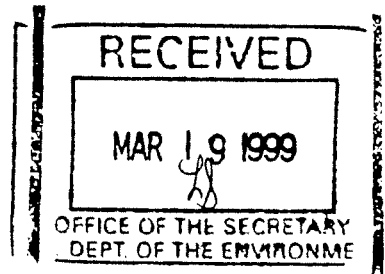




UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

March 18, 1999

The Honorable Jane T. Nishida
Secretary
Maryland Department of the Environment
2500 Broening Highway
Baltimore, Maryland 21224



Dèar Secretary Nishida:

The Environmental Protection Agency (EPA), Region III has reviewed the report "Total Maximum Daily Loads (TMDLS) of Nitrogen and Phosphorus for Fairlee Creek" which were submitted by the Maryland Department of the Environment (MDE) on February 10, 1999. Pursuant to 40 CFR Section 130.7(d), EPA is approving the Fairlee Creek TMDLS.

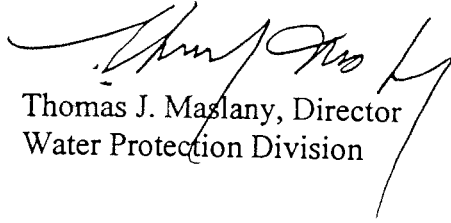
The definition of Load Allocation (LA) at 40 CFR Section 130.2(g) states, in part, that "Load Allocations are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading." Further, a wasteload allocation (WLA), according to 40 CFR Section 130.2(h), is "The portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality-based effluent limitation." In addition, a TMDL is defined at 40 CFR Section 130.2(I) as "The sum of the individual WLAs for point sources and LAs for nonpoint sources and natural background."

The TMDL report submitted by Maryland did not include individual WLAs for individual point sources and land use-based LAs for nonpoint sources. However, the supporting documentation provided with the TMDL report, specifically the Technical Memoranda, did provide one allocation scenario with individual point and nonpoint source allocations. EPA relied upon this information in reviewing and approving the TMDL submittal and in preparing our approval rational, which is enclosed. We expect that for future TMDLS, the technical memoranda will be included in any public notice of the TMDLS.

EPA has determined that the TMDLS and the Technical Memoranda for Nitrogen and Phosphorus for Fairlee Creek are consistent with the regulations and requirements of 40 CFR Section 130. Pursuant to 40 CFR §§ 130.6 and 130.7(d)(2), these TMDLS and the supporting documentation, including the Technical Memoranda, should be incorporated into Maryland's current water quality management plan. EPA has authority to object to issuance of a National Pollutant Discharge Elimination System (NPDES) permit that is inconsistent with WLAs established for that point source. If an NPDES permit is issued with an effluent limitation that does not reflect the WLA contained in the approved TMDL and Technical Memoranda, it is expected that Maryland will document this change in the permit Fact Sheet, as discussed in our

source included in the TMDL analysis for review and comment. If you have any questions or concerns, please contact me at 215-814-2050 or Tom Henry at 215-814-5265.

Sincerely,



Thomas J. Maslany, Director
Water Protection Division

Enclosure

cc: Patricia Gleason
Elaine Harbold
Thomas Henry
Stefania Shamet

**Total Maximum Daily Loads of Nitrogen and Phosphorus
for Fairlee Creek
Rationale for Approval**

A. Introduction

The Maryland Department of the Environment (MDE, Maryland, or "the State") submitted the report "Total Maximum Daily Loads (TMDL) for Nitrogen and Phosphorus for Fairlee Creek" to EPA for final Agency review on February 10, 1999. This report included separate Total Maximum Daily Loads (TMDLs) for nitrogen and phosphorus. Supporting documentation also was provided in the form of two Technical Memoranda.

This document will set forth EPA's rationale for approving the TMDLs for nitrogen and phosphorus. Our rationale is based on information provided in the TMDL report and the supporting documentation, including the Technical Memoranda. Our review of the TMDL report and Technical Memoranda determined that the following 8 requirements were met:

- A) The TMDLs are designed to implement the applicable water quality standards.
- B) The TMDLs include a total allowable load as well as individual wasteload allocations and load allocations.
- C) The TMDLs consider the impacts of background pollutant contributions.
- D) The TMDLs consider critical environmental conditions.
- E) The TMDLs consider seasonal environmental variations.
- F) The TMDLs include a Margin of Safety (MOS).
- G) There is reasonable assurance that the proposed TMDLs can be met.
- H) The TMDLs have been subject to public participation.

B. Review Summary

MDE has developed a low-flow TMDL as well as an average flow TMDL for both nitrogen and phosphorus. The low-flow TMDLs apply from May 1 to October 31 while the average flow TMDL applies on an annual basis. Table 1 below summarizes the elements of the low-flow and average-flow TMDLs. EPA finds that Maryland has provided sufficient information to meet all of the 8 basic requirements for establishing a TMDL. Therefore, EPA approves the TMDLs, Technical Memoranda, and supporting documentation for nitrogen and phosphorus for Fairlee Creek.

Table 1, Summary of TMDLs

Parameter	TMDL	LA	WLA	MOS	FA*	Type/Period
Nitrogen (lb/month)	654	523	21	26 and implicit	84	Low-flow May 1 - October 31
Phosphorus (lb/month)	77	47	11	2 and implicit	17	
Nitrogen (lb/year)	83,420	79,490	260	2,650 and implicit	1,020	Average-flow Annual
Phosphorus (lb/year)	6,310	5,780	140	190 and implicit	200	

* Future Allocation (FA) - See discussion at Section 2 of this document

C. Background

In response to the requirements of Section 303(d) of the Clean Water Act (CWA), MDE listed Fairlee Creek on the 1996 and 1998 CWA 303(d) list of impaired waters. Nutrients (Nitrogen and Phosphorus) were listed as the cause of impairment in Fairlee Creek as demonstrated by signs of eutrophication and low dissolved oxygen in violation of the water quality standard. The high concentrations of algae combined with low dissolved oxygen content of the water also caused violations of the designated uses of Fairlee Creek which are indicated as Use I (Water Contact Recreation and Protection of Aquatic Life) and Use II (Shellfish Harvesting Waters)¹. Section 303(d) of the CWA further states that a TMDL must be developed for those waterbodies identified as impaired by the State where technology-based and other required controls did not provide for attainment of water quality standards. The TMDLs submitted by MDE are designed to address acceptable levels of nitrogen and phosphorus, as demonstrated by the WASP5 model, in order to ensure that the water quality standard for dissolved oxygen is maintained. Furthermore, these levels of nitrogen and phosphorus will also provide for the control of eutrophication and seasonal algae blooms and allow the designated uses of Fairlee Creek to be met.

D. Discussion of Regulatory Conditions

EPA finds that the TMDLs of Nitrogen and Phosphorus for Fairlee Creek meet the regulatory requirements of the Clean Water Act. Our approval is outlined according to the regulatory requirements listed below.

1) *The TMDL is designed to implement the applicable water quality standards*

¹ Code of Maryland Regulations 26.08.02

MDE identified nitrogen and phosphorus as the causes of violations of the water quality standards, specifically the designated uses of Fairlee Creek. While Maryland does not have numeric water quality criteria for nitrogen and phosphorus, Maryland does utilize its narrative criteria listed at Section 26.08.02B of the Code of Maryland Regulations. In order to determine compliance with water quality standards, Maryland uses a numerical limitation for chlorophyll-a, which is a surrogate indicator for narrative criteria. In addition, the TMDLs are designed to achieve compliance with Maryland's dissolved oxygen water quality criterion of 5 mg/l².

The elevated nitrogen and phosphorus levels contributed to excessive algae blooms and wide diurnal fluctuations in dissolved oxygen content with the potential to cause fish kills. In order to eliminate the excessive algae blooms and maintain the dissolved oxygen concentrations above the water quality criterion of 5 mg/l², the elevated levels of nitrogen and phosphorus need to be reduced. MDE has demonstrated, through the use of a predictive model (WASP5), that the TMDLs will ensure compliance with the narrative criteria by restoring the designated uses of Fairlee Creek and meet the dissolved oxygen water quality criterion by maintaining nitrogen and phosphorus loads at the targeted levels. In addition, the water quality goal of reducing high chlorophyll-a concentrations³, a surrogate indicator of algae blooms, will also be achieved. This will further ensure that the water quality standards of Fairlee Creek are met in relation to nutrients.

2) *The TMDL includes both wasteload allocations and load allocations.*

Total Allowable Loads

The critical season for excessive algal growth in Fairlee Creek has been identified by Maryland as during the low flow summer months. During this period the system is poorly flushed, resulting in slow moving, warm water, which is susceptible to excessive algal growth. In order to control the algal activity and its impacts on water quality, particularly with respect to dissolved oxygen levels, Maryland has established individual TMDLs for nitrogen and phosphorus that apply for the summer months of May 1 through October 31. Maryland presented these loads as monthly loads to be consistent with the monthly concentration limits to eventually be required by NPDES permits. Expressing the TMDLs as monthly loads is consistent with federal regulations at 40 CFR 130.2(I), which state that TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure.

Maryland also recognized that nutrients may reach the river in significant amounts during higher flow periods. Modeling has shown that increased flushing at higher flows prevents immediate water quality problems. However, there is a concern that nutrient laden sediment, delivered and transported during higher flows, is causing excessive sediment oxygen demand, nutrient accumulation and siltation when it deposits in the area of a marina at the head of tide.

² Code of Maryland Regulations-Sections 26.08.02.03A(2) and 26.08.02.03C(2)

³ Refer to discussion at Section 6 of this document

Because of this concern during higher flow events, Maryland also developed TMDLs for average flow conditions, which will be applied as annual loads. Although the water quality problems occur during low flow, the annual TMDLs are intended to prevent backsliding on current nonpoint source loads, thereby making an initial effort to address possible sedimentation problems while the situation is further evaluated.

The TMDLs for nitrogen and phosphorus are presented in Table 1 above.

EPA's regulations at 40 CFR §130.2(I), define "total maximum daily load (TMDL)" as the "sum of the individual WLAs for point sources and LAs for nonpoint sources and natural background." As the total loads provided by Maryland equal the sum of the individual WLAs for point sources and the land-based LAs for nonpoint sources set forth below and in the Technical Memoranda provided with the TMDLs, the TMDLs for nitrogen and phosphorus for Fairlee Creek are consistent with Section 130.2(I). Pursuant to 40 CFR §§130.6 and 130.7(d)(2), these TMDLs and the Technical Memoranda and supporting documentation, should be incorporated into Maryland's current water quality management plan.

Waste Load Allocations

EPA's regulations require that an approvable TMDL include individual WLAs for each point source. Maryland's TMDL report for Fairlee Creek did not include individual waste load allocations for each point source of nitrogen and phosphorus. However, the Technical Memoranda did provide a breakdown of the TMDL to each point source based on the low flow and average flow TMDLs. These individual loads are presented below:

Table 2, Summary of low-flow and average-flow TMDL WLAs

Source	Permit #	Low-flow TMDL WLA		Average-flow TMDL WLA	
		TN Load (lb/month)	TP Load (lb/month)	TN Load (lb/year)	TP Load (lb/year)
Great Oak Landing	MD0024945	21	11	260	140
Existing WLA		21	11	260	140
Maximum Allowable Point Source Load ^a		105	28	1,280	340
Future Allocation		84	17	1,020	200

^a As determined by the model

The WLA for Great Oak Landing was developed using current estimated loads. Actual effluent data for nutrients is not required to be reported due to the small size of the discharge and thus not available. The WLA represents a conservative estimate based on facility design flow

and concentration of the effluent. Any revision to the WLA for Great Oak Landing or additional WLAs for new or expanding discharges must be shown to be consistent with the total load in providing for the attainment of water quality standards in the manner set forth below.

The Future Allocation (FA) represents the difference between the current estimated load and the maximum allowable load from point sources which the stream can assimilate without exhibiting impairment of the water quality standards. Allocating any portion of the FA to a WLA must be shown to be consistent with the total load in providing for the attainment of water quality standards in the manner set forth below.

Load Allocations

Maryland provided adequate land use data in the TMDL report, but did not distribute the total Load Allocation to specific land use categories in the TMDL report. Maryland included a gross load allocation for the low-flow and average-flow TMDLs. Below is a summary of the LAs for each flow condition.

Table 3, Summary of low-flow and average-flow TMDL LAs

	Low-flow TMDL LAs		Average-flow TMDL LAs	
	Nitrogen (lb/month)	Phosphorus (lb/month)	Nitrogen (lb/year)	Phosphorus (lb/year)
Load Allocation	523	47	79,490	5,780

According to federal regulations at 40 CFR 130.2(g), load allocations are best estimates of the loading, which 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 source loads should be distinguished.

The load allocation for the low-flow TMDL represents actual in stream values as determined from 5 water quality stations within the basin during July and August of 1991 and include any natural background concentrations. Under low-flow conditions, nonpoint source loads are mainly due to groundwater and not attributable to any particular use. It is unlikely, given the nature of low-flow nonpoint source loads, that these values have changed greatly from 1991.

The nonpoint source loads for the average-flow TMDL were calculated using a land use area/loading coefficient approach using year 2000 loading rates based on the results of the Chesapeake Bay Model (CBM) (U.S. EPA, 1991) for three land uses types (urban, agriculture, forest). Prior to incorporating those nonpoint source loads into the model, the loads for nitrogen

and phosphorus were reduced 10% and 9%, respectively⁴. The reduced loads represent the actual nonpoint source contribution of the load allocation. The background contribution determined from the low-flow TMDL LA is also included.

As noted above, Maryland did not provide a breakdown of the total allowable loads for nonpoint sources to individual land use categories at the average flow condition in the TMDL report. However, the Technical Memoranda provide breakdown for the average flow conditions. According to the Technical Memoranda, the specific loads for the average flow condition are as follows:

Land Use	Nitrogen	Phosphorus
	lb/yr	lb/yr
Agricultural	71,440	5,510
Forest	5,440	70
Urban	2,610	200
Totals	79,490	5,780

Allocation Scenarios

EPA realizes that the above breakout of the total loads for nitrogen and phosphorus to the point sources and nonpoint sources is one allocation scenario. As implementation of the established TMDLs proceeds, Maryland may find that other combinations of point and nonpoint source allocations that are more feasible and/or cost effective.

Federal regulations at 40 CFR 122.44(d)(1)(vii)(B), require that, for a National Pollutant Discharge Elimination System (NPDES) permit for an individual point source, the effluent limitations must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. EPA has authority to object to issuance of a National Pollutant Discharge Elimination System (NPDES) permit that is inconsistent with WLAs established for that point source. To ensure consistency with these TMDLs, as NPDES permits are issued for the point sources that discharge the pollutants of concern to Fairlee Creek, any deviation from the WLAs set forth in the Technical Memoranda and described herein for the particular point source must be documented in the permit Fact Sheet and made available for public review along with the proposed draft permit and the Notice of Tentative Decision. The documentation should 1) demonstrate that the loading change is

⁴ Based on the Maryland Department of Agriculture Best Management Practice (BMP) database to represent BMP's already implemented in the Fairlee Creek basin

consistent with the goals of the TMDL and will implement the applicable water quality standards, 2) demonstrate that the changes embrace the assumptions and methodology of these TMDLS and Technical Memoranda, and 3) describe that portion of the total allowable loading determined in the state's approved TMDL report that remains for other point sources (and future growth where included in the original TMDL) not yet issued a permit under the TMDL. It is also expected that Maryland will provide this Fact Sheet, for review and comment, to each point source included in the TMDL analysis as well as any local and State agency with jurisdiction over land uses for which load allocation changes may be impacted.

In addition, EPA regulations and program guidance provides for effluent trading. Federal regulations at 40 CFR 130.2(I) state: "If Best Management Practices (BMPs) or other nonpoint source pollution controls make more stringent load allocations practicable, then wasteload allocations can be made less stringent. Thus, the TMDL process provides for nonpoint source control tradeoffs." The state may trade between point sources and nonpoint sources identified in this TMDL as long as three general conditions are met: 1) the total allowable load to the waterbody is not exceeded, 2) the trading of loads from one source to another continues to properly implement the applicable water quality standards and embraces the assumptions and methodology of these TMDLS and Technical Memoranda, and 3) the trading results in enforceable controls for each source. Final control plans and loads should be identified in a publicly available planning document, such as the state's water quality management plan (see 40 CFR §§130.6 and 130.7(d)(2)). These final plans must be consistent with the goals of the approved TMDLS.

Based on the foregoing, EPA has determined that the TMDLS and the Technical Memoranda for Nitrogen and Phosphorus for Fairlee Creek are consistent with the regulations and requirements of 40 CFR Section 130. Pursuant to 40 CFR §§ 130.6 and 130.7(d)(2), these TMDLS and the supporting documentation, including the Technical Memoranda, should be incorporated into Maryland's current water quality management plan

3) *The TMDL considers the impacts of background pollutant contributions.*

The State indicates that the load allocations for the low-flow TMDL represent background nonpoint source loads from 1991 attributable to mostly groundwater recharge and that these loads account for both natural and human-induced load contributions. The average-flow TMDL load allocations include the same background contributing load as determined from the in stream data used in the low-flow TMDL.

4) *The TMDL considers critical environmental conditions.*

The requirements at 40 CFR 130.7(c)(1) require TMDLS to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of Fairlee Creek is protected during times when it is most vulnerable.

Situations where stream flows are reduced to levels approaching 7Q10⁵, there are higher levels of nutrient concentrations, and water temperatures are warmer creating favorable environmental conditions for algal growth represent critical conditions for Fairlee Creek⁶. Furthermore, the period during which water quality standards violations are documented, which are during low-flow periods for Fairlee Creek, represent critical conditions. The low-flow TMDL for nitrogen and phosphorus developed by MDE demonstrates that water quality standards and designated uses for Fairlee Creek are met, including maintaining the dissolved oxygen concentration above 5 mg/l, during critical conditions.

The State also recognizes that increased nonpoint source loads of nutrients during precipitation events could adversely affect water quality, thus a critical condition itself. In that regard, MDE has developed an annual TMDL based on average flow conditions which take into account the increased loads from nonpoint sources.

5) *The TMDL considers seasonal environmental variations.*

The annual TMDL based on average flow considerations developed by the State appropriately considers seasonal variations. The water quality and hydrology of streams are impacted by seasonality. Typically, seasonal variations are described by low-flow conditions in the summer and early fall while high flows usually occur during the winter and early spring⁷. Development of a low-flow TMDL as well as an annual, average flow TMDL effectively considers impacts which may be due to seasonal variations and demonstrates compliance with the water quality standards, including maintaining the dissolved oxygen concentration.

6) *The TMDL includes a Margin of Safety.*

This requirement is intended to add a level of conservatism to the modeling process. MDE has indicated that the TMDL uses combined implicit and explicit margins of safety (MOS) to provide conservatism to the model and comply with regulations. Separate explicit margins of safety are applied to both the low-flow and average -flow TMDLs.

The low-flow TMDL MOS is calculated as 5% of the nonpoint source load for nitrogen and phosphorus, which actually represents 4% and 2.6%, respectively, of the low-flow TMDL. The average-flow TMDL MOS is calculated as 3% of the nonpoint source load for nitrogen and phosphorus, which actually represents 3.2% and 3%, respectively, of the annual TMDL.

The State also applies an implicit MOS by setting an upper model limit on chlorophyll-*a* concentrations of 50 $\mu\text{g/l}$, which is conservative given that a generally acceptable range is 50 $\mu\text{g/l}$ to 100 $\mu\text{g/l}$. Chlorophyll-*a* is a measure of algal biomass in waters and is a significant link

⁵ 7Q10 represents the 7-day average low-flow occurring once in 10 years

⁶Critical conditions and seasonality are discussed in detail in Section 2.3.3 of EPA's Technical Guidance Manual for developing Total Maximum Daily Loads, Book 2, Part 1 (EPA 823-B-97-002)

between the dissolved oxygen concentration and nutrient levels. Placing a conservative upper limit on algal biomass, which is predicated on reduced levels of nutrients, adds a level of conservatism to the TMDL. Furthermore, the State developed the annual, average-flow TMDL under the assumption that summer temperatures were experienced year-round. Warmer temperatures would provide favorable environmental conditions for algae blooms and violations of the dissolved oxygen water quality criterion. The model also assumed continuous average flows and loads, which is a conservative approach.

EPA agrees that the combined approach used by MDE is appropriate.

7) *There is reasonable assurance that the TMDL can be met*

EPA requires that there be a reasonable assurance that the TMDL can be implemented. Here, the WLAs will be implemented through the NPDES permit process. See 40 CFR § 122.44(d)(1)(vii)(B). EPA has authority to object to issuance of any NPDES permit that is not consistent with the WLAs described in the TMDLs and Technical Memoranda.

Nonpoint source controls can be implemented through a number of existing programs, including Maryland's Lower Potomac Tributary Strategy, which was developed as part of Maryland's commitments under the Chesapeake Bay Agreement, EPA's Clean Water Action Plan, and Maryland's Water Quality Improvement Act of 1998.

In addition, there will be follow-up monitoring within five years as part of Maryland's Watershed Cycling Strategy. This follow-up monitoring will allow Maryland and EPA to determine whether these TMDLs have been implemented successfully.

7) *The TMDL has been subject to public participation.*

The TMDLs of Nitrogen and Phosphorus for Fairlee Creek were open for public comment from December 3, 1998 through January 4, 1999. Only one set of written comments was received by MDE, which was provided with the TMDL document along with responses from the State. EPA generally agrees with the responses given to the comments.