

EPA NEW ENGLAND'S TMDL REVIEW

TMDL: **China Lake**, (East and West Basins), Kennebec County, Maine
(ME ID#328 5448 located in China and Vassalboro, ME)
1998 303(d) list: Blooms; <2003 TMDL development.

STATUS: Final

IMPAIRMENT/POLLUTANT: Algae blooms due to excessive nutrient loading. The TMDL is proposed for total phosphorus (TP).

BACKGROUND: The Maine Department of Environmental Protection (ME DEP) submitted to EPA New England the final China Lake TMDL for total phosphorus (TP) with a transmittal letter dated October 10, 2001, received by EPA on October 15, 2001. All of EPA's September 11, 2001 questions and comments (on the August 16, 2001 draft TMDL) have been answered or were taken 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 40 CFR Part

REVIEWERS: Jennie Bridge (617-918-1685) E-mail: bridge.jennie@epa.gov
Alison Simcox, Ph.D. (617-918-1684) E-mail: simcox.alison@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 China Lake TMDL describes the waterbody (a dual basin drainage lake) and the cause of impairment as identified in the 1998 303(d) list (nuisance algae growth/blooms due to nutrient enrichment of lakes). The document describes the pollutant of concern, total phosphorus, and identifies the location (by tributary subwatershed) and magnitude of phosphorus sources from atmospheric deposition (12%) and from eighteen subcategories of land use within the watershed which include: agricultural practices, residential, recreational, and other development, septic systems, roads, and non-cultural uses (see Table 4 page 22 of TMDL report). Information on population and growth characteristics is provided (pages 11-12, TMDL report). Internal sediment recycling is evaluated (pages 28-29, TMDL report).

ME DEP provides an explanation and analytical basis for expressing the TMDL for nuisance algae blooms through the surrogate measure of phosphorus loadings, also using measures of Secchi disk transparency (SDT) and chlorophyll *a*. (See page 4, in general, and pages 25-28, in detail, of TMDL report. See also section 2 below which documents ME's water quality standards.)

ME DEP explains that it was not possible to separate natural background from nonpoint sources (page 28 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 to the lake. 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.

In order to clarify EPA's review comment/question about our confusion over the significance of shoreline erosion, ME DEP explained that the "shoreline zone" (page 6 TMDL report) extends inland far beyond the lake/shoreland interface to include shoreline roads and development, and therefore accounts for a significant source of phosphorus; in contrast, "shoreline erosion" (page 10) refers to the more limited lake/shore interface which ME DEP states "is responsible for a relatively minor amount of the total external loading of phosphorus to China Lake." Visual observation by ME DEP staff has not provided evidence of significant shoreline erosion (personal communication, David Halliwell, Roy Bouchard, ME DEP, 10/22/01). An earlier and less intensive shoreline survey by ME DEP staff yielded an estimate of actively eroding shoreline that was close to (within 1-2% of) the June, 2000 survey done by the China Lake Association (3,161 feet or 4%) (personal communication, Roy Bouchard, ME DEP, 10/22/01).

We note that the text on page 5 (4th par, 4th line) stands as written; a typo appears on page 51, Appendix C last line of Dave Halliwell's response to comment (personal communication, David Halliwell, ME DEP 10/22/01).

Assessment: EPA New England concludes that the ME DEP has done an admirable job of characterizing China Lake's 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.

The China 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 25-26).

ME DEP identifies a numeric water quality target for the TMDL of 15 ppb total phosphorus (TP) (2,830 kg TP/yr) which ME DEP predicts will result in the attainment of water quality standards. The numeric in-lake target was selected using best professional judgement 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) (page 26).

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 a numeric water quality target.

The 15 ppb target concentration was selected based on review of statewide water quality data for lakes with low levels of apparent color (<26 SPU), lake-specific data for China Lake, and on water quality goals of ME DEP. EPA New England is satisfied that this review was thorough and, based on our review, EPA concurs that the available data support the conclusion that an in-lake concentration of 15 ug/l will eventually attain Maine's 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.

The loading capacity for China Lake is set at 2,830 kg TP/yr. (See page 26 TMDL report). 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 28 TMDL report).

ME DEP links water quality to phosphorus loading by (1) picking a target in-lake phosphorus level based on historic state-wide and in-lake water quality data (page 26 TMDL report), (2) using an empirical phosphorus retention model, calibrated to in-lake phosphorus concentration data to determine the pollutant loading corresponding to the desired water quality in the lake (see page 27 TMDL report), and (3) comparing the loading target to existing phosphorus loadings estimated by applying phosphorus export coefficients to land area with specified land uses (see Table 4, page 22 TMDL report). These analytical methods are widely recognized as appropriate for lake TMDL development.

ME DEP explains that the justification for expressing the loading capacity as an annual load, as opposed to a daily load, lies in the lake basins relatively long hydraulic residence time (0.65 - 0.72, or 1-2 flushes per year) (page 26 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 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 calculates that the total load of phosphorus contribution to China Lake must be limited to 2,830 kg TP/yr in order to achieve the in-lake target goal of 15 ppb TP. The TMDL allocates all of this loading capacity as a gross allotment to existing and future nonpoint sources and to natural background. ME DEP's calculation of the current external loading of TP averages 2,059 kg annually (page 23 TMDL report). The internal TP loading varies from an average under

bloom conditions of 2,553 kg down to an average of 1,201 kg during non- nuisance algae bloom summers (pages 28-29 TMDL report). ME DEP also explains in-lake remedial options to address internal recycling (pages 39-40 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 levels 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.

China 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 know existing point sources of pollution in the China Lake watershed, the waste load allocation for all existing and future point sources is set at 0 (zero) kg/year of total phosphorus (page 29 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 China Lake 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 China Lake TMDL includes an implicit margin of safety (MOS) through the relatively conservative selection of the numeric water quality target of 15 ppb as well as the selection of

relatively conservative phosphorus export loading coefficients for cultural pollution sources (Table 4) (see pages 22 and 29 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 15 ug/l is a fairly 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 of 15 ppb and 17 ppb represents a [13.4%] (378kg TP/yr) implicit margin of safety.

Assessment: EPA new England concludes that adequate MOS (roughly 12%) 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 15 ppb based on a state-wide data base for naturally 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)).

The China 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 29-30 TMDL report). The TMDL is protective of all seasons, given China Lake's average hydraulic retention time of 1-2 years. We also note 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 China Lake TMDL describes the history of volunteer monitoring (since 1971), and explains that the Kennebec Water District began a more intensive water quality sampling at three locations in the dual basin lake in 1995. A cooperative (KWD and ME DEP) long-term water quality monitoring plan will continue in China Lake between the months of May to October. The data will be used to track seasonal and inter-annual variation and long term trends in water quality in China Lake (see page 30 TMDL report).

Assessment: EPA New England concludes that the ongoing monitoring by the Kennebec Water District, 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.

Field inventories, survey summaries, and recommended steps for implementing the China Lake TMDL are described in pages 30-40 of the TMDL report. Specific recommendations for BMPs are outlined for several sources of phosphorus pollution, including roads (camp, state, and town), house lots, farms, and commercial lots. The report recommends: support and enforcement of the town of China's existing phosphorus control ordinance to reduce loads from construction/development activity, septic system survey follow-up, shoreline survey follow-up on erosion, stream and tributary survey follow-up on areas of significant development, continued implementation of the China Region Lakes Alliance *Watershed Management Plan* (1999). ME

DEP also includes information on past and current projects in the watershed funded through CWA §319 nonpoint source program.

Comment: Addressed, though not required. EPA New England thinks that ME DEP has done an admirable job targeting BMPs to implement the necessary TMDL reductions.

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 by (1) providing information on current surveys and work in the watershed (see pages 30-40 TMDL report), (2) stating that a combination of the NPS BMPs will provide significant overall reduction in the total phosphorus loading to the China Lake (page 39 TMDL report), and (3) explaining the priority ranking of China Lake in the context of Maine’s state-wide EPA-approved NPS control program (page 39 TMDL report).

Comment: Addressed, though not required. EPA New England concurs that the historic and current technical support and assistance from ME DEP and Kennebec County SWCD to several active watershed stakeholder organizations, local participation in past and forthcoming 319 BMP implementation programs to control soil erosion from identified sources, and ME DEP’s strong NPS strategy all provide reasonable assurance that load allocations will be achieved. We also note that the Kennebec Water District, in cooperation with ME DEP, has a commitment to conduct regular, open water lake monitoring to assess the adequacy of the TMDL, and if necessary, the TMDL will be revised. This provides EPA with additional assurance that water quality standards will ultimately be met in China Lake.

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 the China Lake TMDL is described on pages 40-41 of the report. ME DEP issued public notice of the public review draft TMDL availability over the August 18-19, 2001 weekend via local newspapers, and on ME DEP's Internet web site, following a preliminary review by interested stakeholder groups (including China Lake Association, Kennebec County SWCD - NRCS office, China Region Lakes Alliance, Kennebec Water District, and Town of China Code Enforcement Officer). ME DEP and MACD (Maine Association of Conservation Districts) staff also participated in several local education/outreach meetings with lakeshore residents in 1999 - 2000; MACD (under contract to ME DEP) were in contact with town offices and the Kennebec County SWCD-NRCS office. The public comment period deadline was September 18, 2001.

ME DEP received most comments during the preliminary stakeholder review, and only one written comment (from a seasonal resident) during the public comment period. All significant comments, both on the preliminary and the public review drafts, were taken into account in the final draft. All of EPA's comments/questions have either been taken into account in the final TMDL report, or satisfactorily answered.

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