

August 12, 2004

Andrew Fisk  
Maine Department of Environmental Protection  
#17 State House Station  
Augusta, Maine 04333-0017

**SUBJECT: Notification of Approval of Highland Lake TMDL**

Dear Mr. Fisk:

Thank you for Maine's submittal of the Highland Lake Total Maximum Daily Load (TMDL) for total phosphorus. This waterbody is included on Maine's 2002 303(d) list and was moved up as a priority for TMDL development from past listings due to the high level of stakeholder interest in this particular lake. The purpose of the TMDL is to address algae blooms due to excessive nutrient loading from nonpoint source pollution.

The U.S. Environmental Protection Agency (EPA) hereby approves Maine's August 2, 2004 Highland Lake TMDL received by EPA on the same day electronically. EPA has determined that this TMDL meets the requirements of §303(d) of the Clean Water Act (CWA), and of EPA's implementing regulations (40 CFR Part 130). Attached is a copy of our approval documentation.

We are very pleased with the quality of your TMDL submittal. Your staff, in collaboration with the Lakes Environmental Association (LEA) and the Maine Association of Conservation Districts (MACD) have done an excellent job of preparing and ground-truthing a comprehensive and informative TMDL report. The extent of local interest, collaboration, and long-term pollution control activity in this watershed is impressive. My staff and I look forward to continued cooperation with the ME DEP in exercising our shared responsibility of implementing the requirements under Section 303(d) of the CWA.

Sincerely,

Linda M. Murphy, Director  
Office of Ecosystem Protection

cc (electronic):  
David Courtemanch, ME DEP  
David Halliwell, ME DEP

In-house distribution (electronic):

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## EPA NEW ENGLAND'S TMDL REVIEW

**TMDL:** **Highland Lake**, Cumberland and Oxford Counties, Maine  
HUC: ME 0106000101; ME ID# 3454 located in Bridgton, ME  
2002 303(d) list: declining trend (DO); 2003-4 TMDL development.

**STATUS:** Final

**IMPAIRMENT/POLLUTANT:** Declining trend in trophic status due to excessive nutrient loading from nonpoint source pollution. The TMDL is calculated for total phosphorus (TP).

**BACKGROUND:** The Maine Department of Environmental Protection (ME DEP) submitted electronically to EPA New England the final Highland Lake TMDL for total phosphorus (TP) with a transmittal letter dated August 2, 2004. EPA provided July 14, 2004 comments on the July 2, 2004 draft TMDL. ME DEP took all comments received into account in the final submission.

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.

**REVIEWERS:** Jennie Bridge (617-918-1685) E-mail: [bridge.jennie@epa.gov](mailto:bridge.jennie@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.*

#### **6. 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 Highland Lake TMDL describes the waterbody and the cause of impairment as identified in the 2002 303(d) list (see pages 4, and 9-10 TMDL report). The document describes the pollutant of concern, total phosphorus, and identifies the location (by tributary subwatershed) and magnitude of phosphorus sources from atmospheric deposition (7%) and from 25 subcategories of land use within the watershed which include: agricultural and forested land, shoreline development, non-shoreline development, and non-developed land (see Table 3 page 27 TMDL report). Information on population and growth characteristics is provided (page 10 TMDL report). Internal sediment recycling is evaluated (page 0 TMDL report).

ME DEP explained that it was not possible to separate natural background from nonpoint sources (page 25 TMDL report). In this case, not separating natural background is reasonable because of the limited and general nature of the information available (land use categories) related to potential phosphorus sources. Without more detailed site-specific information on nonpoint source loading, it would be very difficult to separate natural background from the total nonpoint source load, and attempting to do so would add little value to the analysis.

ME DEP provides an explanation and analytical basis for expressing the TMDL for nuisance algae blooms through surrogate measures using Secchi disk transparency (SDT), phosphorus loadings, and chlorophyll a. (See also section 2 below which documents ME's water quality standards.)

**Assessment:** EPA New England concludes that the ME DEP has done an adequate job of characterizing sources of impairment.

## **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.*

Highland Lake TMDL describes the applicable narrative water quality standards (see page 25 TMDL report). The report defines applicable narrative criteria, designated uses, and antidegradation policy (page 26).

ME DEP identifies a numeric water quality target for the TMDL of **8 ppb** total phosphorus (TP) (467 kg TP/yr) which ME DEP predicts will result in the attainment of water quality standards. The numeric target was selected using best professional judgment based on available water

quality data (average epilimnion grab/core samples) corresponding to non-bloom conditions, as reflected in measures of both Secchi disk transparency (>2.0 meters) and chlorophyll-a (<8.0 ppb) levels in non-colored water (page 26 TMDL report).

**Assessment:** EPA New England concludes that ME DEP has properly presented its water quality standards and has made a reasonable interpretation of the narrative water quality criteria in the standards when setting the numeric water quality target.

### 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 loading capacity for Highland Lake is set at **467 kg TP/yr** (see page 29 TMDL report), based on a target goal of 8 ppb. The loading capacity is set to protect water quality and support uses during critical conditions which occur during the summer season when environmental conditions (e.g., higher temperatures, increased light intensity, etc.) are most favorable for aquatic plant growth (page 31 TMDL report).

ME DEP links water quality to phosphorus loading by:

- picking a target in-lake phosphorus level, based on historic state-wide and in-lake water quality data (page 26 TMDL report),
- using an empirical phosphorus retention model, calibrated to in-lake phosphorus concentration data, to 29-31 TMDL report), and
- comparing the loading target to existing phosphorus loadings estimated by applying phosphorus export coefficients to land area with specified land uses (see Table 3 page 27 TMDL report).

These analytical methods are widely recognized as appropriate for lake TMDL development.

ME DEP explains that selected phosphorus loading coefficients in Table 3 (primarily for roads

and residential land use) “were reduced (from total P values) to account for the estimated bioavailability of the soil runoff sources according to available literature” (page 28 TMDL report).

ME DEP explains the justification for expressing the loading capacity as an annual load, as opposed to a daily load, lies in the lake basins relatively low flushing rate (0.91 flushes per year) (page 29 TMDL report).

**Assessment:** EPA New England concludes that the loading capacity has been appropriately set at a level necessary to attain and maintain applicable water quality standards. The TMDL is based on a reasonable and widely accepted approach for establishing the relationship between pollutant loading and water quality in lakes.

EPA New England also concurs with expressing the TMDL as an annual loading based on the reason provided by ME DEP (relatively long average hydraulic residence time).

#### **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.*

ME DEP allocates all of the loading capacity of **467 kg TP/yr** for Highland Lake as the “load allocation”, a gross allotment to existing and future nonpoint sources and to natural background (page 31 TMDL report). Calculation of necessary reduction is provided (page 18 TMDL report).

**Assessment:** EPA New England concludes that the load allocation is adequately specified in the TMDL at a level necessary to attain and maintain water quality standards. The degree of load reductions necessary to achieve the in-lake phosphorus level is based in part on an estimate of current loadings.

#### **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.*

Highland Lake is a Class GPA water in Maine. According to Maine statute, “There may be no new direct discharge of pollutants into Class GPA waters.” [38 MRSA 465-A (1) (c)] ME DEP explains that, as there are no known existing point sources of pollution (including regulated stormwater sources) in the lake watershed, the waste load allocation for all existing and future point sources is set at 0 (zero) kg/year of total phosphorus (page 32 TMDL report).

**Assessment:** EPA New England concurs that the WLA component of the TMDL is appropriately set equal to zero based on ME DEP’s determination that there are no existing point source discharges subject to NPDES permit requirements in the watershed.

## **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 Highland Lake TMDL includes an implicit margin of safety (MOS) through the relatively conservative selection of the numeric water quality target of 8 ppb as well as the selection of relatively conservative phosphorus export loading coefficients for cultural pollution sources (Table 3) (see page 27 TMDL report). Based on both historical records and ME DEP’s analysis of a state-wide limnological database for non-colored or <26 SPU lakes, ME DEP believes that a target of 8 ug/l is a highly conservative goal because “nuisance algae blooms (plankton growth of algae which causes Secchi disk transparency to be less than 2 meters) are more likely to occur at 18 ppb or above. The difference between the in-lake target 8ppb and 17 ppb represents a **53%** implicit margin of safety for Highland Lake. ME DEP also mentions an additional unquantified margin of safety for attainment of state water quality goals is provided by the inherently conservative methods used to estimate future growth (page 30 TMDL report).

**Assessment:** EPA New England concludes that adequate MOS (roughly 53%) is provided for the following reasons: (1) EPA believes a significant implicit MOS is provided in the selection of an in-lake TP concentration of 8 ppb based on a state-wide data base for non-colored lakes, and (2) the adequacy of this MOS is supported by in-lake data.

## 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)).*

Highland Lake TMDL considered seasonal variations because the allowable annual load was developed to be protective of the most sensitive time of year - during the summer, when conditions most favor the growth of algae and aquatic macrophytes (see page 32 TMDL report). The TMDL is protective of all seasons, given lake's flushing rate of 0.91 flushes/year, and the fact that BMPs (implemented and proposed) have been designed to address TP loading during all seasons.

**Assessment:** EPA New England concludes that seasonal variation has been adequately accounted for in the TMDL because the TMDL was developed to be protective of the most environmentally sensitive period, the summer season. In addition, phosphorus controls are expected to be in place through the year so that these controls will reduce pollution whenever sources are active.

## 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.*

The Highland Lake TMDL describes the history of volunteer monitoring (since 1975), and describes the continued cooperative long-term water quality monitoring to be conducted monthly from May to October through continued efforts of Lakes Environmental Association (LEA) in cooperation with ME DEP. ME DEP anticipates sufficient data will be acquired to adequately track seasonal and inter-annual variation and long term trends in water quality in the lake (see page 22 TMDL report).

**Assessment:** EPA New England concludes that the ongoing monitoring by the LEA in cooperation with ME DEP is sufficient to evaluate the adequacy of the TMDL.

## 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 Highland Lake phosphorus control action plan is described in pages 19-22 of the TMDL report, including recommendations for future work. Specific recommendations for eight action items address the following sources of pollution: individual action of landowners and shoreline erosion, roadways, agriculture, forestry. The TMDL report also includes a summary of recent and current NPS/BMP projects in the watershed (some funded through CWA §319 nonpoint source program).

**Assessment:** Addressed, though not required. EPA New England thinks that ME DEP has done an admirable job in targeting BMPs to achieve the TMDL

## 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."*

ME DEP addresses reasonable assurances that NPS reductions will occur by providing information on past and current surveys and work in the watershed which point to a long term local commitment to improving water quality in Highland Lake (see page 22 TMDL report). The report documents an extensive and long standing collaborative approach to water quality restoration over the past 30 years. The LEA, in cooperation with area landowners, has worked diligently since the early to mid-70's to address point and NPS pollution in the watershed. The Town of Bridgton has also shown a high level of commitment to protecting the lake through strong enforcement of Shoreland Zoning standards, and by creating an erosion and sedimentation control district.

**Assessment:** Addressed, though not required.

## 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.*

The public participation process for Highland Lake TMDL is described on pages 32-33 of the TMDL report. ME DEP issued public notice of the TMDL availability on July 2, 2004 via local newspapers, and on ME DEP's Internet web site, following a preliminary review by 27 interested organizations/individuals representing the stakeholder group (June 5-7, 2004). Many local education/outreach meetings on the TMDL development process occurred with town officials and lakeshore residents from summer 2002 – spring 2004. The public comment deadline was July 30, 2004. Other than comments from EPA to move ahead with approval, no additional comments were received during the public review period.

**Assessment:** EPA New England concludes that ME DEP has done an adequate job of involving the public during the development of the TMDL, and provided adequate opportunities for the public to comment on the TMDL.

**Data for entry in EPA's National TMDL Tracking System**

TMDL Name	<b>Highland Lake</b>
Lead State	Maine (ME)
TMDL Status	Final
Pollutant ID	515 (total phosphorus)
TMDL End Point	8 ppb TP
TMDL Type	Nonpoint Source
List ID (from system)	
Impairment ID	Declining trend in trophic status (DO): Decline in water quality due to excessive nutrient loading from nonpoint sources. (Use same as East Pond ID # 2469)
Cycle (list date)	2002
Establishment Date (approval)	August 12, 2004
EPA Developed	No

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