 25 Pa. Code Section 93.4a to the BMP-based stormwater programs to protect and maintain existing uses and maintain water quality necessary to support those uses in all streams and to protect and maintain water quality in special protection streams.

- A uniform approach to post construction stormwater management that emphasizes ground water recharge through infiltration, water quality treatment and discharge volume and rate control with a goal of replicating infiltration and runoff characteristics of the site prior to development.

- The proposed Part II Water Quality Management permit is not included in the final policy. Instead, post construction stormwater management planning has been integrated into the NPDES stormwater permitting programs.

- The promotion of a comprehensive watershed approach to stormwater management through the Act 167 stormwater management planning program.

- The final policy clarifies that existing Department policies and programs related to flood protection and combined sewer overflows are not affected by this policy.

Fundamentally, the policy emphasizes the reduction of stormwater runoff generated by development and other activities by encouraging the minimization of impervious cover, use of low impact development designs, and the use of innovative stormwater BMPs that provide infiltration, water quality treatment, and otherwise more effectively manage the volume and rate of stormwater discharges. These stormwater BMPs and planning practices will be advanced through increased emphasis on the Department's Act 167 stormwater management planning program and implementation of the new (Phase II) and existing (Phase I) NPDES Stormwater Discharge Associated with Construction Activity Permit programs, and the new NPDES MS4 permits.

Administratively the Department is advancing a consistent approach to stormwater management in all NPDES stormwater permits and in the Act 167 stormwater planning processes. Department-approved Act 167 stormwater management plans and NPDES permits required under the federal Clean Water Act will include the same planning objectives to protect and maintain existing uses and maintain the level of water quality necessary to protect those uses in all streams, and to protect and maintain water quality in special protection streams. For instance, municipalities who follow the recommended stormwater planning protocol in the MS4 General Permit described in this policy can satisfy those planning objectives in both the applicable NPDES permits and the Act 167 stormwater planning requirements. In addition, persons implementing post construction stormwater plans under Act 167 that emphasize infiltration, water quality treatment and other volume and rate controls can also satisfy the post construction stormwater management planning requirements of the NPDES Stormwater Discharge Associated with Construction Activity Permit and the MS4 Permit.

The terms stormwater and stormwater management as utilized throughout the policy refer to increased volumes and rates of runoff resulting from construction and land development activities. Stormwater management as recommended in this policy is not intended to address over bank flooding resulting from major storm events. Stream and river flooding from major storm events is addressed through the Department's Flood Protection and Stream Improvement Programs.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMPREHENSIVE STORMWATER MANAGEMENT POLICY

Document ID # 392-0300-002

September 28, 2002

DOCUMENT NUMBER: 392-0300-002

TITLE: Comprehensive Stormwater Management Policy

EFFECTIVE DATE: September 28, 2002

AUTHORITY:

Pennsylvania Clean Streams Law (35 P.S. §§ 691.1-691.1001); Pennsylvania Stormwater Management Act (32 P.S. §§ 680.1-680.17); Federal Clean Water Act (33 U.S.C.A § 1342), 40 CFR Part 122 and 25 Pa Code Chapters 92, 93, 96, 102, 105, and 111.

POLICY:

The Department will ensure activities and plans approved under its authority will employ stormwater management plans utilizing best management practices to protect and maintain ground water resources, preserve ground water supplies, maintain stream base flows, and protect, preserve, and maintain the physical stability, and environmental integrity of waters of the Commonwealth.

PURPOSE:

Clean, reliable ground water and surface water resources are critical for sustaining the environmental health of our natural resources, protecting the public's health and safety, and maintaining the economic vitality of the Commonwealth. The purpose of this policy is to ensure effective stormwater management to minimize the adverse impacts of stormwater on ground water and surface water resources to support and sustain the social, economic and environmental quality of the Commonwealth, and to integrate federal Clean Water Act Stormwater Management requirements.

APPLICABILITY:

This policy applies to all Department programs implementing stormwater management.

DISCLAIMER:

The policies and procedures outlined in this guidance document are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements. The policies and procedures herein are not adjudications or regulations. There is no intent on the part of DEP to give the rules in these policies that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

PAGE LENGTH: 8 pages

LOCATION: Volume 15, Tab 21

COMPREHENSIVE STORMWATER MANAGEMENT POLICY

This policy document describes the Department's update of its stormwater management programs, using existing authority, to improve water quality, sustain water quantity including ground water recharge and stream base flow, and to implement federal stormwater management obligations.

This policy provides a framework for the integration of all Department stormwater management programs and promotes a comprehensive watershed approach to stormwater management in the Commonwealth. This policy identifies and integrates existing legal requirements and post construction stormwater management planning goals, objectives, and recommended procedures into the various Department stormwater management programs.

Unmanaged or poorly managed stormwater can result in stream bank scour, stream destabilization, sedimentation, loss of groundwater recharge, loss of base flow, localized flooding, habitat modification and water quality and quantity impairment. Conversely, properly managed stormwater through properly constructed and maintained best management practices (BMPs) can remove pollutants, facilitate ground water recharge through retention and infiltration, provide base flow for surface waters, and maintain the stability and the environmental integrity of waterways and wetlands. To provide long-term protection and sustainability of ground and surface water resources, stormwater should be managed at the source or origin as an environmental resource to be protected rather than as a waste to be quickly discharged and moved downstream.

Fundamentally, the goals of the policy are to improve and sustain ground and surface water quality and quantity through the use of planning practices and BMPs that minimize the generation of stormwater runoff, provide ground water recharge and minimize the adverse effects of stormwater discharges on ground and surface water resources. This policy also supports the fulfillment of the state's obligation under 25 Pa. Code Section 93.4a to protect and maintain existing uses and the level of water quality necessary to protect those uses in all surface waters and to protect and maintain water quality in "special protection" waters. Special protection waters are Pennsylvania's highest quality surface waters and include Exceptional Value (EV) and High Quality (HQ) waters.

RECOMMENDED POST CONSTRUCTION STORMWATER MANAGEMENT PROCESS TO MEET REGULATORY STANDARDS

Procedurally, post construction stormwater management plans required under the NPDES Stormwater Discharges Associated with Construction Activities permit program and the NPDES Municipal Separate Storm Sewer System (MS4) permit program, as well as stormwater management plans developed under the Act 167 program, must demonstrate compliance with the antidegradation requirements at 25 Pa. Code Section 93.4a to protect and maintain existing uses and the level of water quality necessary to protect those uses in all surface waters and protect and maintain water quality in special protection waters.

This policy recommends that in order to meet the regulatory requirements of 25 Pa. Code Section 93.4a, persons involved in the development of post construction stormwater management plans should prepare a comparative pre and post construction stormwater management analysis.

In watersheds other than special protection, based upon the comparative stormwater management analysis, planners and applicants should evaluate and utilize infiltration BMPs to manage the net change in stormwater generated or otherwise replicate to the maximum extent possible preconstruction stormwater infiltration and runoff conditions so that post construction stormwater discharges do not degrade the physical, chemical or biological characteristics of the receiving waters. Additionally, water quality treatment BMPs must be employed where necessary to ensure protection of existing uses and the level of water quality necessary to protect those existing uses. Finally, the volume and rate of stormwater discharges must be managed to prevent the physical degradation of receiving waters, such as scour and streambank destabilization.

In special protection watersheds, based upon the comparative stormwater management analysis, planners and applicants can ensure that existing water quality will be protected and maintained by demonstrating that post construction infiltration equals or exceeds preconstruction infiltration and that any post construction discharge will not degrade the physical, chemical or biological characteristics of the special protection surface water. In these special protection watersheds, infiltration BMPs should be used to the maximum extent possible. To the extent that planners and applicants cannot totally infiltrate stormwater to pre construction volumes due to site conditions or limitations, off-site compensation projects in the same watershed and preferably upstream of the project site should be evaluated and employed to protect and maintain water quality. Additionally, water quality treatment BMPs must be employed where necessary to ensure the protection and maintenance of water quality. Finally, the volume and rate of stormwater discharges must be managed to prevent the physical degradation of receiving waters, such as scour and streambank destabilization.

Overall, the implementation of these stormwater management approaches will meet the requirements of 25 Pa. Code Section 93.4a by reducing pollutant loads to streams, recharging aquifers, protecting stream base flows, preventing stream bank erosion and streambed scour, and protecting the environmental integrity of receiving waters.

INTEGRATION OF POST CONSTRUCTION STORMWATER MANAGEMENT PLANNING INTO EXISTING STORMWATER PROGRAMS

NPDES Stormwater Discharge Associated with Construction Activity Permit Program

Pennsylvania regulates stormwater impacts occurring during construction under the Erosion and Sediment Pollution Control Program. All earth disturbances of 5000 square feet or greater require the development and implementation of an erosion and sediment control plan under 25 Pa. Code Chapter 102. Erosion and sediment control BMPs are used to minimize the potential for accelerated erosion and sediment pollution from these activities. The Department has developed a manual, "Erosion and Sediment Pollution Control Program Manual," that identifies BMPs, provides recommended site design standards and specifications as well as their applicability to various situations. For High Quality (HQ) and Exceptional Value (EV) watersheds, there are more protective BMP requirements contained in Chapter 102. Beyond these planning and implementation requirements persons conducting earth disturbance activities are required to secure the appropriate NPDES permit as follows:

Phase I Earth Disturbances 5 Acres or Greater

EPA regulations implementing the Clean Water Act require NPDES permits for construction activities of five (5) acres or greater (Phase I). Using its existing authority pursuant to the Department's regulations found in 25 Pa. Code Chapters 92, 93, 96 and 102, Pennsylvania began to implement the Phase I Stormwater NPDES program in 1992. Under the Department's regulations, any earth disturbance 5 acres or greater (including earth disturbances of less than 5 acres that occur as a part of a larger common plan of development or sale consisting of 5 acres or more) requires a permit prior to the commencement of the earth disturbance. An individual NPDES permit is required for projects located in HQ and EV watersheds and in most circumstances a general permit is available for use in all other watersheds. The Department has delegated the primary functions and responsibilities of the program to County Conservation Districts under the authority contained in the Conservation District Law.

Phase II Earth Disturbance between 1 and 5 acres

In 1999, EPA promulgated Phase II stormwater regulations establishing NPDES permit requirements for construction activities with between 1 and 5 acres of earth (including earth disturbances less than 1 acre that occur as part of a larger common plan of development or sale between 1 and 5 acres), with a point source discharge. Pennsylvania is required to implement the Phase II requirements by December 8, 2002.

An NPDES Phase II permit is not required for earth disturbance activities of between 1 and 5 acres unless there is point source discharge of stormwater to surface waters of the Commonwealth. For activities that do not have a point source discharge, the erosion and sediment pollution control plan requirements in Chapter 102 described above will be used as the substantive environmental control requirements for those projects. Earth disturbance activities of between 1 and 5 acres (small construction sites) that include a point source discharge and which are located in HQ and EV watersheds require an individual NPDES permit. In most circumstances a general permit is available for use in all other watersheds.

Integration of Post Construction Stormwater Management Plans into NPDES Stormwater Discharge Associated with Construction Activity Permits

Since 1990, the Federal NPDES regulations have required the identification of post construction stormwater management BMPs in the permit application or Notice of Intent for General Permit users. To further advance effective stormwater management and to support the regulatory requirements found at 25 Pa. Code Section 93.4a, the Department has amended the permit application and Notice of Intent for General Permits to require the identification of post construction stormwater management BMPs within a site specific post construction stormwater management plan. Post Construction Stormwater Management Plans should be developed in accordance with the process described above and supported by references listed in Appendix A of this policy.

NPDES Municipal Separate Storm Sewer System (MS4) Discharge Permit Program

The federal Phase II stormwater regulations also established NPDES permit requirements for MS4 discharges from Municipal Separate Storm Sewer Systems (MS4s). Pennsylvania is required to implement these MS4 requirements by December 2002. Based on 1990 census data there are approximately 700 municipalities and other facilities within the Commonwealth that must meet the Phase II permit requirements.

In general terms, the MS4 permit requirements are to develop, implement and enforce a BMP based stormwater program with these six elements:

1. implement a public education program;
2. include public involvement in decision making;
3. eliminate or treat discharges not composed entirely of stormwater;
4. require erosion and sediment controls for construction activities;
5. require BMPs to manage post-construction stormwater for new development and redevelopment; and
6. require pollution prevention/good housekeeping for municipal operations.

EPA's Phase II regulations allow existing state and local regulatory programs to be used to meet the MS4 requirements. The Department will use a general permit to cover the required program elements in watersheds other than special protection. Pennsylvania will use the Stormwater Management Act ("Act 167") Program as a centerpiece of the MS4 program for Pennsylvania. In general, municipalities that have developed and are implementing an Act 167 Plan developed on a watershed basis that includes the water quality protective measures, including an MS4 module, will be able to meet the EPA MS4 NPDES requirements through the Act 167 process.

Municipalities that are required to obtain an MS4 permit but which have discharges to watersheds without an approved Act 167 Plan that meets the water quality requirements of 25 Pa. Code Section 93.4a, will be encouraged to work with their county to develop a stormwater plan that meets the requirements of Act 167 and the Phase II MS4 permit. Financial assistance for that effort is authorized under Act 167, and a special MS4 module is available for this purpose. Municipalities that do not want to participate in the Act 167 process will be required to develop a separate municipal plan to meet the MS4 requirements, without the use of state cost-sharing funding under Act 167.

Integration of Post Construction Stormwater Management Plans into Act 167 Stormwater Management Plans and MS4 permits

Under the Stormwater Management Act (Act 167), counties are required to develop a watershed based stormwater management plan that is implemented by affected municipalities through municipal ordinances. Both the statute and implementation guidelines require these plans to include provisions to protect water quality, existing uses and the level of water quality necessary to protect those existing uses in all surface waters and to protect and maintain water quality in special protection waters. Funding has generally been available from the Department to cover

75% of the cost to develop the plan. Act 167 also authorizes funding to support municipal implementation of ordinances adopted under the Act 167 plan.

This program has evolved since it began in 1979. Watershed based stormwater management plans developed under Act 167 approved by the Department will include water quality and quantity protection requirements to be implemented by municipalities at the local level as discussed above. Where Act 167 plans implement these water quality and quantity requirements, individuals and the Department may rely on those Act 167 plans and implementing municipal ordinances to meet the relevant MS4 NPDES permitting requirements for municipalities under the Clean Water Act Phase II stormwater program.

The Department will encourage the use of Act 167 plans to facilitate implementation of the new MS4 NPDES permit program, described above, by including an "MS4 module" in the planning process. In this way, municipalities required to meet the MS4 requirement will be able to do so using the watershed plans, cost-share funds and municipal ordinances available under Act 167.

NPDES Industrial Stormwater Permit Program

The existing Phase I of the federal NPDES stormwater permitting regulations for industrial facilities includes eleven (11) categories of industrial activity that are required to be permitted, including the construction activities discussed previously in this policy (5 acres or more).

A permit exception is incorporated in the Phase II program. This exception is referred to as the "no exposure certification" exception. The exception allows all but 1 (construction) of the 11 industrial activities to bypass the permitting process and requirements if their industrial activities and materials are not "exposed to stormwater." A similar exception, under Phase I, only applied to one industrial activity, commonly referred to as "light industry." "Light industry" operators were not required to submit any information supporting their claim for the exception.

The Phase II program covers the same industrial categories but expands the "no exposure" permit exception. The exception previously enjoyed by "light industry" activities is now available for all categories (except for construction activity) listed under the definition of "industrial activity." The new rule allows for a simple and cost-effective way to comply with permitting provisions when industrial activities and materials are completely sheltered from stormwater. Under the EPA rule, operators now have the option of either applying for a permit, or submitting a "no exposure certification" form, conditioned on the discharge not contributing "to the violation of, or interfering with the attainment or maintenance of, water quality standards, including designated uses."

The Department will implement the no exposure certification by amending its existing stormwater discharge general permit for industrial activities. The next permit revision will provide all permittees with an option to either submit the Notice of Intent for coverage under the statewide general permit, or to submit a "no exposure certification" statement. The certifications must be made on a facility wide basis and are required every five years.

Flood Protection and Combined Sewer Overflow Programs

While stormwater management is related to flood protection this policy is not intended to address major flood events on streams and rivers or modify existing flood protection programs and policies of the Department. Additionally, this policy is not intended to modify or otherwise affect existing policies and programs of the Department related to combined sewer overflows.

TECHNICAL SUPPORT AND GUIDANCE

There are numerous sources of technical support and guidance available in print and electronically which provide an array of development planning options and post construction stormwater BMPs that can be used to meet the objectives of this policy and underlying legal requirements. A list of recently developed manuals and reference materials is included in Appendix A of this policy. The Department is in the process of developing a Pennsylvania specific post construction stormwater BMP manual that is expected to be available in 2004.

Appendix A

Stormwater Management BMP Manuals

Delaware Conservation Design For Stormwater Management Guidance Manual (1997)
Address: DNREC
Division of Soil and Water Conservation
Sediment and Stormwater Program
89 Kings Highway
Dover, DE 19901
Website: http://www.dnrec.state.de.us/dnrec2000/Divisions/Soil/Stormwater/Apps/DesignManualRequest.htm
Cost: $25

2000 Maryland Stormwater Design Manual (10/2000)
Address: Maryland Department of the Environment
Water Management Administration
Nonpoint Source Program
2500 Broening Highway
Baltimore, MD 21224
(410) 631-3543 or 1-800-633-6101
Website: http://www.mde.state.md.us/environment/wma/stormwatermanual/Manual_CD/Introduction.pdf
http://www.mde.state.md.us/environment/wma/stormwatermanual/publist2.htm
Cost: October 2000 edition, web download – free
April 2000 edition, printed version - $25

Revised Manual for New Jersey: Best Management Practices for Control of Nonpoint Source Pollution from Stormwater (5/2000, 5th draft)
Address: NJDEP
Division of Watershed Management
Sandra A. Blick
PO Box 418
Trenton, NJ 08625-0418
H2Oshed@dep.state.nj.us
Website: http://www.state.nj.us/dep/watershedmgt/bmpmanual.htm
Cost: web download - free

New York State Stormwater Management Design Manual (10/2001)
Address: New York State
Department of Environmental Conservation
625 Broadway
Albany, NY 12233
Webpage: http://www.dec.state.ny.us/website/dow/swmanual/swmanual.html
Cost: web download - free

Pennsylvania Handbook of Best Management Practices for Developing Areas (1997)

Address: PACD
225 Pine St.
Harrisburg, PA 17101
(717) 236-1006
(717) 236-6410 - fax

Website: http://www.pacd.org/products/bmp/bmp_handbook.htm
http://www.pacd.org/products/bmp/bmp_orderform.htm

Cost: web download – free (limited browser version)
printed version - $20-30

Center for Watershed Protection

Address: 8391 Main Street
Ellicott City, MD 21043-4605
(410) 461-8323
(410) 461-8324 - fax

Website: http://www.cwp.org/

Pennsylvania Department of Environmental Protection

Address: Division of Waterways, Wetlands and Erosion Control
P. O. Box 8775
Harrisburg, PA 17105-8775
(717) 787-6827
(717) 787-5986 – fax

Website: http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/stormwatermanagement.htm
http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/WWEC/StrmH2O_Home.htm

Address: Southeast Regional Office
Lee Park, Suite 6010
555 North Lane
Conshohocken, PA 19428
(610) 832-6130
(610) 832-6133 – fax

Website: http://www.dep.state.pa.us/dep/deputate/fieldops/se/water/PCSWM.htm

Appendix I

Stormwater Runoff Water Quality Science/Engineering Newsletter
Devoted to Urban/Rural Stormwater Runoff
Water Quality Management Issues

* * * * *

Volume 5 Number 5
December 2, 2002

Editor: Anne Jones-Lee, PhD
Contributor to this Issue:
G. Fred Lee, PhD, PE, DEE

* * * * *

This issue of the Newsletter is primarily devoted to a presentation of a recent US EPA headquarters memorandum, "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs." This memo establishes the Bush Administration US EPA policy for including NPDES permitted urban and highway stormwater runoff in TMDLs. There are still some important unresolved issues concerning how the US EPA approach will be implemented with respect to the BMP ratcheting down process to ultimately achieve water quality standards (see NLs 1-2, 1-5). As discussed in previous Newsletters (see NLs 1-2, 1-3, 1-5, and 2-2) all NPDES permitted discharges must not cause or contribute to violations of water quality standards. In the past and under this recently announced policy for incorporating NPDES permitted urban and highway stormwater runoff in TMDLs, this requirement still stands. However, the timetable for controlling violations of water quality standards caused by urban stormwater runoff still has not been established. This situation is not surprising since, as discussed in previous Newsletters (see NL 3-3), compliance with water quality standards associated with urban stormwater runoff from developed areas will cost the public served by the storm sewer system from $5 to $10 per person per day. Previous issues of this Newsletter that discuss these issues are available from www.gfredlee.com.

The Water Environment Federation (WEF) has recently held a three day conference in Phoenix, AZ devoted to WEF 2002 TMDL Science and Policy. The proceedings from this conference will be of interest to all of those interested in TMDL issues. About 100 papers were presented on various TMDL science/policy issues. There were over 450 attendees including US EPA HQ and Regional senior staff in the TMDL program and other programs. Based on the discussions, major changes are likely in the national TMDL program in the next year. There were sessions of about six papers each on each of the major TMDL topics including water quality monitoring, water quality modeling, uncertainty in modeling of water quality, reasonable assurance, water quality standards, relationship between water quality standards and beneficial uses, nutrients and N and P water quality standards, urban stormwater quality standards/variances, clean sediment management issues, narrative standard implementation in TMDLs, biological impact and assessment issues, stakeholder involvement, BMP effectiveness, revised use attainability analysis, NPS load allocation issues, pollutant trading, pathogens, human vs animal fecal coliform source tracing, etc. There were several papers presented at this conference devoted to how states are addressing the regulation of urban stormwater runoff causing violations of water quality standards.

According to the WEF website, www.wef.org, papers are now available for purchase and download from the 2002 National TMDL Science and Policy Conference. The WEF has established a link from its website to view abstracts for individual papers.

US EPA Washington DC

November 22, 2002

MEMORANDUM

SUBJECT: 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 /S/

Office of Wetlands, Oceans and Watersheds

James A. Hanlon, Director /S/

Office of Wastewater Management

TO: Water Division Directors

Regions 1 - 10

This memorandum clarifies existing EPA regulatory requirements for, and provides guidance on, establishing wasteload allocations (WLAs) for storm water discharges in total maximum daily loads (TMDLs) approved or established by EPA. It also addresses the establishment of water quality-based effluent limits (WQBELs) and conditions in National Pollutant Discharge Elimination System (NPDES) permits based on the WLAs for storm water discharges in TMDLs. The key points presented in this memorandum are as follows:

- NPDES-regulated storm water discharges must be addressed by the wasteload allocation component of a TMDL. See 40 C.F.R. § 130.2(h).
- NPDES-regulated storm water discharges may not be addressed by the load allocation (LA) component of a TMDL. See 40 C.F.R. § 130.2 (g) & (h).
- Storm water discharges from sources that are not currently subject to NPDES regulation may be addressed by the load allocation component of a TMDL. See 40 C.F.R. § 130.2(g).
- 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. See 40 C.F.R. § 130.2(i). In cases where wasteload allocations are developed for categories of discharges, these categories should be defined as narrowly as available information allows.
- The WLAs and LAs are to be expressed in numeric form in the TMDL. See 40 C.F.R. § 130.2(h) & (i). EPA expects TMDL authorities to make separate allocations to NPDES- regulated storm water discharges (in the form of WLAs) and unregulated storm water (in the form of LAs). EPA recognizes that these allocations might be fairly rudimentary because of data limitations and variability in the system.

- NPDES permit conditions must be consistent with the assumptions and requirements of available WLAs. See 40 C.F.R. § 122.44(d)(1)(vii)(B).
- WQBELs for NPDES-regulated storm water discharges that implement WLAs in TMDLs may be expressed in the form of best management practices (BMPs) under specified circumstances. See 33 U.S.C. §1342(p)(3)(B)(iii); 40 C.F.R. §122.44(k)(2)&(3). If BMPs alone adequately implement the WLAs, then additional controls are not necessary.
- EPA expects that most WQBELs for NPDES-regulated municipal and small construction storm water discharges will be in the form of BMPs, and that numeric limits will be used only in rare instances.
- When a non-numeric water quality-based effluent limit is imposed, the permit's administrative record, including the fact sheet when one is required, needs to support that the BMPs are expected to be sufficient to implement the WLA in the TMDL. See 40 C.F.R. §§ 124.8, 124.9 & 124.18.
- The NPDES permit must also specify the monitoring necessary to determine compliance with effluent limitations. See 40 C.F.R. § 122.44(i). Where effluent limits are specified as BMPs, the permit should also specify the monitoring necessary to assess if the expected load reductions attributed to BMP implementation are achieved (e.g., BMP performance data).
- The permit should also provide a mechanism to make adjustments to the required BMPs as necessary to ensure their adequate performance.

This memorandum is organized as follows:

(I). Regulatory basis for including NPDES-regulated storm water discharges in WLAs in TMDLs;

(II). Options for addressing storm water in TMDLs; and

(III). Determining effluent limits in NPDES permits for storm water discharges consistent with the WLA

(I). Regulatory Basis for Including NPDES-regulated Storm Water Discharges in WLAs in TMDLs

As part of the 1987 amendments to the CWA, Congress added Section 402(p) to the Act to cover discharges composed entirely of storm water. Section 402(p)(2) of the Act requires permit coverage for discharges associated with industrial activity and discharges from large and medium municipal separate storm sewer systems (MS4), i.e., systems serving a population over 250,000 or systems serving a population between 100,000 and 250,000, respectively. These discharges are referred to as Phase I MS4 discharges.

In addition, the Administrator was directed to study and issue regulations that designate additional storm water discharges, other than those regulated under Phase I, to be regulated in order to protect water quality. EPA issued regulations on December 8, 1999 (64 FR 68722), expanding the NPDES storm water program to include discharges from smaller MS4s (including all systems within "urbanized areas" and other systems serving populations less than 100,000) and storm water discharges from construction sites that disturb one to five acres, with opportunities for area-specific exclusions. This program expansion is referred to as Phase II.

Section 402(p) also specifies the levels of control to be incorporated into NPDES storm water permits depending on the source (industrial versus municipal storm water). Permits for storm water discharges associated with industrial activity are to require compliance with all applicable provisions of Sections 301 and 402 of the CWA, i.e., all technology-based and water quality-based requirements. See 33 U.S.C. §1342(p)(3)(A). Permits for discharges from MS4s, however, "shall require controls to reduce the discharge of pollutants to the maximum extent practicable ... and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants." See 33 U.S.C. §1342(p)(3)(B)(iii).

Storm water discharges that are regulated under Phase I or Phase II of the NPDES storm water program are point sources that must be included in the WLA portion of a TMDL. See 40 C.F.R. § 130.2(h). Storm water discharges that are not currently subject to Phase I or Phase II of the NPDES storm water program are not required to obtain NPDES permits. 33 U.S.C. §1342(p)(1) & (p)(6). Therefore, for regulatory purposes, they are analogous to nonpoint sources and may be included in the LA portion of a TMDL. See 40 C.F.R. § 130.2(g).

(II). Options for Addressing Storm Water in TMDLs

Decisions about allocations of pollutant loads within a TMDL are driven by the quantity and quality of existing and readily available water quality data. The amount of storm water data available for a TMDL varies from location to location. Nevertheless, EPA expects TMDL authorities will make separate aggregate allocations to NPDES-regulated storm water discharges (in the form of WLAs) and unregulated storm water (in the form of LAs). It may be reasonable to quantify the allocations through estimates or extrapolations, based either on knowledge of land use patterns and associated literature values for pollutant loadings or on actual, albeit limited, loading information. EPA recognizes that these allocations might be fairly rudimentary because of data limitations.

EPA also recognizes that the available data and information usually are not detailed enough to determine waste load allocations for NPDES-regulated storm water discharges on an outfall-specific basis. In this situation, EPA recommends expressing the wasteload allocation in the TMDL as either a single number for all NPDES-regulated storm water discharges, or when information allows, as different WLAs for different identifiable categories, e.g., municipal storm water as distinguished from storm water discharges from construction sites or municipal storm water discharges from City A as distinguished from City B. These categories should be defined as narrowly as available information allows (e.g., for municipalities, separate WLAs for each municipality and for industrial sources, separate WLAs for different types of industrial storm water sources or dischargers).

(III). Determining Effluent Limits in NPDES Permits for Storm Water Discharges Consistent with the WLA

Where a TMDL has been approved, NPDES permits must contain effluent limits and conditions consistent with the requirements and assumptions of the wasteload allocations in the TMDL. See 40 CFR § 122.44(d)(1)(vii)(B). Effluent limitations to control the discharge of pollutants generally are expressed in numerical form. However, in light of 33 U.S.C. §1342(p)(3)(B)(iii), EPA recommends that for NPDES-regulated municipal and small construction storm water discharges effluent limits should be expressed as best management practices (BMPs) or other similar requirements, rather than as numeric effluent limits. See *Interim Permitting Approach for Water Quality-Based Effluent Limitations in Storm Water Permits,* 61 FR 43761 (Aug. 26, 1996). The Interim Permitting Approach Policy recognizes the need for an iterative approach to control pollutants in storm water discharges. Specifically, the policy anticipates that a suite of BMPs will be used in the initial rounds of permits and that these BMPs will be tailored in subsequent rounds.

EPA's policy recognizes that because storm water discharges are due to storm events that are highly variable in frequency and duration and are not easily characterized, only in rare cases will it be feasible or appropriate to establish numeric limits for municipal and small construction storm water discharges. The variability in the system and minimal data generally available make it difficult to determine with precision or certainty actual and projected loadings for individual dischargers or groups of dischargers. Therefore, EPA believes that in these situations, permit limits typically can be expressed as BMPs, and that numeric limits will be used only in rare instances.

Under certain circumstances, BMPs are an appropriate form of effluent limits to control pollutants in storm water. See 40 CFR § 122.44(k)(2) & (3). If it is determined that a BMP approach (including an iterative BMP approach) is appropriate to meet the storm water component of the TMDL, EPA recommends that the TMDL reflect this.

EPA expects that the NPDES permitting authority will review the information provided by the TMDL, see 40 C.F.R. § 122.44(d)(1)(vii)(B), and determine whether the effluent limit is appropriately expressed using a BMP approach (including an iterative BMP approach) or a numeric limit. Where BMPs are used, EPA recommends that the permit provide a mechanism to require use of expanded or better-tailored BMPs when monitoring demonstrates they are necessary to implement the WLA and protect water quality.

Where the NPDES permitting authority allows for a choice of BMPs, a discussion of the BMP selection and assumptions needs to be included in the permit's administrative record, including the fact sheet when one is required. 40 C.F.R.§§ 124.8, 124.9 & 124.18. For general permits, this may be included in the storm water pollution prevention plan required by the permit. See 40 C.F.R. § 122.28. Permitting authorities may require the permittee to provide supporting information, such as how the permittee designed its management plan to address the WLA(s). See 40 C.F.R. § 122.28. The NPDES permit must require the monitoring necessary to assure compliance with permit limitations, although the permitting authority has the discretion under EPA's regulations to decide the frequency of such monitoring. See 40 CFR § 122.44(i). EPA recommends that such permits require collecting data on the actual performance of the BMPs. These additional data may provide a basis for revised management measures. The monitoring data are likely to have other uses as well. For example, the monitoring data might indicate if it is necessary to adjust the BMPs. Any monitoring for storm water required as part of the permit should be consistent with the state's overall assessment and monitoring strategy.

The policy outlined in this memorandum affirms the appropriateness of an iterative, adaptive management BMP approach, whereby permits include effluent limits (e.g., a combination of structural and non-structural BMPs) that address storm water discharges, implement mechanisms to evaluate the performance of such controls, and make adjustments (i.e., more stringent controls or specific BMPs) as necessary to protect water quality. This approach is further supported by the recent report from the National Research Council (NRC), *Assessing the TMDL Approach to Water Quality Management* (National Academy Press, 2001). The NRC report recommends an approach that includes "adaptive implementation," i.e., "a cyclical process in which TMDL plans are periodically assessed for their achievement of water quality standards" . . . and adjustments made as necessary. *NRC Report* at ES-5.

This memorandum discusses existing requirements of the Clean Water Act (CWA) and codified in the TMDL and NPDES implementing regulations. Those CWA provisions and regulations contain legally binding requirements. This document describes these requirements; it does not substitute for those provisions or regulations. The recommendations in this memorandum are not binding; indeed, there may be other approaches that would be appropriate in particular situations. When EPA makes a TMDL or permitting decision, it will make each decision on a case-by-case basis and will be guided by the applicable requirements of the CWA and implementing regulations, taking into account comments and information presented at that time by interested persons regarding the appropriateness of applying these recommendations to the particular situation. EPA may change this guidance in the future.

If you have any questions please feel free to contact us or Linda Boornazian, Director of the Water Permits Division or Charles Sutfin, Director of the Assessment and Watershed Protection Division.

cc: Water Quality Branch Chiefs Regions 1 - 10

Permit Branch Chiefs Regions 1 - 10

1.0 Introduction

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA's) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for waterbodies that are not meeting their designated uses even though pollutant sources have implemented technology-based controls. A TMDL establishes the allowable load of a pollutant or other quantifiable parameter based on the relationship between pollutant sources and in-stream water quality. A TMDL provides the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources and restore and maintain the quality of the state's water resources (USEPA, 1991).

As a result of biological investigations conducted by the Pennsylvania Department of Environmental Protection (PA DEP) that identified observed impacts on aquatic life and numerous exceedances of the applicable dissolved oxygen (DO) criteria, much of the Wissahickon Creek watershed has been listed on the State’s 303(d) list of impaired waters. The watershed is heavily impacted by urbanization and is listed as impaired due to problems associated with elevated nutrient levels, low dissolved oxygen concentrations, siltation, chlorine, water/flow variability, oil and grease, and pathogens. This study will fulfill the requirements for nutrient and siltation TMDL development for all waters in the Wissahickon Creek basin included in the State’s 303(d) list. Separate studies are underway to address those impairments resulting from chlorine, oil and grease, pathogens, and low dissolved oxygen concentrations. These studies will address the impairments through either direct TMDL development or additional monitoring to determine if recent changes in management practices have resulted in improved water quality conditions and subsequent removal of the stream segments from the 303(d) list. For those stream segments listed as impaired as a result of “water/flow variability” and “other habitat alterations,” sources of impairments are related to those sources contributing to the nutrient and siltation impairments. Therefore, through implementation of best management practices to address nutrient and siltation TMDLs, these related impairments will be addressed indirectly.

1.1 Background Information

The Wissahickon Creek drains approximately 64 square miles and extends 24.1 miles in a southeasterly direction through lower Montgomery and northwestern Philadelphia Counties (Figure 1.1). Major tributaries in the basin include Sandy Run and Pine Run, draining a heavily urbanized area east of the mid-section of the watershed. Other tributaries to Wissahickon Creek include Trewellyn Creek, Willow Run - East, Willow Run - West, Rose Valley Tributary, Paper Mill Run, Creshiem Creek, Monoshone Creek, Prophecy Creek, Lorraine Run, Wises Mill Tributary, and Valley Road Tributary. All tributaries mentioned are included with the mainstem

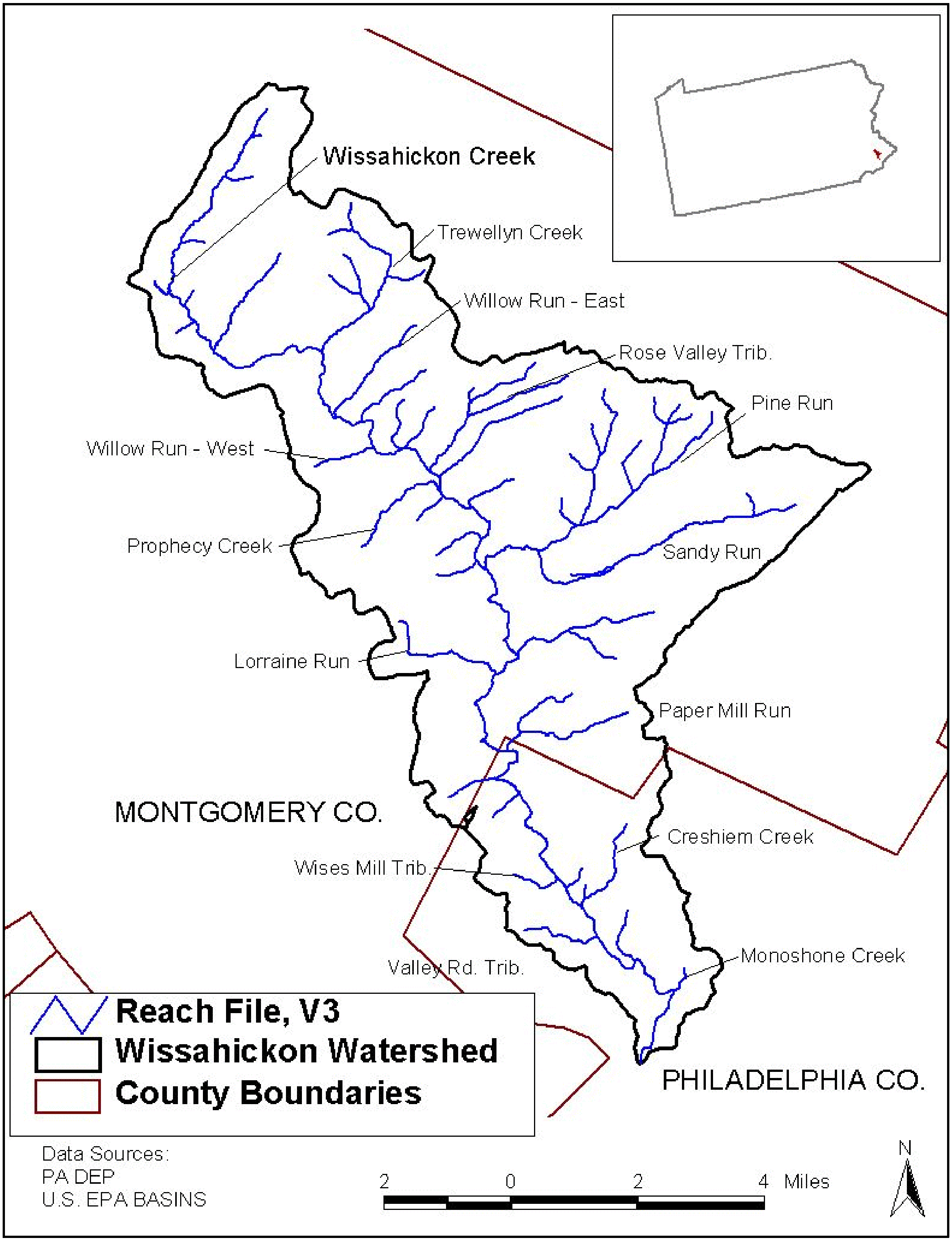

Figure 1-1. Wissahickon Creek watershed

of the Wissahickon Creek on Pennsylvania's 303(d) list of impaired waters.

The headwaters and upper portions of the watershed consist primarily of residential, agricultural, and wooded land use. The mid-section of the watershed is dominated by industrial, commercial, and residential land use. The lower 6.8 miles of the watershed is enclosed by Fairmount Park, which is maintained for recreational use. Tributaries of the lower portion of the watershed provide storm drainage from single and multi-family residential areas.

Biological investigations of Wissahickon Creek over the past 20 years have repeatedly documented a problem regarding eutrophic conditions in the mainstem and tributaries (Boyer, 1975; Strekal, 1976; Boyer, 1989; Schubert, 1996; Boyer, 1997; Everett, 2002). Total phosphorus concentrations decreased substantially in 1988 as a result of a combination of the phosphate ban and wastewater treatment plant upgrades and/or phasing out of smaller treatment plants. However, levels are still significant enough to result in nuisance algal growth (Boyer, 1997). Results of a 1998 survey of the periphyton conducted by PA DEP indicate that excess nutrient levels in the Wissahickon Creek may be contributing to impairments found in the watershed by causing an alteration in the benthic community as a result of increasing algal biomass (Everett, 2002). Analysis of the periphyton data by the Academy of Natural Sciences of Philadelphia (ANSP) concluded that the Wissahickon Creek is a nutrient enriched system, with eutrophic conditions present in the stream as a whole. ANSP further concluded that this eutrophication can be attributed to sewage treatment plant (STP) effluents and possibly leached fertilizers and other runoff (West, 2000; Everett, 2002). As further evidence of eutrophic conditions, diurnal dissolved oxygen sampling performed by PA DEP in 1999 and 2002 showed repeated violations of State water quality criteria.

Another impact on the biological community and a source of impairment is the diminution of baseflow. Several portions of the headwaters and tributaries have exhibited no baseflow during PA DEP 1997 inspections conducted in conjunction with the Unassessed Waters Program, an August 2001 site visit conducted by PA DEP and EPA Region 3, and PA DEP data collection of Summer 2002. Sources of baseflow reduction may be a result of one or more of several activities, including the increase of impervious area and subsequent loss of groundwater recharge resulting from urbanization, and groundwater pumping and drawdown (personal communication with Alan Everett, PA DEP). Diminution of baseflow is addressed directly as an impairment included in the 303(d) list under the category of Water/Flow Variability. Management practices recommended in Section 5 to address nutrient and siltation impairments also address impairments due to Water/Flow Variability.

Habitat alteration is affected not only by increased biomass and diminution of baseflow, but also hydraulic/hydrology changes resulting from increased urbanization. Generally, there are three major forms of habitat modification related to hydrologic/hydraulic enhancements caused by urbanization: (1) instream modifications produced by increased stormflows (siltation, bank destabilization, embeddedness, etc.), (2) out-of-stream habitat alterations (riparian vegetation removal, bank alteration, etc.), and (3) stream encroachments (dams, enclosures, bridges, etc.) (personal communication with Alan Everett, PA DEP). All three categories of habitat modification are interrelated and are addressed directly as a source of impairment for segments included in the 303(d) list for Habitat Alterations. Siltation and Water/Flow Variability are also addressed separately in the 303(d) list, but are related to Habitat Alterations. Since they are related to the same source of impairment, the management practices identified to relieve the nutrient and siltation impairments will have a positive impact on the habitat alteration impairments as well.

1.2 Impairment Listing

TMDL development for this study was limited to nutrient and siltation impairments. A complete list of all impaired segments in the Wissahickon Creek basin is provided in Appendix A.

1.2.1 Nutrient Impairments

Ten stream segments in the Wissahickon Creek watershed have been included in Pennsylvania's 303(d) list due to nutrient impairments (Table 1-1; Figure 1-2). These include five segments of the Wissahickon Creek mainstem as well as five stream segments of tributaries. Although nutrients are required to support a healthy biological assembly, excessive nutrient loading can be detrimental to the biological system. Excessive nutrients fosters an unhealthy and expanded growth in primary production which decreases DO levels in the stream when these organisms respire in evening hours or when they are broken down by bacterial agents upon completion of their life-cycle. Sources of nutrients have been identified as municipal point sources and urban runoff/storm sewers.

Table 1-1. Nutrient impaired stream segments of the Wissahickon Creek basin

Segment Name	Segment ID	Pollutant	Source	Year First Listed
Wissahickon Creek	971218-1345-ACE	Nutrients	Municipal Point Source; Urban Runoff/Storm Sewers	1998
Wissahickon Creek	971209-1430-ACE	Nutrients	Municipal Point Source; Urban Runoff/Storm Sewers	1998
Wissahickon Creek	971209-0930-ACE	Nutrients	Municipal Point Source; Urban Runoff/Storm Sewers	1998
Wissahickon Creek	971222-0930-ACE	Nutrients	Municipal Point Source; Urban Runoff/Storm Sewers	1998
Wissahickon Creek	971222-1130-ACE	Nutrients	Municipal Point	1998

Segment Name	Segment ID	Pollutant	Source	Year First Listed
			Source; Urban Runoff/Storm Sewers	
Lorraine Run	971215-1000-ACE	Nutrients	Urban Runoff/Storm Sewers	1998
Sandy Run	971215-1133-ACE 859*	Nutrients	Municipal Point Source; Urban Runoff/Storm Sewers	1996
UNT Sandy Run	971215-1303-ACE 860*	Nutrients	Industrial Point Sources	1996
Pine Run	971215-1300-ACE	Nutrients	Urban Runoff/Storm Sewers	1998
Pine Run	971215-1303-ACE	Nutrients	Municipal Point Source; Urban Runoff/Storm Sewers	1998
Trewellyn Creek	971217-1145-ACE	Nutrients	Urban Runoff/Storm Sewers	1998

* Segment Identification on 1996 Section 303(d) List.

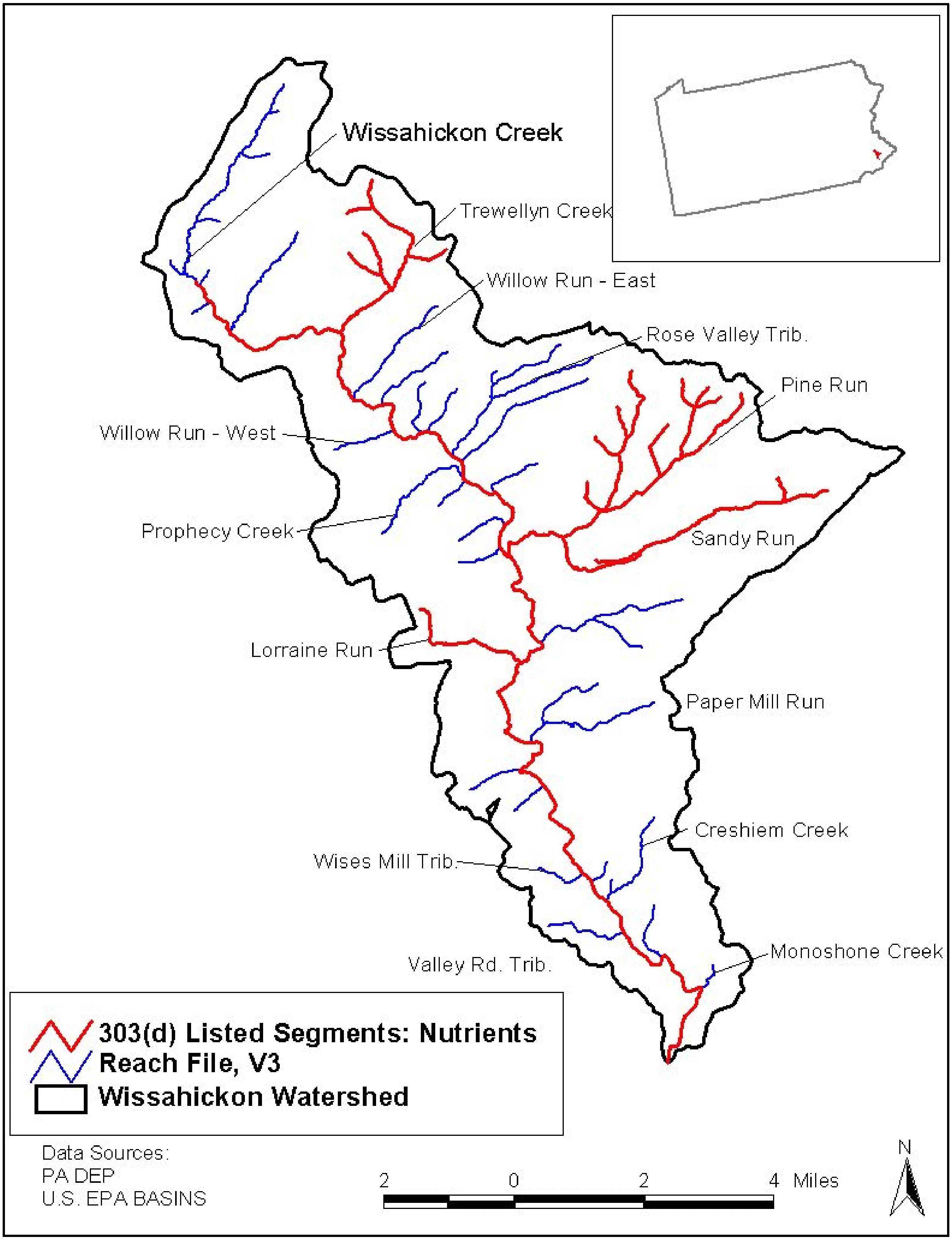

Figure 1-2. Wissahickon Creek segments impaired due to nutrients

1.2.2 Siltation Impairments

Twenty one stream segments in the Wissahickon Creek watershed have been included on Pennsylvania's 303(d) list due to siltation impairments (Table 1-2; Figure 1-3). These include the six segments of Wissahickon Creek as well as fifteen additional stream segments in the watershed. Excessive sediment loading and siltation are detrimental to the biological community for many reasons. Siltation reduces the habitat complexity through the filling of pools and interstitial spaces between gravel and sand. Excess sediment can clog an organism's gill surfaces, which decrease its respiratory capacity. This pollutant also impacts visual predators by negatively impacting their ability to hunt and feed in a more turbid environment. Sources of siltation impairments include urban runoff/storm sewers and habitat modification.

Table 1-2. Siltation impaired stream segments of the Wissahickon Creek basin

Segment Name	Segment ID	Pollutant	Source	Year Listed
Wissahickon Creek	971209-0930-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Wissahickon Creek	971209-1430-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Wissahickon Creek	971218-1045-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Wissahickon Creek	971218-1345-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Wissahickon Creek	971222-0930-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Wissahickon Creek	971222-1130-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Monoshone Creek	971208-1430-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Creshiem Creek	971209-1200-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Valley Road Tributary	971208-1235-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Wises Mill Tributary	971208-1000-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Paper Mill Run	971211-1300-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Lorraine Run	971215-1000-ACE	Siltation	Surface Mining	1998
Tributary Downstream of Sandy Run	971215-1130-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Sandy Run	971215-1133-ACE	Siltation	Urban Runoff/Storm Sewers	1998
UNT Sandy Run	971215-1303-ACE 860*	Turbidity/ Suspended Solids	Municipal Point Sources/Other Nonpoint Sources	1996
Pine Run	971215-1303-ACE	Siltation	Urban Runoff/Storm	1998

Segment Name	Segment ID	Pollutant	Source	Year Listed
			Sewers	
Pine Run	971215-1300-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Rose Valley Tributary/Tributary Downstream of Rose Valley Tributary	971216-1415-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Willow Run - East/Tributary Downstream of Willow Run - East	971217-1015-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Trewellyn Creek	971217-1145-ACE	Siltation	Urban Runoff/Storm Sewers	1998
North Wales Tributary/Tributary Upstream of North Wales Tributary	971217-1430-ACE	Siltation	Urban Runoff/Storm Sewers	1998
Tributary Upstream of North Wales Tributary	981015-1100-ACE	Siltation	Habitat Modification	1998

* Segment Code from 1996 Section 303(d) List.

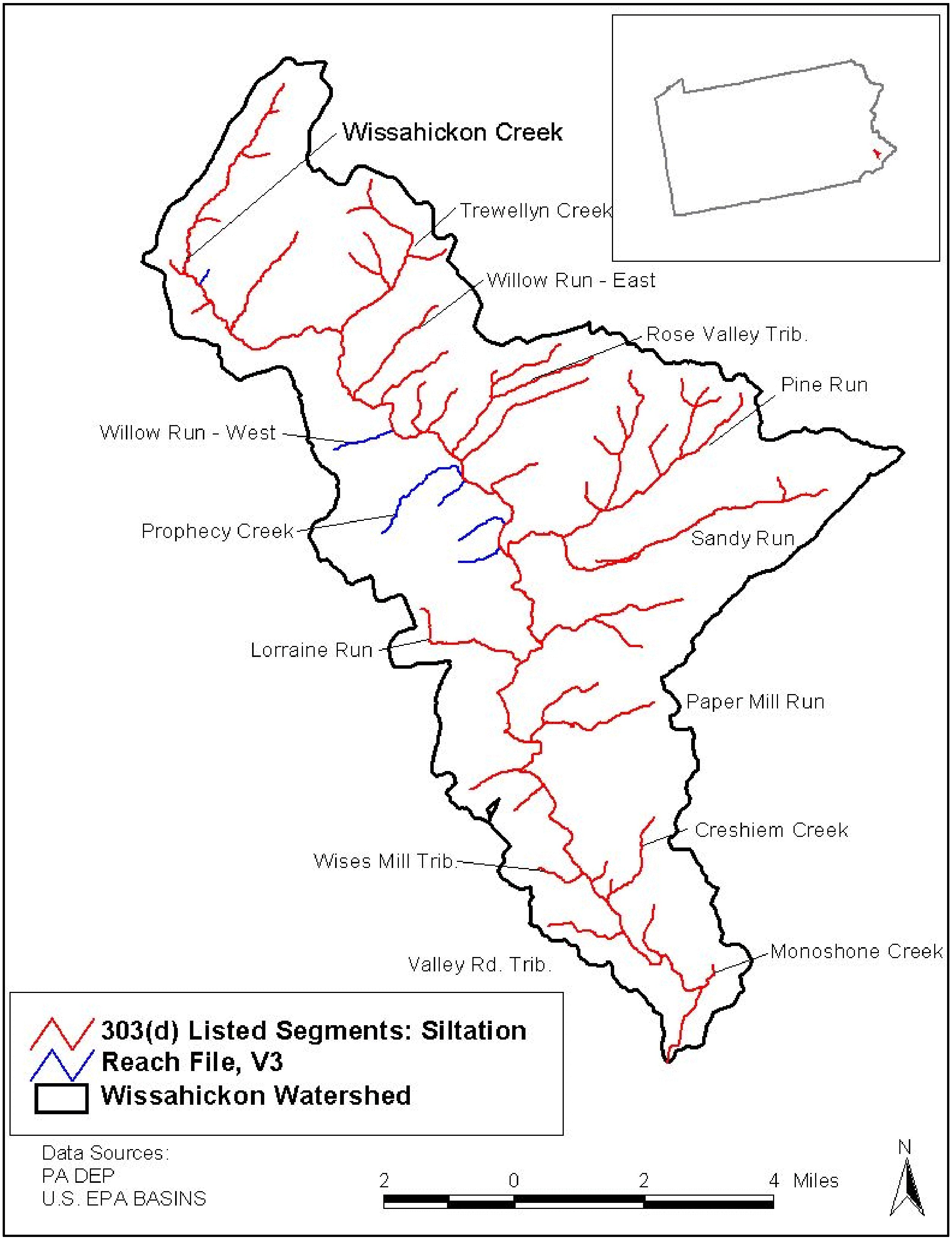

Figure 1-3. Wissahickon Creek segments impaired due to siltation

1.3 Water Quality Standards

Pennsylvania Code, Title 25, Chapter 93 sets forth water quality standards for surface waters of the state. These standards are based upon designated and existing water uses which are to be protected and will be considered by PA DEP in its regulation of discharges. Wissahickon Creek is designated for trout stocking, and is subject to all water quality criteria specific to this designated use and those defined for general statewide water uses. Trout stocking is defined as “maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat” (PA Code, Title 25, 93.3). Statewide water uses include aquatic life, water supply, and recreation. For all designated water uses of Wissahickon Creek, the numeric water quality in Table 1-3 are applicable.

Implementation of the numeric water quality criteria summarized in Table 1-3 is outlined in PA Code, Title 25, Chapter 96.3 as follows:

Chapter 96.3(c): “ To protect existing and designated surface water uses, the water quality criteria described in Chapter 93 (relating to water quality standards), including the criteria in Chapters 93.7 and 93.8a(b) (relating to specific water quality criteria; and toxic substances) shall be achieved in all surface waters at least 99% of the time, unless otherwise specified in this title. The general water quality criteria in Chapter 93.6 (relating to general water quality criteria) shall be achieved in surface waters at all times at design conditions.”

Chapter 96.3(d): “As an exception to subsection (c), the water quality criteria for total dissolved solids, nitrite-nitrate nitrogen, phenolics and fluoride established for the protection of potable water supply shall be met at least 99% of the time at the point of all existing or planned surface potable water supply withdrawals unless otherwise specified in this title.”

In addition to numeric water quality criteria, Wissahickon Creek is also subject to narrative criteria stated in PA Code, Title 25, Chapter 93.6 as follows:

Chapter 93.6(a): “Water may not contain substances attributable to point or nonpoint source discharges in concentration or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant or aquatic life.”

Chapter 93.6(b): “In addition to other substances listed within or addressed by this chapter, specific substances to be controlled include, but are not limited to, floating materials, oil, grease, scum and substances which produce color, tastes, odors, turbidity or settle to form deposits.”

Table 1-3. Numeric water quality standards (PA Code, Title 25, Chapter 93.7)

Pollutant	Designated Use	Criteria		Period
Dissolved Oxygen (mg/L)		Minimum Daily Average	Minimum	
	Trout Stocking (specific)	6.0	5.0	Feb. 15 to July 31
	Warm Water Fishes (statewide)	5.0	4.0	remainder of year
Nitrite plus Nitrate as Nitrogen (mg/L)		Maximum		year round
	Potable Water Supply (statewide)	10.0		
Fecal Coliform (#/100 mL)	Water Contact Sports (statewide)	Maximum geometric mean of 200 per 100 mL, based on a minimum of 5 consecutive samples each sample collected on different days during a 30-day period.	No more than 10% of the total samples taken during a 30-day period may exceed 400 per 100 mL	May 1 to Sept. 30
		Maximum geometric mean of 2,000 per 100 mL, based on a minimum of 5 consecutive samples each sample collected on different days during a 30-day period		remainder of year
	Potable Water Supply (statewide)	Maximum of 5,000 coliforms per 100 mL as a monthly average value, no more than this number in more than 20 samples collected during a month, nor more than 20,000 per 100 mL in more than 5% of the samples		year round
Chloride (mg/L)	Potable Water Supply (statewide)	max = 250		year round
Sulfates (mg/L) *	Potable Water Supply (statewide)	max = 250		year round
TDS (mg/L)	Potable Water Supply (statewide)	max = 750	mo. avg. = 500	year round
TRC (mg/l)	Warm Water Fishes (statewide)	4-day avg. = 0.011	1-hr avg. =0.019	year round
Ammonia Nitrogen	Aquatic life (statewide)	pH and temp. dependent	pH and temp. dependent	year round

* The PA Environmental Quality Board recently proposed to move the point of application of the criteria for sulfate and chloride to the point of all existing or planned surface potable water supply withdrawals.

2.0 Source Assessment

Analyses were performed on historical water quality and streamflow data to determine critical flow conditions and relative loads to assess the impact of point and nonpoint sources on instream water quality. These analyses helped to assess nutrient and siltation sources in the Wissahickon Creek watershed. Identification of critical flow conditions was an important step in determining the methodology used for TMDL development. Under these conditions, the relative impacts of nutrients and siltation sources differed.

2.1 Nutrient Sources

Review of historical data collected at the mouth of Wissahickon Creek provided much insight into the critical period for impact analysis. Once this condition was identified, focus could be directed to those sources that have the most impact during such periods.

2.1.1 Identification of Critical Period (Low-Flow)

Nutrient data have been collected by various agencies at multiple locations on Wissahickon Creek and its tributaries. However, the only historical record of nutrients that extends to present is at the mouth of Wissahickon Creek. From an analysis of streamflow data from USGS gage 01474000 combined with streamflow and water quality data from DEP gage WQN0115, relationships between the magnitude of streamflow and levels of nutrients were established. To ensure that the analysis provides an accurate description of current conditions, data was limited to the period of record from 1990 to 2001. Figures B-1 through B-4 of Appendix B depict statistical and graphical results from the analyses and show that levels of nitrate and phosphorus are higher during periods of low streamflow. This correlation suggests that the critical condition is during low-flow, when nutrient contributions are dominated by point sources or other direct discharges. In addition, nutrient concentrations are shown to vary seasonally, with higher nutrient concentrations generally occurring in the summer and fall.

2.1.2 Point Sources of Nutrients

During low-flow periods, Wissahickon Creek nutrient concentrations are dominated by point source contributions. This was shown in the analyses of 1998 data reported in *Data Review for Wissahickon Creek*, *Pennsylvania* (Tetra Tech, Inc., 2002), and was validated with additional data collected in 2002 by DEP during low-flow conditions of summer 2002. Results of the summer 2002 data collection are summarized in Figures C-1 through C-6 of Appendix C. For both periods, major point sources are observed to have noticeable impacts on nutrient concentrations in the streams.

National Pollutant Discharge Elimination System (NPDES) permitted dischargers in the Wissahickon Creek watershed are summarized in Table 2-1. The discharges range from single family discharges (about 400 to 700 gallons per day) to large industrial and municipal wastewater treatment plants with effluent rates in the range of 1 to 7 million gallons per day (MGD). Major dischargers are defined in U.S. EPA NPDES Permit Writers' Manual as those facilities with design flows greater than one million gallons per day and facilities with EPA/State approved industrial pretreatment programs. In the Wissahickon watershed these facilities constitute a majority of the streamflow in the Wissahickon Creek basin during low-flow periods. Major NPDES facilities in the Wissahickon Creek basin include Ambler Borough (6.5 MGD), Upper Gwynedd Township (5.7 MGD), Abington Township (3.91 MGD), Upper Dublin Township (1.1 MGD), and North Wales Borough (0.835 MGD). Locations of all major and minor discharges are depicted in Figure 2-1.

Table 2-1. Point sources of nutrients in the Wissahickon Creek basin

NPDES No.	Receiving Waterbody	Flow (MGD)	Facility Name	Industry Classification
PA0012190	Wissahickon Creek	0.01775	Precision Tube Co – Mueller St	Roll, Draw & Extrud Nonferrous
PA0023256	Wissahickon Creek	5.7[a]	Upper Gwynedd Township	Sewerage Systems
PA0026603	Wissahickon Creek	6.5	Ambler Boro	Sewerage Systems
PA0052515	Wissahickon Creek	0.0168	Ambler Borough Water Department	Filter Backwash From STP
PA0053538	Wissahickon Creek	na	Merck & Company, Inc	Pharmaceutical Preparations
PA0055387[d]	Wissahickon Creek	0.001	PA Historical & Museum Commission	Sewerage Systems
PA0022586	Tributary to Wissahickon Creek	0.835	North Wales Boro	Sewerage Systems
PA0054577	Tributary to Wissahickon Creek	0.0007[c]	Fishbone, David	Sewerage Systems
PA0057177[d]	Tributary to Wissahickon Creek	0.0004	Plummer, J. Randall	Sewerage Systems
PA0057576	Tributary to Wissahickon Creek	0.0007	Bruce K. Entwisle	Sewerage Systems
PA0053074	Sandy Run	0.0083	Valley Green Corporate Center	Oper of Nonresidential buildings
PA0056901	Sandy Run	0.0136	Jiffy Lube International, Inc	Auto Serv, Exc Rep & Carwashes
PA0026867	Sandy Run	3.91	Abington Township	Sewerage Systems
PA0050865	Rose Valley Tributary	0.053	Gessner Products Co Inc	Plastics Products, NEC
PA0029441	Pine Run	1.1[b]	Upper Dublin Township	Sewerage Systems
PA0013048	Pine Run	na	Honeywell, Inc.	Industrial instruments
PA0051012	Lorraine Run	0.0004	Harris, Albert & Cynthia	Oper of dwelling other than apartment
PA0057631	Lorraine Run	0.0005	Sayers, David & Marie	Sewerage Systems
PA0053210	Lorraine Run	0.0005	Murray SRSTP	Sewerage Systems

a - Approval granted 3/12/20028 for plant expansion from 4.5 to 5.7 MGD
b - Approval granted 9/18/1998 for plant expansion from 1.0 to 1.1 MGD
c - Permit expired; renewal expected.
d - Permit expired; renewal questionable
na - not applicable; monitoring only

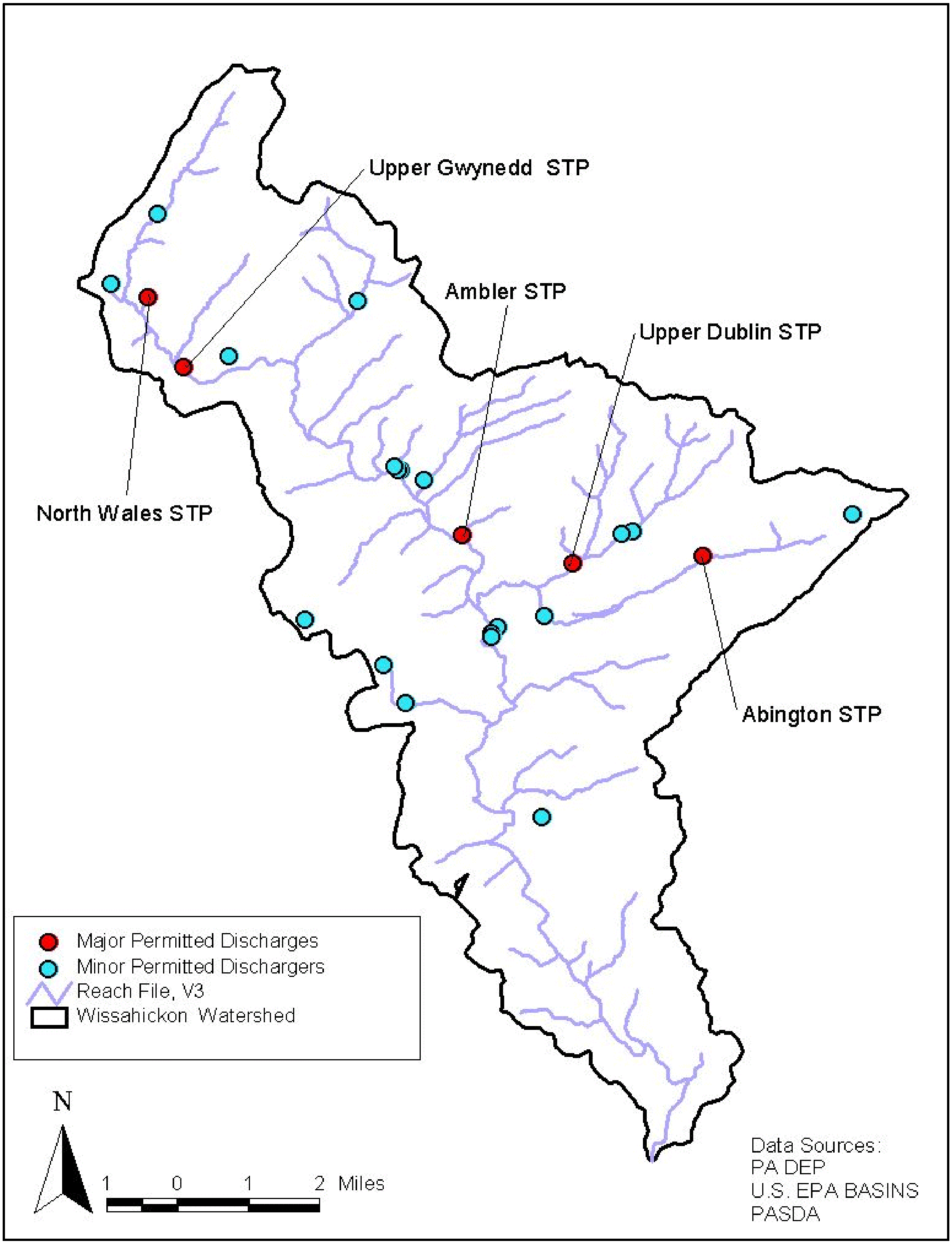

Figure 2-1. Locations of NPDES dischargers in the Wissahickon Creek basin

2.1.3 Nonpoint Sources of Nutrients

During the critical low-flow period, impacts from nonpoint sources are limited since storm runoff is not a factor during such dry conditions. However, other nonpoint sources can potentially impact the streams under such conditions, including runoff from irrigated golf courses, areas with high concentration of septics and/or history of failure, unimpeded cattle access to streams, and impacts of low level dams.

2.1.3.a Golf Courses

During the summer 2002 instream monitoring study performed by PA DEP during low-flow critical conditions, water quality samples were taken upstream and downstream of two golf courses on Sandy Run selected to represent impacts of golf courses on streams of the Wissahickon Creek basin. If substantial impacts were observed, more robust monitoring would be performed to better characterize loads from these areas. However, during the monitoring period, no outstanding increases in nutrient concentrations were observed in the vicinity of the golf courses (Figures C-4 and C-5 of Appendix C). Although increases in diurnal variability of DO in these areas (Figure C-6) suggests an increase in biological activity, this occurrence is likely the result of reduced shading from tree canopy and nutrient loads from upstream sources.

2.1.3.b Septic Systems

PA DEP determined that during low-flow conditions, impacts from failed septic systems are negligible since most of the watershed utilizes sanitary sewer services.

2.1.3.c Unimpeded Cattle Access to Streams

Unimpeded cattle access is limited to one farm, but this area only impacts the lower portion of the watershed where water quality is less problematic. Moreover, without sufficient supporting data, it is difficult to make assumptions for loads from such sources. However, it was found that by reducing loads in the upstream portions of the watershed to improve conditions in the stream segments where the sources originate, the water quality improved to the point that no local reductions were required for the bottom portion of the Wissahickon Creek watershed (below Route 73). In any case, restoration projects are currently proposed by PA DEP for this portion of the watershed that will seek to reduce these impacts.

2.1.3.d Low Level Dams

Low level dams located throughout the watershed provide opportunity for instream sources of nutrients through sediment release from pooled areas. To assess the impacts from these dams, PA DEP monitored water quality upstream and downstream of two dams on Wissahickon Creek (Figures C-1 through C-3 of Appendix C). If impacts proved significant, a more robust assessment of nutrient loads from the dams would be considered. However, except for a small increase in total phosphorus at one of the dams (Gross Dam), impacts were determined minimal. Rather than attribute a source of nutrients to dams, the effects were accounted for in the water quality calibration of the model.

2.1.4.e Coorson's Quarry

Coorson's Quarry discharges an average of 12.5 cfs to Lorraine Run. This flow is a significant contributor to Wissahickon Creek baseflow and provides reductions to Wissahickon Creek nutrient concentrations by increasing the assimilative capacity of both Lorraine Run and the mainstem of Wissahickon Creek during the critical low flow period. To assess the benefits of the quarry discharge, a sensitivity analysis was performed using the low-flow model. Results of analysis are reported in the *Modeling Report for Wissahickon Creek, Pennsylvania Nutrient TMDL Development - Draft* (hereafter referred to as Nutrient Modeling Report) and showed that if quarry discharges are discontinued, additional DO problems will likely result in the bottom portions of Wissahickon Creek below Lorraine Run. Also, due to the substantial reduction of streamflow that would occur in Lorraine Run, aquatic life within the stream would be affected beyond problems associated with low DO. Therefore, the discharge from Coorson's Quarry benefits the Wissahickon Creek and Lorraine Run, and continued operation of the quarry should be encouraged. This TMDL is based on the assumption that this discharge will continue its operation. If the discharge is reduced to below 0.5 cfs or terminated, the TMDL may need to be revised.

2.1.4.f Background

Although low-flow conditions are dominated by point source contributions, a small amount of baseflow is present with background nutrient concentrations likely controlled by groundwater. These background contributions are extremely small in comparison to point source contributions during low-flow conditions. As a result, background nutrient loads are accounted for in analyses, but impacts are negligible.

2.2 Siltation Sources

Review of historical data collected at the mouth of Wissahickon Creek provided much insight into the critical period for impact analysis. Once this condition was identified, the focus was directed to those sources that have the most impact during such periods.

2.2.1 Identification of Critical Period (High-Flow)

Sources of siltation are generally associated with nonpoint sources and wet weather streamflows. To test this assumption for Wissahickon Creek, total suspended solids (TSS) levels measured at the mouth from 1990 to 2001 were compared against flows. Results of this analysis are reported in Figures B-5 and B-6 of Appendix B. As can be seen from these results, TSS levels during high flows are almost an order of magnitude greater than levels observed at normal flows. Periods of such high flows and corresponding high TSS concentration suggests a relatively large solids loading and potential for siltation to the Wissahickon Creek streambed during wet periods.

2.2.2 Point Sources of Siltation

During wet weather conditions, the impact of point sources listed in Table 2-1 on the total siltation loads to the streams is negligible. However, for those point sources in the Wissahickon Creek watershed with limits for TSS in NPDES permits, those permit limits were considered in the final waste load allocations.

2.2.2.a Overland Sources

Runoff from urban areas carries significant loads of sediment that deposits in the streambed. EPA’s stormwater permitting regulations at 40 CFR 122.26 require municipalities to obtain NPDES permit coverage for all storm water discharges from municipal separate storm sewer systems (MS4s). Implementation of these regulations are phased such that large and medium sized municipalities were required to obtain storm water NPDES permit coverage in 1990 (Phase I) and small municipalities by March 2003 (Phase II). As such, Philadelphia has an existing Phase I MS4 permit and surrounding smaller municipalities in the watershed are required to have NPDES Phase II MS4 permit coverage by March 2003. Figure 2-2 depicts the municipal boundaries within the Wissahickon Creek basin. For each municipality, the sediment loads from stormwater collection systems are considered as point source contributions, which require specific wasteload allocations in the TMDL for each MS4 permitee.

To assess the relative loads of sediment from different land uses within municipal boundaries, EPA used land use specific, unit area loadings. In order to accurately assess the loading based on this methodology, it was paramount to use the most recent and updated land use data available. A current land use dataset for the Wissahickon Creek watershed was developed by the Environmental Resources Research Institute of Penn State University by updating the National Land Cover Data (NLCD) (Vogelmann et al., 1998) using SPOT (System Probatoire pour l'Observation de la Terre) satellite imagery from 2000. The relative areas for each land use in the Wissahickon Creek basin are listed in Table 2-2. The most predominant land uses in the basin are low-intensity residential (38.7%), deciduous forest (26.0%), and a mix between high-density residential and urban (11.5%). Urban and residential land uses in the Wissahickon Creek basin account for over 50% of the total area, and are considered to be major contributors to sediment loads in the Wissahickon Creek watershed.

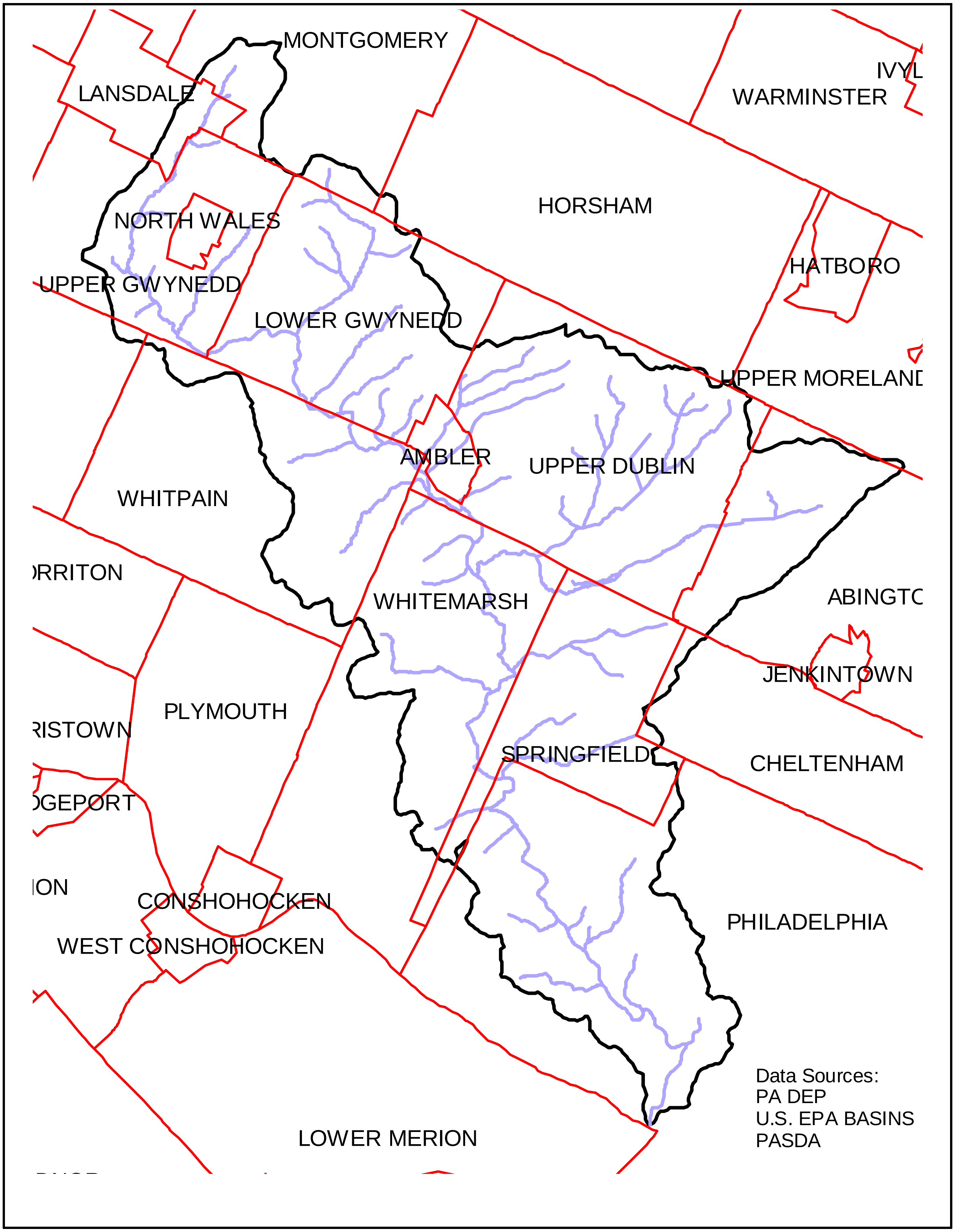

Figure 2-2. Municipal boundaries in the Wisahickon Creek watershed

Table 2-2. Land uses of the Wissahickon Creek watershed

Land Use	Area (sq. mi.)	Percent
Water	0.1	0.2
Low-Intensity Residential	24.7	38.7
High-Intensity Residential/Urban	7.4	11.5
Hay/Pasture	3.8	6.0
Row Crops	3.9	6.0
Coniferous Forest	1.4	2.2
Mixed Forest	5.6	8.7
Deciduous Forest	16.6	26.0
Quarry	0.2	0.2
Coal Mines	0.0	0.0
Transitional	0.2	0.4

2.2.2.b Streambank Erosion

The largest contributors of sediment to Wissahickon Creek are instream sources attributed to streambank erosion. Urbanization and paving of large areas of the watershed result in dramatic increases in stormwater runoff, which lead to periodic high flows that directly cause the erosion of stream banks, contributing silt to the shallow creek bottom. These sources are extremely difficult to pinpoint, measure, and control, but they are currently the leading cause of siltation in the Wissahickon Creek basin. Using the modeling tools and approach outlined in Section 4.2 and *Modeling Report for Wissahickon Creek, Pennsylvania Siltation TMDL Development* (hereafter referred to as Siltation Modeling Report), the sediment load resulting from streambank erosion could be estimated. The cause of the flow variability that results in streambank erosion is related to urban runoff and the sources of the impairments are considered point sources under the MS4 stormwater permits.

2.2.3 Nonpoint Sources of Siltation

Because all of the Wissahickon Creek watershed is considered an urbanized area subject to coverage by MS4 stormwater permits, all sources of siltation to Wissahickon Creek and tributaries (i.e., overland flow and streambank erosion) are considered by EPA as point sources (see Section 2.2.2).

3.0 TMDL Endpoint Determination

To meet the designated uses of Wissahickon Creek and its tributaries, EPA developed water quality targets, or *endpoints*, that will ensure the protection of those uses even under the critical conditions outlined in Sections 2.1.1 and 2.2.1. Selection of these endpoints considers the numeric and narrative water quality criteria designed to protect those designated uses (Section 1.3).

3.1 Nutrient TMDL Endpoint

There are presently no numeric water quality criteria for nutrients defined by PA DEP water quality standards for streams. There are general criteria for the protection of existing and designated uses (including aquatic life uses), see 25 PA Code 93.6 and discussion in Section 1.3 for additional information. As a result, consideration was given to all biological indicators and stressors identified in previous biological assessments of the Wissahickon Creek basin (see Section 1.1) as well as the data showing applicable DO criteria violations. To provide additional decision support, data collected in 1998 and 2002 were analyzed. Results of analyses of 1998 data collected by PA DEP, the Academy of Natural Sciences of Philadelphia (ANSP), and the National Institute of Environmental Renewal (NIER) were reported in *Data Review of Wissahickon Creek, Pennsylvania* (Tetra Tech, Inc., 2002). Results of analyses of 2002 data collected by PA DEP are summarized in Appendix C. These results clearly show a pronounced diurnal fluctuation of DO at several locations of Wissahickon Creek and its tributaries. At many sampling locations, the seasonal standard for minimum and minimum daily average DO concentrations were not met.

Based on that data and analysis, EPA determined that the link between nutrient concentrations, DO concentrations, and biological activity in the streams was a necessary component of endpoint determination. This is especially true since biological impacts were a consideration in the original listing of the waterbodies as impaired due to nutrients. Of the components of instream biological activity, only DO has applicable numeric criteria for stream segments of the Wissahickon Creek basin. The standards for DO are based on levels required to support fish populations, with the critical period (period of higher required concentrations) based on supporting the more stringent aquatic life use for trout stocking. This period requires a minimum DO level of 5.0 mg/L and a minimum daily average of 6.0 mg/L to support the aquatic life use for Trout Stocking (TS) from February 15 through July 31. For the remainder of the year, a minimum DO level of 4.0 mg/L and a minimum daily average of 5.0 mg/L are required to support Warm Water Fish (WWF).

The nutrient TMDL endpoints are based on and ensure achievement of both the minimum and minimum daily average DO for the critical periods associated with TS and WWF. However, in analyses of the streams ability to meet these standards, it was necessary to consider all biological processes that are factors in the impairment of the waterbodies. These factors included the link between nutrient levels and biological activity, including effects of periphyton/algae growth and the resulting diurnal variability of DO resulting from biological processes. Through modeling analyses of the Wissahickon Creek and tributaries (see section 4.1.1 and the Nutrient Modeling Report), instream DO concentration was predicted to be highly sensitive to those parameters directly related to periphyton growth and respiration. In addition, shading or exposure to direct sunlight is also a fairly sensitive factor impacting DO concentration. Other relatively sensitive factors include sediment oxygen demand and stream reareation.

3.2 Siltation TMDL Endpoint

Because Pennsylvania WQS regulations presently have no numeric in-stream criteria for the pollutants of concern, EPA used the "reference watershed" approach to develop the allowable loading rates in the impaired watersheds to protect designated uses.

3.2.1 Reference Watershed Approach

The reference watershed approach is used to estimate the necessary load reduction of sediment that would be needed to restore a healthy aquatic community and allow the streams in the watershed to achieve their designated uses. The reference watershed approach is based on determining the current loading rates for the pollutants of interest from a selected unimpaired watershed that has similar physical characteristics (i.e., landuse, soils, size, geology) to those of the impaired watershed.

The reference watershed approach pairs two watersheds, one attaining its uses and one that is impaired based on biological assessment. Both watersheds must have similar land cover and land use characteristics. Other features, such as base geologic formation, soils, percent slope, landuse, and ecoregion, should be matched to the extent possible (see Siltation Modeling Report for greater detail). The objective of this process is to reduce the loading rate of sediment (or other pollutant) in the impaired stream segment to a level equivalent to or slightly lower than the loading rate in the unimpaired reference stream segment. Achieving the sediment loadings set forth in the TMDLs will ensure that the designated aquatic life of the impaired stream is achieved.

3.2.2 Considerations for Reference Watershed Selection

Two factors formed the basis for selecting a suitable reference watershed. The first factor was to use a watershed that had been assessed by PA DEP and had been determined to attain water quality standards and meet designated uses. The second factor was to find a watershed that closely resembled the impaired watershed in physical properties such as land cover/land use, physiographic province, size, and geology. This was done by means of a desktop screening using several GIS coverages. The GIS coverages included the USGS named stream watershed coverage, the state water plan boundaries, the satellite image-derived land cover grid (MRLC), streams, and Pennsylvania's 305(b) assessed streams database.

There were four steps in determining the reference watersheds that were used to derive the target limits for the TMDLs. Figure 3-1 shows these four steps and how they are used in deriving the target limits. The first step was to locate watersheds that had been recently assessed and were not impaired. Step 2 was to identify a pool of unimpaired watersheds similar in size and geology to the impaired watersheds. Step 3 involved comparing the land cover data of the watersheds and selecting unimpaired watersheds that had land cover characteristics similar to those of the impaired watersheds. Land use distributions were compared on a percentage basis as calculated from MRLC land use data. It was important to have a good match between the sizes of the reference and impaired watersheds so that reasonable comparisons could be made. As a result, the fourth step was used to resize the reference watersheds to produce reasonable matches to the impaired watersheds (see the Siltation Modeling Report).

Once the reference watersheds were selected, their existing sediment loads could be estimated based on watershed modeling using Pennsylvania GIS data. The estimated existing loads were analyzed and then considered as the endpoints or target limits for the impaired streams.

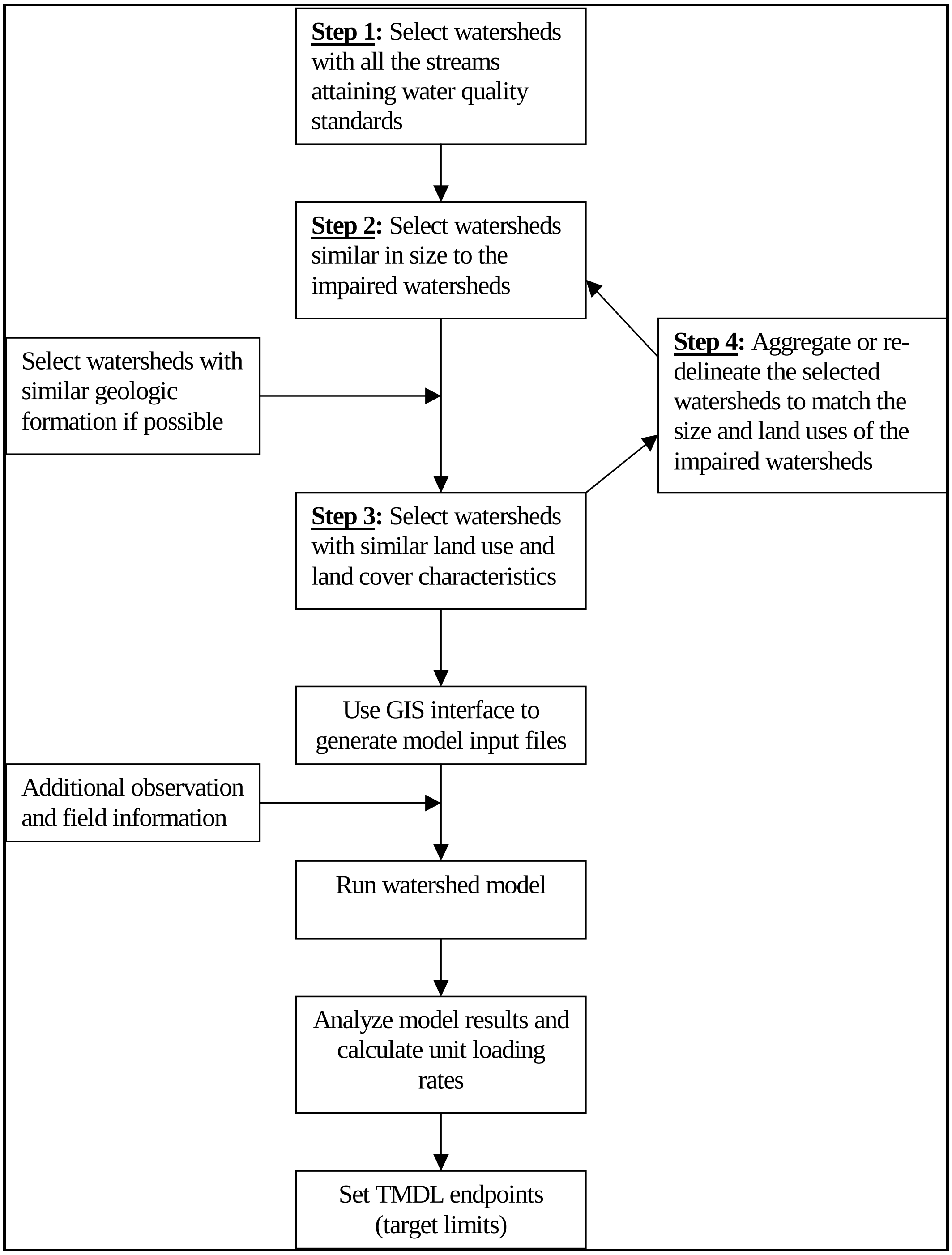

Figure 3-1. Flow chart for the derivation of TMDL target limits. Steps 1 to 4 are used for the determination of the reference watershed.

3.2.3 Selected Reference Watershed and Endpoints

The TMDL endpoints established for this study were determined using Ironworks Creek as the reference watershed (Figures 3-2 and 3-3). The methodology used for identification of candidate reference watersheds and final selection of Ironworks Creek as the target is outlined in the Siltation Modeling Report. The listed segments in the Wissahickon Creek watershed were grouped into five subwatersheds within the Wissahickon Creek watershed for the purpose of matching the waterbodies with an appropriate reference watershed (see the Siltation Modeling Report). Table 3-1 presents each of the five subwatersheds and their associated 303(d)-listed waterbody segments along with their corresponding endpoints determined through the reference approach. The TMDL process uses loading rates in the non-impaired watersheds as targets for loading reductions in the impaired watersheds.

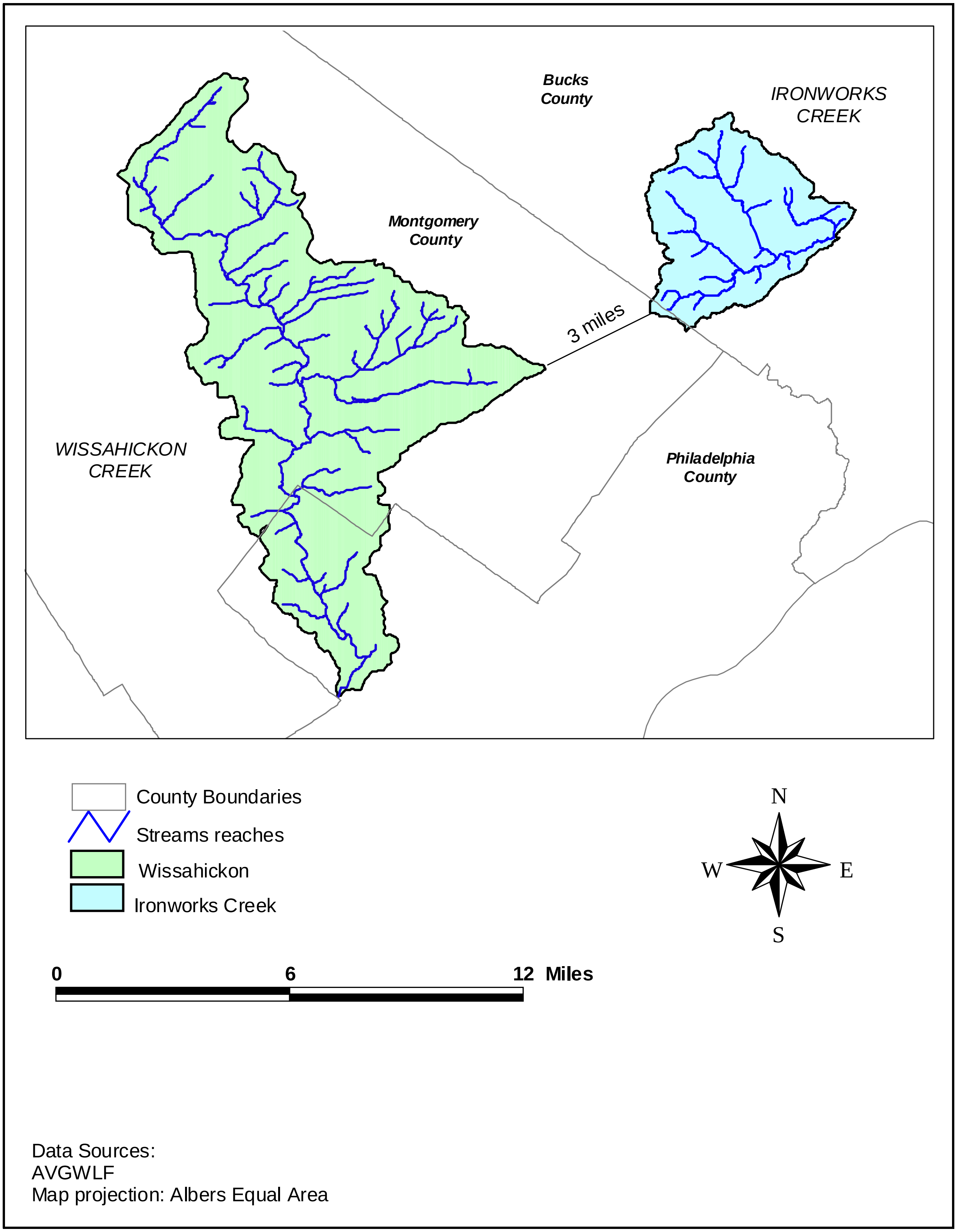

Figure 3-2. The reference watershed (Ironworks Creek) used in TMDL development for the Wissahickon Creek watershed

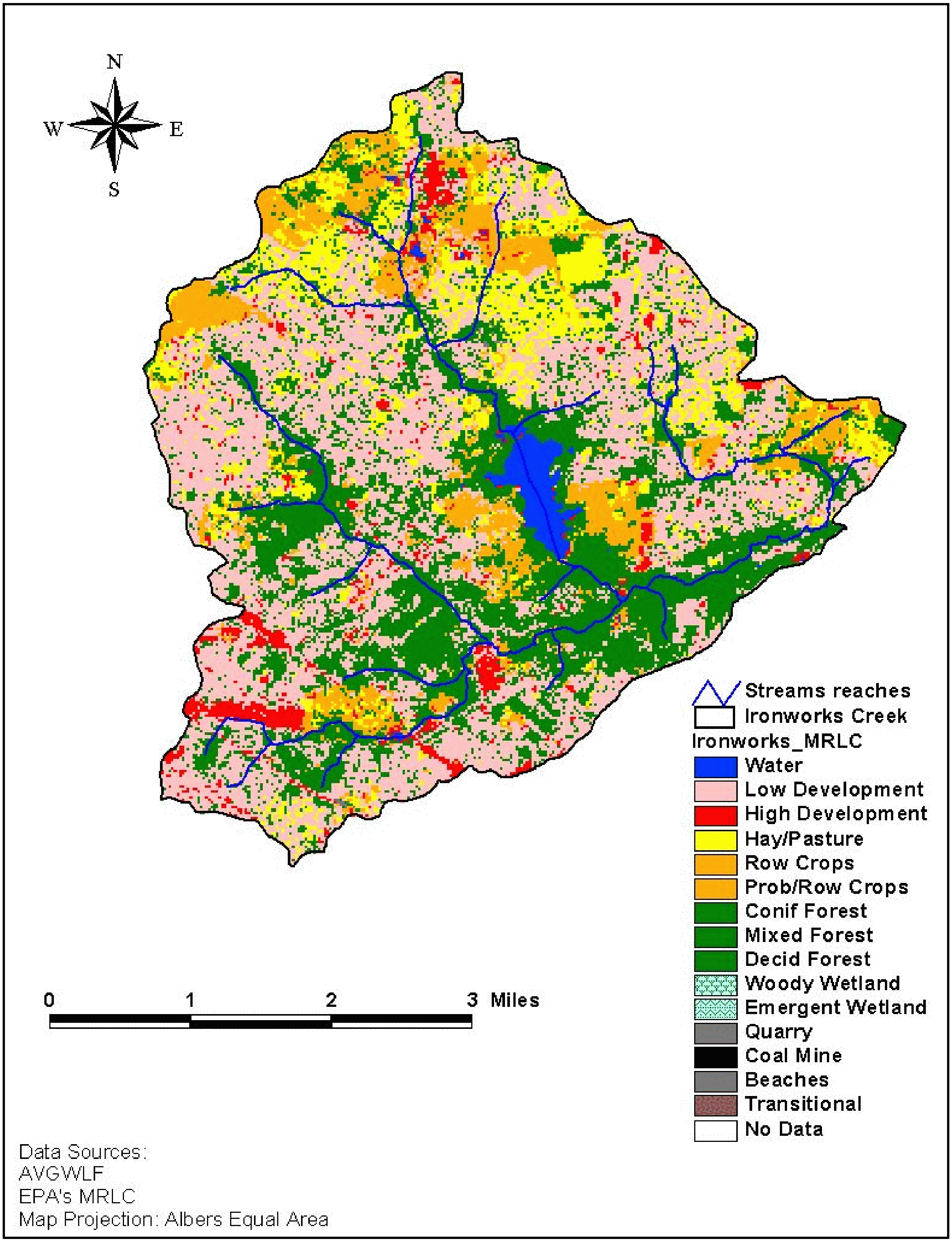

Figure 3-3. Land use distribution of the reference watershed (Ironworks Creek)

Table 3-1. Sediment endpoints determined for the Wissahickon Creek watershed

Subwatershed	303(d)-Listed Segment	TMDL Endpoint (Sediment lbs/yr)
1	971218-1345-ACE	1,935,056
	971218-1045-ACE	
	981015-1100-ACE	
	971217-1430-ACE	
2	971222-0930-ACE	7,436,463
	971222-1130-ACE	
	971217-1145-ACE	
	971216-1415-ACE	
	971217-1015-ACE	
3	971215-1133-ACE	4,103,923
	971215-1300-ACE	
	971215-1303-ACE	
4	971209-0930-ACE	6,667,594
	971208-1000-ACE	
	971211-1300-ACE	
	971215-1000-ACE	
	971215-1130-ACE	
5	971209-1430-ACE	7,330,365
	971209-1200-ACE	
	971208-1430-ACE	
	971208-1235-ACE	
	971208-1000-ACE	

4.0 TMDL Methodology and Calculation

Separate methodologies were utilized for determination of nutrient and siltation TMDLs. Each selected methodology considers specific impacts and conditions determined necessary for accurate source representation and system response.

4.1 Nutrient TMDL

The following sections discuss the methodology used for TMDL development and results in terms of TMDLs and required load reductions for each stream segment listed on Pennsylvania's 303(d) list as impaired due to nutrients.

4.1.1 Methodology

Results from analyses outlined in Section 2.2.1 describe the low-flow critical period associated with high observed nutrient concentrations causing low DO and harming aquatic life. To determine a TMDL for Wissahickon Creek, a low-flow, steady-state model was utilized that included chemical and biological processes associated with nutrient enriched and eutrophic systems. A steady-state model was used to simulate conditions most likely occurring during a constant, low-flow scenario typical of periods when previously observed problems are prevalent and most critical. This low-flow, steady-state model inherently focused on point sources as the major source of nutrients to the Wissahickon Creek basin. Other potential sources (i.e., runoff from golf course irrigation, impacts from low-level dams, etc.) were assessed on a case-by-case basis, but no quantitative evidence justified the inclusion of such sources in the model under such low-flow conditions (see Section 2.1.3).

For nutrient TMDL development, two models were utilized to simulate the hydrodynamics and water quality of the basin. EPA's Environmental Fluid Dynamics Code (EFDC) was used to simulate hydrodynamics. The EFDC model is a general purpose modeling package for simulating three dimensional flow, transport, and biogeochemical processes in surface water systems including rivers, lakes, estuaries, reservoirs, wetlands, and coastal regions. The EFDC model was originally developed at the Virginia Institute of Marine Science for estuarine and coastal applications and is considered public domain software. To model water quality, a modified version of EPA's Water Quality Analysis Simulation Program (WASP5) used results from the hydrodynamic model to simulate those processes associated with nutrients, DO, and biological activity. Modifications to the WASP5 model included sub-routines accounting for biological processes associated with periphyton growth to account for impairment effects from algal growth. This version was configured by Hydraulic and Water Resources Engineers, Inc. (HWRE) as a subcontractor to Tetra Tech, Inc. for EPA Region 1 and Maine Department of Environmental Protection, and was refined by Tetra Tech, Inc. to provide accurate adaptation to Wissahickon Creek. Both EFDC and WASP5 have been applied successfully in numerous applications to rivers, lakes, and coastal waters, and are well-known and well-documented tools for mechanistically simulating the processes of concern in Wissahickon Creek.

An important step in the steady-state analysis of Wissahickon Creek was the identification of an appropriate critical low flow for the analysis. A standard flow often utilized for low-flow, steady-state analysis is the 7Q10 flow, defined as the streamflow that occurs over 7 consecutive days and has a 10-year recurrence interval, or a 1 in 10 chance of occurring in any given year. A 7Q10 flow of 16.26 cfs was calculated for Wissahickon Creek based on flow records at the mouth (USGS gage 01474000). However, point source inputs to Wissahickon Creek, characterized in the model at design (maximum) flows, exceed the calculated 7Q10 flow. Because the flow record used to calculate the 7Q10 inherently includes flow inputs from the point sources, this low flow was revised to identify the "background" 7Q10 flow at the mouth—the low flow not including influences from typical point source discharges. Further statistical analysis of flows throughout the watershed and those contributed from point sources was conducted, resulting in a modeled critical low flow of 42.52 cfs at the mouth of Wissahickon Creek with dischargers at maximum design flows (see the Nutrient Modeling Report).

The modeling system for nutrient TMDL development was first configured and calibrated for low-flow conditions observed in summer 2002 using data collected by USGS, PA DEP, and major dischargers in the watershed. Once calibrated, the modeling system was configured for 7Q10 flow conditions to assess "baseline" conditions in the stream. To achieve water quality endpoints in the stream segments, multiple scenarios were modeled to account for varying discharge concentrations and conditions. Optimal results were reached that met instream water quality endpoints with minimal impact to stakeholders. However, reductions were required from dischargers so that these endpoints could be met. A detailed description of the background, configuration, and calibration of the modeling system is provided in the Nutrient Modeling Report.

4.1.2 TMDL Calculation

Separate TMDLs were established for each individual stream segment listed on Pennsylvania's 303(d) list. Each TMDL consists of a point source wasteload allocation (WLA), a nonpoint source load allocation (LA), and a margin of safety (MOS). These TMDLs identify the sources of pollutants that cause or contribute to the impairment of the DO criteria and allocate appropriate loadings to the various sources. Given the scientific knowledge available, and utilizing the model processes that describe the interrelationship of nutrients, carbonaceous oxygen demand (CBOD), sediment oxygen demand (SOD), and their impact on DO, EPA determined that the appropriate pollutants for these TMDLs, LAs and WLAs are ammonia, nitrate and nitrite, ortho phosphate, and CBOD. Additional information on this determination can be found in the Nutrient Modeling Report.

The equation used for TMDLs and allocations to sources is:

TMDL = WLA + LA + MOS

The WLA portion of this equation is the total loading assigned to point sources. The LA portion is the loading assigned to nonpoint sources. The MOS is the portion of loading reserved to account for any uncertainty in the data and the computational methodology used for the analysis. For this study, the MOS is assumed implicit through conservative assumptions and the steady-state modeling approach of low flow conditions.

4.1.3 Waste Load Allocations

Federal regulations (40 CFR 130.7) require TMDLs to include individual WLAs for each point source. Of the twenty three National Pollution Discharge Elimination System (NPDES) permitted dischargers, only five facilities are likely to require reductions to their respective NPDES permit limits for the pollutants considered.

Using the model described above, EPA made these allocations by reducing CBOD, ammonia nitrogen, nitrate and nitrite, and ortho phosphate loads from NPDES point sources until daily average and minimum daily DO criteria were satisfied. WLAs for each point source were determined on a case-by-case basis, with most reductions determined by local improvements downstream from the point of discharge. Where dischargers were in close proximity, sensitivity analyses were performed to ensure that appropriate sources received reductions. The Nutrient Modeling Report provides details regarding the reduction procedure using the modeling system.

At the request of stakeholders, effluent water quality from Ambler Borough (PA0026603), Upper Gwynedd Township (PA0023256), Abington Township (PA0026867), Upper Dublin Township (PA0029441), and North Wales Borough (PA0022586) were modeled assuming DO concentrations of 7.0 mg/L, which is higher than levels presently specified by NPDES permits for each discharger. This was justified because higher DO concentrations are generally provided by these dischargers. One of the assumptions for each of these WLAs is that the effluent DO concentration will be raised to 7.0 mg/l. These WLAs therefore require not only that the pollutant specific limits be consistent, but also that the facility achieve a DO effluent concentration of no less than 7.0 mg/l.

Based on these TMDLs EPA recommends that the five aforementioned major dischargers have their NPDES effluent limits modified when next reissued to reduce the amounts of CBOD, NH_3-N, NO_3+NO_2-N, and ortho PO_4 consistent with the WLAs developed in this TMDL as well as meet the facility DO effluent quality of at least 7.0 mg/l. Specific WLAs for each facility and pollutant are listed in the TMDL tables of Appendix F.

4.1.4 Load Allocations

According to federal regulations (40 CFR 130.2(g)), load allocations are best estimates of the nonpoint and/or background loading. These allocations may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint human-induced sources should be distinguished (EPA, 2001).

Nonpoint source loads within the Wissahickon Creek basin were based on low-flow samples collected by PA DEP in summer 2002. Water quality samples were taken at upstream locations and select tributaries to estimate background loads. These loads were included in the calculations of TMDLs. However, no load reductions were determined necessary for background loads. As a result, stream segments 971215-1000-ACE (Lorraine Run), 971215-1300-ACE (headwaters of Pine Run), and 971217-1145-ACE (Trewellyn Creek) required no reductions for either WLAs nor LAs because no major point sources were present and water quality data did not suggest that such reductions were warranted. However, to address the impairments in these stream segments, implementation measures are recommended in Section 5.1 to address non-source related factors that can result in biological improvements.

Although the majority of nutrient loads to stream segment 971209-0930-ACE (bottom of the Wissahickon Creek mainstem) were from upstream segments and considered nonpoint source, reductions to these upstream segments were reached in meeting their TMDLs. As a result of upstream reductions, stream segment 971209-0930-ACE met the DO criteria and no reductions were required for sources within this stream segment to meet the TMDL.

4.1.5 TMDL Results and Allocations

TMDLs were developed for each of the seasonal water quality criteria for DO applicable to the Wissahickon Creek basin and include: (1) Trout Stocking (TS) from February 15 to July 31, and (2) Warm Water Fishes (WWF) for the remainder of the year (see Table 1-3). For each stream segment in the Wissahickon Creek basin included in Pennsylvania’s 303(d) list due to nutrients (Figure 4-1), separate TMDLs, WLAs, and LAs were determined and are summarized in Tables 4-1 and 4-2 for both TS and WWF periods, respectively. Total loads were determined for $CBOD_5$, ammonia nitrogen, nitrate-nitrite nitrogen, and ortho phosphate. A complete list of individual WLAs, LAs, and TMDLs for each stream segment and seasonal DO criteria are provided in Appendix F.

For each of the five major dischargers, WLAs are listed in Tables 4-3 and 4-4 for TS and WWF DO criteria, respectively. WLAs are specific to the summer period. For the remainder of the year, implementation of WLAs require seasonal adjustments following PA DEP procedures (PA DEP, 1997). For more detail, see Section 5.

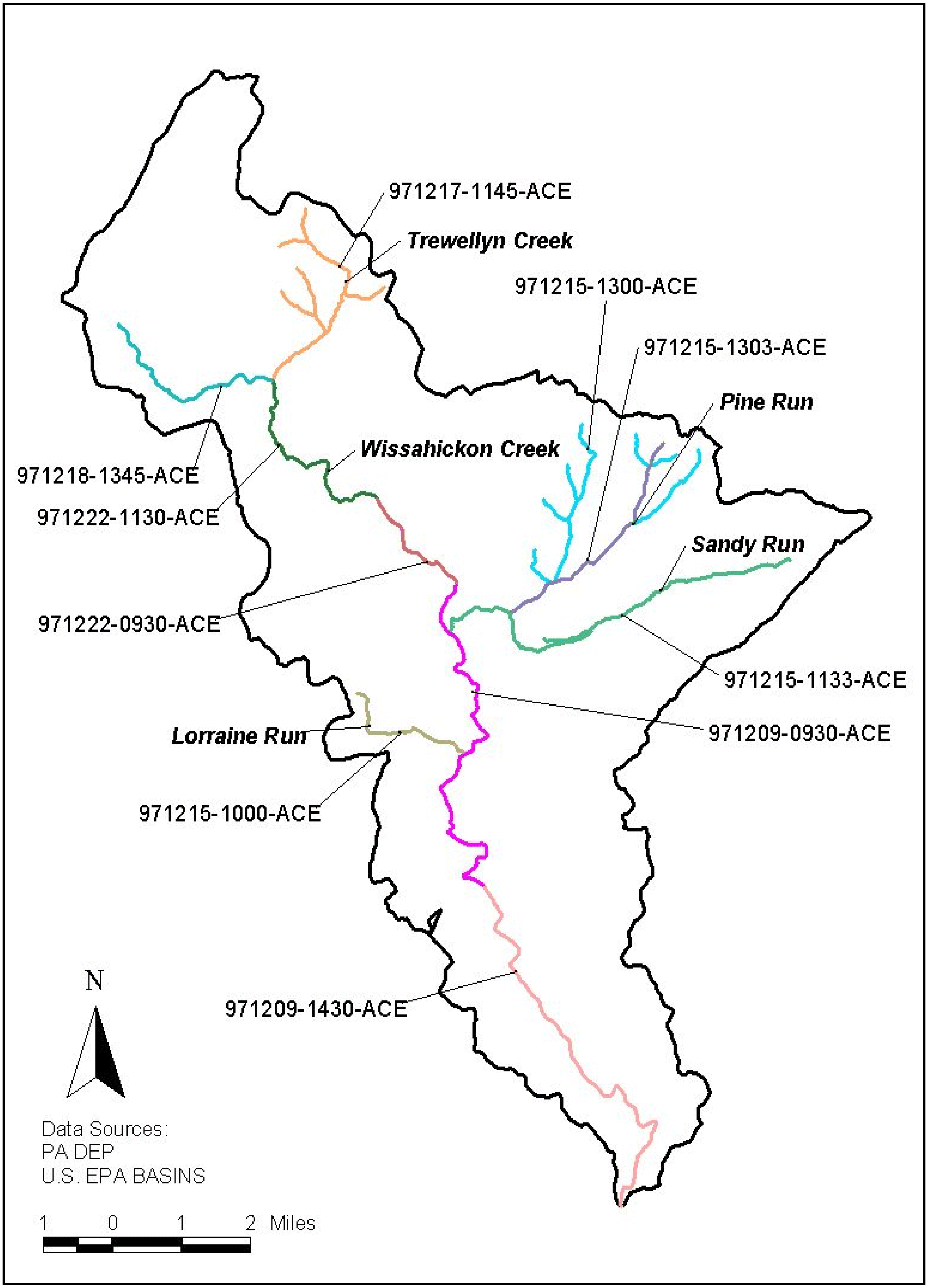

Figure 4-1. Stream segments of the Wissahickon Creek basin listed for nutrients

Table 4-1. TMDL summary by stream segment for the Wissahickon Creek basin - Trout Stocking (February 15 to July 31)

Sum of Waste Load Allocations					
Segment Name	Segment ID	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4 (lbs/day)
Wissahickon Creek	971218-1345-ACE	258.846	38.513	1057.952	96.224
Wissahickon Creek	971209-1430-ACE	0.000	0.000	0.000	0.000
Wissahickon Creek	971209-0930-ACE	1.034	0.202	0.321	0.046
Wissahickon Creek	971222-0930-ACE	543.402	81.466	1657.755	254.221
Wissahickon Creek	971222-1130-ACE	0.000	0.000	0.000	0.000
Lorraine Run	971215-1000-ACE	0.118	0.022	0.052	0.006
Sandy Run	971215-1133-ACE	244.684	23.571	986.281	60.511
Pine Run	971215-1300-ACE	0.000	0.000	0.000	0.000
Pine Run	971215-1303-ACE	116.740	20.572	335.664	13.266
Trewellyn Creek	971217-1145-ACE	0.000	0.000	0.000	0.000
Sum of Load Allocations					
Segment Name	Segment ID	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4 (lbs/day)
Wissahickon Creek	971218-1345-ACE	0.670	0.011	0.457	1.215
Wissahickon Creek	971209-1430-ACE	832.692	101.270	4065.812	402.456
Wissahickon Creek	971209-0930-ACE	1058.705	131.464	4121.076	413.614
Wissahickon Creek	971222-0930-ACE	159.364	20.025	1033.639	90.568
Wissahickon Creek	971222-1130-ACE	222.733	33.223	1050.113	95.465
Lorraine Run	971215-1000-ACE	123.732	1.344	134.480	1.949
Sandy Run	971215-1133-ACE	110.735	19.379	336.908	13.127
Pine Run	971215-1300-ACE	1.181	0.040	0.986	0.100
Pine Run	971215-1303-ACE	1.181	0.040	0.986	0.100
Trewellyn Creek	971217-1145-ACE	1.922	0.049	0.162	0.029

Table 4-2. TMDL summary by stream segment for the Wissahickon Creek basin - Warm Water Fishes (August 1 to February 14)

Sum of Waste Load Allocations					
Segment Name	Segment ID	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4 (lbs/day)
Wissahickon Creek	971218-1345-ACE	445.052	86.405	1051.573	170.411
Wissahickon Creek	971209-1430-ACE	0.000	0.000	0.000	0.000
Wissahickon Creek	971209-0930-ACE	1.034	0.202	0.321	0.046
Wissahickon Creek	971222-0930-ACE	543.402	81.466	1646.820	254.221
Wissahickon Creek	971222-1130-ACE	0.000	0.000	0.000	0.000
Lorraine Run	971215-1000-ACE	0.118	0.022	0.052	0.006
Sandy Run	971215-1133-ACE	326.145	65.235	986.281	150.935
Pine Run	971215-1300-ACE	0.000	0.000	0.000	0.000
Pine Run	971215-1303-ACE	137.319	22.868	300.307	21.062
Trewellyn Creek	971217-1145-ACE	0.000	0.000	0.000	0.000
Sum of Load Allocations					
Segment Name	Segment ID	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4 (lbs/day)
Wissahickon Creek	971218-1345-ACE	0.000	0.000	0.000	0.000
Wissahickon Creek	971209-1430-ACE	973.035	167.356	4031.623	559.839
Wissahickon Creek	971209-0930-ACE	1239.972	206.190	4080.025	575.352
Wissahickon Creek	971222-0930-ACE	278.761	58.710	1032.974	159.435
Wissahickon Creek	971222-1130-ACE	383.300	77.696	1045.820	167.137
Lorraine Run	971215-1000-ACE	123.732	1.344	134.480	1.949
Sandy Run	971215-1133-ACE	130.034	21.600	301.853	20.805
Pine Run	971215-1300-ACE	1.181	0.040	0.986	0.100
Pine Run	971215-1303-ACE	1.181	0.040	0.986	0.100
Trewellyn Creek	971217-1145-ACE	1.922	0.049	0.162	0.029

Table 4-3. WLAs for five major dischargers in the Wissahickon Creek watershed - Trout Stocking (April 1/May 1 to July 31 - see Section 5)

Name	NPDES	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	TMDL Percent Reduction CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
North Wales Boro	PA0022586	3.00	0.50	15.16	1.41	70.0%	80.0%	0.0%	70.0%
Upper Gwynedd Township	PA0023256	5.00	0.74	20.08	1.82	50.0%	59.0%	0.0%	49.0%
Ambler Boro	PA0026603	10.00	1.50	30.52	4.68	0.0%	0.0%	0.0%	0.0%
Abington Township	PA0026867	7.50	0.72	30.27	1.85	25.0%	64.0%	0.0%	60.0%
Upper Dublin Township	PA0029441	12.77	2.25	36.71	1.45	14.9%	10.0%	0.0%	36.9%

A - Calculated from NPDES permit limit

B - Calculated from average of summer 2002 monitoring. If allocations exceeded average of 2002, 0.0 % is reported.

Table 4-3b. WLAs for all facilities discharging nutrients to Wissahickon Creek watershed in pounds per/day - Trout Stocking (April/May1 to July 31 - see Section 5)

Name	NPDES	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
Upper Dublin Township	PA0029441	116.74	20.572	335.664	13.266
Abington Township	PA0026867	243.979	23.433	984.961	60.291
Valley Green Corporate Center	PA0053074	0.705	0.139	1.320	0.220
SFU	PA0057631	0.042	0.010	0.021	0.002
Murray SRSTP	PA0053210	0.042	0.002	0.004	0.002
SFU	PA0051012	0.034	0.010	0.027	0.002
North Wales Boro	PA0022586	20.828	3.470	105.160	9.771
Upper Gwynedd Township	PA0023256	237.196	35.010	952.755	96.408
SFU	PA0057576	0.059	0.018	0.006	0.003
Merck & Co. Inc.	PA0053538	0.763	0.015	0.031	0.042
Ambler Borough Water Department	PA0052515	0.763	0.015	0.031	0.040
PA Historical & Museum Commission	PA0055387	0.212	0.169	0.255	0.004
SFU	PA0054577	0.059	0.018	0.035	0.002
Ambler Boro	PA0026603	543.402	81.466	1,657.755	254.221

Table 4-4. WLAs for five major dischargers in the Wissahickon Creek watershed - Warm Water Fishes (August 1 to October 31 - see Section 5)

Name	NPDES	CBOD5 (mg/L)	NH3-N (mg/L)	NO3+NO2-N (mg/L)	Ortho PO4-P (mg/L)	TMDL Percent Reduction			
						CBOD5[A]	NH3-N[A]	NO3+NO2-N[B]	Ortho PO4-P[B]
North Wales Boro	PA0022586	5.90	1.37	21.22	2.40	41.0%	45.0%	0.0%	49.0%
Upper Gwynedd Township	PA0023256	8.50	1.62	19.05	3.22	15.0%	10.0%	0.0%	9.9%
Ambler Boro	PA0026603	10.00	1.50	30.31	4.68	0.0%	0.0%	0.0%	0.0%
Abington Township	PA0026867	10.00	2.00	30.27	4.63	0.0%	0.0%	0.0%	0.0%
Upper Dublin Township	PA0029441	15.00	2.50	32.85	2.30	0.0%	0.0%	0.0%	0.0%

A - Calculated from NPDES permit limit

B - Calculated from average of summer 2002 monitoring. If allocations exceeded average of 2002, 0.0 % is reported.

Table 4-4b. WLAs for all facilities discharging nutrients to Wissahickon Creek watershed in pounds per/day - Warm Water Fish (August 1 to October 31 - see Section 5)

Name	NPDES	CBOD5 (lbs/day)	NH3-N (lbs/day)	NO3+NO2-N (lbs/day)	Ortho PO4-P (lbs/day)
Upper Dublin Township	PA0029441	137.319	22.868	300.107	21.062
Abington Township	PA0026867	325.439	65.197	984.961	150.715
Valley Green Corporate Center	PA0053074	0.705	0.139	1.320	0.220
SFU	PA0057631	0.042	0.010	0.021	0.002
Murray SRSTP	PA0053210	0.042	0.002	0.004	0.002
SFU	PA0051012	0.034	0.010	0.027	0.002
North Wales Boro	PA0022586	40.940	9.540	147.201	16.619
Upper Gwynedd Township	PA0023256	403.383	76.837	903.908	152.574
SFU	PA0057576	0.059	0.018	0.006	0.003
Merck & Co. Inc.	PA0053538	0.670	0.011	0.457	1.215
Ambler Borough Water Department	PA0052515	0.763	0.015	0.031	0.040
PA Historical & Museum Commission	PA0055387	0.212	0.169	0.255	0.004
SFU	PA0054577	0.059	0.018	0.035	0.002
Ambler Boro	PA0026603	543.402	81.466	1,646.820	254.221

4.1.6 Consideration of Critical Conditions

Federal Regulations (40 CFR 130.7(c)(1)) require TMDLs to consider critical conditions for streamflow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality and designated uses of the waterbodies are protected during periods when they are most vulnerable. Critical conditions include combinations of environmental factors that result in attaining and maintaining the water quality criteria and have an acceptably low frequency of occurrence (USEPA, 2001).

TMDLs for Wissahickon Creek adequately address critical conditions for flow through analysis of 7Q10 conditions in the basin. This flow regime was determined to have the most severe impacts on the aquatic life use. The analysis of 7Q10 conditions and flow budget for the basin are described in the Nutrient Modeling Report. For such a low flow period, most of the Wissahickon Creek streamflow is dominated by point source flows. Upstream of Route 73, dischargers account for almost 100 percent of flow. During low flow periods, nutrient concentrations are historically higher, but dissolved oxygen concentrations are lower (see Section 2.1.1).

Critical conditions for nutrient loads were considered by determining WLAs based on maximum flows from dischargers set by design flows specified in NPDES permits for each facility. Under normal summer conditions, the cumulative discharge flow ranges from 50 to 60 percent of combined design flows. Use of design flows in TMDL determination provides additional assurance that when design flows are reached, the water quality in the stream will meet water quality criteria.

Water quality standards for DO vary seasonally for the Wissahickon Creek basin as a result of the more stringent trout stocking aquatic life use and its associated DO criteria. Higher standards for DO are specified for less than a 6 month period from February 15 through July 31. This period of more stringent criteria was considered an essential component of critical conditions for the basin.

4.1.7 Consideration of Seasonal Variation

As shown in Section 2.1.1, higher nutrient concentrations typically occur during the summer low-flow period. The low-flow period has a reduced assimilative capacity of discharges due to less streamflow available for dilution. Also, the activity of aquatic biota varies seasonally as a function of streamflow and temperature, with higher impacts associated with warmer, low-flow conditions. Since biological activity was an important consideration in Pennsylvania’s original listing of the stream segments as impaired due to nutrients, attention to the summer low-flow period was critical. If the stream segments are protected during this critical period, then other periods of lower temperatures, less biological activity, and more assimilative streamflow capacity are inherently protected since the solubility of oxygen is inversely proportional to temperature, less volatile during periods of lower biological activity, and an increased flow dilutes the pollutant loading.

Seasonal DO criteria were also considered in TMDL analysis. Separate TMDLs were developed for the 6 month period from February 15 through July 31 for trout stocking and the remainder of the year designated for warm water fish.

4.2 Siltation TMDLs

The following sections discuss the methodology used for TMDL development as well as the results of the TMDL study. The TMDL results include the load reductions required for each stream segment listed on Pennsylvania's 303(d) list as impaired due to siltation.

4.2.1 Methodology

Results of analysis reported in Section 2.2.1 show that most siltation is likely to occur during wet weather events when runoff is greatest. The increased sediment load acts to fill interstitial spaces and pools, clogs gill surfaces, and creates a more turbid environment. These factors negatively impact the biological community and can create an aquatic life use impairment. To develop a siltation TMDL for the impaired reaches in the basin, a "reference watershed approach" was utilized. Once the impaired and reference watersheds were matched, a watershed model was used to simulate the sediment loads from different sources. The modeling framework used in this study consisted of a modified application of the Generalized Watershed Loading Function (GWLF) watershed model (Haith and Shoemaker, 1987), including a special module for simulation of streambank erosion. GWLF has been used by Pennsylvania in developing numerous TMDLs including Donegal Creek and Conodoguinet Creek (Tetra Tech, Inc, 2000). The ArcView Version of the Generalized Watershed Loading Function (AVGWLF), developed by the Environmental Resources Research Institute of the Pennsylvania State University (Evans et al. 2001), was utilized for development of GWLF model input and estimation of sediment loadings from overland runoff, . Using hydrology input parameters established by the AVGWLF model, BasinSim (Dai et al., 2000) was used to run GWLF with model output specially formatted for a separate Streambank Erosion Simulation Module. Loadings from streambank erosion were estimated with this separate module using daily flows predicted by GWLF, site-specific information, and process-based algorithms.

For TMDL development, the model was applied to both the impaired and reference watersheds, and results were compared with available monitoring data in the impaired watershed. The sediment loads calculated for the reference watersheds were used as endpoints for the impaired watersheds. TMDLs were then developed for the impaired watersheds using those endpoints as the measure of adequate water quality and protection of aquatic life uses. A general description of the approach is shown in Figure 4-2. The Siltation Modeling Report details the technical approach and outlines the selection of the reference watershed, model configuration and calibration, and procedures for TMDL development and source reductions.

There are several factors that create uncertainty in the watershed model used for determination of sediment loads. The reference watershed approach used land-use-based, unit-area loading rates predicted by the watershed model to allocate sediment loads for the TMDLs. Therefore, changes in the land use from the data used or differences between local sediment loads and established values could cause the model to over or underestimate the sediment loads. The AVGWLF model documented a monthly sediment load not an instantaneous load as reported in sampling data. The weather station used for the model was 15 miles from the watershed, therefore storms captured in the weather data may not have impacted the Wissahickon Creek basin, likewise, storms in the Wissahickon Creek basin may not have been recorded at the weather station.

4.2.2 TMDL Calculation

EPA established separate TMDLs for each individual stream segment listed on Pennsylvania’s 303(d) list. Each TMDL consists of a point source wasteload allocation (WLA), a nonpoint source load allocation (LA), and a margin of safety (MOS). These TMDLs identify the sources of pollutants that cause or contribute to the siltation impairment and allocate appropriate loadings to the various sources.

The equation used for developing TMDLs is as follows:

TMDL = WLA + LA + MOS

The WLA portion of this equation is the total loading assigned to point sources. The LA portion is the loading assigned to nonpoint sources. The MOS is the portion of loading reserved to account for any uncertainty in the data and the computational methodology used for the analysis. For this study, separate approaches for TMDL calculation were used for determination of WLAs associated with overland runoff and streambank erosion (see Section 4.2.3), with different MOS

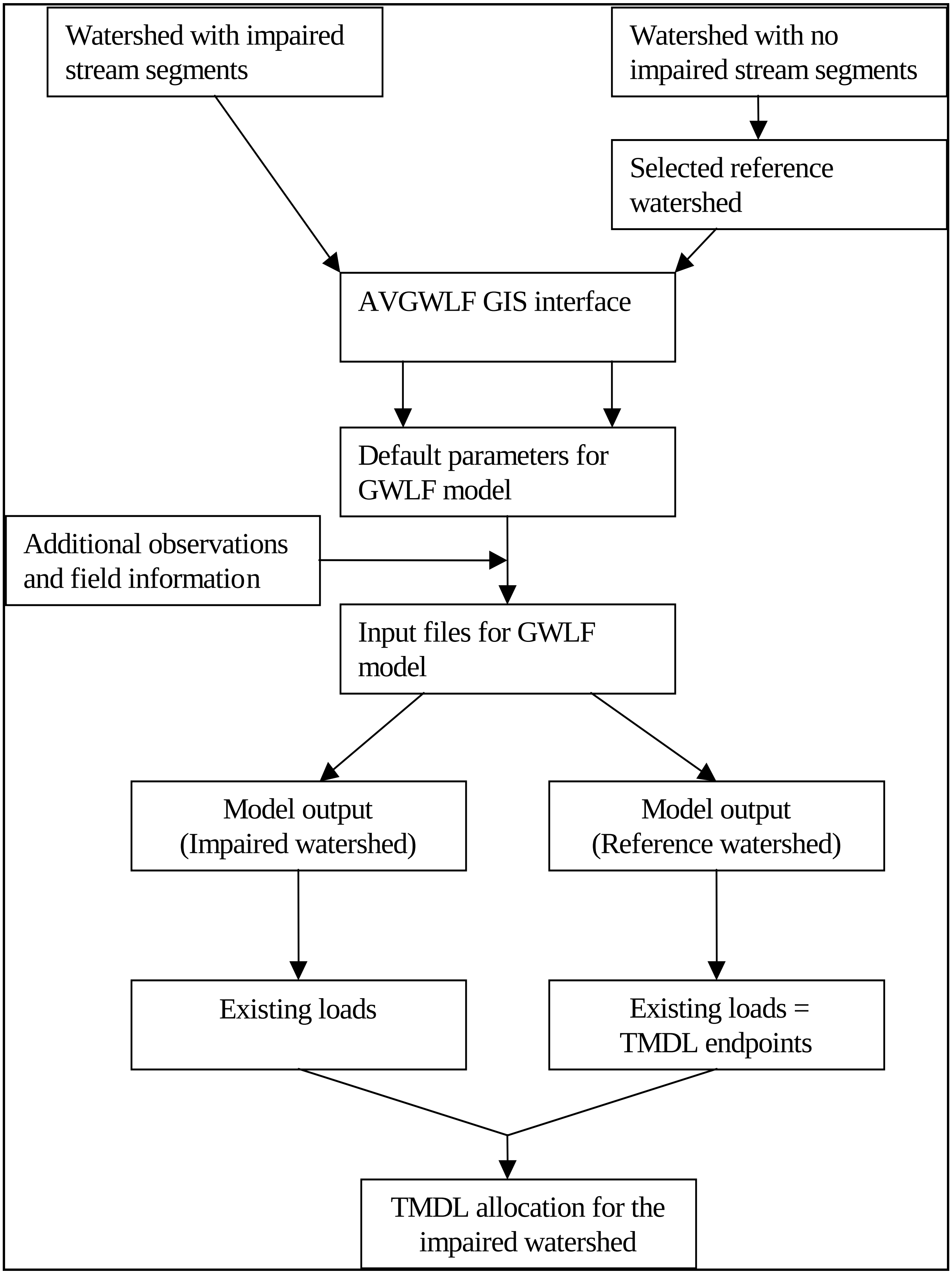

Figure 4-2. General description of approach for siltation TMDL development

assumptions for each. For overland runoff, an explicit MOS of 10% was assumed to ensure protection of the stream segments. For streambank erosion, due to the conservative assumptions regarding allocation of loads throughout the watershed (see Section 3.2.6 of the Siltation Modeling Report), an implicit MOS was assumed (i.e., no numeric MOS for TMDL calculation).

4.2.3 Waste Load Allocations

Federal regulations (40 CFR 130.7) require TMDLs to include individual WLAs for each point source. Of the 13 NPDES dischargers permitted to discharge specific amount of sediment (measured as TSS), none required reductions to their NPDES permit limits (e.g., treated sewage effluents). Based on available discharge monitoring reports (DMR) the average discharge of sediment from such facilities in the watershed was usually well below the permitted TSS concentration.

Stormwater permits typically do not have numeric limits for sediment. EPA's stormwater permitting regulations require municipalities to obtain permit coverage for all stormwater discharges from separate storm sewer systems (MS4s). For these discharges, WLAs were determined using land-use-specific, unit-area loads determined in modeling analysis for specific regions of the Wissahickon Creek basin, as well as the streambank erosion within each municipality. As discussed in greater detail in the Siltation Modeling Report, the Wissahickon Creek watershed was divided into five main subwatersheds in order to match the impaired watershed with the smaller reference watershed Ironworks Creek. Sediment loads were estimated for each of the five subwatersheds and then distributed among municipalities as MS4 stormwater permit loads (WLAs) for each individual 303(d)-listed watershed. Distribution of loads was accomplished within the five subwatersheds for all 303(d) listed watersheds and municipalities based on the corresponding unit-area loading (lbs/acre/year) for overland runoff and streambank erosion determined though modeling analysis. Figure 4-3 presents the five main subwatersheds and Figure 4-4 presents the 303(d)-listed watersheds throughout the entire Wissahickon Creek watershed. Table 4-5 presents the listed watersheds within each of the five modeled subwatersheds. A GIS coverage of municipal boundaries was obtained from the Pennsylvania Spatial Data Access (PASDA) and presented in Figure 2-2.

Table 4-5. Watersheds impaired by siltation within each of the five modeled subwatersheds

Subwatershed	Impaired Segment
1	971218-1345-ACE
	971218-1045-ACE
	981015-1100-ACE
	971217-1430-ACE

Subwatershed	Impaired Segment
2	971222-0930-ACE
	971222-1130-ACE
	971217-1145-ACE
	971216-1415-ACE
	971217-1015-ACE
3	971215-1133-ACE
	971215-1300-ACE
	971215-1303-ACE
4	971209-0930-ACE
	971208-1000-ACE
	971211-1300-ACE
	971215-1000-ACE
	971215-1130-ACE
5	971209-1430-ACE
	971209-1200-ACE
	971208-1430-ACE
	971208-1235-ACE
	971208-1000-ACE

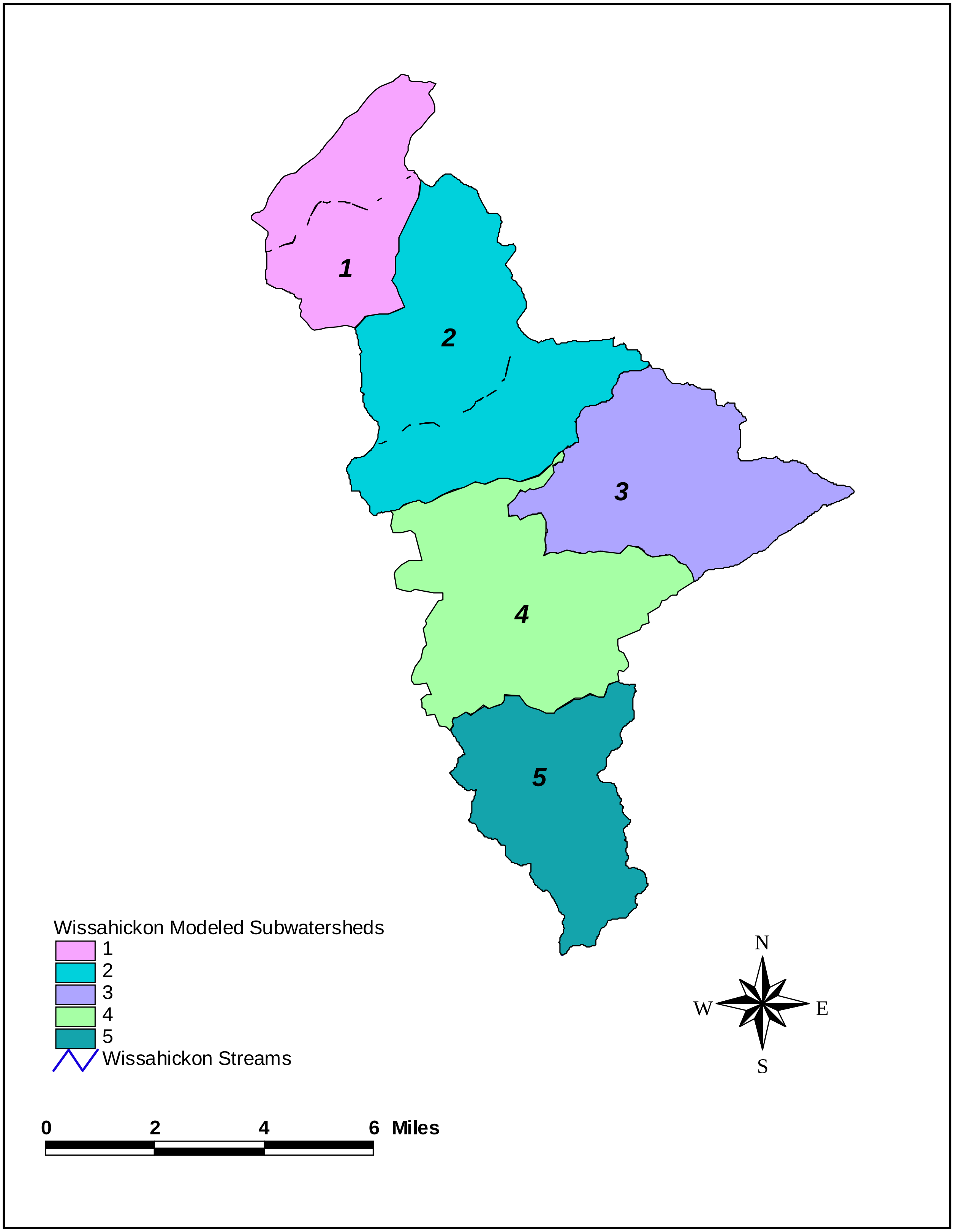

Figure 4-3. Five main subwatersheds in the Wissahickon Creek watershed

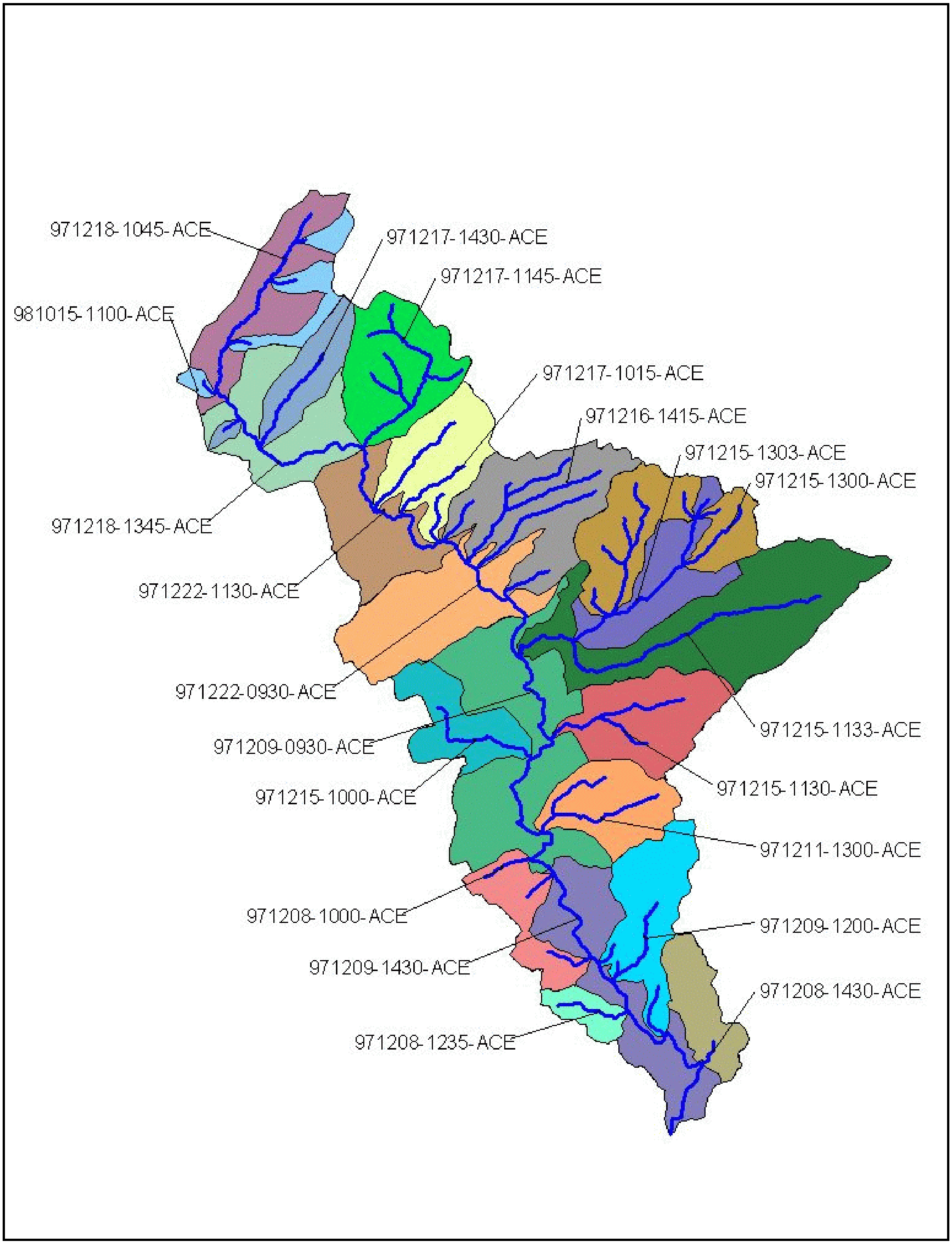

Figure 4-4. Watersheds listed for siltation in the Wisahickon Creek watershed

4.2.4 Load Allocations

According to federal regulations (40 CFR 130.2(g)), load allocations are best estimates of the nonpoint source and background loading. These allocations may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint sources should be distinguished (EPA, 2001).

The Wissahickon basin was divided into 5 subwatersheds (see Figure 4-3) to better match the reference watershed size. The upstream load (i.e., the loads from subwatersheds 1, 2, and 4 into subwatersheds 2, 4, and 5, respectively) were the only sediment loads in the watershed that received LAs in the Wissahickon Creek basin as these loads were originating from sources outside the demarcated watershed.

4.2.5 TMDL Results and Allocations

Since the Wissahickon Creek watershed was divided into 5 smaller subwatersheds (see Figure 4-3) to better match the reference watershed size, sediment allocations began at the top of the watershed (i.e., subwatershed 1) and continued downstream to the mouth of the watershed (i.e., subwatershed 5). After sediment reductions sufficient to achieve and maintain water quality standards were made to the first subwatershed (subwatershed 1) based on the sediment load in the reference watershed, the resulting reduced sediment load was added to the next downstream subwatershed (subwatershed 2) to represent the in-stream sediment load coming from upstream. The sediment load coming from subwatershed 1 was subjected to the sediment delivery ratio (SDR) for subwatershed 2 to account for natural losses. The same upstream load was also added to the reference watershed to account for loading from upstream. The total sediment load in the subwatershed was then compared to the reference watershed sediment load so that reductions could be made. This process continued downstream to the mouth of the Wissahickon Creek watershed. As the reduced sediment loads from upstream Wissahickon Creek were added to the downstream subwatersheds, no further reductions were made to the upstream loads since they were already meeting the appropriate reference watershed sediment target.

For each stream segment in the Wissahickon Creek basin included on Pennsylvania’s 303(d) list due to siltation (Figure 4-4), separate TMDLs, WLAs, and LAs were determined . Total sediment loads from landuses within the Wissahickon Creek watershed were based on unit area loadings for each landuse (Table 4-6). The streambank erosion sediment load was distributed to each of the listed segments in the appropriate watershed based on the drainage area of each listed segment (i.e., if a particular listed watershed made up 12 percent of the larger modeled subwatershed, it received 12 percent of the streambank erosion load). TMDLs are summarized by listed segment in Tables 4-7 through 4-11.

Note that in Tables 4-7 through 4-11, the WLA is presented in two different ways. In order to meet the reference watershed sediment loads that were determined to be the TMDL endpoints for each of the five modeled subwatersheds, the loads from dischargers were multiplied by the SDR in each of the respective watersheds. This resulted in accounting for transport losses of the sediment from the dischargers as it travels through the watershed. The WLA (SDR applied) represents the sediment load from dischargers at the mouth of the watershed after the SDR has been applied. The WLA (SDR not applied) represents the sediment load at the “end of pipe” for each of the dischargers and was based on the permitted flow and TSS concentrations (which were converted to lbs/yr). None of the sediment dischargers in the watershed required reductions. The lower WLA with the SDR applied accounts for natural losses as the sediment moves through the watershed.

Each municipal source (MS4 stormwater permit) (Figure 2-2) received a WLA based on the sediment loading from landuses and streambank erosion within the municipal boundaries. The individual WLAs for each municipal area are presented as a total for each township in Table 4-12. Appendix G provides the TMDLs in greater detail for each impaired stream segment (i.e., loads distributed by source).

Table 4-6. Unit area loading rates for sediment by landuse

	Unit Area Loading Rate (lbs/acre/yr)				
	Subwatershed 1	Subwatershed 2	Subwatershed 3	Subwatershed 4	Subwatershed 5
Low-Intensity Residential	124.12	73.20	43.32	42.72	46.22
High-Intensity Residential/Urban	105.12	54.56	21.94	21.47	23.69
Hay/Pasture	51.60	48.02	76.84	42.54	108.17
Row Crops	464.28	301.79	153.30	137.20	256.82
Coniferous Forest	3.13	2.74	4.94	5.74	8.82
Mixed Forest	3.99	3.93	5.67	4.81	9.43
Deiduous Forest	5.43	4.58	7.00	8.69	32.00
Quarry	0.00	0.00	0.00	619.45	0.00
Coal Mines	0.00	0.00	0.00	352.72	0.00
Transitional	0.00	0.00	405.13	356.93	439.68

Table 4-7. TMDLs for impaired watersheds within subwatershed 1

Subwatershed	LA (lbs/yr)	WLA (SDR not applied)* (lbs/yr)	WLA (SDR applied)* (lbs/yr)	MOS (lbs/yr)	TMDL (lbs/yr)
971217-1430-ACE North Wales Tributary	0.00	132472.14	132472.14	13523.44	145995.58
971218-1045-ACE Wissahickon Creek	0.00	232627.14	232627.14	23977.92	256605.06
971218-1345-ACE Wissahickon Creek	0.00	832826.33	343101.57	23269.82	366371.39
981015-1100-ACE Tributary Upstream of North Wales Tributary	0.00	104064.32	104064.32	9938.99	114003.31
TOTAL	**0.00**	**1301989.93**	**812265.17**	**70710.17**	**882975.34**

*See explanation in above paragraph

Table 4-8. TMDLs for impaired watersheds within subwatershed 2

Subwatershed	LA (lbs/yr)	WLA (SDR not applied)* (lbs/yr)	WLA (SDR applied)* (lbs/yr)	MOS (lbs/yr)	TMDL (lbs/yr)
971216-1415-ACE Rose Valley Tributary	0.00	812,868.14	307,981.49	18,834.77	326,816.25
971217-1015-ACE Willow-Run East	0.00	157,663.24	157,663.24	11,976.98	169,640.22
971217-1145-ACE Trewellyn Creek	0.00	177,794.61	177,794.61	15,424.21	193,218.82
971222-0930-ACE Wissahickon Creek	0.00	220,671.91	220,671.91	17,766.70	238,438.61
971222-1130-ACE Wissahickon Creek	0.00	115,823.55	115,823.55	13,152.62	128,976.17
Upstream Load**	132,446.30	0.00	0.00	0.00	132,446.30
TOTAL	**132,446.30**	**1,484,821.45**	**979,934.79**	**77,155.28**	**1,189,536.38**

*See explanation in above paragraph

**Upstream load includes the TMDL load from subwatershed 1

Table 4-9. TMDLs for impaired watersheds within subwatershed 3

Subwatershed	LA	WLA (SDR not applied)	WLA (SDR applied)	MOS	TMDL
971215-1133-ACE Sandy Run	0.00	590,668.53	293,476.35	17,264.19	310,740.53
971215-1300-ACE Pine Run	0.00	129,773.35	129,773.35	9,773.98	139,547.34
971215-1303-ACE Pine Run	0.00	182,899.94	99,467.99	6,648.62	106,116.61
TOTAL	**0.00**	**903,341.82**	**522,717.69**	**33,686.79**	**556,404.48**

*See explanation in above paragraph

Table 4-10. TMDLs for impaired watersheds within subwatershed 4

Subwatershed	LA (lbs/yr)	WLA (SDR not applied)* (lbs/yr)	WLA (SDR applied)* (lbs/yr)	MOS (lbs/yr)	TMDL (lbs/yr)
971208-1000-ACE Wises Mill Tributary	0.00	13,828.33	13,828.33	1,379.47	15,207.80
971209-0930-ACE Wissahickon Creek	0.00	202,378.54	201,010.76	16,283.52	42,189.97
971211-1300-ACE Paper Mill Run	0.00	64,552.66	64,552.66	6,301.52	70,854.18
971215-1000-ACE Lorraine Run	0.00	897,469.23	189,501.11	5,094.41	194,595.52
971215-1130-ACE Tributary Downstream of Sandy Run	0.00	89,456.59	89,456.59	8,216.71	97,673.30
Upstream Load**	202,221.19	0.00	0.00	0.00	202,221.19
TOTAL	**202,221.19**	**1,267,685.35**	**558,349.45**	**37,275.63**	**797,846.27**

*See explanation in above paragraph

**Upstream load includes the TMDL load from subwatersheds 2 and 3

Table 4-11. TMDLs for impaired watersheds within subwatershed 5

Subwatershed	LA (lbs/yr)	WLA (lbs/yr)	MOS (lbs/yr)	TMDL (lbs/yr)
971208-1235-ACE Valley Road Tributary	0.00	27,913.47	2,073.29	29,986.76
971208-1430-ACE Monoshone Creek	0.00	60,137.76	4,848.89	64,986.65
971209-1200-ACE Creshiem Creek	0.00	105,882.10	8,343.44	114,225.54
971209-1430-ACE Wissahickon Creek	0.00	139,955.17	10,915.42	150,870.59
971208-1000-ACE Wises Mill Tributary	0.00	45,843.44	3,307.20	49,150.63
Upstream Load*	147,601.56	0.00	0.00	147,601.56
TOTAL	**147,601.56**	**379,731.93**	**29,488.24**	**556,821.73**

*Upstream load includes the TMDL load from subwatershed 4

Table 4-12. Summary of sediment wasteload allocations for streambank erosion and overland load by municipality (MS4)

Municipality	Existing Load from Streambank Erosion (lbs/yr)	Streambank Erosion WLA (lbs/yr)	Percent Reduction for Streambank Erosion	Existing Overland Load (lbs/yr)	Overland Load WLA (lbs/yr)	Percent Reduction for Overland Load (lbs/yr)	TOTAL WLA (lbs/yr)
Abington	121,604.46	41,116.77	0.66	362,538.56	87,796.68	0.76	128,913.40

Municipality	Existing Load from Streambank Erosion (lbs/yr)	Streambank Erosion WLA (lbs/yr)	Percent Reduction for Streambank Erosion	Existing Overland Load (lbs/yr)	Overland Load WLA (lbs/yr)	Percent Reduction for Overland Load (lbs/yr)	TOTAL WLA (lbs/yr)
Ambler	17,974.49	9,346.73	0.48	75,008.50	32,843.24	0.56	42,189.97
Cheltenham	1,758.29	1,512.13	0.14	20,549.46	4,449.00	0.78	5,961.13
Horsham	2,611.24	1,267.20	0.51	5,764.44	2,288.51	0.60	3,555.71
Lansdale	10,032.37	5,216.83	0.48	60,295.96	47,115.59	0.22	52,332.43
Lower	168,245.82	87,487.83	0.48	575,510.64	349,872.50	0.39	437,360.30
Montgomery	25,443.78	13,230.77	0.48	135,550.26	97,897.57	0.28	111,128.30
North Wales	8,414.77	4,375.68	0.48	50,070.60	37,955.87	0.24	42,331.55
Philadelphia	133,827.01	115,091.23	0.14	1,413,863.47	265,770.10	0.81	380,861.30
Springfield	51,241.03	38,361.29	0.25	700,517.47	151,803.80	0.78	190,165.00
Upper Dublin	350,903.91	131,125.58	0.63	906,098.66	333,482.10	0.63	464,607.60
Upper	73,016.96	37,968.82	0.48	695,874.85	512,615.60	0.26	550,584.30
Upper	1,108.17	366.85	0.67	1,303.29	494.72	0.62	861.57
Whitemarsh	79,221.96	51,034.76	0.36	479,266.95	188,497.70	0.61	239,532.40
Whitpain	105,137.80	55,148.05	0.48	357,776.46	236,125.20	0.34	291,273.30
Worcester	1,423.06	739.99	0.48	10,644.84	9,610.08	0.10	10,350.07

The WLA for the municipalities identified above is the summation of the stream bank erosion and overland flow components identified in Table 4-12.

4.2.6 Critical Conditions

The GWLF model is a continuous-simulation model that uses daily time steps for weather data and water balance calculations. Monthly calculations are made for sediment and nutrient loads, based on the daily water balance accumulated to monthly values. Because there is usually a significant lag time between the introduction of sediment to a waterbody and the resulting impact on beneficial uses, establishing these TMDLs using average annual conditions is protective of the waterbody. Accounting for annual conditions ensures protection of Wissahickon Creek and tributaries through consideration of all seasonally variable hydrologic conditions, including extended wet periods, periods associated with isolated storms, and dry periods with intermediate rainfall events. By basing the TMDL on annual average conditions, both high and low flow conditions were taken into account, as well as seasonality.

4.2.7 Seasonal Variation

The continuous-simulation model used for this analysis considers seasonal variation through a number of mechanisms. Daily time steps are used for weather data and water balance calculations. The model requires specification of the growing season and hours of daylight for each month. The combination of these model features accounts for seasonal variability. As mentioned in the previous section, by basing the TMDL on annual average conditions, both high and low flow conditions were taken into account, as well as seasonality.

5.0 Reasonable Assurance and Implementation

Development of TMDLs is only the beginning of the process for stream restoration and watershed management. Load allocations to point and nonpoint sources serve as targets for improvement, but success is determined by the level of effort put forth in making sure that those goals are achieved. Load reductions proposed by nutrient and siltation TMDLs require specific watershed management measures to ensure successful implementation.

5.1 Nutrient TMDL

Implementation of best management practices (BMPs) in conjunction with waste load reductions from point sources should eventually achieve the loading reduction goals established in the TMDLs. Further "ground truthing" should be performed in order to assess both the extent of existing BMPs, and to determine the most cost-effective and environmentally protective combination of BMPs required for meeting the nutrient reductions outlined in this report.

For stream segments of Trewellyn Creek (971217-1145-ACE), Lorraine Run (971215-1000-ACE), and headwaters of Pine Run (971215-1300-ACE), no reductions from point sources were necessary because either none were present or data was not available to suggest that DO criteria were not being met. Data was simply not available for model calibration or verification that there was an impairment. For these segments, it is assumed that biological conditions in the stream are most likely caused by environmental factors that can be remedied through proper management techniques, rather than a result of load reductions in the stream. Specific BMPs are suggested by EPA to provide assurance that biological improvements are provided for these stream segments. Poor biological conditions are considered to be controlled by two primary factors for these segments: (1) extremely shallow conditions in the stream caused by lack of baseflow, and (2) lack of sufficient shading to naturally reduce the biological activity stimulated by higher water temperatures resulting from exposure to direct sunlight. To provide additional baseflow for the low-flow period, BMPs are recommended that encourage infiltration through either stormwater retention or stream buffer zones. Such management practices would also address those stream segments of the Wissahickon Creek basin included on the 303(d) list as a result of impairments associated with water/flow variability. To increase shading, EPA recommends that additional tree canopy be provided along the stream banks.

Several other stream segments will benefit from similar BMPs in conjunction with upstream waste load reductions. Additional tree canopy can potentially reduce biological activity causing diurnal variability of DO concentrations resulting in violations of water quality standards. In addition, BMPs that seek to increase baseflow can result in additional assimilative capacity of the stream for point source discharges.

The nutrient TMDL and WLAs reported herein are contingent on the assumption that NPDES permits for the five significant municipal facilities increase the effluent DO concentrations to 7.0 mg/L as a daily minimum. To provide flexibility in implementation, equally protective TMDLs and WLAs were determined for several scenarios: (1) all major discharges with DO levels at 6.0 mg/L (includes required increases from Ambler Borough and Abington Township), and (2) all major dischargers with DO levels at 7.0 mg/L, 3) all major dischargers with DO levels at 7.5 mg/L, 4) all major dischargers with DO levels at 7.75 mg/L, and 5) all major dischargers with DO levels at 8.0 mg/L. These scenarios will be used as guidance for reissuing NPDES permits so that the TMDLs are met. The reader is referred to Appendix D of this report for a discussion of the WLAs required to attain and maintain state water quality standards for each of the above scenarios. EPA recommends that WLAs and amendments to permit limits be based on the concentrations specified in Tables 4-3 and 4-4. However, the concentrations presented in Appendix D could also be considered as viable options for the permitting authority. These would ensure protection of the stream segments under all varying seasonal and hydrology conditions.

This TMDL considered the implementation of seasonal limits. Chapter 4 of this report presents the recommended allocations to two seasonal periods for which this TMDL is applicable. In addition, Pennsylvania Department of Environmental Protection (DEP) has established a seasonal effluent limitations strategy for permitting point sources. This strategy is documented in DEPs policy "Determining Water Quality-based Effluent Limits", December 9, 1997. This strategy establishes a set of seasonal "multipliers" for various conventional and non-conventional pollutants. Table 5-1 provides these multipliers for the pollutants covered under this TMDL. Note that the state has not included a multiplier for dissolved oxygen or nitrite-nitrate (NO2-NO3). For this TMDL, EPA has assumed that the multiplier for NO2-NO3 is the same as the one for phosphorus.

Table 5-1. Seasonal multipliers based on DEPs seasonal effluent limitations strategy

Parameter	Seasonal Time Period	Winter Limit Multiplier
BOD	Nov 1 - Apr 30	2.0
Phosphorus	Nov1 - Mar 31	2.0
Ammonia	Nov 1 - Apr 30	3.0

Based on these multipliers and seasonal time periods for the pollutants of concern, 'winter' limits were determined. Note that this TMDL did not include water quality modeling for the 'winter' period and the 'winter' limits are based solely on DEP's strategy. Modifications to these 'winter' limits can be made with no impact on this TMDL. Table 5-2 below provides the 'winter' limits for the five significant municipal facilities considered in this TMDL. These winter limits are based on two separate periods. Since the trout stocking standard applies from mid-February through June, the winter multipliers for the period mid-February to May 1 for BOD and mid-February through April 1 for Phosphorus and NO2-NO3 were applied to the allocations determined for the low flow stocking period. The warm water fishes standard applies from July through mid-February so the winter multipliers for the period November to mid-February for BOD and November through mid-February for Phosphorus and NO2-NO3 were applied to the allocations determined for the low flow warm water fishes period

Table 5-2. Seasonal limits based on Pennsylvania's strategy (mg/L)

Pollutants	North Wales	Upper Gwynedd	Ambler	Abington	Upper Dublin
BOD (Nov 1 - Feb 15)	11.8	17	20	20	30
BOD (Feb 15 - April 30)	6.0	10.0	20.0	15.0	25.5
Ortho P (Nov 1 - Feb 15)	4.8	6.4	9.2	9.3	4.6
Ortho P (Feb 15 - March 31)	2.8	3.6	9.2	3.7	2.95
NO2-NO3 (Nov 1 - Feb 15)	No Limit	No Limit	No Limit	No Limit	No Limit
NO2-NO3 (Feb 15 - March 31)	No Limit	No Limit	No Limit	No Limit	No Limit
NH3 (Nov 1 - Feb 15)	4.1	4.9	4.5	6	7.5
NH3 (Feb 15 - April 30)	1.5	2.22	4.5	2.16	6.75

As shown in results reported in the Nutrient Modeling Report, lower portions of Wissahickon Creek benefit from flows provided by Coorson's Quarry. Under current loading conditions, if quarry flows cease, the modeling system predicts that without TMDL load reductions, additional violations in the DO standards are likely to occur. Similar analysis was performed for TMDL allocations during the Trout Stocking period and results showed that if Coorson's Quarry decreases effluent flow to the minimum allowed (0.5 cfs) in their NPDES permit (revised in permit reissued in April 2003)), no additional DO violations occur (Appendix D).

To provide additional assurance that TMDLs are protective of the designated uses of the Wissahickon Creek basin, analysis was performed to ensure that WLAs for ammonia did not result in violations of water quality criteria. The ammonia standard is calculated based on pH and water temperature. During summer 2002, the median pH was 7.45 and the median water temperature was 23.9 degrees C. Under these conditions, the following instream criteria were calculated from PA standards:

Max. total ammonia nitrogen = 4.85 mg/L
Average total nitrogen over 30-day period = 1.14 mg N/L

To provide assurance that the Wissahickon Creek TMDLs do not impact the Water Supply designated use of the Schuylkill River, analysis was performed to ensure compliance with the Water Supply use criteria at the Queen Lane water intake. Results of this analysis are reported in Appendix E.

5.2 Siltation TMDL

There is reasonable assurance that the goals of this TMDL can be met with proper watershed planning, aggressive implementation of storm water flow and pollutant reduction best management practices (BMPs), and strong political and financial mechanisms. Reasonable assurance that the TMDLs established for sediment will require a comprehensive, adaptive approach that addresses:

- point and nonpoint source pollution,
- existing and potential future sources,
- regulatory and voluntary approaches.

The 64 square mile Wissahickon Watershed comprises a variety of land uses from urban to suburban to forest and parkland. The mainstem of the Creek traverses southeasterly for 24 miles through 16 Townships and several boroughs, from the headwaters in Lansdale to the mouth at the Schuylkill River in Philadelphia's Fairmount Park. The banks and surrounding land around the Wissahickon Creek vary as the Creek travels through each township and borough. The specific methods used to address high pollutant load reductions will vary with the land use along the particular segment of Creek. The methods used will also vary depending on the particular source of the pollutant load whether it is stream bank erosion from high flow conditions or overland flow which carries the pollutants from surrounding land.

The existing siltation problems in the Wissahickon watershed can be attributed to two main causes:

- <u>Stormwater Runoff</u> - Delivery of sediment to the stream carried by overland flow of stormwater (83.5% of total).

- <u>Instream Bank Erosion</u> - Sediment added to the water column because of stream bank erosion caused simply by the rapid delivery of a large volume of water to the stream during storms (16.5%of total). Frequent flashy storms which cause bankfull conditions result in significant erosion and scour of the stream bank

For purposes of allocating the loads, this TMDL report allocates the sediment fractions contributed by both instream bank erosion and overland flow as WLAs. These wasteload allocations are characterized as such due to the fact that the Wissahickon watershed is in an urbanized area that is regulated by the NPDES Program for MS4s discharge of stormater. While the loads can be grossly attributed to the MS4s as municipal point sources, the actual contribution of sediment may in some areas be due to "nonpoint sources" as well, including agricultural activities, forested lands, industrial activities, and other sources regulated and unregulated through the stormwater program.

The relative contribution of sediment by both sources varies throughout the watershed according to the distribution of land uses between urbanized and other sources, such as agriculture, and the amount of impervious cover in the watershed. Instream bank erosion is the most significant contributor. Therefore, reductions in the sediment entrained in overland flow must be accompanied by substantial reductions in the volume of water delivered to the stream in order to achieve the water quality objectives of the TMDL. Efforts must also be taken to control future potential sources of sediment and stormwater as new construction and redevelopment occurs. Because of the complexity of the problem and the potential solutions, an adaptive approach will be needed to achieve the TMDLs.

Pennsylvania's Approach to Control Stormwater

Both regulatory and nonregulatory approaches will be needed to achieve the necessary load reductions. Pennsylvania's program is being constructed to integrate State requirements under Act 167 for stormwater management planning, Federal requirements for permitting through the National Pollutant Discharge Elimination System (NPDES) program, and voluntary financial incentives provided to communities and project sponsors. Pennsylvania also recently adopted a *Comprehensive Stormwater Management Policy* (September 28, 2002)

Pennsylvania's *Comprehensive Stormwater Management Policy*

Stormwater management was identified as a priority in Pennsylvania during 15 water forums held throughout the State during 2001. As a result, DEP proposed a compressive stormwater management policy to more fully integrate post-construction stormwater planning requirements, emphasizing the use of ground water infiltration and volume and rate control best management practices (BMPs), into the National Pollutant Discharge Elimination System (NPDES) permitting program. The Policy also emphasizes the obligation under Pennsylvania's water quality standards (25 Pa. Code Section 93.4a) for stormwater management programs to maintain and protect existing uses and the level of water quality necessary to protect those uses.

Pennsylvania's *Stormwater Management Act of 1978* (Act 167)

In Pennsylvania, Act 167 requires each county to develop plans for each of its watersheds within its boundaries. This would be an excellent mechanism to properly plan watershed improvement projects in the Wissahickon. The watershed covered by an Act 167 Plan may cover a number of municipalities and could also cross county boundaries. Act 167 Plans must include provisions for improved water quality, groundwater recharge, post-construction storm water control standards, and stream bank protection strategies in addition to other storm water controls. In addition, a community must enact, administer, and enforce storm water ordinances within six months of PADEP's approval of the Act 167 Plans. Since 1985, Pennsylvania has been authorized to provided grants to counties up to 75% of costs of preparing the plans. Funds also authorized to provide municipalities with grants for implementation.

The Act 167 regulations specify that stormwater management plans be undertaken in two phases: Phase I, preparation of the Scope of Study; and Phase II, the actual plan preparation. Participation in Act 167 to date has been limited and most existing plans were developed to address flooding and not water quality. Pennsylvania is hopeful that participation in the program will increase now that more than 700 communities in Pennsylvania will need to have stormwater management plans in place to meet NPDES Program requirements. As of February 2003, 84 Act 167 plans have been completed by 46 counties, requiring 764 municipalities to implement ordinances. Also, 35 plans by 21 counties are underway (498 municipalities). To receive DEP approval, Act 167 plans must include water quality, groundwater recharge, post-construction stormwater control standards, and stream bank protection strategies in addition to stormwater quantity control. A community must enact, administer, and enforce its stormwater ordinances within six months of DEP approval. An Act 167 plan has not yet been prepared for the Wissahickon watershed.

Several benefits can accrue to communities who pursue Act 167 planning. As stated earlier, State funds are available for plan development. In addition, once a community has enacted its stormwater ordinances, the community may be eligible for PENNVEST Low Interest Loans to correct existing stormwater drainage problems. Projects may include transport, storage and infiltration of stormwater and best management practices to address point or nonpoint source pollution associated with stormwater.

Phase II Stormwater Permits or MS4s

Under the NPDES storm water program, operators of large, medium and regulated small municipal separate storm sewer systems (MS4s) require authorization to discharge pollutants under an NPDES permit. The NPDES permitting program is implemented by the Pennsylvania Department of Environmental Protection (DEP) under a delegation agreement with EPA.

Phase I of the Federal Stormwater NPDES Program began in 1990 and covered municipalities having a municipal separate storm sewer system and having a population greater than 100,000 (including portions of Philadelphia). Phase I also extended to construction activities which disturbed more than 5 acres of land and to 11 categories of industrial activity. In Pennsylvania, the City of Philadelphia is one of two cities covered under the Phase I program.

Phase II implementation is underway. Phase II requirements for the Federal NPDES stormwater program were described in Federal regulations at 40 CFR 122(a)(16) issued in December 1999. Phase II extended the requirement to small MS4s in urbanized areas as defined by the 1990 and 2000 census data and for construction activities requiring stormwater permits reduced the threshold for the land area disturbed to one acre. As a result, the 16 municipalities in the Wissahickon watershed are now being required to apply for and comply with NPDES permits for stormwater. Maps identifying the urbanized area which includes the Wissahickon watershed and its political jurisdictions can be found on DEP's website at www.dep.state.pa.us under the directLINK stormwater.

MS4s were required to apply for permit coverage by March 10, 2003. The application was required to describe the stormwater management program they intend to implement, including a schedule, best management practices and measurable goals for each element of the municipal program. MS4 communities are required to implement a stormwater management program in their jurisdictions by the end of their 5-year permit term in March 2008. Pennsylvania issued a general permit to be used for MS4 permits (PAG-13). MS4s encompassing Special Protection watersheds in Pennsylvania will be covered through individual permits. The MS4 permittees in the Wissahickon watershed have all applied for permit coverage and their applications are under review.

Implementation of the BMPs consistent with the stormwater management program and the "Minimum Control Measures" outlined in 40 CFR 132.34 is considered to constitute compliance with the standard of compliance, "maximum extent practicable" or MEP. To achieve reductions in stormwater discharges, EPA regulations establish six categories of "Minimum Control Measures" BMPs that must be met by permittees (these are "narrative" permit effluent limitations). The six BMP categories, also called "minimum control measures" in the Federal regulations, are:

1. Public education and outreach on stormwater impacts.

2. Public involvement/participation consistent with state/local requirements in the development of a stormwater management plan.

3. Illicit discharge detection and elimination, including mapping of the existing stormwater sewer system(including at least the outfalls) and adoption of an ordinance to prohibit illicit connections and control erosion and sedimentation from development. .

4. Control of runoff from construction sites when one to five acres of land are disturbed. (Phase I covered sites larger than five acres.)

5. Post-construction stormwater monitoring and management in new development and redevelopment, and

6. Pollution prevention and good housekeeping for municipal operations and maintenance facilities

Under Phase II, permittees are also required to establish measurable goals for each BMP. Pennsylvania has also developed a "Protocol" which MS4s covered under the general permit can adopt to satisfy the requirements of the permit. MS4s can also choose to develop their own programs, but they must seek DEP approval. EPA has developed a National Menu of BMPs available for meeting the minimum control measures. Information can be found on EPA's website at http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm.

It is important to note that while many MS4 Phase II permits in Pennsylvania are expected to be issued as general permits with individual communities submitting Notices of Intent (NOIs), there are other avenues available. MS4 permits could be issued in the future on a watershed basis to improve stormwater management where multiple jurisdictions are responsible for a single watershed, as is the case in the Wissahickon, or where the approach can be specialized to focus on a pollutant of concern to all, such as sediment. A watershed permit could contain specialized requirements, provide the flexibility to facilitate pollutant trading to achieve results, and also provide economies of scale in plan development and implementation.

The Relationship of MS4 Permits to TMDLs

The MS4 communities in the Wissahickon watershed have received WLAs for sediment. A November 22, 2002, EPA Memorandum entitled "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Stormwater Source and NPDES Permit Requirements Based on Those WLAs" clarified existing regulatory requirements for MS4s connected with TMDLs. The Memorandum also affirms EPA's view that an iterative adaptive management BMP approach is appropriate. Some of the major points raised in the Memorandum include the following:

- NPDES-regulated stormwater discharges must be considered in the TMDL asWLAs and may not be addressed by the LA component of the TMDL.
- Most water quality based effluent limitations for NPDES-regulated municipal and small construction stormwater discharges will be in the form of BMPs.
- Numeric limits will be used in permits only in rare instances.
- EPA expects WLAs and LA's in TMDLs to be in numeric form, although EPA recognizes that these allocations might be fairly rudimentary because of data limitations and variability in the system.
- Stormwater discharges from sources that are not currently subject to NPDES requirements may be listed as LAs.
- The NPDES permit should specify monitoring necessary to comply with effluent limitations, to determine if expected load reductions from BMPs are expected to achieve the WLA in the TMDL, i.e., BMP performance data.
- The permit should also provide a mechanism to make adjustments to the required BMPs as necessary to insure adequate performance.

In order to carry out the Phase II NPDES Stormwater program, DEP developed a General Permit for Stormwater Discharges from Small MS4s (PAG-13) to provide NPDES coverage to the more than 700 municipalities in Pennsylvania, which EPA reviewed and approved. As described by PAG-13, the MS4 permittee must, within the permit term, implement and enforce a stormwater management program approved by DEP which is designed to reduce the discharge of pollutants from its MS4 to the maximum extent practicable, with the goal of protecting water quality and satisfying the appropriate water quality requirements of the Federal Clean Water Act and the Pennsylvania Clean Streams Law. The program must contain a schedule, Best Management Practices (BMPs) and measurable goals for the six Minimum Control Measures as described in the Federal regulations and in PAG-13 and the program be approved by DEP. Communities who wholly or in part encompass Special Protection Watersheds are expected to apply for individual permits.

In accordance with Phase II NPDES Stormwater requirements, the municipalities in the Wissahickon watershed were required to apply for a permit by March 10, 2003 and are required to implement a stormwater management program by March 10, 2008. All have done so and their Notices of Intent are under review. PAG-13 outlines the following schedule for the next five years and includes the six minimum measures and measures of success.

Watershed Planning

The first step to effectively address the complex and varied nature of this part urban, part suburban, and rural watershed, is to develop a Watershed Management Plan which contains a plan of action for flow and pollutant load reduction and groundwater recharge. The Plan should address three major facets of watershed rehabilitation including 1) flow and pollutant reduction mechanisms (structural and nonstructural BMPs); 2) institutional mechanisms (Memorandum Of Agreements between municipalities and revised municipal ordinances); and 3) funding mechanisms (state and Federal grants, local utility fees etc.)

Flow and Pollutant Reduction Mechanisms - Storm Water BMPS

The major categories of BMPs that exist to reduce overland flow, promote groundwater recharge and reduce pollutant loads to streams include the following.

Nonstructural BMPs

- Public Education and Involvement
- Mapping of storm water utility
- Illicit discharge detection and elimination
- Good housekeeping practices

Structural BMPs

- Subsurface Storage
- Detention Ponds (with proper design)
- Infiltration Facilities
- Vegetative Filter Strips
- Wetlands and Bioretention
- Porous Pavement
- On-site runoff mechanism
- Low impact development

Urban areas with a high percentage of impervious ground cover are often difficult places to incorporate many of the BMPs listed. Protecting water quality in these areas is difficult for many reasons including, diverse pollutant loads, large runoff volumes, limited areas suitable for surface water treatment systems, high implementation costs, and destruction of natural buffer zones adjacent to water bodies. There are however, numerous case studies and a growing amount of research that exists on this subject that indicates using a combination of BMPs to fit the constraints of urban areas can be successful in restoring water quality and recharging the groundwater. A detailed article about an urban retrofit in Seattle, WA may be found at http://seattlepi.nwsource.com/local/95881_model20.shtml A detailed description of storm water treatment practices to achieve Storm Water Phase II Retrofit in Madison, Wisconsin can be found on EPA's web site at www.epa.gov/owow/nps/natlstormwater03.

BMPs best suited for urban areas include: retrofit of existing runoff management facilities to increase their size or promote enhanced infiltration; installing trash capturing devices in the utilities, install inlet and grate inserts that trap oil and sediment; disconnecting rather than eliminating impervious areas with vegetated buffers; infiltration devices or other pervious materials; installing bioretention landscaping in parking lots; incorporating velocity dissipation devices such that the natural physical and biological characteristics and functions are maintained, etc. There is an approach for highly urbanized areas that has been developed by the EPA which is described in *National Management Measures to Control Nonpoint Source Pollution from Urban Areas*, December 2002, which would be an excellent resource for watershed restoration in portions of the Wissahickon. (www.epa.gov/owow/nps/urbanmm/index/htm) Additional watershed restoration resources (BMPs) are included following this discussion. Communities could also establish a program to evaluate existing stormwater sources and prioritize those for retrofits to maximize reductions in stormwater discharges. Additional information on the benefits of retrofits is available at www.stormwatercenter.org.

Institutional Mechanisms

Memorandum of Agreement (MOA) between municipalities
Municipal Ordinance that promotes preservation or restoration of natural hydrologic cycle
Building Codes that require Low Impact Development (LID)

MOAs can be established between Municipalities to work cooperatively and share resources. These types of MOAs have worked successfully in many parts of the country. Los Angeles, for instance has an agreement between 18 municipalities to implement the storm water regulations jointly. North Central Texas Council of Governments has an agreement with all townships in the Trinity Watershed to share outreach materials and contribute to one central website.

PADEP has finalized a Model Ordinance for municipalities that operate "municipal separate storm sewer systems" (MS4s) is available on DEP's website at www.dep.state.pa.us under the directLINK stormwater. This Model Ordinance can be adopted by municipalities or used as a guide in developing their own. The Model Ordinance sets forth provisions to prohibit nonstorm water discharges, erosion and sediment control plans, and requirements for post construction runoff from new development and redevelopment. The model Ordinance includes Low Impact Development techniques for storm water management within municipalities.

Funding Mechanisms

Federal Grants (CWA Section 104(b)(3), CWA Section 319, State Revolving Fund)
State Grants (Act 167 grant, Growing Greener, PENNVEST)
Local storm water utility fees

One of the best and most readily available funding sources of those listed above is Pennsylvania's Stormwater Management Act, Act 167. Since 1985, Pennsylvania has been authorized to provide grants to counties up to 75% of costs of preparing the plans. Municipalities are provided similar grants for implementation. EPA funds are available through Pennsylvania under CWA Section 319 or the Nonpoint Source Program to fund some of those projects. As of November 27, 2002, 319 funds were also made available for activities relating to the implementation of the NPDES Storm Water Phase II program for FY 2003. At the time of writing of this TMDL, these Section 319 funds were being made available for FY 2004. (President Bush signed into law on November 27, 2002 the *Great Lakes Legacy Act of 2002*, HR 1070, S 2544).

Growing Greener provides State funding and is by Pennsylvania as the mechanism to fund projects under Section 319. Growing Greener has provided funding for stormwater retrofits, demonstrated by grants to five entities in southeastern Pennsylvania last year to address stormwater. DEP's Southeastern Regional Office has also placed a high priority on activities to better control stormwater, reflecting the strong public interest in this area.

Table 5-3 is a useful guide for funding sources available nationally and through the state. In addition to these grants and loans, Municipalities themselves have the option of developing storm water utility fees or to incorporate costs to operate storm water facilities in the water or sewer bill of residents.

Additional Watershed Restoration Resources - BMPs

1. National Menu of Best Management Practices for Storm Water Phase II (www.epa.gov/npdes/menuofbmps/menu.htm)

2. National Storm Water Best Management Practices (BMP) Database *www.bmpdatabase.org*

3. Preliminary Data Summary of Urban Storm Water Best Management Practices, EPA document, August 1999, EPA-821-R-99-012, Washington, DC. (www.epa.gov/ost/stormwater)

BMP Options	Typical Sediment Removal (percent)
Retention Basins	50 - 80
Constructed Wetlands	50 - 80
Infiltration Basins	50 - 80
Infiltration Trenches/Dry Wells	50 - 80
Porous Pavement	65-100
Vegetated Filter Strips	50 - 80
Surface Sand Filters	50 - 80
Other Media Filters	65-100

4. EPA Chesapeake Bay Program document titled, "Storm Water Best Management Practice Categories and Pollutant Removal Efficiencies", updated March 10, 2003. (Chesapeake Bay Program's Urban Storm Water Workgroup, Annapolis, MD, www.chesapeakebay.net/uwg.htm, select "Current Projects and Information")

BMP Options	Typical Sediment Removal (percent)
Wet Ponds and Wetlands	80%
Filtering	85%
Infiltration	90%
Streambanks Restoration	2.55 lb/ft

Additional Watershed Restoration Resources - Funding Mechanisms

1. Growing Smarter Toolkit: Catalog of Financial and Technical Resource
A listing of current technical and financial assistance programs available in Pennsylvania. Each listing provides basic information on the program and a point of contact for more information
http://www.inventpa.com/docs/GrowingSmarterToolkit.pdf Or write to:
Governor's Center for Local and Governmental Services, Dept of Community and Economic Development, 400 North St, 4th Floor, Commonwealth Keystone Bldg, Harrisburg, PA 17120
This resource includes links to Pennsylvania's Growing Greener Grant Program at www.dep.state.pa.us/growgreen/

2. The Catalog of Federal Domestic Assistance
This web site gives you access to a database of all Federal programs available to State and local governments (including the District of Columbia); Federally-recognized Indian tribal governments; Territories (and possessions) of the United States; domestic public, quasi-public, and private profit and nonprofit organizations and institutions; specialized groups; and individuals.
http://www.cfda.gov/

3. An Internet Guide to Financing Storm water Management This guide addresses the complex series of questions that managers must answer when developing plans to pay for storm water programs. For example:
– How much revenue will we need?
– What are the alternative ways to generate revenue?
– How can we match sources to needs?
– How much are people willing to pay?

This guide is a compilation of effective funding tools that has evolved during the past 25 years as public managers have developed interesting, innovative approaches to paying for runoff programs.
http://stormwaterfinance.urbancenter.iupui.edu/

Important Note #1: The Center for Urban Policy and the Environment as well as the American Waterworks Association are also excellent reference points of contact for information on funding. They have extensive lists of contacts and papers explaining how other cities and towns have worked through the Storm Water Phase II implementation.

Important Note #2 : Studies show that municipal storm water management can cost residents on average between $6.00 to $22.00 a year in increased fees.

Table 5-3 Sources of NPDES stormwater funding for state and local governments

Name of Grant/ Source of Funding	Brief Description	Eligibility	Contact/How to Apply	Amount of Funding Available	Application Deadline
Chesapeake Bay Small Watershed Grants Program	Grants for work at the local level to protect and improve watersheds in the Chesapeake Bay Watershed.	local governments and non-profits	National Fish and Wildlife Foundation, 1120 Connecticut Ave, NW, Suite 900, Washington, DC 20036 http://www.nfwf.org/programs/chspke_app.htm – Jonathan Mawdsley (202) 857-0166	Total $2½ million – typical grant is around $25,000	Annually on February 1st
Five Star Restoration Challenge Grant Program	Grants for community based wetland, riparian and coastal habitat restoration projects	Local governments and non-profits	National Fish and Wildlife Foundation, 1120 Connecticut Ave, NW, Suite 900, Washington, DC 20036 http://www.nfwf.org/programs/5star-rfp.htm – Tom Kelsh (202) 857-0166	Average grant is $10,000	Annually on March 1st
Economic Development Administration, US Dept of Commerce	Project grants to assist in the construction of public works in areas experiencing substantial economic distress. For description of program: http://www.cfda.gov/static/p11300.htm	States, cities, counties, institutions of higher education, and Economic Development Districts, and private or public nonprofit organizations or associations	Applicants MUST contact the EDR servicing the State in which the project is located or other designated EDA Official. The economic development representative or other appropriate EDA Official assigned as coordinator for the project will provide necessary forms and assistance to interested applicants Philadelphia Regional Office http://www.osec.doc.gov/eda/html/1a11_1e_philadelphia.htm Curtis Center, Suite 140 South Independence Square West Philadelphia, PA 19106-3821 215-597-4603 Paul M. Raetsch, Regional Director praetsch@eda.doc.gov	On average, EDA grants cover approx 50 % of project costs.	No fixed deadline

Name of Grant/ Source of Funding	Brief Description	Eligibility	Contact/How to Apply	Amount of Funding Available	Application Deadline
Coastal Zone Management **(CZM)** and Coastal Nonpoint Pollution Program **(CNPP)** Grants	These grants fund local projects that enhance the capabilities of local organizations to prevent nonpoint source pollution, including storm water	State agencies, local government, regional agencies, and nonprotfit groups	Application forms can be obtained from the Delaware Valley Regional Planning Commission (DVRPC) web page at http://www.dvrpc.org/planning/czm/AppGuide2002Rev.pdf Jim Nagy, Coastal Zone Management Program at 717-783-2402, email: jnagy@state.pa.us.	$20,000-$40,000 (max $50,000)	9/27/02 (annually in September)
Clean Water Act Section 104(b)(3), EPA Headquarters	Project grants for unique & innovative projects that address the requirements of the NPDES program. Please note this is a competitive process.	State water pollution control agencies, interstate agencies, Tribes, colleges and universities, and other public or nonprofit organizations	www.epa.gov/owm/cwfinance/index.htm	Range/Average of Financial Assistance - $5,000 to $500,000 per project	Not posted for FY '03
Clean Water Act Section 106	To assist States/Interstate agencies in establishing & maintaining adequate programs and measures for prevention and control of surface & ground water pollution.	State and Interstate water pollution control agencies	State Applications should be sent to EPA, Region III, Grants Audit & Management Branch.	Amount to each State determined by a national formula	August 1, 2002 for FY '03 Grants

Name of Grant/ Source of Funding	Brief Description	Eligibility	Contact/How to Apply	Amount of Funding Available	Application Deadline
Pennsylvania Infrastructure Investment Authority (**PENNVEST**)	Low interest loans for design, engineering, and construction of municipal storm water and conveyance and control systems, drinking water facilities, and wastewater systems. **NOTE**: Any municipality, authority or private entity that is eligible under a **PENNVEST** project will be automatically considered for **PENNVEST** Growing Greener grant funds.	Any owner and/or operator of a water, sewer or municipal storm-water system.	http://www.pennvest.state.pa.us/pennvest/cwp/view.asp?A=4&Q=72530 contact: Beverly Reinhold (717) 783-6589 breinhold@state.pa.us	loan amount of up to 100% of total project cost, based on need; ; amount of loan varies - up to $11 million per project for one municipality - up to $20 million for more than one municipality	no set deadline
Watershed Restoration and Protection Grants **(PADEP)**	Grants for watershed restoration and protection (e.g., abandoned mine drainage and urban and agricultural runoff)	Municipalities, watershed associations, conservation districts, nonprofit groups	www.dep.state.pa.us/growgreen http://www.dep.state.pa.us/growgreen/watershedprotection/FactSheets/G2factsheet.pdf NOTE: applicants MUST discuss their project with a watershed manager prior to submitting application. 717-705-5400	$55 million annually statewide	2/3/03 (tentative) and annually thereafter
DEP Storm water Management Program	The storm water management program administers a grant program under the Storm Water Management Act (Act 167) for counties to prepare watershed plans to manage storm water runoff from new land development activities. Plans are implemented by municipalities through the enactment or amendment of local ordinances.		http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/stormwatermanagement.htm Durla Lathia PADEP P.O. Box 8555 Harrisburg, PA 17105 email: dlathia@state.pa.us	$1.2 million annually statewide	

6.0 Public Participation

Public participation is not only a requirement of the TMDL process, but is essential to its success. At a minimum, the public must be allowed at least 30 days to review and comment prior to establishing a TMDL. Also, EPA must provide a summary of all public comments and responses to those comments to indicate how the comments were considered in the final decision.

Multiple publicly held meetings have been provided throughout all stages of the project to inform and update the public on all aspects of the project as it evolved. The public was encouraged to participate in data collection efforts and provide comments to a report of the data review and proposed TMDL methodology prior to TMDL development. In addition, EPA provided the public the unique opportunity to suggest modeling scenarios prior to TMDL development. As a result, several suggestions of stakeholders were included in TMDL development. The following provides a chronology of opportunities for public participation provided throughout the project:

October 23, 2001	Public meeting to discuss overview of Wissahickon Creek impairments, objectives of TMDLs, and alternative methodologies for TMDL development.
January 4, 2002	Draft *Data Review for Wissahickon Creek, Pennsylvania* was provided to public for comment
January 17, 2002	Public meeting to discuss selected methodologies for TMDL development
March 1, 2002	Final *Data Review for Wissahickon Creek, Pennsylvania* and responses to public comment were provided to stakeholders; as requested, stakeholders were provided a list of data collection to assist in TMDL development.
April 4, 2002	Public meeting to discuss (1) data collection for nutrient TMDL development and (2) reference watershed selection.
November 4, 2002	Public meeting to discuss (1) results of summer 2002 data collection, (2) preliminary results of model calibration for nutrient TMDL development, and (3) the selected reference watershed
November 7, 2002	Letter to stakeholders inviting suggestions regarding model scenarios to be tested nutrient TMDL development (scenarios due by November 18)
February 10, 2003	Public notice of draft *Nutrient and Siltation TMDL Development for Wissahickon Creek, Pennsylvania* (comment period ending March 14)

March 4 & 5, 2003	Two public meetings providing presentation of nutrient and siltation TMDL results; addendum to draft *Nutrient and Siltation TMDL Development for Wissahickon Creek, Pennsylvania* provided.
March 11, 2003	Draft *Modeling Report for Wissahickon Creek, Pennsylvania Nutrient TMDL Development* provided to stakeholders to assist in technical review of model.
March 14, 2003	Comment period extended to March 28, 2003.
June 9, 2003	Public notice of second draft *Nutrient and Siltation TMDL Development for Wissahickon Creek, Pennsylvania* with responses to comments of first draft.
June 13, 2003	Public meeting providing presentation of technical issues associated with the nutrient and siltation TMDL results; addendum to draft *Nutrient and Siltation TMDL Development for Wissahickon Creek, Pennsylvania* provided.
June 16, 2003	Public meeting providing presentation of general issues associated with the nutrient and siltation TMDL results; addendum to draft *Nutrient and Siltation TMDL Development for Wissahickon Creek, Pennsylvania* provided.

In addition to the events outlined above, EPA met with stakeholders on several occasions throughout and after the public comment period of the first draft *Nutrient and Siltation TMDL Development for Wissahickon Creek, Pennsylvania* to discuss options for nutrient TMDLs. These meetings provided stakeholders' opportunity to question EPA's contractor during technical review of the models and provided EPA with insight regarding model scenarios that could be tested for development of WLAs.

Following public comment, the draft *Modeling Report for Wissahickon Creek, Pennsylvania Nutrient TMDL Development*, the low-flow model utilized for development of nutrient TMDLs was revised to address concerns of stakeholders. Likewise, specific issues were addressed regarding calculation of siltation TMDLs. Due to the extent of modifications to the analytical framework resulting in subsequent changes in TMDL results and WLAs, the TMDL Report was re-opened for public comment on June 9th, 2003.

7.0 References

Ambrose, R.B., T.A. Wool, J.L. Martin, J.P. Connolly, and R.W. Schanz. 1991. WASP5.x, A Hydrodynamic and Water Quality Model - Model Theory, User's Manual, and Programmer's Guide. USEPA, Athens, GA.

Bennett, A.F. 1976. Open boundary conditions for dispersive waves. J. Atmos. Sci. 32:176-182.

Bennett, A.F., and P.C. McIntosh. 1982. Open ocean modeling as an inverse problem: tidal theory. *J. Phys. Ocean.* 12:1004-1018.

Blumberg, A.F., and L.H. Kantha. 1985. Open boundary condition for circulation models. *J. Hydr. Engr.* 111:237-255.

Boyer, M.R. 1989. Aquatic Biological Investigation, Wissahickon Creek, 3/15/89 (unpublished internal report). PA DEP, Conshohocken, PA.

Boyer, M.R. 1997. Aquatic Biology Investigation, Wissahickon Creek, 6/17/97 (unpublished internal report). PA DEP, Conshohocken, PA.

Delaware Valley Regional Planning Commission. Wissahickon Creek land use GIS coverage, provided by Philadelphia Water Department.

Evans, B.M., and D.W. Lehning. 2000. *ArcView GWLF for Windows*. Version 3.0. Environmental Resources Research Institute, Pennsylvania State University, University Park, Pennsylvania. (Note: The software was distributed on CD on April 21, 2000. The CD also includes Pennsylvania State GIS data sets for watershed modeling.)

Evans, B.M., S.A. Sheeder, and W.S. Brown. 2000. AVGWLF Users Guide. Environmental Resources Research Institute, Pennsylvania State University, University Park, PA.

Evans, B.M., S.A., Sheeder, K.J. Corrandi, and W.S. Brown. *AVGWLF Version 4.0: User's Guide*. November 2001.

Everett, A.C. 2002. Periphyton Standing Crop and Diatom Assemblages in the Wissahickon Watershed. (unpublished internal report). PA DEP, Conshohocken, PA.

Haith, D.A., and L.L. Shoemaker. 1987. Generalized Watershed Loading Functions for Streamflow Nutrients. Water Resources Bulletin 23(3):471-478.

Haith, D.A., R. Mandel, and R.S. Wu. 1992. *GWLF: Generalized Watershed Loading Functions User's Manual, Version 2.0.* Department of Agriculture and Biological Engineering, Cornell University, Ithaca, NY

Hamrick, J.M. 1992. A Three-Dimensional Environmental Fluid Dynamics Computer Code: Theoretical and Computational Aspects, Special Report 317. The College of William and Mary, Virginia Institute of Marine Science. 63 pp.

Hamrick, J. M. 1994: Linking hydrodynamic and biogeochemcial transport models for estuarine and coastal waters. *Estuarine and Coastal Modeling, Proceedings of the 3rd International Conference,* ed. M.L. Spaulding et al., pp. 591-608. American Society of Civil Engineers, New York.

Lung, W.S., 1994. Water Quality Modeling of the ST. Martin River, Assawoman and Isle of Wight Bays, Final report to Maryland Department of the Environment.

PA DEP, 1997. Implementation Guidance for Determining Water Quality Based Point Source Effluent Limitations. Document ID: 391-2000-003.

PA DEP. 2002. Comprehensive Stormwater Management Policy.

Pennsylvania Code. Title 25, Environmental Protection. Web page: http://www.pacode.com/secure/data/025/025toc.html

Schubert, S.T. 1996. Aquatic Biology Investigation, Wissahickon Creek, 2/6/96 (unpublished internal report). PA DEP, Conshohocken, PA.

Strekal, T.A. 1976. Aquatic Biology Investigation - Sewerage, Wissahickon Creek, 12/29/76 (unpublished internal report). PA DEP, Conshohocken, PA.

Tetra Tech, Inc. 2000. Total Maximum Daily Load For the Conodoguinet Creek Watershed Pennsylvania. Prepared for PA DEP and EPA Region 3.

Tetra Tech, Inc. 2002. Data Review for Wissahickon Creek, Pennsylvania. Prepared for PA DEP and EPA Region 3.

USEPA. 1998. Better Assessment Science Integrating Point and Nonpoint Sources. BASINS, Version 2.0 User’s Manual. EPA-823-B-98-006. USEPA, Office of Water.

USEPA Region 3, 2000. Hydrodynamic and Water Quality Model of Christina River Basin, Pennsylvania, Delaware, and Maryland.

USEPA. 2002. Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs. Memorandum to USEPA Water Division Directors, Regions 1-10.

USEPA Region 3. 2001. Total Maximum Daily Loads for the Christina River Basin, Pennsylvania, Delaware, and Maryland.

USEPA Region 9. 2001. Modeling Approach, Calibration and Application of a Low-Flow Hydrodynamic and Water Quality Model of the Los Angeles River for Nutrient and Related Effects of TMDLs.

Vogelmann, J.E., T. Sohl, and S.M. Howard. 1998. Regional characterization of land cover using multiple sources of data. Photogrammetric Engineering and Remote Sensing 64: 45-57.

West, N. 2000. Diatoms of Wisshickon Creek (PA), (unpublished internal report). Academy of Natural Sciences of Philadelphia, Philadelphia, PA.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
01-01	E-mail commentor - General	See Response to Letter # 19.
02-01	E-mail commentor - General	See Response to Letter # 19.
03-01	E-mail commentor - General	See Response to Letter # 19.
04-01	E-mail commentor - General	See Response to Letter # 19.
05-01	E-mail commentor - General	See Response to Letter # 19.
06-01	E-mail commentor - General	See Response to Letter # 19.
07-01	E-mail commentor - General	See Response to Letter # 19.
08-01	E-mail commentor - General	See Response to Letter # 19.
09-01	E-mail commentor - General	See Response to Letter # 19.
10-01	E-mail commentor - General	See Response to Letter # 19.
11-01	E-mail commentor - General	See Response to Letter # 19.
12-01	E-mail commentor - General	See Response to Letter # 19.
13-01	E-mail commentor - General	See Response to Letter # 19.
14-01	E-mail commentor - General	See Response to Letter # 19.
15-01	E-mail commentor - General	See Response to Letter # 19.
16-01	E-mail commentor - General	See Response to Letter # 19.
17-01	E-mail commentor - General	See Response to Letter # 19.
18-01	E-mail commentor - General	See Response to Letter # 19.
19-01	The strongest protections proposed in the TMDL will end on July 31 of each year. This means that during the remainder of the summer when the Creek is at low flow and most at risk from pollution, it will receive inadequate protection. The stricter standards should continue through September to protect the creek when it is most vulnerable.	The varying allocations for the early summer and late summer are based on the changing state adopted water quality standards for dissolved oxygen. The limits established in this TMDL are protective of stream uses for both periods. The limits are also based on a low stream flow condition that will occur during the early summer as well as the late summer periods. Because the TMDL is designed to meet standards for both periods, the stream will be adequately protected during the critical environmental conditions.

Letter ID	Public Comment	EPA Response
19-02	The "low flow" calculation used in the TMDL is two and a half times higher than the measured flow. This contrived low flow number over estimates the amount of water in the creek at low flow and will lead to inadequate reductions of pollutants in the creek. The TMDL should use the actual measured low flow number to protect water quality.	The TMDL report and the modeling technical report addresses this issue. The commenter is referred to those reports for detailed discussion on how the low flow design condition was determined and the basis for the method used. EPA believes that the design flow used in this TMDL is appropriate and protective of stream uses and water quality standards. Although the critical flow for TMDL analysis is noted to exceed the 7Q10, this is due largely to the assumption that sewage treatment plants discharge at design flows specified in their respective NPDES permits. For TMDL calculation, design flows must be incorporated into the critical condition so that accurate WLAs can be determined for each permitted flow. Although NPDES permit holders may not historically discharge at design flows, WLAs must be calculated for those flows that are allowable under the permits. Therefore, to include these design flows with a background flow under 7Q10 conditions, a unique methodology was required. The sum of these effluent flows is 27.96 cfs, which exceeds the 7Q10 by 172% and conservatively considers critical conditions when the background streamflow is at 7Q10 low-flow conditions. Such conservativeness provides assurance that wasteload allocations are protective of the stream during critical low-flow.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
19-03	In this draft the biggest discharger of treated sewage into the Wissahickon Creek is not required to reduce its discharges. To fully protect the creek from excessive nutrient pollution, all upstream sewage treatment plants including the large ones, should be required to reduce their nutrient discharges.	In order to fully understand the reasoning behind the allocations made to the largest facility (Ambler) discharging to the Wissahickon one does need to understand the impacts of dilution and the actions and reactions of nutrients and other pollutants in the water body. The facilities discharging to the upper reaches of the stream are essentially the stream, i.e., there is no, or very little, water in the stream before the facility discharges it waste water. Because of this, very low concentrations of the pollutants are needed in the effluent to assure that the water quality standards are meet. As this waste water travels downstream ,the associated pollutants are 'assimilated'. That is how natural processes work to remove them from the stream, processes such as biological degradation of carbonaceous material and algal activity and other processes work to introduce additional dissolved oxygen into the steam. By the time this water reaches the Ambler discharge much of the nutrients have been removed from the stream. In addition the volume of water in the stream has increased. This process in total then provides water to dilute the waste water from Ambler. This dilution thus allows Ambler to discharge a waste that is higher in nutrient content. Other processes in the stream also change as the water volume increases and stream characteristics change. As all of these processes are analyzed as a whole, it can be shown, as has been done in the TMDL, that downstream waste water facilities have the benefit of changing stream conditions resulting in less of a pollutant reduction. The allocations for Ambler, although less stringent than for those facilities in the water's headwaters, will allow the stream to attain and maintain water quality standards. An understanding of the actions and interactions between the pollutants, algae and other biological processes occurring in the stream is needed to understand why nutrient load reductions are less for a larger facility. The commenter is urged to review the modeling report to get a better understand of the natural processes considered in the development of the TMDL.
19-04	Finally, the Wissahickon Creek should be required to meet the drinking water quality standards for nitrates and nitrites at its mouth since it empties into the Schuylkill River just a half a mile above the Philadelphia Water Department's Queen Lane intake. The draft TMDL relies too heavily on the Schuylkill River to dilute the nutrient pollution to meet drinking water quality standards. If for some reason, water drawn by the Queen Lane intake should contain a greater percentage of Wissahickon Creek water than EPA predicted, the Nitrate-Nitrite standard for drinking water supply could be violated and drinking water consumers could be placed at risk. The EPA should use the more protective methodology from the January 2003 draft TMDL	State water quality standards require that a nitrite-nitrate concentration of 10 mg/L be met at the point of water supply intake. Since there is no intake at the mouth of the Wissahickon Creek, requiring this concentration to be met at the mouth would be inconsistent with the state standards. EPA believes that a sufficient margin of safety has been included in the calculation of the nitrite-nitrate load reductions to fully protect the Philadelphia water supply intake. However, should conditions change in the future, than the TMDL will be reinstated. The commenter is referred to the TMDL report and the nutrient modeling report for a further discussion on how the Schuylkill River was considered in the analysis.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
20-01	E-mail commentor - General	See Response to Letter # 19.
21-01	E-mail commentor - General	See Response to Letter # 19.
22-01	E-mail commentor - General	See Response to Letter # 19.
23-01	E-mail commentor - General	See Response to Letter # 19.
24-01	E-mail commentor - General	See Response to Letter # 19.
25-01	E-mail commentor - General	See Response to Letter # 19.
26-01	E-mail commentor - General	See Response to Letter # 19.
27-01	All general questions, please see responses to #19.	See Response to Letter # 19.
28-01	E-mail commentor - General	See Response to Letter # 19.
29-01	E-mail commentor - General	See Response to Letter # 19.
30-01	E-mail commentor - General	See Response to Letter # 19.
31-01	Some previously subbmitted comments are still relevant. The Borough of Ambler has previously submitted many comments, especially on March 28, 2003 and April 11, 2003. While EPA has responded to many of those comments, some of the previously submitted comments are still relevant, and are included again with this set of comments. Some previously submitted technical comments and statements of fact have not been repeated in this document.	EPA has included the Response to Comments for the March 2003 draft TMDL.
31-02	Request for supporting documents. As requested in our February 14, 2003 letter, and again in our comments submitted April 11, 2003, we hereby request copies of all references and related documentation utilized in preparing this TMDL, including, but not limited to, all the materials referenced in Section 1.0 of the Draft TMDL, all the documents listed in Section 7.0 of the Draft TMDL, and the actual justification documents prepared for placing the Wissahickon Creek and associated tributaries on the 303d list	EPA is preparing a decision docket that will contain all of the documents that were used in the development of the TMDL in one location. This docket will be extensive. The commenter is invited to visit the EPA Region III offices and review the docket. We would be prepared to make copies of those documents that, during the visit, the commenter identifies. The complete documentation for the listing of the Wissahickon Creek and its tributaries in the state's section 303(d) list would be available from the state. It is suggested that the commenter contact the state to obtain this information.

Letter ID	Public Comment	EPA Response
31-03	The 30-day comment period for the simultaneous review of both the computer model and the TMDL documents is inadequate. Although the dischargers appreciate EPA's incorporation of many of our comments in the revised documents, simply too much material has been distributed for a thorough review to be completed in 30 days. Therefore, the dischargers may raise technical issues in the future after subsequent review of the TMDL documents	The dischargers may raise technical and other issues at any time. Note however, that EPA will be issuing this TMDL by no later than October 9, 2003.
31-04	All references to ortho-PO4 must be changed to ortho-PO4-P EPA has indicated that the intended analytical parameter for ortho-phosphate will be ortho-P04-P. All references in the TMDL documents should be revised accordingly.	All references to Ortho-PO4 have been changed to Ortho-PO4-P. In the rare chance that a reference has slipped through without being changed to Ortho-PO4-P, all readers should fully understand that the correct reference throughout the report is Ortho-PO4-P.
31-05	Data collected between the years 1990 and 2002 verifies that the wastewater dischargers on Wissahickon Creek do not pose a credible threat to the drinking water supply for the residents of Philadelphia. No potable water supply intake exists on the Wissahickon Creek, nor is any potable water supply intake planned for the Wissahickon Creek. Application of potable water supply criteria are inappropriate.	The NPDES permitted discharges have been given the privilege of discharging their waste water to the Wissahickon Creek or its tributaries. With this privilege comes the responsibility of the dischargers to assure that the users of the stream's water are fully protected against health and other issues. In addition, Pennsylvania's water quality standards protec the public water supply use statewide. Specifically suggesting that because there are no withdrawals on the Wissahickon there is no need to protect for potable water supply, and hence no need to reduce nitrite-nitrate levels in the effluent, is a narrow interpretation of the regulations and does not support the dischargers expected responsibilities. It is fully known that the City of Philadelphia has a potable water supply intake on the Schuylkill River and just a few hundred feet below the confluence with the Wissahickon Creek, and on the same river bank as the Wissahickon Creek. EPA hopes that it is also obvious to all that because of the location of this withdrawal Wissahickon water is part of the intake water and therefore portions of the Wissahickon water is used as a potable water supply. Therefore steps must be taken by those with the privilege of discharging waste water into the Wissahickon to assure that the water supply intake, whether or not that intake is directly on the Wissahickon Creek is adequately pretected.

Letter ID	Public Comment	EPA Response
31-06	Data collected between the years 1990 and 2002 verifies that the wastewater dischargers on Wissahickon Creek do not pose a credible threat to the drinking water supply for the residents of Philadelphia. The data presented by EPA in Appendix B of the TMDL document indicates that the maximum nitrate-nitrogen concentration observed at the mouth of the Wissahickon Creek between the years 1990 and 2001 was 7.89 mg/l. A sample collected by PADEP on August 15, 2002, when the average daily flow was 16.0 cfs (less than 7Q10) produced a nitrate-nitrogen concentration of 5.57 mg/l. Philadelphia Water Department has indicated maximum reported nitrate-nitrogen concentrations at the Queen Lane intake of 6 mg/l. These facts are presented to contradict the hyperbole that the WWTPs on the Wissahickon Creek pose a threat to the babies of Philadelphia.	US EPA is not stating that the Borough of Ambler is a threat to drinking water supplies. Rather, the TMDL is designed to ensure that at critical low flow conditions, when dischargers are at design effluent flows, drinking water supplies are protected. Wasteload allocations determined for the TMDL cannot impact the other designated uses, especially those related to human health.
31-07	Data collected between the years 1990 and 2002 verifies that the wastewater dischargers on Wissahickon Creek do not pose a credible threat to the drinking water supply for the residents of Philadelphia. No nitrite-nitrate NPDES effluent concentrations should be proposed for any wastewater treatment plant as part of the Wissahickon Creek TMDL.	EPA disagrees with this statement. Please see the response to comment 31-05 for EPA's position on the need to protect the water supply and the NPDES dischargers responsibilities to that end.
31-08	The Wissahickon Creek meets warm water fishes (WWF) during critical low flow periods.	The TMDL was based on assuring that the standards will attain and maintain existing water quality standards. Part of maintaining the standards is to look to the future to assure that standards will be met when the point sources are at full design flowdesign capacity.
31-09	The Wissahickon Creek does support the maintenance of stocked trout. Water with adequate dissolved oxygen for trout is available in the lower portions of the Wissahickon Creek during drought conditions. Therefore, the Wissahickon Creek continues to "maintain stocked trout" through the end of July 31, even during drought conditions.	Although the dissolved oxygen is adequate for trout stocking in the lower portions of the Wissahickon Creek, the same does not hold true for the upper portions and several of its tributaries, particularly under the design conditions. Since the trout stocking use designation applies to the entire Wissahickon Creek watershed, the statement that "...the Wissahickon Creek continues to maintain stocked trout throughout the end of July 31, even during drought conditions." is not accurate.

Letter ID	Public Comment	EPA Response
31-10	The trout stocked fishery criteria are being improperly applied. Upstream of Route 73, the designation of "maintenance of stocked trout" is an unattainable designated use during drought conditions in the Wissahickon Creek. The criteria for warm water fish can be maintained during drought conditions. The municipal dischargers object to the misapplication of the trout-stocking criteria in drought conditions. If EPA persists in applying the Trout Stocked Fishery criteria during critical low flow conditions, a Use Attainability Analysis (UAA) may be required to support the stream designation.	Federal regulations require that the TMDL be developed to attain and maintain existing water quality standards. Those existing water quality standards include a use designation of trout stocking for the entire Wissahickon Creek watershed. EPA properly applied the trout stocking criteria for dissolved oxygen as the basis for this TMDL. There are procedures for requesting and developing a use attainability analysis (UAA) to determine if a change in the a stream's use is appropriate. We suggest the commenter contact the state to get additional information on procedures if they wish to pursue a UAA.
31-11	The Pennsylvania Fish and Boat Commission's criteria presented in Management of Trout Fisheries in Pennsylvania Waters (1997) preclude the realistic possibility of trout stocking upstream of Route 73. No reach of the Wissahickon Creek between the Ambler WWTP and Fort Washington State Park would meet the availability and access requirements necessary to allow public trout fishing.	EPA has followed federal regulations in the use of the existing water quality standards for the development of this TMDL. EPA will not address possible standards changes or the appropriateness of existing standards in this TMDL. Any issues or concerns with existing standards should be directed to the state through the appropriate procedures.
31-12	The draft TMDL document provides specific guidance on improving water quality. Reference is made to section 5.1 where the EPA discusses how best management practices (BMPs) can be used to improve water quality. This section states, "Such management practices would also address those stream segments of the Wissahickon Creek basin included on the 303(d) list as a result of impairments associated with water/flow variability." The use of BMPs is a viable option that should be considered before imposing unnecessary TMDL once enough scientifically valid data are generated to determine what needs to be done.	The use of appropriate BMPs is a viable option for meeting the TMDL. Federal regulations to provide for the delay of the development of a TMDL until BMPs have been installed and evaluated. The results of the TMDL can be used as a basis for determining the need for BMPs, determining the level of removal necessary from BMPs to meet water quality standards and the general location of where BMPs would be most effective.

Letter ID	Public Comment	EPA Response
31-13	Areas of low DO occur in open canopy areas, which can be improved with BMPs. The second and third paragraphs of Section 5.1 of the Draft TMDL discuss that poor biological conditions are controlled by extremely shallow conditions in the stream and lack of sufficient shading. The Draft TMDL mentions that Best Management Practices (BMPs) should be considered to reduce biological activity, which causes diurnal variability of DO. EPA should apply this approach to all the areas of the Wissahickon Watershed where low diurnal AM DO values were observed before EPA issues any numerical TMDLs that would be issued into NPDES permits.	It is the dischargers responsibility to meet water quality standards. EPA will not apply BMPs, including the use of increased shading, in determining permit limits. Federal regulations and guidance allow for trading programs. If the discharger wishes to consider the possibility of trading options between point and nonpoint source controls, there are procedures for addressing that. However it is the dischargers responsibility to evaluate this tradeoff not EPA's. EPA nonertheless continues to encourage local efforts to restore the tree canopy and historian buffers.
31-14	Basis for 303(d) listing decision not provided with draft TMDL. The Draft TMDL does not include any specific documentation regarding the existing condition of the benthic community. Only references to previous studies are included, but copies of these references are not provided, nor are any specific quantifiable conclusions presented.	The state developed the list of waters in accordance with federal regulations. Each year the lists were developed, EPA reviewed and approved those lists. This process was completed outside of the TMDL development process. Documentation of the listing decisions can be found through the monitoring and assessment program. In addition, the lists have all been noticed for public comment, before EPA approval, at which time the public, including the commenter, had the opportunity to request the listing supporting information as well as question the listing of specific waters. Since adequate public participation for the listing decisions were made available through the listing process it has not and will not be repeated here. It is suggested that the commenter contact the state concerning the listing of any waters.
31-15	No reasonable assurance presented that the proposed changes in WWTP effluents will affect benthic community. The fact that the observed in-stream DO did not violate the Warm Water Fishery criteria suggests that the wastewater treatment plants are not impairing the benthic community within Wissahickon Creek. The proposed adjustments to the NPDES permits may cause an increase in the DO in the Creek, but since the minimum DO is already above 4.0 mg/1, EPA cannot reasonably assure that the benthic community will improve.	The TMDL considered critical design conditions in the development of the TMDL. These design conditions included an increase in effluent flow based in permitted values. Under those conditions it was noted that additional treatment was needed in order to assure that not only the warm water fishes use was protected but also the trout stocking use. The sediment TMDL was based on the need to protect benthic communities. During the summer 2003 monitoring period, a period characteristic of low flow, several violations of the aquatic life DO standard occurred on both Wissahickon Creek and Sandy Run. At critical low-flow conditions (7Q10), impacts on DO are expected to become worse. The calibrated water quality model verified this assumption, showing low DO at various locations in the watershed as a result of point source contributions of nutrients and impacts on biological processes in the stream. The TMDL Report and Nutrient Modeling Report clearly report this linkage, which is supported by a water quality model with a strong basis in general scientific practices.

Letter ID	Public Comment	EPA Response
31-16	PADEP sampling procedures may have violated critical EPA protocols. Analyses of the benthic community and DO measurements intended to demonstrate non-attainment of water quality criteria should be conducted over a 100 meter reach of stream to eliminate the possibility that the observed "deficient" area was not simply an anomaly, or due to non-representative sampling. Many of PADEP's dissolved oxygen measurements were indicated as being "directly" upstream or downstream from bridges. The proximity of bridges to sampling locations may invalidate the results obtained at those locations. Similarly, PADEP's dissolved oxygen measurements appear to have been collected in one isolated location, thereby not providing a representative analysis of the overall aquatic environment.	The quality assurance work plan developed by PADEP was reviewed and approved by EPA. The sampling was conducted consistent with that work plan. The basics of the sampling program was also shared with those interested citizens inthe Wissahickon and PADEP and EPA addressed any comments that were received.
31-17	EPA has assumed unrealistic flow scenarios. The dischargers currently do not discharge at their design flows in the summer months, and it is not anticipated that this will happen anytime in the near future. The model is based on low flow conditions. The probability of all dischargers meeting their design flow at the same time during low flow conditions is highly unlikely and not a realistic basis for imposing TMDL. We submit that EPA has the leeway to consider this factor and thereby use realistic conditions.	The commenter is referred to Appendix D of the TMDL report for a discussion on this issue.
31-18	The draft TMDL will impose a significant and unnecessary economic burden on the residents of Montgomery County. Cumulatively, the economic impact to residents of southern Montgomery County will be measured in the tens of millions of dollars, without any funding or reimbursement from the federal or state governments. The draft TMDL will impose significant and unnecessary capital and operating costs on the municipalities without scientific justification and with no reasonable assurance that the TSF designated use will be satisfied during critical low-flow periods. The municipalities support improving the water quality of the Wissahickon Creek. However, the municipalities object to federal and state mandates requiring the expenditure of large sums of taxpayer and ratepayer money on initiatives that may actually provide no discernable benefit to the Wissahickon Creek.	EPA believes that considerable positive impacts will be achieved with the implementation of these TMDLs. EPA also believes that this TMDL may be the first step in nutrient controls. Please see the discussion in Appendix D of the TMDL report. Regarding cost for implementation, EPA provided an overview of some of the potential options for funding in secstion 5 of the TMDL report.

Letter ID	Public Comment	EPA Response
31-19	The proposed TMDL will actually harm the environment. The specific WLAs presently proposed by EPA will cause considerable increases in electricity consumption, the transportation, unloading and handling of chemicals, and substantial increases in solids production (whether chemical or biological) at most of the wastewater treatment plants discharging into the Wissahickon Creek. The sole purpose of increasing the DO in the Wissahickon Creek is to support trout that are not stocked in the upstream portions of the Creek and which could not survive in the upstream portions of the Creek during low flow conditions (regardless of DO). The Draft TMDL presently proposed by EPA will have the net effect of damaging the environment.	This is an interesting comparison made. However, it was made with no data supporting the statement that "The Draft TMDL presently proposed by EPA will have net effect of damaging the environment." EPA has provided a TMDL with scientifically-based data and evaluations that support the results. It would be interesting if the commenter would provide similar scientifically-based supporting information for their statement. Without that supporting data and information to evaluate EPA cannot possibly provide meaningful comment on the commenters unsubstantiated claim.
32-01	Same as 31-1.	See the response to Letter # 31-1.
32-02	Same as 31-2	See the response to Letter # 31-2.
32-03	Same as 31-3	See the response to Letter # 31-3.
32-04	Same as 31-4.	See the response to Letter # 31-4
32-05	Same as 31-5.	See the response to Letter # 31-5.
32-06	Same as 31-6.	See the response to Letter # 31-6.
32-07	Same as 31-7.	See the response to Letter # 31-7.
32-08	Same as 31-8.	See the response to Letter # 31-8.
32-09	Same as 31-9.	See the response to Letter # 31-9.
32-10	Same as 31-10.	See the response to Letter # 31-10.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
32-11	The Pennsylvania Fish and Boat Commission's criteria presented in Management of Trout Fisheries in Pennsylvania Waters (1997) preclude the realistic possibility of trout stocking upstream of Route 73. The only portions of the Sandy Run which did not meet the minimum DO criteria for TSF were open canopy sections in golf courses. Other portions of the SAndy Run, downstream of the golf courses, do meet the minimum DO criteria for TSF. No private golf course will be stocked with trout by the Pennsylvania Fish and Boat Commission. Therefore, it is absurd to require the Township of Abington and its residents to expend millions in dollars, and to add chemicals and processes at a WWTP, soley for the purpose of making a portion of the Sandy Run suitable for trout, even though all parties acknowledge the Sandy Run will never see a stocked trout!	Federal regulations require that the TMDL be developed using the existing water quality standards. Pennsylvania has established standards for Sandy Run that include numeric criteria, narrative criteria and use designations. The use designation as established by Pennsylvania and approved by EPA is trout stocking and warm water fishes. The trout stocking applies from February thru July and the warm water fishes the reminding part of the year. In addition to support this designation dissolved oxygen numeric criteria have been established. This TMDL, as required by law, has been established based on those existing and applicable standards. If the commenter has concerns about the standards it is suggested that the commenter discuss these concerns with the state water quality standards program staff.
32-12	Same as 31-12.	See the response to Letter # 31-12.
32-13	Same as 31-13.	See the response to Letter # 31-13.
32-14	Same as 31-14.	See the response to Letter # 31-14.
32-15	Same as 31-15.	See the response to Letter # 31-15.
32-16	Same as 31-16.	See the response to Letter # 31-16.
32-17	Same as 31-17.	See the response to Letter # 31-17.
32-18	Same as 31-18.	See the response to Letter # 31-18.
32-19	Same as 31-19.	See the response to Letter # 31-19.
33-01	See Letter number 34.	See the response to Letter # 34.
34-01	We disagree with the entire premise that the draft TMDL will help maintain the designated use of the Wissahickon Creek, that of a Trout Stocked Fishery (TSF). Trout do not exist in the upper reaches of Wissahickon Creek, and to our knowledge they have not in the past. The upper reaches of the Wissahickon Creek will not support trout at the low flow periods for which the TMDL has been prepared.	The TMDL correctly uses the existing water quality standards for the Wissahickon Creek as established by PADEP, as required by law and regulations. These water quality standards include a use designation of trout stocking with the associated numeric criteria for dissolved oxygen. These standards will be met when the TMDL is implemented.

Letter ID	Public Comment	EPA Response
34-02	The draft TMDL imposes restrictions on the direct dischargers that will result in the imposition of NPDES effluent standards that are unrealistic, economically burdensome, not fully supported by sound science, and are unnecessary to help maintain the designated use of the Wissahickon Creek. The draft TMDL, once they are incorporated into Upper Gwynedd's NPDES discharge permit, will not be consistently achievable with a reasonable margin of safety by technology that currently exists at the Upper Gwynedd Wastewater Treatment Plant (WWTP).	EPA has not established the TMDL based on the treatment capabilities of the existing waste water treatment facilities. Rather the TMDL has been established to assure that the existing water quality standards will be met. EPA acknowledges that additional waste treatment at the significant point sources may be necessary to meet the TMDL requirements.
34-03	The draft TMDL will impose a significant and unnecessary economic burden on the dischargers and taxpayers. The draft TMDL will impose significant and unnecessary capital and operating costs on Upper Gwynedd without scientific justification and without supporting the TSF designated use.	It is the facilities responsibility through the effluent permitting process to assure that the discharge of waste water will not impair or cause impairment to the receiving water quality standards. Since the TMDL is designed to meet the applicable standards, the significant sources must achieve those requirements. EPA believes the TMDL is based on strong scientific data and information. EPA further believes that information provided by the commenters does not provide any additional scientific-based data but rather opinions and projections.
34-04	The draft TMDL phosphorus standard cannot be met with the existing WWTP facilities. Achievement of ammonia significantly <1 mg/l, and CBOD5 of 5 mg/1 is difficult with any reasonable margin of safety. The CBOD5 and ammonia draft TMDL, while achievable with the existing WWTP technology, would still require extensive modifications at significant cost to provide the margin of safety needed for consistent NPDES permit compliance.	EPA developed the TMDL based on the need for those significant sources to assure that water quality will be adequately protected, as required by the Clean Water Act. A number of alternatives were evaluated as a result of public comment to maximize implementability as well as achieving water quality standards The final TMDL reflects those analyses.
34-05	No potable water supply intake exists on the Wissahickon Creek, nor is any potable water supply intake planned for the Wissahickon Creek. Application of potable water supply criteria is inappropriate	EPA is concerned with the narrow view of the sources' responsibilities to assure that potable water supply sources are adequately protected. Pleased see the response to comment 31-05.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
34-06	The data presented by EPA in Appendix B of the TMDL document indicates that the maximum nitrate-nitrogen concentration observed at the mouth of the Wissahickon Creek between the years 1990 and 2001 was 7.89 mg/l. A sample collected by PADEP on August 15, 2002, when the average daily flow was 16.0 cfs (less than 7Q10) produced a nitratenitrogen concentration of 5.57 mg/1. The Philadelphia Water Department has indicated maximum reported nitrate-nitrogen concentrations at the Queen Lane intake of 6 mg/1. These facts are presented to contradict the hyperbole that the WWTPs on the Wissahickon Creek pose a threat to the water supply of Philadelphia. Considering all of the statements listed above, no nitrite-nitrate NPDES effluent TMDL should be proposed for any wastewater treatment plant as part of the Wissahickon Creek TMDL.	The commenter is directed to comment numbers 31-06 and 31-07.
34-07	The extremely limited EPA comment period is unrealistic, and grossly unfair to the dischargers, is not consistent with EPA's own protocol, and does not allow for sound science to be used. This comment is the same comment submitted for the February 2003 draft TMDL. Of course, we recognize and appreciate the fact that EPA issued a revised TMDL on June 9, 2003. We are including it with our comments because it speaks to the issue of the time lost in the TMDL process in the February to April 2003 time frame.	The response to this comment can be found in the response to comment for the February 2003 draft.
34-08	As requested by EPA we submitted comments by the first imposed, extended deadline of March 28, 2003 (re-submitted with our April 11, 2003 comments). The March 28 comments were based on what we had available to us at that time, and reflect what we were able to do in the inadequate comment period provided by EPA. EPA did not respond to any of the comments submitted on March 28, nor provide any new information.	EPA responded to all comments received during each of the extensive comment periods. Please see the previous response to comments.

Letter ID	Public Comment	EPA Response
34-09	We strenuously object to the way the EPA handled the first draft TMDL comment period in terms of the time available and the information provided. Extensions were provided piecemeal, in one case the day before the previous deadline. In addition, we received information piecemeal instead of having everything provided at the outset of the comment period as originally requested in our February 14, 2003 letter.	EPA made every effort to assure that the public was provided sufficient time to review and comment. For several years, PADEP and EPA held stakeholder meetings to discuss the procedures to be used in the TMDL development, the data available and needs, modeling basics, modeling results and the allocation process. EPA and PADEP provided the stakeholders the opportunity to participate in the stream data collection process in 2002. The stakeholders were well aware of the modeling foundation to be used for more than a year before the TMDL was completed. The stakeholders were given the opportunity to review and comment on the data review report. The stakeholders were given the opportunity to review and comment on the sampling quality assurance process. The stakeholders knew the data that was available for modeling much before the comment period. EPA made every effort to provide the technical information to those who were interested in detailed review of the model. EPA established a specific web site to provide the data and model code. EPA arranged and held conference calls with the stakeholders during the comment period to respond directly to any technical issues or questions the stakeholders may have. These calls were scheduled around the limited schedule of the stakeholders' technical expert who had few hours available for such calls due to his teaching and other obligations. Aware that the stakeholders needed a few extra days to review the material, EPA entered into extensive negotiations with the Plaintiffs of the TMDL lawsuit to obtain additional time to complete this TMDL. This resulted in an extra 6 months to complete the TMDL, resulting in an extra amount of time for the stakeholders to review and comment. EPA held multiple public meetings as well as a technical meeting to discuss the technical aspects of the TMDL. EPA held several individual meetings with point source stakeholders to discuss the TMDL. EPA invited the stakeholders to visit our contractor's office to gain more insight into the model - they declined. Please see the TMDL report for more information on the public process used in the development of this TMDL. Based on the extensive opportunities that were provided to the stakeholders EPA does not agree with the claim by the stakeholders that insufficient time was offered to them.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
34-10	The documents posted on the EPA website the afternoon of June 9, 2003, are significantly and substantially different than the documents previously issued by EPA. Issuing a highly technical 191 page Model Report concurrently with a 166-page TMDL document places the stakeholders at a substantial disadvantage during a 30-day public comment period. Although the dischargers appreciate EPA's incorporation of many of our comments in the revised documents, simply too much material has been distributed for a thorough review to be completed in 30 days. Therefore, the dischargers may raise technical issues in the future after subsequent review of the TMDL documents.	See the response to Letter # 31-03.
34-11	During low flow periods, as acknowledged by EPA, the flow from Upper Gwynedd represents virtually all of the flow in the Wissahickon Creek. Without this flow, the Wissahickon Creek would not be viable. Much of the premise of the draft TMDL is that low dissolved oxygen (DO) levels contribute to impairment of the Wissahickon Creek. The facts show that the DO downstream of Upper Gwynedd's outfall is higher than upstream. The Upper Gwynedd WWTP discharge has a positive effect on the Wissahickon Creek. Without the Upper Gwynedd effluent, the Creek would be considerably more impaired.	This is an interesting approach to the water quality problem. Although the dissolved oxygen may be higher below the point source, so too is the concentration for the pollutants discharged by the point sources that impact the level of dissolved oxygen further downstream, such as CBOD, NH3, NO2-NO3 and phosphorus. Because the effluent is the stream, essentially, the discharge must be 'self-sustaining'. That is the discharge of these other pollutants must assure that the dissolved oxygen is maintained at the standards level. This is the responsibility of the point sources. The statement that the stream would be considerably more impaired without the point sources is preposterous and without merit.
34-12	The DO standards for the period February 15 to July 31 and August 1 to February 14 are a minimum of 5 mg/1 and 4 mg/1 of DO, respectively. The data presented by EPA show that there is only 1 data point, downstream of the Upper Gwynedd WWTP before another point source discharge, which shows the DO below the 5 mg/1 standard. These data were collected immediately before the July 31 date when the limits go down to 4 mg/l. The only DO measurement in the Wissahickon Creek which did not meet the standard is 4.63 mg/l. Considering that only 1 DO measurement was marginally below the minimum standard, basing any TMDL on such limited data is scientifically unsound, unrealistic, and not reflective of real world conditions.	EPA believes that this comment may be based on a misunderstanding of the water quality standards. The commenter indicates that a minimum dissolved oxygen standard of 4 mg/L applies during the period August through February. This is not the case nor is it the standard on which the TMDL was based. The commenter must also realize that the TMDL was based on, not specifically existing conditions, but on design conditions, which represent higher effluent flows and hence loadings of pollutants. The existing stream concentrations may not represent those design conditions. As noted in the response to several comments, EPA believes that this TMDL is based on sound science, is realistic to design conditions and reflects the actions and reactions within the Wissahickon Creek and its tributaries.

Letter ID	Public Comment	EPA Response
34-13	Reference is made to section 5.1 where the EPA discusses how best management practices (BMPs) can be used to improve water quality. Until enough scientifically valid data are generated to determine what needs to be done, the use of BMPs is a viable option that should be considered before imposing unnecessary TMDL	See the response to Letter # 31-12.
34-14	The second and third paragraphs of Section 5.1 of the Draft TMDL discuss that poor biological conditions are controlled by extremely shallow conditions in the stream and lack of sufficient shading. BMPs should be considered to reduce biological activity, which causes diurnal variability of DO. EPA should apply this approach to all the areas of the Wissahickon Creek where low diurnal AM DO values were observed before EPA issues any numerical TMDLs that would be incorporated into NPDES permits.	See the response to Letter # 31-13.
34-15	EPA has assumed that all dischargers would discharge at design flows at the same time, which is highly improbable. We submit that EPA has the leeway to consider this factor to use realistic conditions.	See the response to Letter # 31-17.
34-16	The Wissahickon Creek does support the maintenance of stocked trout. The Pennsylvania Fish and Boat Commission lists the Wissahickon Creek as an "Approved Trout Stream". Since the Trout Stocked Fishery criteria acknowledges a seasonal variation, some degree of common sense must be applied to listing a water as impaired during extremely low flow conditions in areas where trout are not stocked. Obtaining a few isolated DO measurements between 4.0 mg/l and 5.0 mg/1 in pre-dawn hours in the latter half of July when the Wissahickon Creek is in the 0 to 10 percentile of flow (less than 7Q2) can hardly be considered a credible justification for expending millions of dollars in construction costs. Water with adequate dissolved oxygen for trout is available in the lower portions of the Wissahickon Creek during drought conditions. Therefore, the Wissahickon continues to "maintain stocked trout" through the end of July 31, even during drought conditions.	See the response to Letter # 31-09, 31-10 and 31-11.

Letter ID	Public Comment	EPA Response
34-17	The Wissahickon Creek meets warm water fishes (WWF) during critical low flow periods. The data collected by the Pennsylvania Department of Environmental Protection (PADEP) in the summers of 1998, 1999 and 2002 verifies that the Wissahickon Creek, downstream of the Upper Gwynedd Township Wastewater Treatment Plant (WWTP), consistently meets the criteria for Warm Water Fishes (WWF) listed in 25 PA Code § 93 during low-flow conditions. In particular, the dissolved oxygen measurements collected by PADEP did not indicate any violations of the WWF criteria, regardless of the time of day the measurement was taken. The presence of adequate dissolved oxygen (above 4 mg/1) contradicts the assertion by PADEP that WWTP effluent is inhibiting the benthic macroinvertebrate community.	See the response to Letter # 34-12.
34-18	Established Pennsylvania Fish and Boat Commission criteria for new trout stocking areas disqualify the upper half of the Wissahickon Watershed from ever being stocked with trout. No reach of the Wissahickon Creek in the vicinity of Upper Gwynedd Township would meet the availability and access requirements necessary to allow public trout fishing.	Federal law and regulations require that TMDLs be designed to attain and maintain applicable water quality standards - numeric, narrative, uses and anti-degradation. In the case of the Wissahickon Creek, those standards include trout stocking for the entire watershed. If there are concerns about existing standards the commenter should address those concerns to the state.
34-19	The trout stocked fishery criteria are being improperly applied. Upstream of Route 73, the designation of "maintenance of stocked trout" is an unattainable designated use during drought conditions in the Wissahickon Creek. The criteria for warm water fish can be maintained during drought conditions. The municipal dischargers object to the misapplication of the trout-stocking criteria in drought conditions. Regardless of the effluent quality from any wastewater treatment plant, the upper portion of the Wissahickon Creek will not support trout at the low flow periods for which the TMDL has been prepared. If EPA persists in applying the Trout Stocked Fishery criteria during critical low flow conditions, a Use Attainability Analysis (UAA) may be required to support the stream designation.	See response to Letter # 31-10.

Letter ID	Public Comment	EPA Response
34-20	We disagree with the whole premise for the TMDL. We hereby request copies of all references and related documentation regarding the relationship of the benthic community to the Draft TMDL. The draft TMDL presently issued by EPA does not present any correlation between the observed benthic community and the effluent from the wastewater treatment plants. Nor do the data collected by PADEP indicate that the Upper Gwynedd discharge has the reasonable potential to negatively impact the benthic community. The proposed adjustments to the NPDES permits may cause an increase in the DO in the Creek, but since the minimum DO is already above 4.0 mg/l, EPA cannot reasonably assure that the benthic community will improve.	Following completion of the TMDL, the commenter may request a review of the adminstrative record for the TMDL. It is suggested that that request be directed to the EPA Region III TMDL Program Manager who will arrange for the commenter to visit the Regional office to review the record. The commenter fails to realize that the benthic community is also impacted by the excessive sediment in the Wissahickon Creek. This excessive sediment is the direct result of storm water flow (volume and velocity) entering the stream from excessive runoff from increased impervious areas due to land use changes. Storm water sources such as MS4 areas (municipal separate storm sewer systems) must control these increases in volume and velocity in order to help reduce stream bank erosion and excessive sediment deposition. As the commenter is aware excessive sediment in a water body will have a significant negative impact on the stream's benthic community. EPA firmly believes that the combination of nutrient control and sediment reduction through better management of storm water flow will assure that the Wissahickon Creek and its tributaries will provide a much improvement environment for both fishes and the benthic community.
34-21	PADEP sampling procedures may have violated critical EPA protocols. Analyses of the benthic community and DO measurements intended to demonstrate nonattainment of water quality criteria should be conducted over a 100 meter reach of stream to eliminate the possibility that the observed "deficient" area was not simply an anomaly, or due to non-representative sampling. The EPA guidance for benthic macroinvertebrate sampling (Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers, Second Edition) also requires analyses to be performed at least 100 meters upstream of any bridge. The proximity of bridges to sampling locations may invalidate the results obtained at those locations. Similarly, PADEP's dissolved oxygen measurements appear to have been collected in one isolated location, thereby not providing a representative analysis of the overall aquatic environment.	See the response to Letter # 31-16.
34-22	Basis for 303(d) listing decision was not provided with draft TMDL. The Wissahickon Creek was placed on the 303(d) list based upon aquatic biology investigations performed in the mid-1990s. The benthic community was reported as poor to fair, but was reported as having improved from previous studies.	See the response to Letter # 21-14.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
34-23	As requested in our February 14, 2003 letter, and again in our comments submitted April 11, 2003, we hereby request copies of all references and related documentation utilized in preparing this TMDL, including, but not limited to, all the materials referenced in Section 1.0 of the Draft TMDL, all the documents listed in Section 7.0 of the Draft TMDL, and the actual justification documents prepared for placing the Wissahickon Creek and associated tributaries on the 303d list.	See the response to Letter # 31-02.
34-24	The specific WLAs presently proposed by EPA will cause considerable increases in electricity consumption, the transportation, unloading and handling of chemicals, and substantial increases in solids production (whether chemical or biological) at most of the wastewater treatment plants discharging into the Wissahickon Creek. The sole purpose of increasing the DO in the Wissahickon Creek is to support trout that are not stocked in the upstream portions of the Creek and which could not survive in the upstream portions of the Creek during low flow conditions (regardless of DO). The Draft TMDL presently proposed by EPA will have the net effect of damaging the environment.	See the response to Letter #t 31-19.
34-25	EPA has indicated that the intended analytical parameter for ortho-phosphate will be orthoP04-P. All references in the TMDL documents should be revised accordingly.	See the response to Letter # 31-04.
35-01	We find that the referenced document is seriously flawed and should be withdrawn pending completion of a scientifically defensible TMDL and amendment of the water quality criteria to reflect current science and the actual time frames necessary to protect the existing and designated uses.	EPA disagrees. The TMDL is based on scientifically valid data and procedures. As required by federal regulation, the TMDL was based on existing water quality standards. There has been no indication by the authority establishing the standards that modifications to those standards are necessary or warranted. The TMDL stands as is and will not be withdrawn or delayed.
35-02	The Township of Abington and Ambler Borough submitted comments on the January 2003 Draft TMDL which were evaluated by EPA. EPA responded to these comments in the Wissahickon Responsiveness Summary for March 2003 Draft. In most cases, EPA's response did not address the specific question. Therefore, these comments are incorporated by reference.	EPA believes that all comments were adequately addressed in the March 2003 responsiveness summary. That summary is included as part of this TMDL.

Letter ID	Public Comment	EPA Response
35-03	We commented that the TMDL only specifies allowable loads and achievement of those loads ensures water quality standard compliance. As such, the TMDL should not specify WLAs as concentration limits in NPDES permits (Ltr# 715-23). EPA responded saying "Both loads and concentrations were provided. If a facility wishes to adjust allowable flows from a facility downwards, the concentrations may be adjusted". This response is misplaced. The TMDL yields a load. Compliance with the load ensures compliance with the TMDL. Current concentration limits may be retained in a NPDES permit provided that the load is not exceeded.	EPA 's response relmains as previous. In situations where the effluent flow is essentially the stream flow, the effluent concentration becomes most important. That is, the effluent concentration is the concentration in the stream and as such is an important consideration in any low flow TMDL. As we have shown in the Appendix D discussion, at lower effluent flows during the 7Q10 low flow, the required effluent concentration is much lower than for the higher permit design flow. We maintain that for situations where effluent flow is the stream flow, concentration considerations are important. The permitting authority, when writing the NPDES permit, should take into consideration the relationship described in Appendix D. i.e., at lower effluent flows, effluent concentrations may need to be lower due to impacts in stream depth, etc. In other words, adjusting the effluent concentration for a lower effluent flow condition may not be beneficial to the point sources as we suspect the commenter may believe.
35-04	We commented that the model was not scientifically justifiable because all critical parameters (e.g., re-aeration, oxidation, SOD, algae/periphyton growth, nitrification) were calibrated with a single set of data (Ltr# 715-01, 12). EPA responded saying it used sound science and EPA Guidance directs it to "not delay the development of TMDLs". The specific point made was that the model includes many unknowns, but only one set of data. It is a well known fact that two unknowns require two equations (e.g., data) to be solved. This model was prepared by changing critical parameters in a step-wise fashion to match the observed DO data without any verification for the values selected (except that the selected values fall within the accepted range). There is no credibility in this approach. At least one set of verification data is necessary to demonstrate that the model calculations are credible. In fact, the final re-aeration rate equation falls well below the accepted range generated by Owens.	In response to comments, model verification and validation results are presented in the final Nutrient Modeling Report.

Letter ID	Public Comment	EPA Response
35-05	We commented that EPA has made no demonstration that the multiple conservative assumptions used in the TMDL are needed to achieve 99 percent compliance and the MOS used in the model is unreasonable (Ltr# 715-13). EPA responded saying the TMDL is required to consider critical conditions (Q7_10 flow, design plant flow for steady state modeling) regardless of the method of applying MOS. Furthermore, if an implicit MOS is not used, an explicit MOS of 10 % must be assumed. We believe this response is misplaced and, in any event, misses the point. PADEP requires 99 percent compliance to achieve water quality standards. This compliance point in not in addition to the Q7_10 and the design flow rate. In fact, PADEP typically calculates individual NPDES limits using only the Q7_10 and design flow, thus this response is not correct. However, not only does the TMDL use these critical flows, it also sets each discharger at its permit limits for each parameter. In a multiple-discharger system such as the Wissahickon Creek, such an assumption is extremely conservative.	PADEP does typically use the 7Q10 flow and effluent design flow to calculate individual NPDES limits. In fact, a review of the latest fact sheet and calculations for the Upper Gwynedd facility shows that PADEP also uses the 7Q10 and effluent design flows for multiple discharges as well. In fact the modeling guidance for the WQAM model used by PADEP for multiple discharge scenarios suggests the use of effluent design flows for the point sources as does several other PADEP guidance. This procedure is common practice for PADEP for multiple discharge situations. The TMDL is being developed to assure standards are attained and maintained into the future with the ultimate future being design build-out of the point sources, the critical condition. Please also see the discussion in Appendix D of the TMDL report for a further discussion on the impacts and consideration of using various and what the commenter would describe as less conservative assumptions.
35-06	We commented that EPA assumed that the water quality reflective of the reference site is necessary to ensure use protection from siltation. This assumption is not supported by any evidence in the record. (Ltr# 715-27). EPA responded saying that the reference watershed approach is commonly used and it was not necessary to prove that the reference stream was unimpaired. The point we were attempting to make was that the siltation load experienced by the reference watershed does not represent the maximum allowable load above which the watershed would be impaired (e.g., one additional pound would result in noncompliance). Without some demonstration that additional loading is unacceptable, the reference watershed approach is arbitrary and should not be used develop a TMDL without additional supporting documentation.	The reference watershed approach provides an estimate of the TMDL for the impaired watershed, but certainly is not assumed to be exact. As the reference watershed may understate the maximum load possible, there is also the potential for overstatement. To provide additional assurance that the approach is protective of the stream, an explicit margin of safety was also used. Pennsylvania does not currently have numeric criteria for siltation. In the absence of such criteria, the reference watershed approach has been accepted by both EPA and PA DEP as a reasonable and scientific method for assessment of siltation TMDLs.

Letter ID	Public Comment	EPA Response
35-07	The combination of stream dilution flow and point source permitted flow used in the model cannot occur simultaneously; therefore the model evaluates fictitious conditions not representative of the situation of concern.	Although it is not entirely clear what specific point the commenter is attempting to make here, we interpret this comment to imply that effluent flows at low flow stream conditions will always be less that the effluent design flow due to less infiltration, etc into the collection system. Hence the use of a effluent design flow is not appropriate to use during dry weather TMDL development. EPA has addressed this concern in Appendix D of he TMDL report. Note that because the effluent flow is essentially the stream flow under any low flow condition, it has been shown that using a lower effluent flow at low flow stream conditions will result in a lower effluent concentration due to impacts on stream depth, etc., i.e., it is not to the dischargers benefit to use an effluent flow other than that flow recommended in PADEP guidance for establishing the low flow TMDL. Please see Appendix D for more information.
35-08	Separate seasonal stream dilution flows should have been determined to evaluate TMDL requirements for the trout-stocking season and the warm-water designations. Figure 1 presents an illustration demonstrating that the Q7_10 flows for the trout-stocking period (February 15 - July 3 1) exceed those flows for the warm-water designation (August 1 - February 14). The EPA TSD and PADEP allow for consideration of different seasonal flows.	The Commenter is referred to Appendix D of the TMDL report for a discussion on this issue.
35-09	The January 2003 model set fixed re-aeration rates for all 115 segments representing Wissahickon Creek. We commented that this approach is contrary to standard engineering practice and EPA's own water quality modeling guidance, which is to calculate the re-aeration rate based on channel geometry and hydrology using a validated equation. In response, the June 2003 Model employed a "user-defined" re-aeration equation. The Model report noted that the use of validated empirical equations such as Owens yielded very high DO concentrations and "Matching the observed data would have required unreasonably high SOD values". This approach is unacceptable because this user-defined equation has not been validated by comparison with alternate sets of data. Consequently, it is an untested guess that would not stand up to peer-review. This is not good science. The fact that use of a validated and peer-accepted re-aeration equation such as Owens results in high DO predictions suggests that other aspects of the calibration are out of balance.	The original methodology for assignment of re-aeration rates was sufficient for TMDL analysis, but to accommodate concerns of stakeholders, the methodology was refined with the user-defined re-aeration equation. The user-defined re-aeration equation was based on the O'Connor-Dobbins formula, with coefficients adjusted during model calibration. Model validation results have been provided in the final TMDL report. Model results showed consistency in the model's predictive capability. Therefore, the performance of the user-defined re-aeration equation has been tested and proven effective in predicting system response. To respond to the commentor's concern regarding the adequacy of the re-aeration equation, re-assignment of fixed re-aeration rates was considered. However, following successful validation to an independent dataset, the re-aeration equation was determined adequate.

Letter ID	Public Comment	EPA Response
35-10	This model should be subject to independent peer review before it is used to establish a TMDL for the Wissahickon.	Please see the nutrient model technical report for a discussion on model verification. Note that we are using the recognized terminology here concerning model verification. This refers to the verification of the model and its algorithms, etc as opposed to the often misused definition of verifying the model using an independent set of stream data.
35-11	The model assumes that the SOD in the creek is linearly responsive to organic and nutrient loads from the point source dischargers. If this is the case, the SOD should be set using the seasonal or annual average facility performance rather than the design condition that occurs less than one percent of the time. Since all the major dischargers produce a highly polished effluent, we would expect that the sediment demand downstream from an outfall would reflect this condition. In addition, independent tests should be conducted to validate the rates used in the model since these appear to be critical for proper calibration.	The rationale of using the design flows as the baseline critical condition was to ensure conservativeness in estimating the potential impact of the dischargers on water quality. The modeling study considered the properties of the effluent water quality through maintaining a cap for the maximum SOD downstream of the dischargers (Section 4.2, Nutrient Modeling Report). The model has been validated using the 1998 NIER survey data, and results showed that the model reproduced the general water quality distribution in 1998 reasonably well. Thus far, the model has been calibrated and validated using the best available data. Of course, more data would undoubtedly provide better understanding of the SOD in the watershed, but in the absence of such data, EPA is confident with the assumptions that were tested through model calibration and validation. Opportunity was provided to stakeholders prior to the summer 2002 sampling period for collection of SOD data (data gap presented to stakeholders in a public meeting held on April 4, 2002, and identified by EPA in a letter provided to stakeholders on April 18, 2002), but stakeholders expressed no interest in collecting such information or made no recommendations to EPA that this was a data gap that deserved prioritization.

Letter ID	Public Comment	EPA Response
35-12	The revised model compared its periphyton simulation with data collected by PADEP in 1998 "to check the capability of the model in simulating the general trend of periphyton". The report goes on to state that the model predicts periphyton as mass of carbon while the PADEP data are reported as chlorophyll-a, consequently a conversion was required to compare the model with the data. Figure J-13 illustrates the model calibration with periphyton in Wissahickon Creek. No data are presented for any other tributary, in particular for Sandy Run. Thus, there is no way of evaluating whether the model reasonably predicts conditions in Sandy Run. The model over predicts periphyton Chlorophyll-a in Wissahickon Creek in the vicinity of Sandy Run and further upstream. The draft TMDL for the Township of Abington is based entirely on the periphyton predictions in Sandy Run. The model is not calibrated for this parameter in Sandy Run and is poorly calibrated in Wissahickon Creek in the vicinity of Ambler Borough. Given this lack of adequate calibration for this critical parameter, EPA should withdraw the TMDL and recalibrate the model with actual data on periphyton biomass consistent with the calibration period.	As shown in Figure J-13, simulated periphyton results were compared with observed data on Sandy Run (segment 94), with results showing consistency. It should be noted that no mathematical model is developed to mimic all details of a real system (which is virtually impossible). Considering all limitations of mathematical formulations, numerical solutions, and data sparseness against system complexity, a model can only be expected to represent the general behavior of the prototype system. Although periphyton data were collected in 1998, the relative distribution of the biomass was considered a useful measure of the model's ability to simulate the general trend throughout the system. Bearing this in mind, it is clear from Figure J-13 that the model has achieved a reasonable representation of the system; wherever the observed periphyton biomass is high, the model result is also high, and visa versa. Another indication of the success of the model in simulating the periphyton along Sandy Run (as well as Wissahickon Creek and Pine Run) is the good reproduction of the DO diurnal fluctuation resulting from biological processess associated with periphyton biomass (Figures J-4, J-8, J-12).

Letter ID	Public Comment	EPA Response
35-13	The model calibration for Sandy Run (see Figure J-8 of Appendix J) indicates that the dissolved oxygen concentration throughout Sandy Run is almost constant, with an average DO of about 7.0 mg/1. Without any DO sag, the model cannot be calibrated for this tributary. EPA cannot calibrate carbonaceous or nitrogenous oxidation because the CBODu and ammonia loads are very low and the travel time through the tributary is short. The calibration data are too sparse to make a valid calibration under the observed conditions, and without a DO-sag the kinetics cannot be verified. The data for ammonia-nitrogen, nitrate/nitrite-nitrogen, and orthophosphorus cannot be used to calibrate the model because these profiles are also flat. No explanation is provided for the sudden jump in concentration for these parameters approximately 3,000 meters from the mouth of Sandy Run. Given the flat profile of dissolved oxygen in Sandy Run, the model can only be used to evaluate diurnal variation. No periphyton data are presented for Sandy Run. The modifications made between January and June 2003 can only be characterized as guess-work with regard to periphyton because the calibration run cannot be compared with any appropriate measures.	The flat DO profile predicted by the model for Sandy Run was the result of two factors: (1) the waste load from Abington during the calibration period was relatively low, thus resulting in an insignificant DO sag downstream of the discharge; (2) the periphyton activities cause the DO to fluctuate within a day, and since the simulated daily average DO was calculated through averaging the DO at each time step over the 24-hour period, this further impacted the insignificant DO sag. As shown in Figure J-8, the model can be considered reasonably calibrated because, in general, the model simulated DO within the range shown by the observed data. In addition, the model has been validated using 1998 data (Figure L-8 of the final Nutrient Modeling Report) and showed reasonable representation of the DO profile. Based on both the calibration and validation to observed DO data, the model was determined a sufficient representation of the real system. Similarly, the model showed reasonable representation of the general magnitude of NH3-N, NO2-NO3-N, and ortho PO4-P. Disparity between model results and observed data are primarily due to the fact that the model was configured using the average discharger flows and load conditions while the data were collected on specific dates with variable discharger flows and associated loads. The sudden jump in concentrations mentioned by the commentor on Sandy Run are due to the contributions from Pine Run at the confluence with Sandy Run.
35-14	The Pennsylvania Strategy for seasonal limits is not legally binding and, in any event, should not have been used by EPA to establish seasonal limits. The report should have described the basis for establishing each seasonal period, rather than simply referring to a strategy document, so that the applicability of these periods could be carefully evaluated.	EPA has followed PADEP guidelines for establishing seasonal limits. The commenter does not provide any reasonable basis for this statement. If the commenter wishes to understand PADEP's reasoning for the strategy used by the state to establish their own NPDES effluent limits, then the commenter should refer to the state's document and explanation. EPA does not bellieve that further explanation of a state's established procedures is required here.
35-15	We agree that the TMDL should establish less restrictive limitations within each of the designated use periods. However, the periods identified above and the specified mass limits should be modified to account for expected flow conditions and temperature within each seasonal period. Specific seasonal flows will exceed the Q7_10 used in the TMDL. Separate seasnnal low flows should be applied for each seasonal period. Given the significant increase in DO saturation at reduced temperature, the less restrictive trout-stocking period should extend to May 31 for all parameters, and the less restrictive warm water fisheries period should begin on September 1.	EPA addressed these concerns in Appendix D of the TMDL report. The commenter is referred to that document for a discussion.

Letter ID	Public Comment	EPA Response
35-16	Given the significant increase in DO saturation at reduced temperature, the less restrictive trout-stocking period should extend to May 31 for all parameters, and the less restrictive warm water fisheries period should begin on September 1.	The TMDL development process and the water quality standards modification process are separate and distinct processes. The federal regulations require that TMDLs be established to attain and maintain existing water quality standards. If the commenter wishes to discuss the applicability of the existing standard then that discussion should be held with the state under the proper program methods and procedures. The TMDL will not address standards changes.
35-17	EPA's June 2003 TMDL approach is contrary to accepted engineering practice and EPA's own modeling guidance, which requires validation of models. Thus, this model and the TMDL violates the Data Quality Act and its implementing regulations as there is no indication as to the reliability of this model and it is inconsistent with published guidance.	The commenter does not provide any documentation supporting the concerns raised. The commenter indicates that the model is inconsistent with published guidance - no further explanation is provided as to why the commenter believes this to be the case. Without further explanation EPA cannot respond directly to this "observation" by the commenter. However, we have failed to find any EPA document that "requires" validation of models. Note that the EPA document "Technical Guidance Manual for Developing Total Maximum Daily Loads, Book 2: Streams and Rivers, Part 1: Biochemical Oxygen Demand/Dissolved Oxygen and Nutrients/Eutrophication", March 1997, discusses the calibration and validation processes, but does not "require" them. In addition, the guidance discusses validating a model by model coefficient adjustment and model sensitivity analysis and model accuracy, all of which have been completed for the Wissahickon model. There is a substantial amount of information that speaks to the validity and reliability of the Wissahickon model - the commenter is referred to the TMDL report and the technical model report pertaining to the calibration, validation and verification process
35-18	Finally, the "piling on" of multiple conservative assumptions under the rubric of a "Margin of Safety", without demonstrating such margin is reasonable or appropriate or necessary to implement state water quality standards, renders this entire analysis arbitrary and capricious.	EPA believes that again the commenter is providing commentary without supporting information. EPA is unclear as to what the commenter has in mind when referring to "piling on of multiple conservative assumptions". Without a listing of those conservative assumptions commenters believes EPA is "piling on", we cannot adequately respond to this comment. Nor has commenter provided us with sufficient information to evaluate the concern the commenter apparently has with providing a margin of safety in this model.
35-19	A TMDL is only set as necessary to meet water quality standards. The TMDL prepared for Wissahickon Creek is not necessary under non-drought conditions or during periods of lower temperature conditions. EPA, however, applies the TMDL requirements even at higher flows and lower temperatures. This expanded application of the TMDL is arbitrary and capricious and not authorized by federal law. If a TMDL is required for DO objectives, it should only apply for the month of July when stream flows are at or near 7Q10 conditions.	Applying a TMDL for only one month would in no way adequately protect the environment or as providing a reasonable design basis for treatment facilities. A 7Q10 low flow can and does occur at times other than just July and in fact can occur throughout the late spring and summer months. Higher temperatures and other environmental factors that negatively impact in stream quality also occur throughout this period. EPA believes this comment to be without merit. Federal law and regulations require that the TMDL be designed to consider seasonal variations as well as critical environmental conditions. This TMDL does exactly that. Again commenter provides personal opinions without the benefit of supporting information and data.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
35-20	TMDLs may only specify allowable loads and achievement of those loads ensures water quality standards compliance. There is no demonstration that concentration-based limits are necessary to ensure standards compliance even when the TMDL mass limits are met. While NPDES permits may include limitations for both concentration and mass, this does not mean that concentration-based limits are demonstrated to be necessary for this TMDL. The TMDL Report should state that NPDES permits for the affected facilities cannot exceed the mass values presented in the TMDL. Concentration limits can, however, be based on the flow expected under drought conditions and should not be based on the design flow.	EPA refers the commenter to Appendix D of the TMDL report for a discussion on the use of effluent flow expected under drought conditions. There is also a discussion as to why for this effluent dominated condition, effluent concentrations are of particluar importance.
35-21	Federal regulations require states to have an implementation procedure that will be used in the application of narrative water quality criteria (40 CFR § 13 1.11). This procedure provides the public with an objective means to determine how a rule will be interpreted and whether or not the actions in question actually violate state law. DEP has not developed such implementation procedures for siltation. Thus, there is no basis for knowing what the proper water quality objective needs to be or whether or not the current condition actually violates state standards. Proof must be independently presented in the administrative record demonstrating that a violation exists and demonstrating the level of water quality necessary to prevent the violation.	Federal regulation at 40 CFR Part131 is the water quality standards regulation. This regulation describes the requirements and procedures for a State to utilize when developing its water quality standards. The Federal regulation requires that a State adopt designated uses, those uses for each water body or segment whether or not they are being attained, and criteria, that when met, will generally protect those uses. Criteria may be expressed as constituent concentrations, levels, or narrative statements. While 40 CFR §131.11(b)(2) does allow a state to establish criteria in the form of a narrative statement, it does not require that implementation procedures be developed, although a State, at is discretion, may do so. Federal regulation at 40 CFR 131.11(a)(2) does require that where a State adopts narrative criteria for toxic pollutants, the State must identify implementation procedures. However, siltation is not listed as a toxic pollutant under Section 307(a)(1) of the Clean Water Act or 40CFR §401.15.
35-22	EPA has assumed that the water quality reflective of the reference site is necessary to ensure use protection from siltation. This is an assumption not supported by any evidence in the record. The fact that water quality is better elsewhere is not proof of the level of water quality necessary to protect beneficial uses. It is equally plausible that the level of siltation may be much greater than contained in the reference site without significantly impairing beneficial uses. Without such a demonstration (reference site water quality is necessary to protect uses) selection of this as the proper implementation of the narrative standards is arbitrary and capricious.	Pennsylvania listed sections of the Wissahickon Creek watershed on its 1996, 1998, and 2002 Section 303(d) List as being impacted by siltation from urban runoff and storm sewers. Justification for the these listing decisions can be found within these lists which were approved by EPA. This information would be available from the state. See Response to comment for 35-06

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
35-23	The reference stream is declared to be similar to Wissahickon Creek. This claim is not supported by substantial evidence. The critical factors to demonstrate similarity include the prevalence of biota in the stream in question and other essential characteristics that affect siltation (e.g., erodable soils but lack of "flashiness). These parameters, which governed the claimed need for TMDL development, were not examined. Thus the presence of improved biota in the reference stream, if such is the case, is not directly attributable to a lack of siltation.	Selection of a reference watershed with similar characteristics as Wissahickon Creek proved to be a challenge. Not surprisingly, most watersheds with similar land use distribution, soils, geology, and other features would suffer from similar problems regarding siltation, especially with the same level of urbanization. However, other than the size and slope of the watershed, a good match was believed to be found in Ironworks Creek. In response to comments, the methodology for estimation of streambank erosion was revised and reported in the Siltation Modeling Report released with the final TMDL report. The revised methodology considered site-specific variance of such factors as bank stability and vegetation cover conditions. This information was obtained from field surveys performed by PA DEP in 1998, which reported a number of additional qualitative information that substantiated the similarities between the habitat of the Wissahickon Creek and Ironworks Creek. Finally, the new methodology based allocations on a unit-area load for each model subwatershed to provide better comparison between the different size watersheds and associated difference in flow magnitude and stream geometry.
35-24	The Wissahickon Creek watershed is approximately four times larger than the reference watershed. Consequently, flows in Wissahickon Creek will be much greater, even if all other factors are identical, therefore the potential for stream bank erosion and sedimentation are significantly greater. The difference in watershed slope is also significant, with the Ironworks Creek watershed slope more than double that for Wissahickon Creek. The steeper slope may indicate that the stream bed tends to be rockier; therefore there is less likelihood for stream bank erosion. Furthermore, the steeper slope will convey more water with less depth, thus tending to remain within the stream bank during storm events. This condition also lessens the likelihood for stream bank erosion. Based on these considerations, Ironworks Creek cannot be used as a reference watershed because it will under-predict the sediment load.	Selection of a reference watershed with similar characteristics as Wissahickon Creek proved to be a challenge. Not surprisingly, most watersheds with similar land use distribution, soils, geology, and other features would suffer from similar problems regarding siltation, especially with the same level of urbanization. However, other than the size and slope of the watershed, a good match was believed to be found in Ironworks Creek. In response to comments, the methodology for estimation of streambank erosion was revised and reported in the Siltation Modeling Report released with the final TMDL report. The revised methodology considered site-specific variance of such factors as bank stability and vegetation cover conditions. This information was obtained from field surveys performed by PA DEP in 1998, which reported a number of additional qualitative information that substantiated the similarities between the habitat of the Wissahickon Creek and Ironworks Creek. Finally, the new methodology based allocations on a unit-area load for each model subwatershed to provide better comparison between the different size watersheds and associated difference in flow magnitude and stream geometry.

Letter ID	Public Comment	EPA Response
35-25	TMDL Reduction Target is Not Within the Scope of the CWA EPA has concluded that a 40 - 70% reduction in siltation is necessary. There is no indication regarding how this reduction will allow for full attainment of uses while other less restrictive reductions or measures would not. Thus, the restriction imposed was pure guesswork, an arbitrary approach to environmental regulation. Moreover, the TMDL indicated that the primary source of the stream siltation is the stream itself. Internal loadings are generated due to bank erosion, not due to outside inputs. The Act does not regulate the natural generation of pollutants by a water body.	The TMDL addresses sediment in response to Pennsylvania's Section 303(d) listing as the cause of nutrient impairment the reductions in in-stream sediment loads are modeled to identify the necessary sediment load reductions. If at any point in the implementation process, aquatic life uses are determined to be unimpaired, additional reductions or restrictive measures could be reevaluated.
35-26	In revising the January 2003 Siltation TMDL, EPA converted stream bank erosion from a load allocation to a waste load allocation. Such a modification is clearly unwarranted because stream bank erosion does not result from a point source. In fact, municipalities have no way of controlling such a source. EPA suggested at the Public Technical Issues Meeting (June 13, 2003) that the only way to control siltation was through runoff volume control. However, flow is not a pollutant that can be regulated and, moreover, downstream municipalities have no ability to control the flow issuing from upstream municipalities which may be the overriding factor affecting stream bank erosion.	The Final TMDL retains the presumption that allocations attributed to MS4 communities are designated as WLAs. Regarding the reductions required for downstream municipalities the allocations were revised for the final TMDL to better account for upstream sources.
35-27	In short, the proposed TMDL for siltation should be withdrawn and reconsidered. Unless EPA can demonstrate that biota are currently impaired and the degree of siltation causing the impairment, further action on this TMDL should not occur. Moreover, assuming impairment is demonstrated and the cause is siltation, EPA should not seek to regulate external sources of silt as such loads are largely irrelevant to the cause of the impairment. A BMP program implemented by the state to reduce stream flow velocity would be the most appropriate approach. That approach does not require the adoption of an external load restriction.	See response 35-06.
36-01	See Letter # 19.	See the response to Letter # 19.

Letter ID	Public Comment	EPA Response
37-01	PWD submitted comments to the March 2003 drafts for these TMDLs. Unfortunately, the responses to those comments provided to us at the June 13, 2003 Technical Meeting and the presentations made at that meeting were less than adequate. Specifically, our objections to the methodologies used to determine the low flow budget for the nutrient TMDL and the reference watershed approach for the siltation TMDL remain virtually intact.	Although the critical flow for TMDL analysis is noted to exceed the 7Q10, this is due largely to the assumption that sewage treatment plants discharge at design flows specified in their respective NPDES permits. In fact, the sum of these effluent flows is 27.96 cfs, which exceeds the 7Q10 by 172% and conservatively considers critical conditions when the background streamflow is at 7Q10 low-flow conditions. Therefore, rather than overstating the assimilative capacity of the stream (as stated by the commenter), the assimilative capacity under such effluent-dominant conditions is actually severely limited. Such conservativeness provides assurance that wasteload allocations are protective of the stream during critical low-flow.
37-02	We are extremely concerned with the changes in the nutrient TMDL drafts concerning nitrate-nitrite nitrogen. We believe USEPA has grossly overestimated the assimilative capacity of the Wissahickon Creek and, more specifically, the Schuylkill River at the Queen Lane Water Treatment Plant intake for this parameter due to the low flow methodology applied. We are extremely concerned that not only will the proposed TMDL not provide any reductions in nitrate in our Queen Lane Treatment Plant's source water, but that actual degradation could occur in the future as a result. We remind USEPA that actual measurements taken in the Wissahickon Creek used to develop this TMDL had exceedances of the 10 mg/l national primary drinking water standard for nitrate.	Development of TMDLs under such effluent-dominant conditions provides confidence that nutrient reductions result in significant protection under the most critical conditions possible, with effluent flows at design conditions during a 7Q10 period. Should background conditions change in the future or should the drinking water standard not be attained then the TMDL would need to be revisited.
37-03	The changes in the model with regard to the impacts of a cessation of the Coorson's Quarry flow are simply baffling. It is hard to conceive that a loss of the allocation flow of 8 cfs used for the quarry in a watershed with a measured 7Q10 flow of 16.26 cfs could have no impact. Even using the questionable "critical low flow" of 42.52 cfs, it is still hard to believe the loss of close to 20% of baseflow will not impact the stream's assimilative capacity, and therefore the TMDL allocations.	The basis of nutrient TMDL development for Wissahickon Creek and tributaries was the protection of designated uses, specifically aquatic life and trout stocking. These beneficial uses have associated DO criteria that are impacted by nutrient levels in the stream. However, such problems with low DO are localized to specific segments of Wissahickon Creek and tributaries that are mostly in upper portions of the watershed. To prevent low DO in these locations, reductions in nutrient loads were determined for the TMDL. The portion or Wissahickon Creek downstream of the Coorson's Quarry discharge was not found to have problems with low DO as long as nutrient reductions from dischargers were met (as a result of prevention of low DO in other critical locations). In other words, the portion of Wissahickon Creek downstream of Coorson's Quarry was less of a problem regarding low DO than upstream segments. However, the Quarry does provide additional assimilative capacity for the watershed and therefore positively impacts the TMDL as mentioned in the report.

Letter ID	Public Comment	EPA Response
37-04	We have strong objections to the liberal use of the Waste Load Allocation (WLA) component. USEPA has randomly decided to consider these instream sources as point sources in the TMDL calculation. The modeling approach used is simply not adequate for correct allocation of loads among point sources (municipalities). In fact, the City of Philadelphia in particular is inequitably penalized for simply being the last downstream municipality in the watershed by this methodology.	The commenter is referred to the TMDL report and the sediment technical report. The process for allocating sediment to MS4 areas has been modified to better consider the concerns expressed in this comment. Allocations in the final TMDL reflect a less reduction for downstream sources. Use of a waste load allocation for sediment is appropriate since the source of that excessive sediment is increased flow - both volume and velocity - from runoff of areas within MS4 areas. MS4 areas have been defined by EPA as point sources thus requiring waste load allocation.
37-05	In order for the City to support the siltation TMDL, the TMDL document needs to make clear that the siltation TMDL will be further improved and refined through the Adaptive Implementation Process. Until such time improvements and refinements are made, EPA should make clear that the only appropriate implementation strategies would involve non-structural BMPs. As more is learned through the Adaptive Implementation Process, the implementation strategies can then be adjusted accordingly.	TMDLs are dynamic. As additional data becomes available, the TMDL may be revisited. It is expected that the TMDL will be used as a goal for the requirements of PADEP for the first round of MS4 permit. Data submitted by the MS4s as part of their permitting requirements will need to be evaluated when the permits are reissued to determine if additional or different BMPs are warranted. The approach used will require adaptive management through time. Given the magnitude of the reductions required, it is likely that an iterative process will be needed over time to achieve the TMDL targets.
38-01	We are still concerned that EPA included individual wasteload allocations for MS4 municipalities in the TMDL. Pennsylvania will be required to implement the TMDL through its permit program and we are concerned that, in spite of indeterminate language in your response to this same comment on the previous draft of the TMDL, we will be responsible to impose additional monitoring on the municipalities and perhaps even to impose numerical effluent limitations in the future as a result of your TMDL. We do not believe that this potential outcome is accounted for in EPA's guidance and it could cause Pennsylvania municipalities to spend millions of dollars in public funds attempting to meet poorly documented and unjustified permit conditions and limitations.	MS4 areas have been defined by EPA as point sources and are thus requiring a waste load allocation. It is expected that the TMDL will be used as a goal for the requirements of PADEP for the first round of MS4 permits.

Letter ID	Public Comment	EPA Response
38-02	EPA's TMDL for the Wissahickon Creek watershed is the first TMDL in Pennsylvania that addresses nutrient impairments through an endpoint measured by the dissolved oxygen standard. The Department is hopeful that this approach will be effective in adequately addressing the nutrient impairments. However, we believe increased documentation should be developed to add support for this approach and in its use in developing other TMDLs. We recommend you contact our Southeast Regional Office to discuss their perspectives relating to dissolved oxygen and nutrient control .	EPA is confident that the loads (and concentrations) provided by the TMDL will have a beneficial impact on the Wissahickon Creek water quality. It will also appropriately address the nutrient concerns. The commenter is referred to the TMDL report and associated appendices.
38-03	Finally, Pennsylvania does not believe that EPA adequately answered the concerns about the development of this TMDL, which we expressed during the first comment period in our comment letter dated April 10, 2003. We will not reiterate them, but we hope that EPA will give them further consideration to help refine the TMDL process.	EPA has included the response to comments for the previous draft report. If there are concerns with specific responses EPA will try to provide additional information if these specific concerns are identified.
39-01	E-mail commentor - General	See Response to Letter # 19.
40-01	Critical Conditions: We remain concerned that the calculation used in the TMDL for critical low flow is unjustified and overstates the assimilative capacity available in the Creek. Despite criticism of its failure to use the 7Q10 as critical low flow by numerous commentators, the new version of the TMDL continues to use a calculated value rather than the measured 7Q10. In fact, EPA even increased its calculated low flow value from 40.8 cfs in the January 2003 version to 42.52 cfs in the June version (compared to the measured 7Q10 of just 16.26 cfs). We continue to believe that use of this calculation is unjustified, resulting in an excessively high critical low flow that is 260% of the 7Q10.	See response to Letter # 37-01.

Letter ID	Public Comment	EPA Response
40-02	A related concern about flows concerns the use of design flows for the sewage treatment plants, rather than average actual discharge levels, to determine the critical low flow scenario. The sewage treatment plants are permitted to discharge in excess of 18 million gallons per day, but their actual discharges average significantly less – just 50-60% during low flow periods for the Creek. Using the design flows in the models rather than average discharge levels results in an over-statement of flows in the Creek. Using unrealistic design flows produces unrealistic reaeration values, which in turn, will result in projected DO levels that are unachievable under actual discharge conditions. The most critical condition for the Wissahickon is when discharge flows are at their actual summertime rates. Using design flows, rather than actual flows, to calculate the 7Q10 predicts a stream with higher assimilative and reaeration capabilities than actually exist, thus resulting in waste load allocations that are insufficient to address the existing DO problem.	See response to Letter # 37-01 and 19-02. Although the reaeration is a function of streamflow, the impact of reaeration does not overstate the assimilative capacity of the stream with sewage treatment plants at design flows since the stream is over 98% effluent flows at this condition. At the critical condition used for TMDL analysis, the stream is effluent-dominant, and essentially requires dischargers to provide effluent flows that support aquatic life without the benefit of dilution from natural baseflow. Using lower effluent flows reduces the proportion of streamflow from sewage treatment plants. Although it is noted that reaeration also decreases, the reduced reaeration is not as influential on TMDL results as the effluent dominant characteristic of the streamflow. Reduced effluent flows reduces rearation, but also increases the assimilative capacity of the stream as streamflow is better able to dilute the reduced sewage treatment plant contributions.
40-03	EPA has chosen in the new TMDL to impose differing standards for the Trout Stocking Fisheries season (February 15 through July 31) and the remainder of the year. We are concerned that the proposed discharge concentrations in the fall and winter months (those using the Warm Water Fisheries standard) may not be sufficiently protective to return the Creek to health. First, we note that the fall and winter months will see little or no reduction in nutrient discharges. Given that "this TMDL did not include water quality modeling for the ‘winter' period", we are concerned that the minimal reductions required may not be sufficient to ensure that the Creek meets water quality standards during this period. We strongly suggest that EPA utilize the stricter TSF –based limits throughout the year; however, if EPA intends to continue with the two standards approach, it should at minimum extend the application of the standards currently proposed for February 15 to July 31 at least through September 30.	EPA has used the applicable water quality standards as adopted by Pennsylvania for the Wissahickon Creek. These standards provide the periods of the year when specific numeric standards apply. EPA considered the critical conditions when establishing the TMDL. As has been confirmed in many other similar situations, the critical condition for nutrients from point sources, particularly for situations where there is little or no dilution, is the late spring and summer. Nutrient impacts are minimal during the winter months due to temperature, dilution and other considerations. EPA has recommended the use of PADEP's seasonal guidance for those times other than the critical conditions.

Letter ID	Public Comment	EPA Response
40-04	We remain unconvinced that aerating the effluent of the WWTPs will have a long-lasting downstream impact on DO levels. Raising the DO in the effluent results in nutrient reductions being far less than what are necessary to curtail periphyton growth, the true contributor to the stream's low DO levels. This approach treats a symptom rather than the cause of the problems facing the Creek. As a result, we remain opposed to the suggestion to offset nutrient reductions with higher levels of DO in the effluent from the WWTPs.	See the discussion in Section 3.1 of the TMDL Report regarding nutrient criteria and endpoints used for nutrient TMDL development. There are currently no criteria for acceptable levels of periphyton growth. Therefore, to measure the impact on aquatic life, and to provide an endpoint for TMDL development, DO criteria were used. At effluent dominant conditions in the stream, with all plants discharging at design flows and existing permitted DO levels at 6.0 mg/L, it is impossible for the instream DO to meet the Trout Stocking minimum DO criteria (also at 6.0 mg/L) without reducing effluent concentrations to levels that would be extremely difficult to meet using current treatment technologies. Furthermore, although the sewage treatment plants are permitted at 6.0 mg/L DO, most are normally observed to discharge at above 7.0 mg/L, so instream conditions are unlikely to change significantly due to changes in permitted effluent DO. Therefore, changes in permitted effluent DO do not treat the symptom, but rather consider conditions in the stream that are realistic and most likely to be remedied as a result of the wasteload allocations prescribed. Through modeling analysis (including simulation of diurnal DO swings resulting from periphyton growth), the nutrient wasteload allocations and effluent DO were not predicted to result in violations in the DO criteria, therefore ensuring protection of Trout Stocking and Aquatic Life.
40-05	We are also concerned that the June 2003 draft no longer requires reductions from all five of the sewage treatment plants. The Ambler Sewage Treatment Plant, the single largest discharger of nutrients into the Creek, was in the first draft, required to reduce its discharges by 10% for ammonia, 14% for CBOD-5 and 58.3% for Ortho Phosphate (assuming effluent DO at 7.0 mg/L). But in the new draft, the Ambler plant will not be required to reduce its discharges at all, and is even allowed potentially to increase its Nitrate-Nitrite discharges. This concerns us in light of the 1998 data showing that DO levels below the Ambler plant are lower than those below the upstream Upper Gwynedd Township plant. We are concerned that continued or increased discharges from this plant may result in continued impairment of the Creek downstream of the Ambler plant.	Changes in nutrient wasteload allocations in the June 2003 draft TMDL report were the result of improved model representation as outlined in the Nutrient Modeling Report. The previous model was limited in its ability to represent specific processes in the stream which resulted in unrealistic reductions of nutrients from sewage treatment plants. As stated by the commentor, reductions from upstream dischargers will benefit the portion of Wissahickon Creek on which the Ambler STP is located, therefore limiting the necessary nutrient reductions from the plant. Modeling analysis predicted that no negative downstream impacts will result from the wasteload allocations assigned to Ambler STP.

Letter ID	Public Comment	EPA Response
40-06	The revised TMDL again indicates that the downstream reaches of the Wissahickon Creek will violate the DO standard if all flow ceases from Coorson's Quarry. We repeat our previous comment that the TMDL should compute a separate set of discharge limits that assume a cessation of discharges from the Quarry. DEP should notify each of the major dischargers that their NPDES permit would be re-opened and modified to reflect these new limits should the Quarry ceases its discharges..	The present NPDES permit for Coorson's Quarry requires a minimum flow of 0.5 cfs. Therefore, if the quarry ceases flow, the discharge permit will be violated. Appendix D of the TMDL report provides assurance that at the minimum discharge flow of 0.5 cfs, the TMDL does not result in additional violations of the DO criteria, and thus does not impact wasteload allocations.
40-07	The required nutrient reductions must be incorporated into the NPDES permits for the WWTPs that are up for renewal later this year and early in 2004. While a delay in meeting the new limits to allow for plant renovation may be appropriate, the limits must be incorporated into these new permits and cannot be allowed to wait for another five years.	EPA regulations at 40 CFR 122.44(d) require permits that are issued where a TMDL has been established be consistent with that TMDL. Permits issued after the TMDL is established for the Wissahickon Creek must meet that regulatory requirement.
40-08	While we support the recommendations regarding implementation of BMP's for Trewellyn Creek, Lorraine Run and the headwaters of Pine Run, the TMDL is silent on who will implement these BMP's, how and when. Encouraging infiltration and additional tree canopy are important changes, but absent information on how they will be implemented and by whom, we are skeptical of a "reasonable assurance of success".	The TMDL is intended to provide cleanup targets but not to prescribe all implementation requirements. These types of issues and questions must be addressed as the TMDL is implemented. The dischargers may want to consider canopy impacts on water quality or watershed groups may want to address BMP implementation through state grants. A watershed group may want to act as the foundation for gathering different groups together to establish a watershed approach to implementing various non-point source controls.
40-09	The PA Department of Environmental Protection raised concerns about the possibility of reducing phosphorus concentrations in the Creek in order to reduce nuisance algae growth, which in turn could enable the Creek to better support other human use water quality standards. EPA's response in the June 2003 TMDL was to suggest that this topic be deferred until after the phosphorus limits in this TMDL have been met and further stream-specific studies done to determine low-growth phosphorus concentrations for the Creek. We do not support leaving this issue to some unspecified period. Since the current nutrient TMDL deals with phosphorus, it would seem sensible to address the algae issue in this current TMDL. If it is not possible to address this issue in the current TMDL in a timely fashion, a specific timetable should be established for further study and a deadline set for revising nutrient discharge standards in order to bring the Creek into compliance with Pennsylvania water quality standards.	The commenter is referred to Appendix D of the TMDL report for more information on this issue. EPA also believes that the Wissahickon Creek watershed should continue to be monitored to observe the effectiveness of implementing the TMDL.

Letter ID	Public Comment	EPA Response
40-10	Instead of requiring the Creek to meet the potable water supply standard, the new TMDL allows it to be met at the Queen Lane water intake. This in turn allows dilution of the water from the Wissahickon Creek, with its high Nitrate-Nitrite levels, with water from the Schuylkill River, whose Nitrate-Nitrite levels are generally lower. Such an approach allows a greater level of risk to public health by permitting Nitrate-Nitrite levels in the Wissahickon to violate water quality criteria for potable water supply by over 50%. If for some reason, water drawn by the Queen Lane intake should contain a greater percentage of Wissahickon Creek water than EPA predicted, the Nitrate-Nitrite standard for drinking water could be violated. Given the potentially fatal nature of this illness, we believe EPA should utilize the more protective methodology from the January 2003 TMDL	EPA believes that the current approach will adequately protect the City of Philadelphia's potable water supply.
40-11	We encourage EPA to revisit its decision to allocate sediment reductions more heavily to downstream communities, considering instead a more even approach.	This has been reconsidered. Please see the TMDL report and the sediment technical report.
40-12	During the recent public hearing on the June 2003 draft, EPA staff indicated that the required reductions in Waste Load Allocations for each municipality will not be incorporated into their MS4 stormwater permits for at least ten years. In light of that fact, we are skeptical that there is a "reasonable assurance of success" for implementation of the sediment TMDL. In order to provide a "reasonable assurance of success", EPA should reopen and modify the MS4 permits applied for in March 2003 to incorporate the sediment WLA's developed by this TMDL. At a very minimum, the WLA's for sediment should be included in the MS-4 permits when they are renewed in 2008 in order to ensure that the reductions indicated by this TMDL are implemented.	The phase II MS4 permits issued to municipalities following the March 2003 deadline include effluent requirements in the form of BMPs consistent with the national . Reporting information and additional data will allow the permits to be revisited in 2008 when they are scheduled for reissue.
41-01	Gobreski's e-mail for Robert Wendelgass (Same as # 40)	See Response to Letter # 40.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
42-01	While the Watershed Association believes that nutrients may be only a partial explanation for the creek's impairment, a position that the TMDL report seems to also hold, nutrients are a very significant factor affecting the condition of the stream. WVWA does not have the technical expertise to comment on the workings of the models, but without evidence to the contrary, assumes that the simulations are reasonably accurate predictors of future dissolved oxygen levels. The Wissahickon Valley Watershed Association's reaction to the TMDL report is that it is reasonable, will lead to needed improvements in water quality in the Wissahickon Creek and should be implemented. Following that, agencies should continue to study the creek, monitor progress in improving water quality and take further actions, if needed, to meet water quality standards.	EPA agrees that the Wissahickon Creek watershed should continue to be monitored to observe the effectiveness of implementing the TMDL.
43-01	E-mail commentor - General	See Response to Letter # 19.
44-01	E-mail commentor - General	See Response to Letter # 19.
45-01	E-mail commentor - General	See Response to Letter # 19.
46-01	E-mail commentor - General	See Response to Letter # 19.
47-01	E-mail commentor - General	See Response to Letter # 19.
48-01	E-mail commentor - General	See Response to Letter # 19.
49-01	E-mail commentor - General	See Response to Letter # 19.
50-01	E-mail commentor - General	See Response to Letter # 19.
51-01	E-mail commentor - General	See Response to Letter # 19.
52-01	E-mail commentor - General	See Response to Letter # 19.
53-01	E-mail commentor - General	See Response to Letter # 19.
54-01	E-mail commentor - General	See Response to Letter # 19.
55-01	E-mail commentor - General	See Response to Letter # 19.
56-01	E-mail commentor - General	See Response to Letter # 19.
57-01	E-mail commentor - General	See Response to Letter # 19.
58-01	E-mail commentor - General	See Response to Letter # 19.

Letter ID	Public Comment	EPA Response
59-01	E-mail commentor - General	See Response to Letter # 19.
60-01	E-mail commentor - General	See Response to Letter # 19.
61-01	E-mail commentor - General	See Response to Letter # 19.
62-01	E-mail commentor - General	See Response to Letter # 19.
63-01	E-mail commentor - General	See Response to Letter # 19.
64-01	E-mail commentor - General	See Response to Letter # 19.
65-01	E-mail commentor - General	See Response to Letter # 19.
66-01	E-mail commentor - General	See Response to Letter # 19.
67-01	E-mail commentor - General	See Response to Letter # 19.
68-01	E-mail commentor - General	See Response to Letter # 19.
69-01	E-mail commentor - General	See Response to Letter # 19.
70-01	E-mail commentor - General	See Response to Letter # 19.
71-01	E-mail commentor - General	See Response to Letter # 19.
72-01	E-mail commentor - General	See Response to Letter # 19.
73-01	E-mail commentor - General	See Response to Letter # 19.
74-01	E-mail commentor - General	See Response to Letter # 19.
75-01	E-mail commentor - General	See Response to Letter # 19.
76-01	E-mail commentor - General	See Response to Letter # 19.
77-01	E-mail commentor - General	See Response to Letter # 19.
78-01	E-mail commentor - General	See Response to Letter # 19.
79-01	E-mail commentor - General	See Response to Letter # 19.
80-01	E-mail commentor - General	See Response to Letter # 19.
81-01	E-mail commentor - General	See Response to Letter # 19.
82-01	E-mail commentor - General	See Response to Letter # 19.
83-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
84-01	E-mail commentor - General	See Response to Letter # 19.
85-01	E-mail commentor - General	See Response to Letter # 19.
86-01	E-mail commentor - General	See Response to Letter # 19.
87-01	E-mail commentor - General	See Response to Letter # 19.
88-01	E-mail commentor - General	See Response to Letter # 19.
89-01	E-mail commentor - General	See Response to Letter # 19.
90-01	E-mail commentor - General	See Response to Letter # 19.
91-01	E-mail commentor - General	See Response to Letter # 19.
92-01	E-mail commentor - General	See Response to Letter # 19.
93-01	E-mail commentor - General	See Response to Letter # 19.
94-01	E-mail commentor - General	See Response to Letter # 19.
95-01	E-mail commentor - General	See Response to Letter # 19.
96-01	E-mail commentor - General	See Response to Letter # 19.
97-01	E-mail commentor - General	See Response to Letter # 19.
98-01	E-mail commentor - General	See Response to Letter # 19.
99-01	E-mail commentor - General	See Response to Letter # 19.
100-01	E-mail commentor - General	See Response to Letter # 19.
101-01	Duplicate record of letter number 31.	See letter #31.
102-01	We support your efforts to attain and maintain the Pennsylvania water quality standards for the Wissahickon Creek. We remained concerned that the current TDML carries no assurance that the requisite reductions will ever be implemented. We urge the EPA to make its final Nutrient and Siltation TMDL Development for the Wissahickon Creek defendable, enforceable and effective in reducing the pollution levels currently experienced in the Wissahickon Creek.	Federal regulations at 40 CFR 122.44 require that a permit be consistent with any established TMDL. This will require implementation of the waste load allocations assigned to the point sources for both the nutrients and sediment. There are no similar requirements for allocations assigned to non-point sources. The TMDL does not add any new regulatory requirements for implementation but must rely on existing regulations.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
103-01	We note that the DEP and several municipalities within the watershed have offered technical comments on the modeling that we hope are addressed in the final TMDLs established for the Wissahickon Creek.	EPA has addressed all technical comments received.
103-02	The nutrient reduction proposed relies primarily on waste load allocations assigned to major publicly-owned waste water treatment plants. These reductions will be implemented through NPDES permit renewals. Though the treatment plant discharges are an important source of nutrients, the impact of the nutrients are further exacerbated by declining bedflow into the stream due to surrounding development and use of groundwater. Lack of riparian buffers, infiltration of stream flow into sewer lines, and dams could also enhance the negative impact of nutrient enrichment of the stream.	EPA agrees. Reduced base flow, increased development with its associated increase in storm water flow and velocity and increased waste water flow and pollutant loads have served as the basis for water quality concerns in the Wissahickon Creek watershed. Communities should address these concerns on a watershed basis in order to better assure that Wissahickon Creek water quality is protected.
103-03	We are aware of that several municipal wastewater treatment plant operators have raised concerns about their ability to meet the various proposed waste load allocations. One of the elements of the TMDL process is to establish standards that are reasonable to implement. It is unclear whether or not the proposed standards can be reasonably implemented by each authority without placing unfair cost burdens on their ratepayers. Some analysis of the practicality of these municipal treatment plant waste load allocations should be included in the report. Also, the report should offer some discussion of alternative measures to address nutrient standards such as various land control measures, bedflow enhancement, or changes to the established trout stock fishery use designation.	The TMDL does not address costs associated with meeting water quality standards. The purpose of the TMDL is to establish the pollutant loads (or other appropriate units) that are necessary to attain and maintain water quality standards. The point sources are ‘permitted' to discharge pollutants to the receiving waters. As such they must assure that they are not negatively impacting the water quality. The discharge of pollutants that will violate this must be removed or reduced to a level where standards are met. We believe that the limits established by the TMDL are technically achievable, but possibly at a cost to the dischargers. We have received comments to the effect that the cost of meeting the limits necessary to attain water quality standards but with no supporting data. Alternatives to meeting the established effluent limits may be proposed by point sources, possibly as a trading opportunity. Again EPA believes this to be the responsibility of the point sources as the TMDL is implemented. A watershed approach should be considered - quit possibly organized by a watershed group or possibly by the Planning Commission.
103-04	The TMDL report establishes sediment waste load allocations for each municipality to address the siltation impairment. The benefit of this is unclear since it appears that the watershed hydrologic conditions- the potential for quick high velocity floods- are more of a contributing factor to the sediment loads in the Wissahickon Creek. Efforts to reduce the volume and velocity of runoff should be pursued by the municipalities.	The sediment load is interconnected with the volume and velocity issue. If these can be controlled then the sediment load would be reduced and hence the TMDL met.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
103-05	The Pennsylvania Stormwater Management Act (Act 167) and most stormwater management ordinances implemented by municipalities are focused on preventing increased stormwater from new development, not retrofitting stormwater controls in developed areas. Despite the fact that only modest amounts of development are anticipated within the Wissahickon Creek Watershed in the next several decades, we have begun an Act 167 plan in the Sandy Run watershed and will develop a plan for the remaining portions of the Wissahickon Creek watershed in the near future.	Comment noted.
104-01	E-mail commentor - General	See Response to Letter # 19.
105-01	E-mail commentor - General	See Response to Letter # 19.
106-01	E-mail commentor - General	See Response to Letter # 19.
107-01	E-mail commentor - General	See Response to Letter # 19.
108-01	E-mail commentor - General	See Response to Letter # 19.
109-01	E-mail commentor - General	See Response to Letter # 19.
110-01	E-mail commentor - General	See Response to Letter # 19.
111-01	E-mail commentor - General	See Response to Letter # 19.
112-01	E-mail commentor - General	See Response to Letter # 19.
113-01	E-mail commentor - General	See Response to Letter # 19.
114-01	E-mail commentor - General	See Response to Letter # 19.
115-01	E-mail commentor - General	See Response to Letter # 19.
116-01	E-mail commentor - General	See Response to Letter # 19.
117-01	E-mail commentor - General	See Response to Letter # 19.
118-01	E-mail commentor - General	See Response to Letter # 19.
119-01	E-mail commentor - General	See Response to Letter # 19.
120-01	E-mail commentor - General	See Response to Letter # 19.
121-01	E-mail commentor - General	See Response to Letter # 19.
122-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
123-01	E-mail commentor - General	See Response to Letter # 19.
124-01	E-mail commentor - General	See Response to Letter # 19.
125-01	E-mail commentor - General	See Response to Letter # 19.
126-01	E-mail commentor - General	See Response to Letter # 19.
127-01	E-mail commentor - General	See Response to Letter # 19.
128-01	E-mail commentor - General	See Response to Letter # 19.
129-01	E-mail commentor - General	See Response to Letter # 19.
130-01	E-mail commentor - General	See Response to Letter # 19.
131-01	E-mail commentor - General	See Response to Letter # 19.
132-01	E-mail commentor - General	See Response to Letter # 19.
133-01	E-mail commentor - General	See Response to Letter # 19.
134-01	E-mail commentor - General	See Response to Letter # 19.
135-01	E-mail commentor - General	See Response to Letter # 19.
136-01	E-mail commentor - General	See Response to Letter # 19.
137-01	E-mail commentor - General	See Response to Letter # 19.
138-01	E-mail commentor - General	See Response to Letter # 19.
139-01	E-mail commentor - General	See Response to Letter # 19.
140-01	E-mail commentor - General	See Response to Letter # 19.
141-01	E-mail commentor - General	See Response to Letter # 19.
142-01	E-mail commentor - General	See Response to Letter # 19.
143-01	E-mail commentor - General	See Response to Letter # 19.
144-01	E-mail commentor - General	See Response to Letter # 19.
145-01	E-mail commentor - General	See Response to Letter # 19.
146-01	E-mail commentor - General	See Response to Letter # 19.
147-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
148-01	E-mail commentor - General	See Response to Letter # 19.
149-01	E-mail commentor - General	See Response to Letter # 19.
150-01	E-mail commentor - General	See Response to Letter # 19.
151-01	E-mail commentor - General	See Response to Letter # 19.
152-01	E-mail commentor - General	See Response to Letter # 19.
153-01	E-mail commentor - General	See Response to Letter # 19.
154-01	E-mail commentor - General	See Response to Letter # 19.
155-01	E-mail commentor - General	See Response to Letter # 19.
156-01	E-mail commentor - General	See Response to Letter # 19.
157-01	E-mail commentor - General	See Response to Letter # 19.
158-01	E-mail commentor - General	See Response to Letter # 19.
159-01	E-mail commentor - General	See Response to Letter # 19.
160-01	E-mail commentor - General	See Response to Letter # 19.
161-01	E-mail commentor - General	See Response to Letter # 19.
162-01	E-mail commentor - General	See Response to Letter # 19.
163-01	E-mail commentor - General	See Response to Letter # 19.
164-01	E-mail commentor - General	See Response to Letter # 19.
165-01	E-mail commentor - General	See Response to Letter # 19.
166-01	E-mail commentor - General	See Response to Letter # 19.
167-01	E-mail commentor - General	See Response to Letter # 19.
168-01	E-mail commentor - General	See Response to Letter # 19.
169-01	E-mail commentor - General	See Response to Letter # 19.
170-01	E-mail commentor - General	See Response to Letter # 19.
171-01	E-mail commentor - General	See Response to Letter # 19.
172-01	E-mail commentor - General	See Response to Letter # 19.

Letter ID	Public Comment	EPA Response
173-01	E-mail commentor - General	See Response to Letter # 19.
174-01	E-mail commentor - General	See Response to Letter # 19.
175-01	E-mail commentor - General	See Response to Letter # 19.
176-01	E-mail commentor - General	See Response to Letter # 19.
177-01	E-mail commentor - General	See Response to Letter # 19.
178-01	E-mail commentor - General	See Response to Letter # 19.
179-01	E-mail commentor - General	See Response to Letter # 19.
180-01	E-mail commentor - General	See Response to Letter # 19.
181-01	E-mail commentor - General	See Response to Letter # 19.
182-01	E-mail commentor - General	See Response to Letter # 19.
183-01	E-mail commentor - General	See Response to Letter # 19.
184-01	E-mail commentor - General	See Response to Letter # 19.
185-01	E-mail commentor - General	See Response to Letter # 19.
186-01	E-mail commentor - General	See Response to Letter # 19.
187-01	E-mail commentor - General	See Response to Letter # 19.
188-01	E-mail commentor - General	See Response to Letter # 19.
189-01	E-mail commentor - General	See Response to Letter # 19.
190-01	E-mail commentor - General	See Response to Letter # 19.
191-01	E-mail commentor - General	See Response to Letter # 19.
192-01	E-mail commentor - General	See Response to Letter # 19.
193-01	E-mail commentor - General	See Response to Letter # 19.
194-01	E-mail commentor - General	See Response to Letter # 19.
195-01	E-mail commentor - General	See Response to Letter # 19.
196-01	E-mail commentor - General	See Response to Letter # 19.
197-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
198-01	E-mail commentor - General	See Response to Letter # 19.
199-01	E-mail commentor - General	See Response to Letter # 19.
200-01	E-mail commentor - General	See Response to Letter # 19.
201-01	E-mail commentor - General	See Response to Letter # 19.
202-01	E-mail commentor - General	See Response to Letter # 19.
203-01	E-mail commentor - General	See Response to Letter # 19.
204-01	E-mail commentor - General	See Response to Letter # 19.
205-01	E-mail commentor - General	See Response to Letter # 19.
206-01	E-mail commentor - General	See Response to Letter # 19.
207-01	E-mail commentor - General	See Response to Letter # 19.
208-01	E-mail commentor - General	See Response to Letter # 19.
209-01	E-mail commentor - General	See Response to Letter # 19.
210-01	E-mail commentor - General	See Response to Letter # 19.
211-01	E-mail commentor - General	See Response to Letter # 19.
212-01	E-mail commentor - General	See Response to Letter # 19.
213-01	E-mail commentor - General	See Response to Letter # 19.
214-01	E-mail commentor - General	See Response to Letter # 19.
215-01	E-mail commentor - General	See Response to Letter # 19.
216-01	E-mail commentor - General	See Response to Letter # 19.
217-01	E-mail commentor - General	See Response to Letter # 19.
218-01	E-mail commentor - General	See Response to Letter # 19.
219-01	E-mail commentor - General	See Response to Letter # 19.
220-01	E-mail commentor - General	See Response to Letter # 19.
221-01	E-mail commentor - General	See Response to Letter # 19.
222-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
223-01	E-mail commentor - General	See Response to Letter # 19.
224-01	E-mail commentor - General	See Response to Letter # 19.
225-01	E-mail commentor - General	See Response to Letter # 19.
226-01	E-mail commentor - General	See Response to Letter # 19.
227-01	E-mail commentor - General	See Response to Letter # 19.
228-01	E-mail commentor - General	See Response to Letter # 19.
229-01	E-mail commentor - General	See Response to Letter # 19.
230-01	E-mail commentor - General	See Response to Letter # 19.
231-01	E-mail commentor - General	See Response to Letter # 19.
232-01	E-mail commentor - General	See Response to Letter # 19.
233-01	E-mail commentor - General	See Response to Letter # 19.
234-01	E-mail commentor - General	See Response to Letter # 19.
235-01	E-mail commentor - General	See Response to Letter # 19.
236-01	Standards must continue through September each year to protect the creek when it is most vulnerable. Ending the strongest protections on July 31 of each year is unacceptable. The Creek is at risk from pollution through the summer months.	Please see response to comment 40-03.
236-02	The "low flow" calculation used in the TMDL is two and a half times higher than the measured flow. This devised number will not provide adequate reductions of pollutants. The TMDL	Please see response to comment 40-02.
236-03	Excessive nutrient pollution must be tightly regulated. All upstream sewage treatment plants must reduce their nutrient discharges. The largest treated plants cannot be exempt from responsibility to the environment.	Please see response to comment 40-05.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
236-04	The Wissahickon Creek must meet the drinking water quality standards for nitrates and nitrites at its mouth. It is not acceptable to expect water from the Schuylkill River to dilute nutrient pollution to meet to drinking water standards. Water drawn by the Queen Lane intake could contain more Wissahickon Creek water than predicted violating the Nitrate-Nitrite standard. The potentially fatal nature of "Blue Baby" syndrome puts water consumers in danger. Please set the health and welfare of people as your highest priority.	Please see response to comment 40-10.
237-01	E-mail commentor - General	See Response to Letter # 19.
238-01	E-mail commentor - General	See Response to Letter # 19.
239-01	E-mail commentor - General	See Response to Letter # 19.
240-01	E-mail commentor - General	See Response to Letter # 19.
241-01	E-mail commentor - General	See Response to Letter # 19.
242-01	E-mail commentor - General	See Response to Letter # 19.
243-01	E-mail commentor - General	See Response to Letter # 19.
244-01	E-mail commentor - General	See Response to Letter # 19.
245-01	E-mail commentor - General	See Response to Letter # 19.
246-01	E-mail commentor - General	See Response to Letter # 19.
247-01	E-mail commentor - General	See Response to Letter # 19.
248-01	E-mail commentor - General	See Response to Letter # 19.
249-01	E-mail commentor - General	See Response to Letter # 19.
250-01	E-mail commentor - General	See Response to Letter # 19.
251-01	E-mail commentor - General	See Response to Letter # 19.
252-01	E-mail commentor - General	See Response to Letter # 19.
253-01	E-mail commentor - General	See Response to Letter # 19.
254-01	E-mail commentor - General	See Response to Letter # 19.
255-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
256-01	E-mail commentor - General	See Response to Letter # 19.
257-01	E-mail commentor - General	See Response to Letter # 19.
258-01	E-mail commentor - General	See Response to Letter # 19.
259-01	E-mail commentor - General	See Response to Letter # 19.
260-01	E-mail commentor - General	See Response to Letter # 19.
261-01	E-mail commentor - General	See Response to Letter # 19.
262-01	E-mail commentor - General	See Response to Letter # 19.
263-01	E-mail commentor - General	See Response to Letter # 19.
264-01	E-mail commentor - General	See Response to Letter # 19.
265-01	E-mail commentor - General	See Response to Letter # 19.
266-01	E-mail commentor - General	See Response to Letter # 19.
267-01	E-mail commentor - General	See Response to Letter # 19.
268-01	E-mail commentor - General	See Response to Letter # 19.
269-01	E-mail commentor - General	See Response to Letter # 19.
270-01	E-mail commentor - General	See Response to Letter # 19.
271-01	E-mail commentor - General	See Response to Letter # 19.
272-01	E-mail commentor - General	See Response to Letter # 19.
273-01	E-mail commentor - General	See Response to Letter # 19.
274-01	E-mail commentor - General	See Response to Letter # 19.
275-01	E-mail commentor - General	See Response to Letter # 19.
276-01	E-mail commentor - General	See Response to Letter # 19.
277-01	E-mail commentor - General	See Response to Letter # 19.
278-01	E-mail commentor - General	See Response to Letter # 19.
279-01	E-mail commentor - General	See Response to Letter # 19.
280-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
281-01	E-mail commentor - General	See Response to Letter # 19.
282-01	E-mail commentor - General	See Response to Letter # 19.
283-01	E-mail commentor - General	See Response to Letter # 19.
284-01	E-mail commentor - General	See Response to Letter # 19.
285-01	E-mail commentor - General	See Response to Letter # 19.
286-01	E-mail commentor - General	See Response to Letter # 19.
287-01	E-mail commentor - General	See Response to Letter # 19.
288-01	E-mail commentor - General	See Response to Letter # 19.
289-01	E-mail commentor - General	See Response to Letter # 19.
290-01	E-mail commentor - General	See Response to Letter # 19.
291-01	E-mail commentor - General	See Response to Letter # 19.
292-01	E-mail commentor - General	See Response to Letter # 19.
293-01	E-mail commentor - General	See Response to Letter # 19.
294-01	E-mail commentor - General	See Response to Letter # 19.
295-01	E-mail commentor - General	See Response to Letter # 19.
296-01	E-mail commentor - General	See Response to Letter # 19.
297-01	E-mail commentor - General	See Response to Letter # 19.
298-01	E-mail commentor - General	See Response to Letter # 19.
299-01	E-mail commentor - General	See Response to Letter # 19.
300-01	E-mail commentor - General	See Response to Letter # 19.
301-01	E-mail commentor - General	See Response to Letter # 19.
302-01	E-mail commentor - General	See Response to Letter # 19.
303-01	E-mail commentor - General	See Response to Letter # 19.
304-01	E-mail commentor - General	See Response to Letter # 19.
305-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
306-01	E-mail commentor - General	See Response to Letter # 19.
307-01	E-mail commentor - General	See Response to Letter # 19.
308-01	E-mail commentor - General	See Response to Letter # 19.
309-01	E-mail commentor - General	See Response to Letter # 19.
310-01	E-mail commentor - General	See Response to Letter # 19.
311-01	E-mail commentor - General	See Response to Letter # 19.
312-01	E-mail commentor - General	See Response to Letter # 19.
313-01	E-mail commentor - General	See Response to Letter # 19.
314-01	E-mail commentor - General	See Response to Letter # 19.
315-01	E-mail commentor - General	See Response to Letter # 19.
316-01	E-mail commentor - General	See Response to Letter # 19.
317-01	E-mail commentor - General	See Response to Letter # 19.
318-01	E-mail commentor - General	See Response to Letter # 19.
319-01	E-mail commentor - General	See Response to Letter # 19.
320-01	E-mail commentor - General	See Response to Letter # 19.
321-01	E-mail commentor - General	See Response to Letter # 19.
322-01	E-mail commentor - General	See Response to Letter # 19.
323-01	E-mail commentor - General	See Response to Letter # 19.
324-01	E-mail commentor - General	See Response to Letter # 19.
325-01	E-mail commentor - General	See Response to Letter # 19.
326-01	E-mail commentor - General	See Response to Letter # 19.
327-01	E-mail commentor - General	See Response to Letter # 19.
328-01	E-mail commentor - General	See Response to Letter # 19.
329-01	E-mail commentor - General	See Response to Letter # 19.
330-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
331-01	E-mail commentor - General	See Response to Letter # 19.
332-01	E-mail commentor - General	See Response to Letter # 19.
333-01	E-mail commentor - General	See Response to Letter # 19.
334-01	E-mail commentor - General	See Response to Letter # 19.
335-01	E-mail commentor - General	See Response to Letter # 19.
336-01	E-mail commentor - General	See Response to Letter # 19.
337-01	E-mail commentor - General	See Response to Letter # 19.
338-01	E-mail commentor - General	See Response to Letter # 19.
339-01	E-mail commentor - General	See Response to Letter # 19.
340-01	E-mail commentor - General	See Response to Letter # 19.
341-01	E-mail commentor - General	See Response to Letter # 19.
342-01	E-mail commentor - General	See Response to Letter # 19.
343-01	E-mail commentor - General	See Response to Letter # 19.
344-01	E-mail commentor - General	See Response to Letter # 19.
345-01	E-mail commentor - General	See Response to Letter # 19.
346-01	E-mail commentor - General	See Response to Letter # 19.
347-01	E-mail commentor - General	See Response to Letter # 19.
348-01	E-mail commentor - General	See Response to Letter # 19.
349-01	E-mail commentor - General	See Response to Letter # 19.
350-01	E-mail commentor - General	See Response to Letter # 19.
351-01	E-mail commentor - General	See Response to Letter # 19.
352-01	E-mail commentor - General	See Response to Letter # 19.
353-01	E-mail commentor - General	See Response to Letter # 19.
354-01	E-mail commentor - General	See Response to Letter # 19.
355-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
356-01	E-mail commentor - General	See Response to Letter # 19.
357-01	E-mail commentor - General	See Response to Letter # 19.
358-01	E-mail commentor - General	See Response to Letter # 19.
359-01	Duplicate record - see letter number 38.	See letter #38
360-01	E-mail commentor - General	See Response to Letter # 19.
361-01	E-mail commentor - General	See Response to Letter # 19.
362-01	E-mail commentor - General	See Response to Letter # 19.
363-01	E-mail commentor - General	See Response to Letter # 19.
364-01	E-mail commentor - General	See Response to Letter # 19.
365-01	E-mail commentor - General	See Response to Letter # 19.
366-01	E-mail commentor - General	See Response to Letter # 19.
367-01	E-mail commentor - General	See Response to Letter # 19.
368-01	E-mail commentor - General	See Response to Letter # 19.
369-01	E-mail commentor - General	See Response to Letter # 19.
370-01	E-mail commentor - General	See Response to Letter # 19.
371-01	E-mail commentor - General	See Response to Letter # 19.
372-01	E-mail commentor - General	See Response to Letter # 19.
373-01	E-mail commentor - General	See Response to Letter # 19.
374-01	E-mail commentor - General	See Response to Letter # 19.
375-01	E-mail commentor - General	See Response to Letter # 19.
376-01	E-mail commentor - General	See Response to Letter # 19.
377-01	E-mail commentor - General	See Response to Letter # 19.
378-01	E-mail commentor - General	See Response to Letter # 19.
379-01	E-mail commentor - General	See Response to Letter # 19.
380-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
381-01	E-mail commentor - General	See Response to Letter # 19.
382-01	E-mail commentor - General	See Response to Letter # 19.
383-01	E-mail commentor - General	See Response to Letter # 19.
384-01	E-mail commentor - General	See Response to Letter # 19.
385-01	E-mail commentor - General	See Response to Letter # 19.
386-01	E-mail commentor - General	See Response to Letter # 19.
387-01	E-mail commentor - General	See Response to Letter # 19.
388-01	E-mail commentor - General	See Response to Letter # 19.
389-01	E-mail commentor - General	See Response to Letter # 19.
390-01	E-mail commentor - General	See Response to Letter # 19.
391-01	E-mail commentor - General	See Response to Letter # 19.
392-01	E-mail commentor - General	See Response to Letter # 19.
393-01	E-mail commentor - General	See Response to Letter # 19.
394-01	E-mail commentor - General	See Response to Letter # 19.
395-01	E-mail commentor - General	See Response to Letter # 19.
396-01	E-mail commentor - General	See Response to Letter # 19.
397-01	E-mail commentor - General	See Response to Letter # 19.
398-01	E-mail commentor - General	See Response to Letter # 19.
399-01	E-mail commentor - General	See Response to Letter # 19.
400-01	E-mail commentor - General	See Response to Letter # 19.
401-01	E-mail commentor - General	See Response to Letter # 19.
402-01	E-mail commentor - General	See Response to Letter # 19.
403-01	E-mail commentor - General	See Response to Letter # 19.
404-01	E-mail commentor - General	See Response to Letter # 19.
405-01	E-mail commentor - General	See Response to Letter # 19.

Wissahickon Responsiveness Summary - Oct. 9, 2003

Letter ID	Public Comment	EPA Response
406-01	E-mail commentor - General	See Response to Letter # 19.
407-01	E-mail commentor - General	See Response to Letter # 19.
408-01	E-mail commentor - General	See Response to Letter # 19.
409-01	E-mail commentor - General	See Response to Letter # 19.
410-01	E-mail commentor - General	See Response to Letter # 19.
411-01	E-mail commentor - General	See Response to Letter # 19.
412-01	E-mail commentor - General	See Response to Letter # 19.
413-01	E-mail commentor - General	See Response to Letter # 19.
414-01	E-mail commentor - General	See Response to Letter # 19.
415-01	E-mail commentor - General	See Response to Letter # 19.
416-01	E-mail commentor - General	See Response to Letter # 19.
417-01	E-mail commentor - General	See Response to Letter # 19.