



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029
3/27/2007

Dr. Richard Eskin, Director
Technical and Regulatory Services Administration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 540
Baltimore, MD 21230

Dear Dr. Eskin:

The U.S. Environmental Protection Agency (EPA) Region III is pleased to approve the Total Maximum Daily Loads (TMDL) for phosphorus and sediment in the Loch Raven Reservoir and phosphorus in Prettyboy Reservoir located in Baltimore, Carroll, and Harford Counties, Maryland. The TMDL Report was submitted by the Maryland Department of the Environment (MDE) on September 15, 2006 to EPA for review and approval. The TMDLs were developed and submitted in accordance with Section 303(d)(1)(c) and (2) of the Clean Water Act to address impairments of water quality as identified in Maryland's Section 303(d) list. The Loch Raven Reservoir (02-13-08-05) and the Prettyboy Reservoir (02-13-08-06) were first identified on Maryland's 1996 Section 303(d) list of water quality-limited segments as impaired by nutrients, sediments (Loch Raven), and metals with listings of bacteria (Prettyboy), mercury in fish tissue, and impacts to biological communities added in 2002. TMDLs to address mercury were completed for both reservoirs in 2002. Water Quality Analyses for metals were completed for both reservoirs in 2003. The remaining impairments within these watersheds will be addressed by Maryland at a future date. The TMDLs described in this document were developed to address localized water quality impairments identified within the watershed, specifically the nutrient and sediment impairments.

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 (LAs) 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 enclosure to this letter describes how the phosphorus and sediment TMDLs for Loch Raven Reservoir and the phosphorus TMDLs for Prettyboy Reservoir satisfy each of these requirements.



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 contact Mr. Thomas Henry, TMDL Program Manager, at (215) 814-5752.

Sincerely,

Signed

Jon M. Capacasa, Director
Water Protection Division

Enclosure

cc: Melissa Chatham, MDE-TARSA
Nauth Panday, MDE-TARSA





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1650 Arch Street
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Decision Rationale

Total Maximum Daily Loads of Phosphorus and Sediments for Loch Raven Reservoir and Total Maximum Daily Loads of Phosphorus for Prettyboy Reservoir, Baltimore, Carroll and Harford Counties, Maryland

Signed

**Jon M. Capacasa, Director
Water Protection Division**

Date: 3/27/2007

Decision Rationale

Total Maximum Daily Loads of Phosphorus and Sediments for Loch Raven Reservoir and Total Maximum Daily Loads of Phosphorus for Pretty Boy Reservoir, Baltimore, Carroll and Harford Counties, Maryland

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) to be developed for those waterbodies identified as impaired by the state where technology-based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), that may be discharged to a water quality-limited water body.

This document sets forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the phosphorus and sediment TMDLs in the Loch Raven Reservoir Watershed and the phosphorus TMDLs in the Prettyboy Reservoir Watershed. These TMDLs were established to address impairments of water quality, caused by nutrients and sediment, as identified in Maryland's 1996 Section 303(d) list for water quality-limited segments. The Maryland Department of the Environment (MDE) submitted the report, *Total Maximum Daily Loads of Phosphorus and Sediments for Loch Raven Reservoir and Total Maximum Daily Loads of Phosphorus for Prettyboy Reservoir, Baltimore, Carroll, and Harford Counties, Maryland* on September 15, 2006. The Loch Raven Reservoir (basin code 02-13-08-05) and Prettyboy Reservoir (basin code 02-13-08-06) are also referred to as the Gunpowder Reservoirs.

EPA's rationale is based on the information contained in the TMDL Report, the Appendices to the report, the Comment Response Document, and MDE's responses to EPA's comments. EPA's review determined that the TMDL meets the following eight regulatory requirements pursuant to 40 CFR Part 130.

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

II. Summary

The TMDL specifically allocates the allowable phosphorus loading to the Loch Raven and Prettyboy Reservoir Watersheds and the allowable sediment loading to the Loch Raven Reservoir Watershed. There are seven permitted point sources of phosphorus and/or sediment

within the Loch Raven Reservoir Watershed. The Prettyboy Reservoir Watershed has three permitted point sources of phosphorus. The fact that the TMDL does not assign WLAs to any other sources in the watershed should not be construed as a determination by either EPA or MDE that there are no additional sources in the watershed that are subject to the National Pollutant Discharge Elimination System (NPDES) program. In addition, the fact that EPA is approving this TMDL does not mean that EPA has determined whether some of the sources discussed in the TMDL, under appropriate conditions, might be subject to the NPDES program. The TMDLs are presented as an average annual load in pounds/year or tons/year because it was developed to meet TMDL endpoints under a range of conditions observed throughout the year. The average daily TMDL is also presented in pounds/day or tons/day. The average annual and average daily TMDLs are presented in Tables 1 and 2, respectively.

Table 1. Summary of Nutrient and Sediment Average Annual TMDLs for Prettyboy and Loch Raven Reservoir Watersheds

Waterbody	Constituent	Rate	TMDL	WLA	LA	MOS
Prettyboy Reservoir	Phosphorus	lbs/year	23,192	2,940	19,092	1,160
Loch Raven Reservoir	Phosphorus	lbs/year	54,941	22,010	30,184	2,747
Loch Raven Reservoir	Sediment	tons/year	28,925	1,210	27,715	Implicit

Table 2. Summary of Nutrient and Sediment Average Daily TMDLs for Prettyboy and Loch Raven Reservoir Watersheds

Waterbody	Constituent	Rate	TMDL
Prettyboy Reservoir	Phosphorus	lbs/day	63.54
Loch Raven Reservoir	Phosphorus	lbs/day	150.95
Loch Raven Reservoir	Sediment	tons/day	79.25

The TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards. The TMDL is a scientifically based strategy that considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a MOS value. The option is always available to refine the TMDL for re-submittal to EPA for approval if environmental conditions, new data, or the understanding of the natural processes change more than what was anticipated by the MOS.

III. Background

The Loch Raven Reservoir and the Prettyboy Reservoir lie within the Gunpowder Falls Watershed. The Gunpowder Falls drain into the Chesapeake Bay north of the City of Baltimore. The drainage area of the Loch Raven and Prettyboy Reservoirs lies primarily in Baltimore and Carroll Counties but also includes small portions of Harford County, Maryland and York County, Pennsylvania. Water supply intakes in Loch Raven Reservoir feed Baltimore City's Montebello Water Treatment Plant. Prettyboy Reservoir, which is upstream of Loch Raven Reservoir, is used as a secondary reservoir to maintain capacity in Loch Raven Reservoir. The

Prettyboy Reservoir Watershed covers 77 square miles with predominantly agriculture (49%), forest (39%), and residential, commercial, or industrial land uses (12%). Loch Raven Reservoir Watershed, excluding Prettyboy reservoir, covers 218 square miles with predominant land uses including forest (38%), agriculture (27%), developed land (21%), and mixed open land (15%). The land use is based on 1997 Maryland Department of Planning Land Use/Land Cover data. Section 2.0 of MDE's TMDL Report provides additional information about the Loch Raven and Prettyboy Reservoir Watersheds, including land use information.

The Loch Raven Reservoir (02-13-08-05) and Prettyboy Reservoir (02-13-08-06) were first identified on Maryland's 1996 Section 303(d) list of water quality-limited segments as impaired by nutrients, sediments (Loch Raven), and metals with listings of bacteria (Prettyboy), mercury in fish tissue, and impacts to biological communities added in 2002. TMDLs to address mercury were completed for both reservoirs in 2002. Water Quality Analyses for metals were completed for both reservoirs in 2003. The remaining impairments within these watersheds will be addressed by Maryland at a future date.

The Maryland Water Quality Standards Stream Segment Designation for the Loch Raven and Prettyboy Reservoir watersheds are Use III-P: Nontidal Cold Water and Public Water Supply (Code of Maryland Regulations, COMAR, 26.08.02.08J). Designated uses present in the Prettyboy and Loch Raven Reservoir watersheds are: 1) growth and propagation of trout; and 2) public water supply. Maryland's general water quality criteria prohibit pollution of waters of the State by any material in amounts sufficient to create nuisance or interfere in designated uses (COMAR, 26.08.02.03). Excessive eutrophication, indicated by elevated levels of chlorophyll *a* (Chl_a), can produce nuisance levels of algae and interfere with designated uses such as fishing and swimming. The excess algal blooms eventually die off and decompose, consuming oxygen. Excessive eutrophication in Prettyboy and Loch Raven Reservoirs is ultimately caused by nutrient overenrichment. An analysis of the available water quality data presented in Section 2.2 of the TMDL Report has demonstrated that phosphorus is the limiting nutrient. In conjunction with excessive nutrients, Loch Raven Reservoir has experienced excessive sediment loads, resulting in a shortened projected lifespan of the reservoir.

The water quality goal of the nutrient TMDLs is to reduce high Chl_a concentrations that reflect excessive algal blooms, and to maintain dissolved oxygen (DO) at a level supportive of the designated uses for Prettyboy and Loch Raven Reservoirs. The water quality goal of the sediment TMDL for Loch Raven Reservoir is to increase the useful life of the reservoir for water supply by preserving storage capacity.

The TMDLs for the nutrient total phosphorus were determined using a time-variable, two-dimensional water quality eutrophication model, CE-QUAL-W2, to simulate water quality in each reservoir. Nonpoint source loads and urban stormwater loads entering the Prettyboy and Loch Raven Reservoirs were estimated using the Hydrologic Simulation Program-Fortran (HSPF) model. The HSPF model is used to estimate flows, suspended solids, and nutrient loads from the watershed's sub-basins, which are linked to the CE-QUAL-W2 models of each reservoir. The TMDLs are based on average annual total phosphorus loads for the simulation period 1992-1997, which includes both wet and dry years, and thus takes into account a variety of hydrological conditions. Section 4.0 of the TMDL Report provides a thorough description of

the CE-QUAL-W2 model and calculations. Chla concentrations indicative of eutrophic conditions can occur at any time of year and are the cumulative result of phosphorus loadings that span seasons. Thus, average annual phosphorus total loads are the most appropriate measure for expressing the nutrient TMDLs for Prettyboy and Loch Raven Reservoirs. Similarly, the sediment TMDL for Loch Raven Reservoir, which is based on the water quality modeling performed for the nutrient TMDLs, is expressed as an average annual load in keeping with the long-term water quality goal of preserving the storage capacity of the reservoir. Section 4.4.2 of the TMDL Report provides a description of the sediment loading cap calculations utilized for the Loch Raven Reservoir Watershed.

CWA Section 303(d) and its implementing regulations require that TMDLs be developed for waterbodies identified as impaired by the state where technology-based and other required controls do not provide for attainment of water quality standards. The TMDLs submitted by MDE are designed to attain acceptable loadings of phosphorus and sediments to Loch Raven Reservoir and acceptable loadings of phosphorus to Prettyboy Reservoir in order to attain the narrative and DO water quality criteria and support the Use III-P designation. Refer to Tables 1 and 2 above for a summary of allowable loads.

IV. Discussion of Regulatory Conditions

EPA finds that MDE has provided sufficient information to meet all of the eight basic requirements for establishing phosphorus and sediment TMDLs for the Loch Raven Reservoir watershed and phosphorus TMDLs for the Prettyboy Reservoir Watershed. EPA therefore approves the phosphorus and sediment TMDLs for the Loch Raven Reservoir and the phosphorus TMDLs in the Prettyboy Reservoir. This approval is outlined below according to the eight regulatory requirements.

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

Water Quality Standards consist of three components: designated and existing uses; narrative and/or numerical water quality criteria necessary to support those uses; and an anti-degradation statement. The Maryland Water Quality Standards Stream Segment Designation for the Loch Raven and Prettyboy Reservoir watersheds are Use III-P: Nontidal Cold Water and Public Water Supply (Code of Maryland Regulations, COMAR, 26.08.02.08J). Designated uses present in the Prettyboy and Loch Raven Reservoir watersheds are: 1) growth and propagation of trout; and 2) public water supply. Maryland's general water quality criteria prohibit pollution of waters of the State by any material in amounts sufficient to create nuisance or interfere in designated uses (COMAR, 26.08.02.03). Excessive eutrophication, indicated by elevated levels of Chla, can produce nuisance levels of algae and interfere with designated uses such as fishing and swimming. The excess algal blooms eventually die off and decompose, consuming oxygen. Excessive eutrophication in Prettyboy and Loch Raven Reservoirs is ultimately caused by nutrient overenrichment. An analysis of the available water quality data presented in Section 2.2 of the TMDL Report has demonstrated that phosphorus is the limiting nutrient. In conjunction with excessive nutrients, Loch Raven Reservoir has experienced excessive sediment loads, resulting in a shortened projected lifespan of the reservoir. Therefore, phosphorus and sediment TMDLs were developed for these watershed areas, as appropriate. The overall objective of the

TMDLs is to reduce the phosphorus and sediment loadings in order to meet the narrative and DO water quality criteria to support the Use III-P designation. EPA believes that this is a reasonable and appropriate water quality goal.

Use III waters are subject to dissolved oxygen (DO) criteria of not less than 6.0 mg/L daily average and 5.0 mg/L at any time (COMAR 26.08.02.03-3E(2)) unless natural conditions result in lower levels of DO (COMAR 26.08.02.03A(2)). New standards for tidal waters of the Chesapeake Bay and its tributaries take into account stratification and its impacts on deeper waters. MDE recognizes that stratified reservoirs and impoundments present circumstances similar to stratified tidal waters, and is applying an interim interpretation of the existing standards to allow for the impact of stratification on DO concentrations. This interpretation recognizes that, given the morphology of the reservoir or impoundment, the resulting degree of stratification, and the naturally occurring sources of organic material in the watershed, hypoxia in the hypolimnion is a natural consequence. The interim interpretation of the non-tidal DO standards, as applied to reservoirs, is as follows:

- A minimum DO concentration of 5.0 mg/L (and 6.0 mg/L daily average for Use III) will be maintained throughout the water column during periods of complete and stable mixing.
- A minimum DO concentration of 5.0 mg/L (and 6.0 mg/L daily average for Use III) will be maintained in the mixed surface layer at all times, including during stratified conditions, except during periods of overturn or other naturally occurring disruptions of stratification; and
- Hypolimnetic hypoxia will be addressed on a case-by-case basis, taking into account morphology, degree of stratification, sources of diagenic organic material in reservoir sediments, and other factors.

The analysis of water quality data discussed in Section 2.2 of the TMDL Report has shown that all observed DO concentrations below 5.0 mg/L in the surface layers of Prettyboy and Loch Raven Reservoir are associated with stratification or the mixing of stratified waters into the surface layers during periods of reservoir overturn or drawdown. On the other hand, seasonal hypoxia occurs regularly in both reservoirs in the hypolimnion.

MDE used Chla, a measure of algal biomass, as the water quality endpoint for the phosphorus TMDL. The Chla endpoints selected for the reservoirs are (1) a maximum permissible instantaneous Chla concentration of 30 µg/L in the surface layers and (2) a 30-day moving average concentration not to exceed 10 µg/L in the surface layers. A concentration of 10 µg/L corresponds to a score of approximately 53 on the Carlson Trophic State Index (TSI). This is the approximate boundary between mesotrophic and eutrophic conditions, which Maryland has determined is an appropriate trophic state at which to manage these reservoirs. Management of these reservoirs at this trophic state is expected to avoid nuisance algal blooms and excessive aquatic macrophyte growth. EPA believes that this is a reasonable and appropriate water quality goal.

To the extent that phosphorus binds to sediments, measures taken to reduce phosphorus loadings will result in concomitant reductions of sediment loads. The reductions are not

necessarily 1:1, and Maryland's rationale for predicting sediment load reductions is described more fully in Section 4.4.2 of the TMDL report. MDE believes that the reductions of sediment and phosphorus loads will be sufficient to prevent violations of the State's narrative water quality criteria.

The TMDLs propose that the violation of the water quality criterion for DO and the narrative standard for nuisance is caused by excessive growth of algae due to phosphorus enrichment. Because phosphorus binds to sediment, sedimentation rates are also related to phosphorus loadings. Reduction of phosphorus loadings associated with sediment will consequently result in a decrease in sedimentation rates and promote attainment of water quality objectives.

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

Total Allowable Load

The allowable loads for the impaired watershed are calculated based on the endpoints described above. These loads are considered the maximum allowable load the watershed can assimilate and still attain water quality standards. The TMDLs and allocations are presented as mass loading rates of pounds/year or tons/year for the average annual load and pounds/day or tons/day for the average daily load. Expressing TMDLs as annual and daily mass loading rates 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. The average annual and average daily TMDLs are presented in Tables 1 and 2, respectively.

EPA regulations at 40 CFR §130.2(i) state that the total allowable load shall be the sum of individual WLAs for point sources, LAs for nonpoint sources, and natural background concentrations. The TMDLs for phosphorus and sediment for the Loch Raven and Prettyboy Reservoir watersheds are consistent with 40 CFR §130.2(i) because the total loads provided by MDE equal the sum of the individual WLAs for point sources and the land-based LAs for nonpoint sources. Pursuant to 40 CFR §130.6 and §130.7(d)(2), this TMDL and the supporting documentation should be incorporated into Maryland's current water quality management plan.

Waste Load Allocations

The Technical Memorandum, *Significant Phosphorus and Sediment Point Sources in the Prettyboy and Loch Raven Reservoir Watersheds*, submitted by MDE specifically identifies the significant point sources of phosphorus in the Prettyboy and Loch Raven Reservoir watersheds and the significant point sources of sediment in the Loch Raven Reservoir watershed. Wasteload allocations have been made to National Pollutant Discharge Elimination System (NPDES) permitted wastewater treatment plants (WWTP), municipal separate stormwater dischargers (MS4s), and other regulated dischargers in the Prettyboy and Loch Raven Reservoir watersheds. The Manchester WWTP and the Hampstead WWTP contribute phosphorus loads in the Prettyboy Reservoir and Loch Raven Reservoir, respectively. Hampstead WWTP also contributes sediment to the Loch Raven Reservoir watershed. Two MS4s discharge phosphorus

to the Prettyboy Reservoir watershed: Baltimore County and Carroll County. These same two MS4s, as well as Harford County, also discharge phosphorus and sediment to the Loch Raven Reservoir watershed. In addition to the WWTP and MS4s, there are three small permittees which discharge sediment to the Loch Raven Reservoir watershed. No reductions were applied to the permitted point sources. Section 2.1.3 of the TMDL Report provides further information on point sources in these watersheds.

Load Allocations

The TMDL summary in Table 1 contains the LA for phosphorus and sediment in the Loch Raven and Prettyboy Reservoir watersheds. According to Federal regulations at 40 CFR §130.2(g), LAs 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 loadings should be distinguished. Maryland conducted a nonpoint source assessment in order to estimate the contributions of agriculture, forest, developed, and mixed open land uses to the overall nonpoint source loadings. Figures 5, 6, and 7 of the TMDL Report provide a breakdown of the existing phosphorus and sediment nonpoint source loads to the Loch Raven and Prettyboy Reservoir watersheds as well as point sources.

The Technical Memorandum, *Significant Phosphorus and Sediment Nonpoint Sources in the Prettyboy and Loch Raven Reservoir Watersheds*, submitted by the MDE, specifically identifies the significant nonpoint sources of phosphorus in the Prettyboy and Loch Raven Reservoir Watersheds and the significant nonpoint sources of sediment in the Loch Raven Reservoir Watershed. Nonpoint source loads for phosphorus and sediment were allocated to two separate land use categories: mixed agriculture, and forest and other herbaceous land. Each land use or source is allocated some percentage of the total allowed phosphorus and/or sediment load originating from nonpoint sources. The nonpoint source loads for phosphorus and sediment were both estimated using the Gunpowder Falls Watershed HSPF model. Each land use load allocation represents average annual load allocations of phosphorous and sediment for Loch Raven Reservoir Watershed and average annual load allocations of phosphorus for Prettyboy Reservoir Watershed.

Federal regulations at 40 CFR §122.44(d)(1)(vii)(B) require that, for an 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 the issuance of an NPDES permit that is inconsistent with WLAs established for that point source. To ensure consistency with this TMDL, if an NPDES permit is issued for a point source that discharges one or more of the pollutants of concern in the Loch Raven and Prettyboy Reservoir watersheds, any deviation from the WLAs set forth in the TMDL Report and described herein for a 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 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 the TMDL; and 3) describe that portion of the total allowable loading determined in the state's

approved TMDL Report that remains for any 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 analyses as well as any local and state agency with jurisdiction over land uses for which LA changes may be impacted. It is also expected that MDE will require periodic monitoring of the point source(s) for total suspended solids, through the NPDES permit process, in order to monitor and determine compliance with the TMDLs WLAs.

In addition, EPA regulations and program guidance provides for effluent trading. Federal regulations at 40 CFR §130.2(i) state: “if Best Management Practices (BMP) or other nonpoint source pollution controls make more stringent LAs practicable, then WLAs may 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 the 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 the TMDL; and 3) the trading results in enforceable controls for each source. Any changes such as these should be subject to public comment. Any revisions to WLAs and/or LAs should be submitted to EPA for review.

Based on the foregoing, EPA has determined that the TMDLs are consistent with the regulations and requirements of 40 CFR Section 130.

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

The TMDLs consider the impact of background pollutants by considering the phosphorus and sediment loads from natural sources such as forested land. The CE-QUAL-W2 and HSPF models also consider background pollutant contributions by incorporating all land uses.

4) *The TMDLs consider critical environmental conditions.*

EPA regulations at 40 CFR §130.7(c)(1) require TMDLs to account for critical conditions for stream flow, loading, and water quality parameters. The intent of the regulations is to ensure that; 1) the TMDLs are protective of human health, and 2) the water quality of the waterbodies is protected during the times when they are most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards¹. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable worst-case scenario condition. Critical conditions were considered while considering

¹EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

seasonal variations, by running the model simulation for several years, from 1992 to 1997 that included a range of hydrological conditions including wet years (1993, 1996), dry years (1992, 1997), and average years (1994, 1995).

- 5) *The TMDLs consider seasonal environmental variations.*

See Requirement 4 above.

- 6) *The TMDLs include a margin of safety.*

The requirement for a MOS is intended to add a level of conservatism to the modeling process in order to account for uncertainty. Based on EPA guidance, the MOS can be achieved through two approaches. One approach is to reserve a portion of the loading capacity as a separate term, and the other approach is to incorporate the MOS as part of the design conditions. MDE has adopted an explicit MOS for phosphorus in accordance with the first approach, whereby the load allocated to the MOS was computed as five percent of the total allowable load.

In establishing a MOS for sediment, MDE has adopted an implicit approach by incorporating conservative assumptions. Because phosphorus binds to sediment, sediment will be controlled as a result of controlling phosphorus. The estimate of sediment reduction is based on the load allocation for phosphorus rather than the entire phosphorus TMDL, including the MOS. Thus the explicit five percent MOS for phosphorus will result in an implicit MOS for sediments. Also, MDE conservatively assumed a sediment to phosphorus ratio of 0.5:1 rather than 0.7:1 in calculated reductions of sediments based on phosphorus reduction measures as discussed in Section 4.4.2 of the TMDL Report.

- 7) *There is reasonable assurance that the TMDLs can be met.*

EPA requires that there be a reasonable assurance that the TMDLs can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR §122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. Furthermore, EPA has the authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source controls to achieve LAs will be implemented in an iterative process that places priority on those sources having the largest impact on water quality, with consideration given to ease of implementation and cost. BMPs can be implemented through a number of existing programs and funding sources, including: the Water Quality Improvement Act of 1998 (WQIA), the Clean Water Action Plan (CWAP) framework, the Maryland Agriculture Water Quality Cost Share (MACS) program, the Low Interest Loans for Agricultural Conservation (LILAC) program, the Maryland Agricultural Land Preservation Easement (MALPE) program, and the Chesapeake Bay Agreement's Tributary Strategies for Nutrient Reduction.

- 8) *The TMDLs have been subject to public participation.*

MDE provided an opportunity for public review of and comment on the phosphorus and sediment TMDLs for the Loch Raven Reservoir Watershed and the phosphorus TMDL for the Prettyboy Reservoir Watershed. The public review and comment period was open from June 26, 2006 through July 25, 2006. The public comment period was extended from July 28, 2006 to August 11, 2006 to allow for review and comment of two additional technical memoranda regarding nonpoint sources and point sources. MDE received four sets of comments for this TMDL which were addressed in MDE's Comment Response Document.

Copies of the reports were sent to the U.S. Fish and Wildlife Service and National Marine Fisheries Service pursuant to Section 7(c) of the Endangered Species Act, requesting the Services' concurrence with EPA's findings that approval of this TMDL does not adversely affect any listed endangered and threatened species and their critical habitats.