



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION III  
1650 Arch Street  
Philadelphia, Pennsylvania 19103-2029  
12/17/2007

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) is pleased to approve the Total Maximum Daily Loads (TMDLs) for total nitrogen and total phosphorus for the Baltimore Harbor, with the exception of the Deep Channel as discussed below, that address the Migratory Fish and Spawning and Open Water (including the restoration variance) designated uses. The TMDL Report was submitted by the Maryland Department of the Environment (MDE) on December 14, 2006, to EPA for review and approval. This TMDL was established and submitted in accordance with Sections 303(d)(1)(c) and (2) of the Clean Water Act (CWA) to address impairments of water quality as identified in Maryland's Section 303(d) Lists. The Baltimore Harbor (basin number 02130903) was identified on Maryland's Section 303(d) Lists as impaired by nutrients (1996 listing), bacteria (1998 listing), PCBs (1998 listing), metals (1998 listing), suspended sediments (1996 listing) and impacts to biological communities (2004). This approval letter addresses the nutrient listing only.

In accordance with Federal regulations at 40 CFR §130.7, a TMDL must comply with the following requirements: (1) be designed to attain and maintain the applicable water quality standards; (2) include a total allowable loading and as appropriate, wasteload allocations 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 in-stream water quality); and (7) be subject to public participation. The nutrient TMDLs for the Baltimore Harbor satisfy each of these requirements for areas of the Harbor with the exception of the Deep Channel. In addition, these TMDLs considered reasonable assurance that the TMDL allocations assigned to nonpoint sources can be reasonably met. A copy of EPA's decision rationale for approval of these TMDLs is included with this letter.

The analysis provided by the state shows that even after the removal of the anthropogenic sources to their maximum level, the water quality criteria for dissolved oxygen cannot be met in the Deep Channel. Therefore, EPA is not including that portion of the Baltimore Harbor in this approval. EPA recommends that the Deep Channel remain on the State's CWA Section 303(d) list of impaired waters and evaluate the water quality needs of this portion of the Harbor, possibly through a Use Attainability Analysis. Following the re-evaluation, an additional TMDL to address the needs of the Deep Channel may be required.

As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL wasteload allocation 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 concerning these TMDLs, please contact Mr. Kuo-Liang Lai, Maryland TMDL Coordinator, at (215) 814-5473 or 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 Load for Nitrogen and Phosphorus in the Baltimore Harbor Watershed Anne Arundel, Carroll and Howard Counties Baltimore City, MD**

Signed

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

**Date: 12/17/2007**



**Decision Rationale**  
**Total Maximum Daily Loads for Baltimore Harbor Watershed**  
**For Nitrogen and Phosphorus, Anne Arundel, Carroll and**  
**Howard Counties, Baltimore City, Maryland**

**I. EPA Decision**

EPA is approving the nitrogen and phosphorus TMDLs for the Baltimore Harbor with the exception of the Deep Channel. Modeled scenarios included one in which anthropogenic sources were removed at their maximum level. This model run showed that, even under these extreme conditions, DO criteria could not be met in the Deep Channel while all other areas of the Harbor – the Migratory Fish and Spawning and Open Water designated use areas – would attain the DO criteria. The Chlorophyll ‘a’ narrative criteria is met in all areas. Because the TMDLs do not attain the water quality criteria for the Deep Channel, EPA is not including the Deep Channel in this approval. Maryland should place the Deep Channel on the section 303(d) list of impaired waters during the next listing cycle for excessive nutrients. Maryland should consider additional study for the Deep Channel, possibly including a use attainability analysis, and re-evaluate the loading requirements for the Deep Channel in order to assure the dissolved oxygen water quality criteria are attained. Allocation model runs show that the DO criteria and chlorophyll ‘a’ narrative criteria are met in all areas of the Harbor except for the Deep Channel as noted above. The results of this allocation run, i.e. the proposed allocations to the point and nonpoint sources as discussed below, represent the TMDLs that EPA is approving with this action. EPA believes the TMDLs as proposed by MDE and the implementation of the included allocations will result in considerable improvement in the Baltimore Harbor. However, further work is needed in the Deep Channel. This approval assumes the allowance of the continuation of water quality standards restoration variance for the Deep Water of the Harbor, i.e. a 7% variance of the DO criteria.

**II. Introduction**

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

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

This document sets forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDLs for nitrogen and phosphorus in the Baltimore Harbor (stream code 02130903) in Maryland. These TMDLs were established to address impairment of water quality as identified in Maryland's 1996 Section 303(d) List of impaired waters. The Maryland Department of the Environment (MDE) submitted the *Total Maximum Daily Loads of Nitrogen and Phosphorus for the Baltimore Harbor in Anne Arundel, Carroll and Howard Counties Baltimore City, Maryland*, dated December 2006 (TMDL Report), to EPA for final review by letter dated December 14, 2006, which was received by EPA on December 19, 2006. The TMDL Report includes two Technical Memoranda, *Significant Nutrient Point Sources in the Baltimore Harbor (Patapsco River Mesohaline) Watershed* and *Significant Nutrient Nonpoint Sources in the Baltimore Harbor (Patapsco River Mesohaline) Watershed*.

The TMDL report as submitted by the MDE establishes TMDLs for nutrients that: (1) are protective of aquatic life in all areas of the Harbor with the exception of the Deep Channel (dredged navigation channel); (2) meet Maryland's and the District's nutrient-related water quality standards with the exception of the Deep Channel; and (3) specifically meet the numeric criteria for dissolved oxygen and Chlorophyll 'a'.

Based on this review, EPA determined that the following seven regulatory requirements have been met for all areas of the Harbor with the exception of the Deep Channel. We will address the Deep Channel later in this Decision Rationale.

1. The TMDL is designed to implement applicable water quality standards.
2. The TMDL includes a total allowable load as well as individual wasteload allocations and load allocations.
3. The TMDL considers the impacts of background pollutant contributions.
4. The TMDL considers critical environmental conditions.
5. The TMDL considers seasonal environmental variations.
6. The TMDL includes a margin of safety.
7. The TMDL has been subject to public participation.

In addition, EPA considered whether there was reasonable assurance that the load allocations for the nonpoint sources in the TMDLs would be met.

### **III. Impairments Identified by the District and Maryland**

The Baltimore Harbor was first identified on the section 303(d) List of impaired waters (the 1996 list) as impaired by nutrients due to signs of eutrophication, expressed as high levels of chlorophyll 'a' (chl 'a') and low concentrations of dissolved oxygen (DO). MDE uses measures of DO and chl 'a' to understand the impacts of nutrients on the ecosystem. For this reason, MDE established TMDLs for nutrients (nitrogen and phosphorus) in the Harbor.

The Baltimore Harbor has also been identified on the impaired waters list as impaired by bacteria (1998), toxics (1998), metals (1998), suspended sediment (1996), and biological impacts (2004). Although in some cases it may be efficient to address all of the identified impairments in a particular water body at the same time in a single TMDL, it is not a requirement of the CWA or

EPA's regulations for TMDLs to be established that way. In this particular case, the TMDLs submitted by MDE were developed to address the excessive nutrient issue only.

EPA finds that these TMDLs designed to restore and maintain the aquatic life uses in their respective waters are in accordance with the CWA's Section 303(d) requirements to resolve the listed impairment and achieve the applicable water quality standards (with the exception of the Deep Channel). EPA also agrees that the TMDLs, once implemented, will improve the water quality of the Harbor.

As discussed below the criteria used as the end points for the TMDLs are dissolved oxygen (DO) criteria and chl 'a' criteria. The Harbor has several criteria for DO, depending on the area of the Harbor. These criteria were developed for aquatic life protection.

#### IV. Allocation Summary

TMDLs are established at a level necessary to attain and maintain existing applicable water quality standards, with the exception of the Deep Channel. The nutrient loading allocations in these TMDLs were developed to assure that all applicable water quality standards related to aquatic life use would be attained and maintained.

Tables 1, 2, 3 and 4 below summarize the allocations developed in this TMDL. In addition to the daily loads, the allocations are presented as annual loads and seasonal loads. Seasonal loads were included since the DO and chl 'a' criteria include seasonal considerations. In addition to the following summary tables, technical memoranda were included with the TMDL that contain more specific allocations by source. These allocations are part of the TMDL and will be discussed in a later section of this Decision Rationale.

**Table 1: Growing Season Allocations**

	<b>Total Nitrogen lbs/growing season</b>	<b>Total Phosphorus lbs/growing season</b>
Nonpoint Sources	459,912	12,776
Point Sources	1,642,014	113,212
Future Allocation	33,204	22,484
MOS (5%)	10,620	316
<b>Total</b>	<b>2,145,750</b>	<b>149,152</b>

**Table 2: Average Annual Allocations**

	<b>Total Nitrogen lbs/year</b>	<b>Total Phosphorus lbs/year</b>
Nonpoint Sources	1,246,036	34,654
Point Sources	3,976,215	243,127
Future Allocation	66,410	45,690
MOS	35,302	838
<b>Total</b>	<b>5,323,963</b>	<b>324,309</b>

**Table 3: Daily Allocations – Seasonal Basis**

	<b>Total Nitrogen lbs/day</b>	<b>Total Phosphorus lbs/day</b>
Nonpoint Sources	2,500	69.4
Point Sources	8,924	615.3
Future Allocations	180.5	122.2
MOS	57.7	1.72
<b>Total</b>	<b>11,662</b>	<b>811</b>

Values may not add due to rounding

**Table 4: Daily Allocations – Annual Basis**

	<b>Total Nitrogen lbs/day</b>	<b>Total Phosphorus lbs/day</b>
Nonpoint sources	3,413	94.9
Point Sources	10,893	666
Future Allocations	181.9	125.2
MOS	96.7	2.29
<b>Total</b>	<b>14,586</b>	<b>888</b>

Values may not add due to rounding

## V. Background

### Baltimore Harbor Watershed

The watershed draining into the Harbor is the Patapsco River Watershed, which includes Jones Falls, Gwynns Falls, Colgate Creek, Bear Creek, Curtis Creek, Stony Creek, and Rock Creek. The Patapsco River Mesohaline (PATMH) segment, or the Baltimore Harbor estuary, is located on the west side of the Chesapeake Bay. The Harbor estuary is the 15 mile tidal region of the lower Patapsco River.

**Table 5: Baltimore Harbor Subwatersheds within Maryland**

<b>Subwatersheds</b>	<b>Area (acres)</b>
Gwynns Falls	41,701
Jones Falls	37,273
Patapsco River	130,662
Baltimore Harbor	59,035
<b>Total</b>	<b>268,671</b>

Natural depths in the Harbor are generally less than 20 feet except in the main navigation channel maintained by the Corp of Engineers. These maintained depths are 50 feet. The tidal range of the Harbor is about 1 foot.

The land use in the Harbor Watershed is diverse. The land use is presented in Table 6.

**Table 6: Land Use in the Harbor Drainage**

Land Use		Acres
Water	1%	1806
Forest	29%	77077
Agriculture	15%	41848
Urban	55%	147940

### Point Sources

The Patapsco Wastewater Treatment Plant (WWTP) and Cox Creek WWTP are municipal point sources that discharge directly to the Harbor. There are 5 industrial sources. The annual loadings of nitrogen and phosphorus from these sources during the model calibration period are shown in Table 7.

**Table 7: Nutrient Loadings from Municipal and Industrial Sources**

	Total Nitrogen Annual Load	Total Phosphorus Annual Load
Municipal	3,455,063	216,099
Industrial	3,00,015	89,376
<b>Total</b>	<b>6,456,078</b>	<b>305,475</b>

### Nonpoint Sources

The loads from urban stormwater and nonpoint sources were estimated using the HSPF model (Hydrologic Simulation Program Fortran). The estimated existing loads (for the calibration period) are shown in Table 8.

**Table 8: Loadings from Nonpoint Sources**

	Total Nitrogen		Total Phosphorus	
	Annual Load	% of Total	Annual Load	% of Total
Urban Stormwater		12		29
Agriculture		12		8
Other		5		6
<b>Total</b>	<b>1,364,400</b>		<b>37,465</b>	

## VI. Existing Water Quality

The Chesapeake Bay Water Quality Monitoring Program has recorded measurements in the Harbor indicating anoxic and hypoxic events occur as early as April and extend until October every year. Increased algal blooms have been found to occur yearly during the warm season. Anoxic conditions occur at the bottom of the navigation channel as well as most tributaries. MDE suggests that the origin of the low DO in the Harbor is not from anoxic Bay water but from



the Harbor's internal processes. Surface DO concentrations did not fall below 5 mg/l. Bottom water DO values ranged from 0 mg/l to 11 mg/l.

Chl 'a' observations show values above the 50ug/l criteria every year, with a seasonal pattern of higher values during the warm months. Concentrations rarely exceed 100ug/l. Bottom chl 'a' values are normally below 20ug/l.

A detailed discussion of the Harbor water quality can be found in the TMDL report.

## **VII. Technical Approach**

### **Modeling Framework**

MDE chose a set of time-variable water quality models as the tool to link the sources of nutrient loadings to the DO criteria and chl 'a' goals. The computational framework chosen for these TMDLs is the three dimensional, time-variable Baltimore Harbor Eutrophication Model (BHEM). This water quality simulation package provides a generalized framework for modeling nutrient fate and transport in surface waters. The BHEM includes a watershed model, a hydrodynamic model, a water quality model and a sediment flux model. The BHEM was calibrated to reproduce observed water quality characteristics for 1992 – 1997 conditions. The calibrated model was peer reviewed by various modeling technical groups. The model and calibration process is described in more detail in the TMDL report as well as a separate modeling report.

### **TMDL Analysis Framework**

The nutrient TMDL analysis consisted of two broad elements: an assessment of growing season loading conditions and an assessment of average annual loading conditions. Both the growing season and the average annual flow condition represent the critical conditions under which the symptoms of eutrophication are typically most acute. Maryland adopted the Chesapeake Bay DO criteria and its associated attainment methodology, utilizing DO biological reference curves to represent the spatial and temporal distribution of DO concentrations. MDE applied the method using the Cumulative Frequency Distributions for the Harbor generated from model output and compared against the CBP reference curves to assess spatial and temporal DO criteria exceedences.

Model results were compared to the quantitative implementation of the narrative chl 'a' criteria as: (1) ensuring that instantaneous concentrations remain below 100 ug/l at all times; and (2) minimizing exceedences of the 50 ug/l, 30-day rolling average, to a frequency that will not result in ecologically undesirable conditions.

### **Model Scenarios**

MDE ran several scenarios: (1) baseline conditions; (2) future conditions (the TMDL); and (3) maximum anthropogenic reduction from the Baltimore Harbor. The baseline serves as the existing condition for a point of reference to compare future reduction needs. The future

condition is the TMDL. The third scenario was used as a bounding exercise to determine if it is possible to achieve water quality standards in the Deep Channel.

The baseline was run for the years 1995 to 1997, which represent a wet, dry and average year. The attainment results for DO for the baseline is shown in Table 9. The chl 'a' analysis showed that in both surface and bottom water chl 'a' concentrations exceeded 50ug/l during early spring and the summer months of 1995 and occasionally were predicted to exceed 100ug/l.

**Table 9: DO Water Quality Attainment at the Baseline Condition**

Period	Designated Use	% Nonattainment
Feb 1 <sup>st</sup> to May 31 <sup>st</sup>	Migratory fish spawning and nursery	3%
June 1 <sup>st</sup> to Sept 30 <sup>th</sup>	Open Water	3%
	Deep Water	23%
	Deep Channel	87%
Oct 1 <sup>st</sup> to Jan 31 <sup>st</sup>	Open Water	2%
Feb 1 <sup>st</sup> to Jan 31 <sup>st</sup>	Open Water	0%

Model results for the maximum removal of anthropogenic sources showed that DO concentrations will be less than 1mg/l in the Deep Channel for approximately 57.8% of the time and volume. The Deep Channel criteria are not met under this scenario. Hydrodynamic conditions of the Harbor system create conditions whereby the Harbor channel becomes anoxic for periods in the summer.

The TMDL scenario was based on a simulation with: (1) WWTP discharges set at design flow and nitrogen and phosphorus concentrations base on Maryland's Enhanced Nutrient Reduction strategy; (2) industrial discharges based on permitted flow and concentrations of nitrogen and phosphorus based on estimates of loading reductions due to technological improvements; and (3) urban stormwater and agricultural loads from all watersheds reduced by 15%. The municipal concentrations are consistent with Maryland's Tributary Strategy and ENR policy. Results of the TMDL scenario are shown in Table 10.

**Table 10: Attainment of DO Water Criteria for TMDL Condition**

Period	Designated use	% Nonattainment
Feb 1 <sup>st</sup> to May 31 <sup>st</sup>	Migratory and fish spawning and nursery	0%
June 1 <sup>st</sup> to Sept 30 <sup>th</sup>	Open Water	0%
	Deep Water	7%
	Deep Channel	78.5%
Oct 1 <sup>st</sup> to Jan 31 <sup>st</sup>	Open Water	0%

As can be seen the DO criteria is met everywhere except the Deep Channel. This is not unexpected since the more critical condition of removal of all of the anthropogenic loads would not achieve DO criteria in the Deep Channel. The chl 'a' concentrations remain below 50ug/l in both the surface and bottom waters, indicating attainment of the narrative criteria for chl 'a'.

## VIII. Discussions of Regulatory Requirements

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

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

$$\text{TMDL} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS}$$

Where:

WLA = waste load allocation

LA = load allocation

MOS = margin of safety

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

The TMDLs were designed to address the eutrophication problem in the Harbor. The DO criteria and narrative chl 'a' were used as the endpoints to address the water quality problem. Table 11 shows the DO criteria applicable to the Harbor.

**Table 11: DO Criteria**

Designated Use II Subcategory	Period	Dissolved Oxygen Criteria
Seasonal migratory fish spawning and nursery	Feb 1 <sup>st</sup> to May 31 <sup>st</sup>	Open water criteria apply
Seasonal shallow water submerged aquatic vegetation	April 1 <sup>st</sup> to Oct 31 <sup>st</sup>	Open water criteria apply
Open water fish and shellfish	Jan 1 <sup>st</sup> to Dec 31 <sup>st</sup>	5.0mg/l 30-day average
Seasonal deep water fish and shellfish	June 1 <sup>st</sup> to Sept 30 <sup>th</sup>	3.0mg/l 30-day average with a 7% variance allowed
Seasonal deep channel refuge	June 1 <sup>st</sup> to Sept 30 <sup>th</sup>	≥ 1mg/l instantaneous minimum

As discussed above, the TMDL allocations met all DO criteria with the exception of the Deep Channel DO. Further, the maximum removal of anthropogenic sources still did not allow the Deep Channel DO criteria to be met. There is a reasonable allocation scenario to meet all of the other DO criteria. Therefore, EPA believes the TMDL meets the water quality standards requirements for all areas of the Harbor except the Deep Channel. MDE should reconsider this portion of the Harbor by including it on the state's section 303(d) List, consider a Use Attainability Analysis and re-evaluate the water quality and allocation needs for the Deep Channel.

The state's chl 'a' criterion states "Chlorophyll a – Concentrations of chlorophyll a in free-floating microscopic aquatic plants (algae) shall not exceed levels that result in ecologically

undesirable consequences that would render tidal waters unsuitable for designated uses”. MDE used EPA guidance as well as other technical sources to determine undesirable concentrations. MDE’s interpretation of the narrative criteria for chl ‘a’ in the Harbor is comprised of the following:

1. Ensure that instantaneous concentrations remain below 100ug/l at all times, and
2. Minimize exceedences of the 50ug/l, 30-day rolling average to a frequency that will not result in ecologically undesirable conditions.

The TMDL scenario showed that chl ‘a’ concentrations remain below 50ug/l in both the surface and bottom waters indicating attainment of the narrative criteria.

**EPA believes that the TMDLs were designed to implement the DO water quality criteria and narrative chl ‘a’ criteria for Migratory Fish and Spawning and Open Water designated uses, including the Deep Water variance. However, the DO criteria for the Deep Channel will not be attained under the proposed allocation scenario.**

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

The TMDL report includes allocations for all sources for annual, seasonal and daily conditions. The associated technical memoranda include specific allocations for all individual point sources and categories of nonpoint sources. The general allocations are presented above in Section IV and the specific point source allocations are contained in the technical memorandum and repeated below. Note that EPA calculated the daily loads based on the annual and seasonal loads provided by the state in the technical memorandum. The daily loads based on the annual allocations were calculated by dividing the annual loads by 365. The daily loads based on the seasonal allocations were calculated by dividing the seasonal loads by 184.

**Table 12: Growing Season Point Source Allocations**

Source Name	Permit Number	Nutrient Loads – lbs/season	
		TN	TP
Patapsco WWTP	MD0021601	333,330	33,330
Cox Creek WWTP	MD0021661	68,484	6,852
International Steel Group	MD0001201-101	31,795	264
International Steel Group	MD0001201-012	304,590	15,230
International Steel Group	MD0001201-014	158,388	7,632
International Steel Group	MD0001201-017	17,058	2,814
International Steel Group	MD0001201-021	52,392	2,622
W.R.Grace	MD0000311	155,370	1,236
Erachem-Comilog	MD0001775	47,502	6
US Gypsum	MD0001457	192	30
Millenium	MD0001279-001	4,338	0
Millenium	MD0001279-002	6,750	0
Cox Creek DMCF		52,601	2,556
Baltimore City stormwater	MD0068292	102,306	10,164
Anne Arundel stormwater	MD0068306	73,662	7,314
Baltimore County stormwater	MD68314	167,784	4,662
Carroll County stormwater	MD0068331	28,644	2,844
Howard County stormwater	MD0068322	36,828	3,660
<b>Total</b>		<b>1,642,014</b>	<b>113,212</b>

**Table 13: Daily Loads based on Growing Season Point Source Allocations**

Source Name	Permit Number	Nutrient Loads – lbs/day	
		TN	TP
Patapsco WWTP	MD0021601	1,812	181
Cox Creek WWTP	MD0021661	372	37
International Steel Group	MD0001201-101	173	1.43
International Steel Group	MD0001201-012	1,655	83
International Steel Group	MD0001201-014	861	41
International Steel Group	MD0001201-017	93	15
International Steel Group	MD0001201-021	285	14
W.R.Grace	MD0000311	844	7
Erachem-Comilog	MD0001775	258	0.033
US Gypsum	MD0001457	192	0.163
Millenium	MD0001279-001	24	0
Millenium	MD0001279-002	37	0
Cox Creek DMCF		286	14
Baltimore City stormwater	MD0068292	556	55
Anne Arundel stormwater	MD0068306	400	40
Baltimore County stormwater	MD68314	912	25
Carroll County stormwater	MD0068331	156	15
Howard County stormwater	MD0068322	200	20
<b>Total</b>		<b>8,924</b>	<b>615</b>

**Table 14: Annual Point Allocations**

Source Name	Permit Number	Nutrient Loads – lbs/year	
		TN	TP
Patapsco WWTP	MD0021601	889,453	66,709
Cox Creek WWTP	MD0021661	182,764	13,707
International Steel Group	MD0001201-101	63,590	526
International Steel Group	MD0001201-012	609,185	30,459
International Steel Group	MD0001201-014	316,776	15,267
International Steel Group	MD0001201-017	34,114	5,625
International Steel Group	MD0001201-021	104,785	5,240
W.R.Grace	MD0000311	310,737	2,475
Erachem-Comilog	MD0001775	95,000	12
US Gypsum	MD0001457	384	64
Millenium	MD0001279-001	8,670	0
Millenium	MD0001279-002	13,495	0
Cox Creek DMCF		462,164	7,240
Baltimore City stormwater	MD0068292	221,274	23,951
Anne Arundel stormwater	MD0068306	159,318	17,245
Baltimore County stormwater	MD68314	362,890	39,279
Carroll County stormwater	MD0068331	61,957	6,706
Howard County stormwater	MD0068322	79,659	8,622
<b>Total</b>		<b>3,976,215</b>	<b>243,127</b>

**Table 15: Daily Loads based on Annual Allocations**

Source Name	Permit Number	Nutrient Loads – lbs/day	
		TN	TP
Patapsco WWTP	MD0021601	2,437	183
Cox Creek WWTP	MD0021661	501	38
International Steel Group	MD0001201-101	174	1.44
International Steel Group	MD0001201-012	1,669	83
International Steel Group	MD0001201-014	868	42
International Steel Group	MD0001201-017	93	15
International Steel Group	MD0001201-021	287	14
W.R.Grace	MD0000311	851	7
Erachem-Comilog	MD0001775	260	0.033
US Gypsum	MD0001457	1.05	0.175
Millenium	MD0001279-001	24	0
Millenium	MD0001279-002	37	0
Cox Creek DMCF		1,266	20
Baltimore City stormwater	MD0068292	606	66
Anne Arundel stormwater	MD0068306	436	47
Baltimore County stormwater	MD68314	994	108
Carroll County stormwater	MD0068331	170	18
Howard County stormwater	MD0068322	218	24
<b>Total</b>		<b>10,894</b>	<b>666</b>



The specific nonpoint source allocations are provided by the State in the Technical Memorandum: Significant Nutrient Nonpoint Sources in the Baltimore Harbor (Patapsco River Mesohaline) Watershed. They are not repeated here.

**EPA believes the proposed TMDLs meet the requirement to include total loads as well as wasteload allocations and load allocations.**

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

All loads of nutrients outside of the modeling domain were considered as background loads to the model. These loads were identified in the allocation tables as allocations to upstream subwatersheds

**EPA believes the proposed TMDLs appropriately considered impacts of background pollutant contributions.**

**4. The TMDLs consider critical environmental conditions.**

The TMDL Report considers critical environmental conditions by modeling the watershed using daily simulations for three years. The three years represent average flow in the Harbor, a wetter than average year, and a drier than average year based on precipitation data and accounts for various hydrological conditions. The simulation period was from 1995 to 1997.

**EPA believes the proposed TMDLs meet the requirement to consider the critical environmental conditions.**

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

The TMDL Report considers seasonal variations by modeling the watershed using daily simulations for three years with seasonal data as appropriate. The critical condition and seasonality was accounted for in the TMDL analysis by the choice of simulation period, 1995-1997. This three-year time period represents a relatively dry year, wet year, and average year, based on precipitation data and accounts for various hydrological conditions.

**EPA believes the proposed TMDLs meet the requirement to consider seasonal environmental variations.**

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

The CWA and EPA's TMDL regulations require TMDLs to include a margin of safety to take into account any lack of knowledge concerning the relationship between effluent limitations and water quality. EPA guidance suggests two approaches to satisfy the MOS requirement. First, it can be met implicitly by using conservative model assumptions to develop the TMDL and its allocations. Alternately, it can be met explicitly by allocating a portion of the allowable load to the MOS. The MOS in these TMDLs is explicit as 5% of the agricultural loads.

**EPA believes the proposed TMDLs meet the requirement to include a margin of safety.**

**7. The TMDLs have been subject to public participation.**

MDE conducted a public review of the proposed TMDLs for nitrogen and phosphorus for the Harbor. The public comment period was open from June 6, 2006 to July 5, 2006. MDE received five sets of comments. Comments were received from Anne Arundel County (two from the Department of Public Works, and one from the Office of Environmental and Cultural Resources); and Baltimore County and Chesapeake Bay Foundation (CBF) (2 individual comments). MDE responded to all comments. The comments and responses were included with the TMDL submitted to EPA. MDE also hosted a Baltimore Harbor TMDL Stakeholder Advisory Group (SAG).

The CBF continued to have concerns with the TMDLs after the close of the comment period and after receipt of MDE's response to their initial comments. MDE continued to discuss and meet with the CBF to attempt to resolve the issues before EPA took final action on the TMDLs as submitted by the state. The CBF's main concerns included the apparent large increase in allocated loads between the 2003 presentation to the SAG and the final TMDL and the fact that the standards were not met everywhere in the Harbor. MDE met most recently on November 5, 2007, to resolve the issues. A letter dated December 3, 2007, responded to the CBF concerns. EPA believes that MDE's response adequately addressed the CBF concerns.

**EPA believes the proposed TMDL meets the requirement to provide adequate opportunity for public participation.**

**IX. There is reasonable assurance that the proposed LAs can be met.**

The TMDL report included a section on "Assurance of Implementation". The implementation of point source nutrient controls that will be an integral component to meet water quality standards in the Harbor will be executed through the state's Enhanced Nutrient Reduction (ENR) strategy and National Pollutant Discharge Elimination System (NPDES) permits. The ENR program provides grant funds to local governments to retrofit or upgrade WWTPs from BNR to ENR at their currently approved design capacity. Deadlines for completion of ENR upgrades will be incorporated into NPDES permits based on the State's ENR upgrade schedule.

The implementation of the stormwater and nonpoint source controls will be through two approaches – stormwater NPDES permits and cooperative agricultural reductions. The five jurisdictions are required to participate in the stormwater NPDES program. Subsequently, stormwater management programs have been implemented by the Counties and the City to control MS4 discharges to the maximum extent practicable. Additional significant planned implementation measures in the Harbor Watershed involve the upgrade or separation of combined sewer systems in the City and the upgrade of sanitary sewer systems in Baltimore County.

Maryland's Water Quality Improvement Act requires that comprehensive and enforceable nutrient management plans be developed, approved and implemented for all agricultural lands throughout Maryland. The Act requires that nutrient management plans for

nitrogen be completed and implemented by 2002, and plans for phosphorus be completed by 2005. Other nonpoint source control plans are described in the TMDL report.