



**UNITED STATES ENVIRONMENTAL PROTECTION  
AGENCY  
Region 1  
1 Congress Street, Suite 1100  
Boston, MA 02114-2023**

January 22, 2008

Laurie Burt, Commissioner  
Department of Environmental Protection  
1 Winter Street  
Boston, MA 02108

Re: Approval of Popponeset Bay System Total Maximum Daily Loads For Total Nitrogen

Dear Commissioner Burt:

Thank you for submitting the Popponeset Bay Total Maximum Daily Loads (TMDLs) for total nitrogen and the considerable effort and coordination that went into their development.

The U.S. Environmental Protection Agency (EPA) has reviewed the document entitled "Final Popponeset Bay Total Maximum Daily Loads For Total Nitrogen (Report # 96-TMDL-4 Control #217.0)" and it is my pleasure to approve the five TMDLs. EPA has determined, as set forth in the enclosed review document, that these TMDLs meet the requirements of Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 Code of Federal Regulations (CFR) part 130.

Please pass on to your staff in the Division of Watershed Management and Massachusetts Estuary Program our congratulations for their excellent work in developing these TMDLs once again.

Sincerely,

/s/

Stephen S. Perkins, Director  
Office of Ecosystem Protection

Enclosure

cc: Glenn Haas, MassDEP  
Rick Dunn, MassDEP  
Steve Halterman, MassDEP  
Mike Hill, EPA  
Steve Silva, EPA

## EPA NEW ENGLAND'S TMDL REVIEW

**DATE:** January 22, 2008

**TMDL:** Popponeset Bay System Total Maximum Daily Loads For Total Nitrogen

**STATUS:** Final

**IMPAIRMENT/POLLUTANT:** 5 TMDLs for Total Nitrogen; 3 segments on the CWA § 303(d) List; 2 segments not currently listed, but determined to be impaired and to be listed on subsequent CWA § 303(d) Lists (See Attachment 1)

**BACKGROUND:** Final Popponeset Bay Total Maximum Daily Loads For Total Nitrogen (Report # 96-TMDL-4 Control #217.0)

MassDEP publicly announced the draft TMDL on March 16, 2005 and copies were distributed to key stakeholders. The draft TMDL was posted on the MassDEP's web site on that date as well. A public meeting was held at the Mashpee Town Hall on March 30, 2005. The public comment period closed on April 13, 2005. MassDEP prepared a response to the public comments which was submitted with the final TMDL to EPA. All comments from the public were taken into account in the Response to Comments and the final TMDL submission. The final revised submission was sent to EPA on November 21, 2006. In addition to the TMDL itself, the submittal included, either directly or by reference, the following additional documents:

- Massachusetts Estuaries Project, Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Popponeset Bay in the Towns of Mashpee and Barnstable, Massachusetts. Massachusetts Estuary Project and MassDEP, final report, September, 2004. [http://www.oceanscience.net/estuaries/report/Popponeset/PopponesetMEPrpt\\_final.pdf](http://www.oceanscience.net/estuaries/report/Popponeset/PopponesetMEPrpt_final.pdf)
- Massachusetts Estuaries Project Embayment Restoration and Guidance for implementation Strategies, MassDEP, 2003. <http://www.mass.gov/dep/water/resources/restore.htm>
- Massachusetts Year 2006 Integrated List of Waters, Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 303(d) and 305(b) of the Clean Water Act (CN 262.1), August, 2007. <http://www.mass.gov/dep/water/resources/tmdls.htm>

The following review explains how the TMDL submission meets the statutory and regulatory requirements of TMDLs in accordance with § 303(d) of the Clean Water Act and EPA's implementing regulations in 40 CFR Part 130.

**REVIEWER:** Mike Hill, telephone number: (617) 918-1398 e-mail address: hill.michael@epa.gov

## REVIEW ELEMENTS OF TMDLs

*Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. § 130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation.*

### 1. **Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking**

*The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments, or chlorophyll *a* and phosphorus loadings for excess algae.*

The document for the Popponesset Bay system TMDLs for total nitrogen describes the water body segments and the cause of the impairments. The Popponesset Bay system consists of the Mashpee River, Shoestring Bay, Ockway Bay, Pinquicket Cove and Popponesset Bay. The document identifies a total of five segments needing a TMDL. Three of the nitrogen impaired segments (Mashpee River, Shoestring Bay and Popponesset Bay) are included on Massachusetts' 2002, 2004 and 2006 Clean Water Act (CWA) §303(d) Integrated Lists. Two segments (Pinquicket Cove and Ockway Bay) not included on the Massachusetts' Integrated List were determined to be impaired during the development of the nitrogen Popponesset Bay system TMDLs and will be placed on future Integrated Lists (See Appendix A).

Pages 1 to 7 of the Popponesset Bay TMDLs for total nitrogen provide an overview of the description and priority ranking of the water bodies, pollutant of concern and pollutant sources. MassDEP has determined that all nutrient impaired segments in the Commonwealth are a high priority (see Massachusetts Integrated List of Waters at: <http://www.mass.gov/dep/water/priorities/priorities.htm>).

#### *Assessment:*

EPA concludes that the description, pollution sources, pollutant of concern and the priority ranking of the waterbodies provided in the TMDL Report and Integrated List of Waters, as described above, are reasonable and consistent with accepted methods used in establishing nutrient TMDLs. Furthermore, EPA concludes that the Popponesset Bay TMDL document has adequately characterized the Popponesset Bay system impairments and their causes.

## **2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target**

*The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.*

The impairments MassDEP has identified are decreases of dissolved oxygen, decreased diversity of benthic animals and periodic algae blooms. Eelgrass beds, which are critical habitat for macroinvertebrates and fish are absent from these waters. In addition, the eelgrass beds in some instances have been replaced by macro algae, which are undesirable because the macro algae does not provide high quality habitat for fish and invertebrates. In the Popponesset Bay system, as in most coastal and marine waters, the nutrient nitrogen above natural conditions, contributes to these undesirable conditions described above – through the promotion of excessive growth of plants and algae including nuisance vegetation, commonly referred to as cultural eutrophication. The TMDL document identifies several provisions of the Commonwealth's water quality standards that are relevant to the cultural eutrophication in these waters, including numeric criteria for dissolved oxygen and narrative criteria for aesthetics and nutrients. EPA guidance states that individual estuarine and coastal marine waters tend to have unique characteristics and therefore, individual waterbody criteria are typically required. For example, the loading of nitrogen that a specific waterbody can handle without becoming impaired varies. Factors that influence the effect of nitrogen include: flow velocity, tidal hydraulics, dissolved oxygen, and sediment adsorption and desorption of nitrogen.

The parameters MassDEP chose to indicate cultural eutrophication caused by excessive nitrogen are the lack of stable eelgrass beds and/or benthic (infaunal) communities. The habitat of the Popponesset Bay system is highest near the tidal inlet on Nantucket Sound and poorest in the most inland tidal reaches. Similarly, nitrogen concentrations are lower near the tidal inlet and higher in the upper inland reaches of the Popponesset Bay system. Aerial photography from 1951 indicates that there were significant eelgrass beds in the central basin of the Popponesset Bay system and at the mouth of Shoestring Bay. No eelgrass beds in Shoestring and Ockway Bays were identified in the 1951 aerial photographs. Subsequent aerial photography surveys in 1995 and 2001 indicated no eelgrass beds in the Popponesset Bay system. Studies show that near the tidal inlet there is a diverse healthy infaunal community, but farther from the inlet, in Shoestring and Ockway Bays, the infaunal habitat is significantly impaired under present nitrogen loading conditions.

Since there are no current eelgrass beds in the Popponesset Bay system, MassDEP used a target total nitrogen concentration of 0.38 mg/L that was used in an EPA approved total nitrogen TMDL for Stage Harbor, Chatham, Massachusetts. The Stage Harbor system also has an inlet that exchanges tidal water with Nantucket Sound and uses stable eelgrass beds and high quality benthic communities to indicate attainment of water quality standards. The target total nitrogen

concentration for the Popponeset Bay system TMDLs relating to eelgrass restoration and healthy infaunal communities was based upon the Stage Harbor as well as other nearby estuaries such as Waquoit Bay that have similar nitrogen dynamics. Although Shoestring and Ockway Bays did not have eelgrass beds as indicated from the 1951 aerial photography, total nitrogen levels in the range of 0.4 to 0.5 mg/L are supportive of high quality infaunal habitat within the Popponeset Bay system. MassDEP, therefore, indicates that a water quality target of 0.38 mg/L of total nitrogen will support healthy eelgrass beds and infaunal communities.

MassDEP identified a location, referred to as the “sentinel” station, in the Popponeset Bay system at which attainment of the water quality target at this locality will result in high quality infaunal habitat and eelgrass beds throughout the Popponeset Bay system and attainment of water quality standards. The sentinel station is located in the upper region of the central basin to Popponeset Bay at the mouth of Shoestring Bay. This location was the most landward eelgrass bed in the aerial photography of 1951. MassDEP asserts that attaining the modeled nitrogen targets at the sentinel locations through implementation of the TMDL will lead to restoration of eelgrass and infaunal habitats in each of the sub-embayments.

*Assessment:*

EPA concludes that Massachusetts has properly presented its numeric water quality standards and has made a reasonable and appropriate interpretation of its narrative water quality criteria for the designated uses of the Popponeset Bay system. In summary, the use of the Linked Model, the description of the process in the TMDL document and the companion Technical Report to this TMDL document adequately demonstrate the basis used to derive the target nitrogen load of 0.38 mg/L at the sentinel station and that this target will achieve water quality standards and designated uses.

### **3. Loading Capacity - Linking Water Quality and Pollutant Sources**

*As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 C.F.R. § 130.2(f) ). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. § 130.2(i)). The TMDL submittal must identify the waterbody’s loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for EPA’s review of the load and wasteload allocations which are required by regulation.*

*In many circumstances, a critical condition must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7(c)(1) ). The critical condition can be thought of as the “worst case” scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. 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 standards.*

The Massachusetts Estuaries Project analytical model is the Linked Watershed-Embayment Management Model (Linked Model). It links watershed inputs with embayment circulation and nitrogen characteristics, and:

- requires site-specific measurements within each watershed and embayment;
- uses realistic “best-estimates” of nitrogen loads from each specific type of land-use;
- spatially distributes the watershed nitrogen loading to the embayment;
- accounts for nitrogen attenuation during transport to the embayment;
- includes a 2D or 3D embayment circulation model depending on embayment structure;
- accounts for basin structure, tidal variations, and dispersion within the embayment;
- includes nitrogen regenerated within the embayment;
- is validated by both independent hydrodynamic, nitrogen concentration, and ecological data; and
- is calibrated and validated with field data prior to generation of additional scenarios.

The Linked Model, as stated in the TMDL document, is a robust and fairly complicated model that determines an embayment's nitrogen sensitivity, nitrogen threshold loading levels (TMDL) and response to changes in the loading rate. A key feature of the approach involves the selection of a sentinel station(s). Attainment of the water quality target at the sentinel location will result in high quality infaunal habitat and eelgrass beds throughout the Popponeset Bay system and achievement of water quality standards. The sentinel station is located in the upper region of the central basin to Popponeset Bay at the mouth of Shoestring Bay. This location was the most landward eelgrass bed in the aerial photography of 1951. This approach captures the critical targets needed to address the impaired segments.

The loading capacity for each sub-embayment within the Popponeset Bay system is set out in Tables 4 and 5 of the TMDL document. The target threshold controllable sub-embayment watershed loads in kilograms per day as identified in Table 4 are as follows: Mashpee River, 16.17 kg/day; Shoestring Bay, 19.72 kg/day; Ockway Bay, 0.76 kg/day; Pinquicket cove, 0.76 kg/day; and Popponeset Bay, 2.77 kg/day. The total loading capacity for each sub-embayment including controllable and uncontrollable sources, such as atmospheric deposition and sediment benthic flux (as set forth in Table 5 of the TMDL document) are as follows: Mashpee River, 26 kg/day; Shoestring Bay, 13 kg/day; Ockway Bay, 3 kg/day; Pinquicket cove, 1 kg/day; and Popponeset Bay, 1 kg/day. The loading capacity was based on achieving a target total nitrogen concentration of 0.38 mg/L at the sentinel station and the sub-embayments within the Popponeset Bay system. The TMDL is based on the worst case scenario which in this case is the summer growing season.

The total loading capacity for each sub-embayment is in some cases greater (Mashpee River and Ockway Bay) than the target threshold controllable load. In some cases the total loading capacity for the sub-embayment is less (Shoestring Bay and Popponeset Bay) than the target threshold controllable load. The differences are negligible for Pinquicket Cove. These differences are due to the fact that in the Mashpee River and Ockway Bay the sediments are releasing nitrogen and consequently adding nitrogen to the water column (positive benthic flux).

In other locations, Shoestring Bay and Popponesset Bay, the sediments are removing nitrogen from the water column (negative benthic flux).

*Assessment:*

Several commenters raised questions about the use of nitrogen inputs used in the Linked Model as average annual loads rather than summer time seasonal averaged values in regard to the concentration of total nitrogen used in the Mashpee River. To achieve water quality standards, a target total nitrogen concentration of 0.38 mg/L must be achieved. This concentration expressed as a mass per day or load for the Mashpee River equals 26 kg/day. This load is based on the worst case scenario which in this case is the summer growing season when excessive algae and plant growth occur due to an overabundance of nutrients. The loading capacity for the Mashpee River was not based on the present nitrogen load (either annual average or summer time seasonal average), but rather what daily load is needed to achieve designated uses and water quality standards, based on restoration of eelgrass beds and infaunal habitat.

The May 1 to September 15 summer time seasonal average nitrogen load is approximately 24 kg/day and the annual average is approximately 15.7 kg/day. It is possible that using a summer time seasonal average as a nitrogen input into the Linked Model, rather than the annual average (which was used in the Linked Model) could result in larger percent reductions in nitrogen for the Mashpee River sub-embayment. However, given that some of the nitrogen in the winter is partially stored in the sediments and released in the summer and that there is more precipitation in the winter, it is apparent that nitrogen inputs have some seasonality. Some of the nitrogen dynamics have opposite cycles and tend to off-set one another. When all of the of the nitrogen inputs are added up from month to month incorporating seasonal temporal and nitrogen storage related issues, the total nitrogen input is relatively stable indicating that an annual average nitrogen load for the Mashpee River is an adequate average to use in the model. Therefore, given some of the offset temporal and storage related nitrogen cycle issues and the conservative assumptions in the model (See Margin of Safety Section below), the nitrogen percent reductions identified for the Mashpee River in Table 4 of 52.7% are reasonable.

The TMDL document explains and EPA concurs with the approach for applying the Linked Model to specific embayments for the purpose of developing daily target nitrogen loading rates and in identifying sources of nitrogen to achieve the total nitrogen targets. EPA believes that this approach is reasonable because the factors influencing and controlling nutrient impairment are adequately identified. Therefore, EPA concludes that the loading capacities have been appropriately set at a level necessary to attain applicable water quality standards and designated uses.

#### **4. Load Allocations (LAs)**

*EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background (40 C.F.R. § 130.2(g) ). Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. § 130.2(g) ). Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.*

*If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.*

Using the Linked Model, MassDEP has identified the portion of the loading capacity allocated to existing and future non-point sources necessary to meet water quality standards. These non-point sources are primarily septic systems, natural background, storm water runoff (including nitrogen from fertilizers), waste water treatment facilities that discharges to groundwater, atmospheric deposition and nutrient-rich sediments. Based on land use, the Linked Model accounts for loading due to storm water, but does not differentiate storm water into a load and wasteload allocation. However, as described below, in the Waste Load Allocation section, the waste load (from storm water) is insignificant (less than 0.30%) compared to the total load. The range of nitrogen loads from storm water to the individual embayments is 0.09 to 1.59% when compared to the individual nitrogen load in each embayment.

#### *Assessment:*

EPA concludes that the load allocations are adequately specified for the TMDLs at levels necessary to attain water quality standards.

## **5. Wasteload Allocations (WLAs)**

*EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 C.F.R. § 130.2(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.*

*In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. But it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.*

*The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.*

EPA interprets 40 CFR 130.2(h) to require that allocations for NPDES regulated discharges of storm water be included in the waste load component of the TMDL. On Cape Cod the vast majority of storm water percolates into the ground and aquifer and proceeds into the embayment systems through groundwater migration. The Linked Model used in the development of the TMDLs accounts for storm water loadings and groundwater loading in one aggregate load as a non-point source – combining the assessments of wastewater and storm water (including storm water that infiltrates into the soil and direct discharge pipes into water bodies) for the purpose of

developing control strategies. Although the vast majority of storm water percolates into the ground in the Popponeset Bay system area, there are some storm water pipes or other conveyances that discharge directly to waterbodies and are subject to the requirements of the Phase II Storm Water NPDES Program. The towns of Barnstable, Sandwich, and Mashpee, are covered under the Phase II General Permit for Storm water Discharges from Municipal Separate Storm Water Sewer Systems (MS4s). The loadings allocated to such storm water discharges must be treated as a waste load allocation. Since the majority of the nitrogen loading comes from septic systems, fertilizer and storm water that infiltrates the ground into the groundwater, the allocation of nitrogen for any storm water point sources that discharge directly to any of the embayments is insignificant as compared to the overall groundwater load (see Appendix C).

Based on land use, the Linked Model accounts for loading of storm water, but does not explicitly breakout storm water into a load and waste load allocation. Based on the fact that there are some storm water discharge pipes or other conveyances within NPDES Phase II area that discharge directly to embayments or waters that are connected to the embayments, the waste load allocation for these sources was determined for each sub-embayment and ranges from 0.09 to 1.59% (compared to the total nitrogen load to each sub-embayment). The WLA is derived from the percent of impervious surface within 200 feet of the waterbodies and the relative load from this area compared to the overall load within each sub-embayment. Although most storm water infiltrates into the ground on Cape Cod, some impervious areas within approximately 200 feet of the shoreline may discharge storm water via pipes or other conveyances directly to the waterbody. For the purposes of waste load allocation, it was assumed that all impervious surfaces within 200 feet of the shoreline discharge directly to the waterbody whether or not they actually do so. The specific WLA are set forth on pages 15 and 16 and Appendix C of the TMDL document.

Although the loading contribution from the point source discharges is insignificant (0.29% or 93.69 kg/year) compared to the non-point sources, the point source discharges are subject to the Phase II Storm Water NPDES Program and their collective load is to be treated as a WLA

*Assessment:*

EPA concludes that the waste load allocation for the point sources is adequate. Furthermore, the loading contribution from the point discharges is insignificant (0.29% or 93.69 kg/year) compared to the non-point sources. Nonetheless, these point discharges are subject to the Phase II Storm Water NPDES Program and are to be treated as a waste load allocation. In the absence of site specific information on direct discharge sources, EPA believes the approach set out in the TMDL for the WLAs is reasonable.

## **6. Margin of Safety (MOS)**

*The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for*

*the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.*

The implicit margin of safety is set out in the TMDL document on pages 18 and 19. There are several factors that contribute to the margin of safety inherent in the approach used to develop these TMDLs including: 1) the Linked Model uses attenuation factors that are lower than those that were actually measured; 2) the selection of the threshold site and nitrogen concentrations were based on stable eelgrass beds or benthic (infaunal) communities, not those starting to show impairment which would have resulted in higher nitrogen concentrations; 3) using a sentinel station that is the furthest inland to set the nitrogen load is conservative because the rest of the embayment is closer to the mouth of the estuary and will have lower nitrogen concentrations because of a greater tidal flux; and 4) the future nitrogen fluxing from sediments is overestimated.

*Assessment:*

EPA concludes that the margin of safety for the TMDL is reasonable.

## **7. Seasonal Variation**

*The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for including seasonal variations in the TMDL must be described (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)).*

The TMDLs for the waterbody segments identified in the document are based on achieving the nitrogen loads during the most critical time period, i.e. the summer growing season (see page 20 of the TMDL document).

*Assessment:*

Since the other seasons are less sensitive to nitrogen loading than the summer growing season, EPA concludes that the TMDL for each waterbody segment is protective of all seasons throughout the year.

## **8. Monitoring Plan for TMDLs Developed Under the Phased Approach**

*EPA's 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), and EPA's 2006 guidance, Clarification Regarding "Phased" Total Maximum Daily Loads, recommend a monitoring plan when a TMDL is developed using the phased approach. The guidance indicates that a State may use the phased approach for situations where TMDLs need to be developed despite significant data uncertainty and where the State expects that the loading capacity and allocation scheme will be revised in the near future. EPA's guidance provides that a TMDL developed under the phased approach should include, in addition to the other TMDL elements, a monitoring plan that describes the additional data to be collected and a scheduled timeframe for revision of the TMDL.*

Because these TMDLs are not "phased" TMDLs, a monitoring plan is not required. Nevertheless, in order to assess the progress in obtaining the TMDLs' water quality goals, MassDEP has recommended that the towns of Mashpee and Barnstable establish a detailed post-

TMDL monitoring plan as set out on page 22 of the TMDL document. EPA recommends that MassDEP and the town work together to develop and implement such a plan. In addition, MassDEP is committed to monitoring the Popponesset Bay system every five years as part of conducting its ongoing water quality assessments in each watershed in Massachusetts.

*Assessment:*

EPA concludes that the anticipated monitoring by and in cooperation with MassDEP is sufficient to evaluate the adequacy of progress toward attainment of water quality standards and designated uses, although not a required element of EPA's TMDL approval process.

## **9. Implementation Plans**

*On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States/Tribes in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA's approval of TMDLs.*

The implementation plan for the Popponesset Bay system's total nitrogen TMDL is described on pages 21 and 22 of the TMDL document and strategies for reducing nitrogen loading are set out in MassDEP's MEP Implementation Guidance report which can be found at: <http://www.mass.gov/dep/water/resources/restore.htm>. The watershed for the Popponesset Bay system includes the towns of Mashpee, Barnstable and Sandwich and MassDEP advises that implementation planning should be coordinated. In addition, these towns are currently developing their Comprehensive Wastewater Management Plan (CWMP). The towns have latitude in considering various implementation scenarios such as land use planning and controls, sewerage and treatment for nitrogen control of sewage and storm water control and treatment.

*Assessment:*

EPA acknowledges that the TMDL document includes an implementation plan. EPA does not approve this component of any TMDL submission.

## **10. Reasonable Assurances**

*EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.*

*In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and “may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs.”*

The Commonwealth has statutory and regulatory authority to encourage implementation of these TMDLs, as explained on page 22 of the TMDL document. In addition, Mashpee and Barnstable have demonstrated their commitment to implement these TMDLs through the comprehensive wastewater planning that they initiated well before the generation of these TMDLs. These towns expect to use the information in these TMDLs to generate support from their citizens to take the necessary steps to remedy existing problems related to nitrogen loading from septic systems, storm water, and runoff (including fertilizers), and to prevent any future degradation of these valuable resources.

*Assessment:*

Reasonable assurance is not necessary for these TMDLs to be approvable, since the point sources are not given less stringent wasteload allocations based on projected non-point source load reductions. EPA, however, concludes that the TMDL document offers reasonable assurances that the TMDLs will be implemented.

## **11. Public Participation**

*EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State/Tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 C.F.R. § 130.7(c)(1)(ii) ). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe’s public participation process, including a summary of significant comments and the State/Tribe’s responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. § 130.7(d)(2) ).*

*Inadequate public participation could be a basis for disapproving a TMDL; however, where EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.*

MassDEP publicly announced the development of the draft TMDL on March 16, 2005. A public meeting was held on March 30, 2005 for public review and solicitation of comments. The public comment period closed on April 13, 2005. MassDEP has done a commendable job involving the public during the development of the TMDLs and has provided ample opportunities for the public to comment. Finally, MassDEP has provided a clear record of the comments received and provided clear responses to those comments. EPA has reviewed the comments and responses and concurs with the conclusions set forth by MassDEP. In addition, EPA investigated the comments raised by the various individuals and found the approach used to establish the TMDLs acceptable.

*Assessment:*

EPA concludes that MassDEP has done a sufficient job of involving the public in the development of the TMDL, provided adequate opportunities for the public to comment and has fully addressed the comments received as set forth in the response to comment section of the TMDL document.

**12. Submittal Letter**

*A submittal letter should be included with the TMDL analytical document, and should specify whether the TMDL is being submitted for a technical review or is a final submittal. Each final TMDL submitted to EPA must be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final submittal, should contain such information as the name and location of the waterbody, the pollutant(s) of concern, and the priority ranking of the waterbody.*

On November 21, 2006, MassDEP submitted a final TMDL for total nitrogen on the Popponeset Bay system for EPA approval.

*Assessment:*

The final document contained all of the elements necessary to approve the TMDLs.

**Attachment 1**  
**5 Total Nitrogen TMDLs Addressed In Document**

<b>Popponeset Bay System Sub-Embayment</b>	<b>Segment Identification Based On 2002 Integrated List</b>	<b>Description</b>	<b>TMDL (kg/day)</b>
Mashpee River	MA96-24_2002	Quinaquisset Avenue to mouth at Shoestring Bay (formerly to mouth of Popponeset Bay), Mashpee	26
Shoestring Bay	MA96-08_2002	Quinaquisset Avenue to Popponeset Bay (line from Ryefield Point, Barnstable to Punkhorn Point, Mashpee, including Gooseberry Island), Barnstable/Mashpee	13
Ockway Bay	Determined to be impaired for nitrogen during the development of this TMDL		3
Pinquickset Cove	Determined to be impaired for nitrogen during the development of this TMDL		1
Popponeset Bay	MA96-40_2002	From line connecting Ryefield Point, Barnstable to Punkhorn Point, Mashpee, to inlet of Nantucket Sound (including Ockway Bay and Pinquickset Cove), Mashpee/Barnstable	1

<b>Data for Entry in EPA's National TMDL Tracking System and Regional Web Page</b>							
TMDL Water Body Name *		<b>Popponeset Bay (5 segments)</b>					
Number of TMDLs*		5					
Type of Pollutant(s) *		Nutrients (nitrogen)					
Number of listed causes (from 303(d) list)		5					
Any <u>Information/prevention</u> TMDLs (Y/N)		N					
Lead State		Massachusetts					
TMDL Status		Final					
<b>Individual TMDLs listed below (one line per segment-pollutant combination)</b>							
TMDL Segment name	TMDL Segment ID #	TMDL Pollutant ID# & name	TMDL Impairment Cause(s)	Pollutant endpoint	Unlisted?	NPDES Point Source & ID#	Segment still listed for something else? (Y/N)
Mashpee River	MA96-24_2002	511 (Total Nitrogen)	Nutrients	0.38 mg/L TN	No	NPDES MS4 General Stormwater Permit	Y Pathogens
Shoestring Bay	MA96-08_2002	511 (Total Nitrogen)	Nutrients	0.38 mg/L TN	No	NPDES MS4 General Stormwater Permit	Y Pathogens
Ockway Bay	UN-N2008-15	511 (Total Nitrogen)	Nutrients	0.38 mg/L TN	Yes	NPDES MS4 General Stormwater Permit	N
Pinquickset Cove	UN-N2008-16	511 (Total Nitrogen)	Nutrients	0.38 mg/L TN	Yes	NPDES MS4 General Stormwater Permit	N
Popponeset Bay	MA96-40_2002	511 (Total Nitrogen)	Nutrients	0.38 mg/L TN	No	NPDES MS4 General Stormwater Permit	N
TMDL Water Pollution Type		Point & Nonpoint Source (Stormwater)					
Cycle (list date)		2006					
Establishment Date (approval)*		Jan 22, 2008					
EPA Developed		No					
Towns affected*		Mashpee, Barnstable and Sandwich, MA					

\* = These data fields used in webpage entries