



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 1  
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BOSTON, MASSACHUSETTS 02114-2023

June 28, 2002

Lauren A. Liss, Commissioner  
Department of Environmental Protection  
1 Winter Street  
Boston, MA 02108

Dear Commissioner Liss:

It is my pleasure to approve five Total Maximum Daily Loads (TMDL's) for lakes targeting total phosphorus. These are: Lake Boon, Leesville Pond, Lake Quinsigamond/Flint Pond, Salisbury Pond and Indian Lake.

EPA has determined, as set forth in the enclosed review document, that these phosphorus TMDL's meet the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations (40 CFR part 130).

I want to congratulate you and the staff of the Division of Watershed Management for the excellent work in developing these TMDL's.

Sincerely,

*Linda M. Murphy*  
Linda Murphy, Director  
Office of Ecosystem Protection

*Lauren - 2 letters  
in one week! Your  
staff deserve a lot of  
credit. Linda*

cc: Cynthia Giles  
Glenn Haas  
Rick Dunn  
Russ Isaac

enclosures (5)

**TMDL Name:** Lake Boon, Hudson and Stowe , MA (MA82011)

**Lead State:** Massachusetts

**TMDL Status:** Approved

**Pollutant ID:** Total Phosphorus

**TMDL end point:** 20 ppb Total Phosphorus (TP)

**List ID:** MA82011

**Impairment ID:** Noxious aquatic plants

**Cycle:** 1998

**TMDL type:** nonpoint source

**TMDL (final) submittal date:** April 29, 2002

**Actual establishment date:** June, 2002

**Notice to public date:** November, 2001

## EPA NEW ENGLAND'S TMDL REVIEW

**TMDL:** Lake Boon, Hudson and Stowe , MA. Concord Watershed.

**STATUS:** Final

**IMPAIRMENT/POLLUTANT:** Noxious Aquatic Plants. The TMDLs are proposed for total phosphorus.

**BACKGROUND:** The Massachusetts Department of Environmental Protection (MADEP) submitted a draft TMDL dated April 26, 2000. Verbal comments were transmitted by EPA-New England in June, 2000. DEP submitted a final TMDL for Lake Boon and requested final approval in a letter dated April 29, 2002.

**REVIEWER:** Bruce Rosinoff (617) 918-1698.

### 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 chlorophyll a and phosphorus loadings for excess algae and reduced clarity in the water column.*

*Assessment:*

The Lake Boon TMDL adequately describes the waterbodies and the causes of impairment as

identified on the 1998 303(d) list. The document describes the pollutant of concern, total phosphorus, and identifies the magnitude of the phosphorus sources including: atmospheric deposition, groundwater, septic systems, dry weather runoff, wet weather runoff, and internal release through sediments. A mass balance nutrient budget approach based on watershed monitoring and in-lake total phosphorus was used to measure existing loadings. MA DEP chose the mass balance approach as the basis for characterizing existing pollutant loading because it relies on actual monitoring data of the lake and watershed rather than loading values from the literature. However, MA DEP determined that the mass balance approach did not adequately characterize the major loading contribution from failing septic systems which would emerge as a discrete but localized spring. For this reason an export coefficient for this source was added to the mass balance approach for septic systems.

Natural background loadings were not distinguished from the total nonpoint source load. In this case not separating natural background is reasonable because of the approach used to estimate loadings by subwatershed and the limited and general nature of the information available related to potential phosphorus sources to Lake Boon. Without more detailed site-specific information on nonpoint source loading, it is very difficult to meaningfully separate natural background from the total nonpoint source load and, attempting to do so would add little value. Important assumptions made in developing the TMDL are discussed regarding the linkage between phosphorus loading and aquatic weed growth. EPA agrees that MA DEP has made a reasonable assumption, lacking detailed data, that both in-lake controls and watershed controls through phosphorus reduction are necessary for the restoration of lakes experiencing macrophyte or algal growth.

EPA concludes that the TMDL document has adequately characterized the impairments and the causes of impairment to Lake Boon. MA DEP has relied on best available information including Diagnostic/Feasibility studies completed in 1987 and 1999 to develop the TMDL. EPA believes that the technical approach used by MA, including pollutant loading characterization and defining the loading capacity, are reasonable and consistent with widely accepted methods used in lake nutrient management studies.

## 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.*

### *Assessment:*

The TMDL document describes the applicable water quality standards on page 11 which include

narrative criteria as well as designated uses. MA DEP has interpreted its narrative criteria by selecting a quantitative water quality target using in-lake total phosphorus at 20 ppb. The numeric target is based upon other typical lakes in equivalent eco-regions. EPA believes that this is a reasonable approach at this time pending final EPA criteria, and in general, this approach should meet water quality standards. The approach of selecting targets based on eco-regions is similar to EPA's present guidance on developing nutrient criteria.

EPA concludes that MA DEP has properly presented its water quality standards and has made a reasonable interpretation of the narrative water quality criteria in the standards. EPA concludes that DEP has made a reasonable judgment that T.P. targets in conjunction with in-lake management practices to control nuisance macrophytes will attain water quality standards.

### **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.*

#### *Assessment:*

The loading capacities for Lake Boon is set at 254 kg/yr of total phosphorus in order to reduce average in-lake TP concentrations to 20 ppb. The loading capacity is set to protect water quality and support uses during critical conditions which occurs during the summer season when the environmental conditions (e.g., higher temperatures, increased light intensity, etc.) are most favorable for aquatic plant growth. Attainment of water quality standards will rely on the use of in-lake management practices to control rooted macrophytes in combination with reducing phosphorus loading from the watershed.

The approach used by MA DEP to link water quality to pollutants for Lake Boon is widely used among lake managers in New England. Most of the lake Diagnostic/Feasibility studies conducted

throughout Massachusetts have followed similar approaches. In-lake nutrient concentrations were modeled to estimate how nutrient management may reduce in-lake nutrient concentrations and reduce the probability of algal blooms in the future. There is uncertainty of both the loading rate and the target load. However, EPA believes that it is reasonable to assume that the percentage phosphorus reduction will result in reaching the target concentration.

The Lake Boon TMDL includes documentation supporting the technical approach and key assumptions used in the analysis. The document discusses some of the limitations that are inherent in the analyses involving nonpoint pollution sources and aquatic macrophytes in lakes. EPA is also familiar with the strengths and weaknesses associated with such analyses. Principal strengths include the use of existing data in conjunction with an empirical model to predict in-lake water quality. Empirical models are based on extensive data from lakes with similar characteristics that demonstrate the relationship between pollutant loading and lake water quality. Weaknesses in the approach relate primarily to; 1) the lack of site-specific information about pollution sources and, 2) the relationship between pollutant loading and aquatic macrophyte growth due to the complexity of natural processes involved with the growth of aquatic plants in lakes.

The TMDL is expressed in terms of allowable annual loadings of total phosphorus rather than daily loadings. As specified in 40 CFR 130.2(i), TMDL's may be expressed in terms of either mass per unit time, toxicity or other appropriate measures. MADEP justifies setting an annual load, as opposed to a daily load, because Lake Boon's overall water quality including excessive aquatic plant growth is a function of long-term average pollutant loadings rather than short-term daily loadings. The use of annual loading targets is a widely accepted practice in lake management. With respect to eutrophication it is important to consider annual loadings because of the long residence time and the fact that the phosphorus that is bound up in particulate matter accumulates, and may become available at much later times for plant growth.

EPA concludes that the loading capacity has been appropriately set at a level necessary to attain (in combination with in-lake management practices) and maintain water quality standards. MADEP has used a reasonable and widely accepted approach to establish the relationship between pollutant loading and water quality. EPA also concurs with expressing the TMDL as an annual loading based on the reasons cited.

#### **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.*

*Assessment:*

The Lake Boon TMDL sets the total of all load allocations for existing and future nonpoint sources to 366 kg/yr total phosphorus. Loads are allocated to: direct precipitation, groundwater discharging directly to the lake, septic systems, dry weather runoff, wet weather runoff and internal release from sediments, as derived from field measurements and modeling. EPA concludes that target load allocations are adequately specified in the TMDL at levels necessary to attain and maintain 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.*

*Assessment:*

MA DEP has not identified any point sources in the watershed for Lake Boon. Thus, the Waste Load Allocation is appropriately set at zero.

## **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.*

*Assessment:*

The Lake Boon TMDL includes an explicit MOS of 10% (28 kg/yr) which has been set aside as unallocated. The lake already meets the 4-foot transparency requirement for swimming beaches and the proposed reduction in phosphorus would likely increase the transparency even more. The lower phosphorus concentrations will lessen the chance of nuisance algal blooms, which may occur as macrophyte biomass is reduced. Lake Boon is listed for noxious aquatic plants, which is loosely related to watershed loads. There is no impairment from nuisance algae now so DEP believes these are protective TMDLs to maintain current conditions with regard to algae.

EPA concludes that adequate MOS is provided in the TMDL to address the noxious aquatic plant problems and the threat of nuisance algal blooms.

## **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)).*

*Assessment:*

The TMDL was developed to be protective of the most environmentally sensitive period (summer season), when conditions are most favorable for plant growth. Therefore, the TMDL will also be protective of water quality during all seasons. Anticipated phosphorus controls are expected to be in place throughout the year and will achieve pollutant reductions necessary to protect water quality on a year-round basis.

EPA concludes that seasonal variations have been adequately accounted for in the TMDL.

## **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), recommends a monitoring plan when a TMDL is developed under the phased approach. The guidance recommends that a TMDL developed under the phased approach also should provide assurances that nonpoint source controls will achieve expected load reductions. The phased approach is appropriate when a TMDL involves both point and nonpoint sources and the point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. EPA's guidance provides that a TMDL developed under the phased approach should include a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards.*



*Assessment:*

Monitoring by MA DEP will be continued on a regular basis according to the five year watershed cycle. The document describes the extent of the proposed monitoring to evaluate the efficacy of the controls and the adequacy of the TMDL. Also, MA DEP will work with and encourage volunteer monitoring groups. Field surveys will also be conducted with watershed residents to help identify pollution sources as part of the implementation plan.

EPA concludes that the proposed monitoring by MA DEP together with the volunteer monitoring will be sufficient to evaluate the adequacy of the TMDL over the next 10 to 15 years.

## **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.*

*Assessment:*

The Implementation Plan for Lake Boon outlines a process for collecting additional information to identify phosphorus sources, provide watershed residents with nonpoint source pollution and water quality training and give guidance to apply for grant and loan funding to control sources. It also relies heavily on the watershed team that will be the focal point for bringing together technical experts and grant writers to work with local governments and watershed associations. Tasks and responsible parties are identified in Table 2 on page 17. MA DEP will also implement additional measures such as in-lake control of sediment phosphorus recycling if the lakes do not meet water quality standards.

## **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."*

*Assessment:*

The responsible organizations for 10 of the 15 implementation tasks in Table 2 are either MA DEP or the watershed team which is headed by the Executive Office of Environmental Affairs. This will provide the high level attention necessary to assure that appropriate load reductions occur. MA DEP will utilize available regulatory tools such as expanded use of its wetlands regulations to help ensure these reductions. EPA also has the opportunity through the Performance Partnership Agreement process to work with MA DEP to provide reasonable assurance for implementing the Lake Boon TMDL.

Implementation rests totally on nonpoint source BMPs. Thus, no point source is being given a less stringent waste load allocation in that nonpoint source reductions will occur. Therefore, reasonable assurance is not required in order for the TMDL to be approved.

## **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.*

*Assessment:*

A summary of the comments received during the public participation process and the responses are described on pages 19-21. MA DEP provided an opportunity for public comment and held a public meetings on December 11, 2001. The list of attendees is included. on pages 45-46.

EPA concludes that MA DEP has provided adequate opportunity for public involvement during the development of the TMDL.

## **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.*

### *Assessment:*

MA DEP's, April 29, 2002, letter clearly states that the TMDL is submitted under Section 303(d) for EPA approval.