

TMDL: Half Moon Lake, Wisconsin
Effective Date:

DECISION DOCUMENT FOR THE APPROVAL OF HALF MOON LAKE TMDL

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements for approvable TMDLs. Additional 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. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable. These TMDL review guidelines are not themselves regulations. They are an attempt to summarize and provide guidance regarding currently effective statutory and regulatory requirements relating to TMDLs. Any differences between these guidelines and EPA's TMDL regulations should be resolved in favor of the regulations themselves.

1. Identification of Waterbody, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the waterbody as it appears on the State's/Tribe's 303(d) list. The waterbody should be identified/georeferenced using the National Hydrography Dataset (NHD), and the TMDL should clearly identify the pollutant for which the TMDL is being established. In addition, the TMDL should identify the priority ranking of the waterbody and specify the link between the pollutant of concern and the water quality standard (see section 2 below).

The TMDL submittal should include an identification of the point and nonpoint sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day. The TMDL should provide the identification numbers of the NPDES permits within the waterbody. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of the natural background. This 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 spatial extent of the watershed in which the impaired waterbody is located;
- (2) the assumed distribution of land use in the watershed (e.g., urban, forested, agricultural);
- (3) population characteristics, wildlife resources, and other relevant information affecting

- the characterization of the pollutant of concern and its allocation to sources;
- (4) present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and
- (5) an 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; chlorophyll *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comments:

The Wisconsin Department of Natural Resources (WDNR) developed one phosphorus TMDL for one segment in the lower Chippewa River Basin, Half Moon Lake (Hydrologic Unit Code 070500006, WBIC # 2125400). The TMDL addresses the phosphorus impacts and impairments which were identified on the Wisconsin 1998 and 2002 303(d) lists. This segment was ranked as high priority on the Wisconsin 1998, and 2002 303(d) lists.

Half Moon Lake is 132 acres in size with a maximum depth of approximately 9 feet. The lake's watershed is 577 acres and approximately 85 percent of the shoreline is publicly owned by the City of Eau Claire. Land use in the watershed is predominantly residential (45 percent) and open land (41 percent) and the remaining land is industrial (14 percent).

There are eight point sources, all storm sewers for the City of Eau Claire, that discharge phosphorus to Half Moon Lake. The city has a storm water discharge permit, permit number WIS050032. Non-point sources are identified as internal and external source loadings to the lake. Internal loadings include phosphorous loadings from the natural sediment release, macrophyte decomposition and release of phosphorus from the sediment from motor boat activities. External non-point source loadings are considered to be from the groundwater pumps from three wells and precipitation (run-off).

The TMDL identifies the existing seasonal phosphorus load of 295 kg to Half Moon Lake from the following sources:

Point source	
• City of Eau Claire storm sewers	15 Kg
Non-point source	
• Ground water pumps	20 Kg
• Precipitation	25 Kg
• Sediment release	125 Kg
• Macrophyte decomposition	60 Kg
• Motor boat activity	50 Kg

EPA finds that the TMDL document submitted by WDNR satisfies all requirements of this first

element.

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

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the anti-degradation policy. (40 C.F.R. §130.7(c)(1)). EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

The TMDL submittal must identify a numeric water quality target(s) – a quantitative value used to measure whether or not the applicable water quality standard is attained. Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. Occasionally, the pollutant of concern is different from the pollutant that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as Dissolved Oxygen (DO) criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

Comments:

The State identified the narrative standard set forth at Section NR 102.04 (1) of the Wisconsin Administrative Code (WAC) as an applicable standard. This standard states in part, “To preserve and enhance the quality of waters, standards are established to govern water management decisions. (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.” The designated use for Half Moon Lake is full body contact recreational use, with a warm water sport fishery as described in S. NR 102.04(3) intro., and (b), WAC as: “FISH AND OTHER AQUATIC LIFE USES. The department shall classify all surface waters into one of the fish and other aquatic life subcategories described in this subsection. Only those use subcategories identified in pars. (a)to (c) shall be considered suitable for the protection and propagation of a balanced fish and other aquatic life community as provided in federal water pollution control act amendments of 1972, PL 92-500; 33 USC 1251 et.seq.

“(b) Warm water sport fish communities. This subcategory includes surface waters capable of supporting a community of warm water sport fish or serving as a spawning area for warm water sport fish.”

An applicable water quality standard for this TMDL is listed in S. NR 102.04(4) intro, and (c), Wis. Adm. Code as follows:

“STANDARDS FOR FISH AND AQUATIC LIFE. Except for natural conditions, all waters, classified for fish and aquatic life shall meet the following criteria:

“(c) pH. The pH shall be within the range of 6.0 to 9.0, with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum.”

Algae blooms in Half Moon Lake are often accompanied by excursions of the Wisconsin water quality criterion for pH. The elevated lake pH levels are due to removal of carbon dioxide from water during photosynthesis (by macrophytes and algae). The reduction in carbon dioxide levels during daylight causes an increase in pH. A reduction in phosphorus levels would result in a decrease in chlorophyll levels (a measure of productivity) and a reduction in maximum pH levels.

EPA finds that the TMDL document submitted by WDNR satisfies all requirements of this second element.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a waterbody for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement chosen. The TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

The TMDL submittal should contain documentation supporting the TMDL analysis, including the basis for any assumptions; a discussion of strengths and weaknesses in the analytical process; and results from any water quality modeling. EPA needs this information to review the loading capacity determination and load and wasteload allocations, which are required by regulation.

TMDLs must take into account *critical conditions* for stream flow, loading, and water quality parameters as part of the analysis of loading capacity. (40 C.F.R. §130.7(c)(1)). TMDLs should define applicable *critical conditions* and describe their approach to estimating both point and nonpoint source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

Comments:

WDNR will consider Half Moon Lake to meet the narrative water quality standard when the mean summer in lake chlorophyll *a* concentration in the lake is 30 ug/l. To achieve this goal, WDNR has determined a total load capacity of phosphorus to be 102 kg seasonally (June-August)

The total load capacity proposed by Wisconsin of 102 kg/season represents a 65 percent reduction of phosphorus. WDNR has determined that this reduction of phosphorus will achieve the water quality target of establishing the appropriate designated use in the lake. The in-lake phosphorus concentration goal represents a mean growing season (June- August). This goal is based on local public input and best professional judgment of WDNR staff using available monitoring data and modeling tools. This reduction is believed to be sufficient to decrease the severity and frequency of algal blooms.

WDNR used the US Corp of Engineers model BATHTUB to relate phosphorus loading to chlorophyll *a* levels. The BATHTUB model is a lake and reservoir response model that can be calibrated to observed conditions and operated on a growing season or annual time step.

EPA finds that the TMDL document submitted by WDNR satisfies all requirements of this third element.

4. Load Allocations (LAs)

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

Comments:

WDNR allocated 89kg/growing season to nonpoint sources. Specific allocations were determined within the lake. The category specific load allocations are as follows (both current load and load allocations are in kg/growing season (gs)):

<u>Category</u>	<u>Current Load (kg/g)</u>	<u>Proposed Reductions (kg/g)</u>	<u>Load Allocation (kg/g)</u>
<u>Non-point</u>			
Sediment release	125	103	22
Macrophyte decomposition	60	38	22
Motor boat activities	50	50	0
<u>Background</u>			
Precipitation	25	0	25
Pumps (groundwater)	20	0	20

The largest contributor to the water is from the sediment at 42 percent of current loadings. The lake intermittently stratifies during summer resulting in reduced dissolved oxygen conditions and increased phosphorus levels near the bottom. Occasionally wind de-stratifies the lake and distributes the sediment-released phosphorus in the water column which stimulates nuisance algae growth.

Other contributors of phosphorous include the decomposition of plants which contributes 20 percent of the current load. As these plants grow they use the phosphorus in the sediment. As they die off they release nutrients into the water. Motor boat activities also re-suspend the phosphorus in the sediment which contributes 17 percent of the current loading or 50 kg.

Background levels of phosphorus are accounted for through the pumping of water from the three ground wells and precipitation. The loading for this is 16 percent or 45 kg.

EPA finds that the TMDL document submitted by WDNR satisfies all requirements of this fourth element.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to individual existing and future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit.

The individual WLAs may take the form of uniform percentage reductions or individual mass based limitations for dischargers where it can be shown that this solution meets WQSs and does not result in localized impairments. These individual WLAs may be adjusted during the

NPDES permitting process. If the WLAs are adjusted, the individual effluent limits for each permit issued to a discharger on the impaired water must be consistent with the assumptions and requirements of the adjusted WLAs in the TMDL. If the WLAs are not adjusted, effluent limits contained in the permit must be consistent with the individual WLAs specified in the TMDL. If a draft permit provides for a higher load for a discharger than the corresponding individual WLA in the TMDL, the State/Tribe must demonstrate that the total WLA in the TMDL will be achieved through reductions in the remaining individual WLAs and that localized impairments will not result. All permittees should be notified of any deviations from the initial individual WLAs contained in the TMDL. EPA does not require the establishment of a new TMDL to reflect these revised allocations as long as the total WLA, as expressed in the TMDL, remains the same or decreases, and there is no reallocation between the total WLA and the total LA.

Comments:

There are eight point sources to Half Moon Lake. These point sources are stormwater discharges from the City of Eau Claire. The City has developed and implemented changes to its stormwater management program to reduce phosphorus loading to the lake. The program activities include stormwater diversion and street sweeping which is outlined in the stormwater permit. Increased frequency of street sweeping, and implementation of other urban Best Management Practices (BMPs) as needed in the watershed are expected to decrease phosphorus loads from this source. The phosphorus load is expected to decrease with additional work by approximately 10 percent from 15 kg to 13 kg. The total contribution to the lake from the point source is minimal at 5 percent of the total current load.

EPA finds that the TMDL document submitted by WDNR satisfies all requirements of this fifth element.

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety (MOS) 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's 1991 TMDL 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.

Comments:

WDNR included an implicit MOS by using a conservative assumption in the modeling. Literature suggests that a single application of alum treatment to a lake will reduce the

phosphorus release ranges from 75 to 90 percent, most often achieving levels greater than 80 percent. In the modeling, WDNR used the mid range for reduction. The City, however will use a second alum treatment to achieve a higher result. The city also plans on using lime treatment to reduce the plant growth. Neither the second alum treatment or the use of lime was considered in the modeling.

EPA finds that the TMDL document submitted by WDNR satisfies all requirements of this sixth element.

7. Seasonal Variation

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

Comments:

The major impairments occur during the summer season when the lake is used and plant growth is at its highest. This is considered the critical time for determining the phosphorus load to the lake. Proposed management practices to reduce the phosphorus loading at this time will also provide benefits to the lake year round.

EPA finds that the TMDL document submitted by WDNR satisfies all requirements of this seventh element.

8. Reasonable Assurances

When a TMDL is developed for waters impaired by point sources only, the issuance of a National Pollutant Discharge Elimination System (NPDES) permit provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with “the assumptions and requirements of any available wasteload allocation” in an approved TMDL.

When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, EPA’s 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by nonpoint sources. However, EPA cannot disapprove a TMDL for nonpoint source-only impaired waters, which do not have a demonstration of reasonable assurance that LAs will be achieved, because such a showing is not required by current regulations.

Comments:

WDNR has demonstrated adequate reasonable assurance that the necessary nonpoint source reductions will occur by implementing programs to address the phosphorus issue at Half Moon Lake.

The City of Eau Claire will be responsible for implementing management actions to meet the pollutant load reductions identified in this TMDL. The internal load reduction goals will be achieved through more aggressive macrophyte harvesting, complete elimination of motorboat activity and a series of potential alum treatments.

The City is committed to implementing management recommendations identified by the Half Moon Lake Advisory Task Force. While funding for these activities has not yet been secured, a significant portion of the costs associated with the alum feasibility study and treatment may be cost shared with WDNR through its Lake Management grant program. If the feasibility study determines that alum treatment would not be effective or appropriate, other sediment release control methods would be studied and pursued.

The only aspect of this TMDL with a regulatory component is urban stormwater management in the form of more frequent street cleaning to reduce contributions to stormwater from lead and other wastes that accumulate in the street. Stormwater management provisions were incorporated into the City of Eau Claire stormwater permit required under NR 216.07 (Wis. Adm. Code). The stormwater permit for the City of Eau Claire was issued in October 2003. Funding to implement urban stormwater BMPs is available through the WDNR Urban Non-point Source Stormwater grant program.

EPA finds that this eighth element has been adequately addressed.

9. Monitoring Plan to Track TMDL Effectiveness

EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur. Such a TMDL should provide assurances that nonpoint source controls will achieve expected load reductions and, such TMDL should include a monitoring plan that describes the additional data to be collected to

determine if the load reductions provided for in the TMDL are occurring and leading to attainment of water quality standards.

Comments:

A baseline for water quality conditions was conducted in 2001. Aquatic plant surveys will be conducted every three years beginning in 2004. Lake water monitoring will begin in 2004 and continue annually for three years. Subsequent monitoring will continue every three years to assess the long term effectiveness of the treatment. Monitoring parameters will be nutrients, chlorophyll a, pH, temperature, and dissolved oxygen.

EPA finds that the TMDL document submitted by WDNR satisfies all requirements of this ninth element.

10. Implementation

EPA policy encourages Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired by nonpoint sources. Regions may assist States/Tribes in developing implementation plans that include reasonable assurances that nonpoint source LAs established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. In addition, EPA policy recognizes that other relevant watershed management processes may be used in the TMDL process. EPA is not required to and does not approve TMDL implementation plans.

Comments:

The Half Moon Lake Advisory Task force identified a variety of management actions to address lake water quality concerns, including the following:

- Reduction of sediment phosphorus through alum treatment. If necessary, the City will use several alum treatments,
- Reduction of phosphorus through the decomposition of aquatic life through increased harvesting, and monitoring of nuisance plant growth,
- Elimination of all motor boat activities by relocating the Ski Sprites (a Wisconsin ski organization who practices on the lake), who have indicated a willingness and desire to relocate,
- Implementation of additional stormwater management controls. One of the controls would be to increase street sweeping,
- Development of a comprehensive stormwater management plan to address sediment and phosphorus loading to the lake.

While EPA reviewed this information, it did not form a basis for the TMDL decision.

11. Public Participation

EPA policy is that there should be full and meaningful public participation in the TMDL development process. The TMDL regulations require that each State/Tribe must subject calculations to establish TMDLs to public review consistent with its own continuing planning process (40 C.F.R. §130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval should describe the State's/Tribe's public participation process, including a summary of significant comments and the State's/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)).

Provision of inadequate public participation may be a basis for disapproving a TMDL. If 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.

Comments:

WDNR stated that the Half Moon Lake Advisory Task force was organized in 2001, and developed recommendations to the City Council for the City of Eau Claire. The task force met regularly for more than a year to develop the final report to the city. Neighborhood associations, environmental groups, recreation interests, private individuals and public agencies were representative of the task force. The task force reported to the City council at open meetings.

The TMDL was public noticed on May 4, 2004 until June 4, 2004. WDNR sent a news release to over 900 entities. The news release, public notice and TMDL were also place on the WDNR website. No public comments were received by the State.

EPA finds that the TMDL document submitted by WDNR satisfies all requirements of this eleventh element.

12. Submittal Letter

A submittal letter should be included with the TMDL submittal, and should specify whether the TMDL is being submitted for a *technical review* or *final review and approval*. Each final TMDL submitted to EPA should 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's/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 review and approval, should contain such identifying information as the name and location of the waterbody, and the pollutant(s) of concern.

Comments:

U.S. EPA received the Half Moon Lake TMDL on July 23, 2004 accompanied by a submittal letter dated June 25, 2004. The submittal letter states that this is the final TMDL submittal for Half Moon Lake.

EPA finds that the TMDL document submitted by WDNR satisfies all requirements of this twelfth element.

13. Conclusion

After a full and complete review, EPA finds that the TMDL for Half Moon Lake watershed satisfies all of the elements of an approvable TMDL. This document addresses a total of one TMDL for one waterbody with a total of one pollutant and one impairment from the 2002 Wisconsin 303d list.

<u>Waterbody</u>	<u>WBIC No.</u>	<u>Pollutant</u>	<u>Impairments</u>
Half Moon Lake	2125400	Phosphorus	eutrophication, pH

EPA's approval of this TMDL extends to the waterbody which is identified in this document and the TMDL with the exception of any portions of the waterbody that is within Indian Country, as defined in 18 U.S.C. Section 1151. EPA is taking no action to approve or disapprove the State's TMDL with respect to those portions of the water at this time. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under Section 303(d) for those waters.