

TMDL: Squaw Lake, Wisconsin
Effective Date: August 22, 2000

DECISION DOCUMENT FOR THE APPROVAL OF SQUAW LAKE TMDL

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 approving TMDLs. The following information allows EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations. Elements of the TMDL that are required for a submission to be considered complete under the CWA and by regulation, are indicated by the use of the verb "must" below.

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.

Comment:

Phosphorus is the pollutant of concern in Squaw Lake, a 129 acre (52 hectare) inland lake located in the Star Prairie Township, St. Croix County, Wisconsin, in the St. Croix River Basin. The Wisconsin Department of Natural Resources (WDNR) submitted the final TMDL for total phosphorus in Squaw Lake to EPA on July 25, 2000, and a final revision on August 22, 2000. Squaw Lake is described as a seepage lake with an intermittent inlet and no outlet. It is listed as a medium priority water and is impaired as a result of non-point source pollution, mainly from agriculture, internal loading and local land use. WDNR included Squaw Lake in its 2 year TMDL Development Schedule. There are no point sources identified or described in the TMDL. The 6,696 acres in the Squaw Lake watershed consist of crop land, pastures, natural areas, wetlands, forests, residential development and open water. WDNR does not expect the need for the future addition of point sources. The estimated maximum phosphorus load is 2,949 lbs. /yr.

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.

Comment:

The narrative water quality criterion, identified by WDNR as NR 102.04(1) of the Wisconsin Administrative Code, states:

"To preserve and enhance the quality of waters, standards are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all waters including the mixing zone and the effluent channel meet the following conditions at all times and under all flow conditions: a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state, b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the states, c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state."

Squaw Lake is not currently meeting the narrative water quality criterion or the designated uses, which are full recreation and support of a warm water sport fishery. Water quality is considered generally poor to very poor, with lake trophic levels ranging from eutrophic to hypereutrophic. Summer lake phosphorus levels are approximately 270 µg/l, resulting in algal blooms, foul odors and the development of algae on the shoreline. Before the installation of an aeration system in 1989, winter fish kills occurred on an average of every 7 to 8 years. These conditions impact the recreational and aesthetic value of the lake and stress fish populations.

WDNR identified a numeric target of 130 µg/l for the in-lake phosphorus concentration. Based on lake modeling, WDNR believes that phosphorus concentrations exceeding this target trigger the algal blooms that lead to use impairments. WDNR assured us that it is their intent, and the intent of other local partners, to bring about a greater improvement in Squaw Lake than what is indicated by the in-lake condition of 130 µg/l. They expect to achieve lower concentrations through use of additional practices, such as wetland restoration and in-lake alum treatments. Furthermore, the water quality of Squaw Lake was worsened by the historical presence of barnyards that discharged manure piles directly into the intermittent stream during spring runoff. These discharges have been

eliminated.

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.

Comment:

WDNR determined the phosphorus loading capacity of Squaw Lake to be 1,569 lbs./yr. The state made this determination based on the cause and effect relationship between chlorophyll-a and the in-lake phosphorus concentration, and by using various models to determine phosphorus loading. As the phosphorus concentration rises, so does the chlorophyll-a concentration, resulting in algae biomass production increases. Several models were used to estimate phosphorus loading and runoff from croplands and woodlands, animal lots and residential developments. The Wisconsin Lake Model Spreadsheet (WILMS) was used to assess in-lake responses based on nutrient loading, watershed runoff volume, lake volume, in-lake phosphorus retention and estimated ground water movement through the lake.

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.

Comment:

WDNR allocated 1,569 lbs./yr. to nonpoint sources and natural background. Total nonpoint source phosphorus load, which includes surface runoff from the immediate drainage area, winterspread manure, shoreline, barnyards, and residential areas, accounted for 87% of the load and averaged 2,575 lbs./yr. Background sources, consisting of in-lake loading, precipitation and ground water, accounted for 13% of the total phosphorus load and averaged 374 lbs./yr. The TMDL calculates a 57% reduction in nonpoint sources and an 80% reduction in background sources.

WDNR believes that these reductions can be achieved by implementing the management actions and best management practices described in their Priority Watershed Project report. WDNR also believes that their plans to restore wetlands in the Squaw Lake watershed would result in additional phosphorus loading reductions.

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.

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.

Comment:

The wasteload allocation for the Squaw Lake TMDL is zero. WDNR states that there are no point sources in the Squaw Lake watershed and that it does not anticipate the addition of future point sources.

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.

Comment:

WDNR provided a margin of safety through the use of conservative implicit assumptions in modeling. Conservative assumptions were used for the pollutant reduction performance of best management practices for barnyard runoff management, manure spreading management and cropland erosion control.

Manure Spreading: Winter manure spreading is the largest loading source category, 42%, based on the phosphorus mass balance. The manure spreading model analysis used a planned percent reduction of 25%, but WDNR believes that better management of spreading can reduce the phosphorus by 25 to 50%. WDNR is trying to eliminate winter spreading, which would result in a reduction in excess of 75% and possibly as high as 90%.

Barnyard Runoff Management: The model analysis used a planned percent reduction of 50%. However, the practices likely to be installed should be in the range of 50% to 75%, depending on the site-specific design of the practices.

Uplands (croplands): The analysis used a planned percent reduction of 25%. With the planned nutrient management, WDNR anticipates a higher level of control of phosphorus, in the range of 25 to 35%.

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)).

Comment:

WDNR incorporated seasonal variation into their models. For the runoff models, most of the external phosphorus loading to Squaw Lake occurs during peak spring runoff, generally February through April. The critical time for in-lake conditions is summer, and the in-lake model, WILMS, used this worst-case seasonal condition for the lake.

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.

Comment:

Squaw Lake has been monitored by the State during the growing season on a yearly basis for more than five years. Monitoring has included temperature and dissolved oxygen, Secchi depth clarity, chlorophyll- a and total phosphorus. Ongoing monitoring is planned to continue for the future. Furthermore, as part of the St. Croix County Lakes Cluster Priority Watershed Project, which includes Squaw Lake, two types of monitoring will occur as part of a statewide effort; Whole Stream Monitoring and Signs of Success. These monitoring efforts focus on the effectiveness of best management practices. The Signs of Success program is short term monitoring designed to provide early evidence that BMPs do improve water quality. Sites within the St. Croix Lakes Cluster have not yet been selected for monitoring.

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.

Comment:

Squaw Lake is part of a larger priority watershed project, and the St. Croix County Lakes Cluster Priority Watershed Project report includes an implementation chapter which describes implementing the management actions for nonpoint source pollution control for Squaw Lake and other lakes in the St. Croix Lakes Cluster. The plans include the following elements:

- *The BMPs needed to control nonpoint sources of pollution;*
- *The cost containment policies;*

- *The cost share agreement procedure;*
- *Schedules for implementing the project, including the critical sites notification schedules;*
- *The critical site designation appeal process; and*
- *The estimated project budget for cost-sharing, staffing and other support.*

10. Reasonable Assurances

EPA guidance calls for reasonable assurances when TMDL 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."

Comment:

Squaw Lake is part of a larger priority watershed project, the St. Croix County Lakes Cluster Priority Watershed Project, that describes clean-up plans for several lakes with similar water quality issues. Designation of a watershed as a "priority watershed" project enables special financial support to local governments and private landowners in the watershed to reduce nonpoint source pollution. Long term cost sharing and local staff funding has been committed to the Priority Watershed Project, providing reasonable assurance that non-point source reductions will occur. Furthermore, specific sites in the Squaw Lake watershed have been designated as critical sites for enforcement under the provision of Wisconsin state law, s. 281.20 and 218.65 Wis. Stats. Landowners have three years to voluntarily enter into cost share agreements, or WNDR can take enforcement action to order the installation of BMPs.

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.

Comment:

The State publicly noticed contents of the Squaw Lake TMDL as part of the St. Croix County Lakes Cluster Priority Watershed Project pursuant to Section NR 121.08(1)(a) of the Wisconsin Administrative Code. A public informational meeting and an official Public Hearing were conducted on March 10, 1997. The State provided EPA with a written determination demonstrating that this opportunity for public participation is consistent with its own continuing planning process and public participation requirements, as required under 40 C.F.R. § 130.7(c)(1)(ii).¹ Pertinent public comments were received and incorporated into the Priority Watershed Plan.²

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.

Comment:

U.S. EPA received the Squaw Lake TMDL on July 25, 2000, accompanied by a submittal letter dated July 17, 2000. In the submittal letter, WDNR stated the purpose of the letter is "to submit the Total Maximum Daily Load (TMDL) for phosphorus in Squaw Lake for EPA's review and approval". The submittal letter included the name and location of the waterbody and the pollutant of concern. The priority ranking of the waterbody was incorporated by reference to the Wisconsin 1998 Section 303(d) listing of Squaw Lake, which specifies its priority. WDNR submitted a final TMDL revision on August 22, 2000.

¹See August 22, 2000 letter from WDNR Staff Attorney Charles R. Hammer to U.S. EPA.

²See Resolution 16-97, Adopting the St. Croix Lakes Nonpoint Source Priority Watershed Plan, dated March 18, 1997.