UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

WW-16J

NOV 09 2007

Brad Moore, Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Dear Mr. Moore:

The United States Environmental Protection Agency (U.S. EPA) has conducted a complete review of the final Twin and Ryan Lakes Total Maximum Daily Load Nutrient Study, including supporting documentation and information. Based on this review, U.S. EPA determined that Minnesota's phosphorus Total Maximum Daily Loads (TMDLs) for four impaired lakes meet the requirements of Section 303(d) of the Clean Water Act and U.S. EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, by this letter, U.S. EPA hereby approves four phosphorus TMDLs addressing aquatic recreational use impairments on four lakes within the Shingle Creek watershed. The statutory and regulatory requirements and U.S. EPA's review of Minnesota's compliance with each requirement are described in the enclosed decision document.

The TMDL Study establishes TMDLs for the Twin and Ryan Lakes based on the current numeric translator for total phosphorus for Class 2B waters in the North Central Hardwood Forest ecoregion (40 ug/l). The State of Minnesota is in the process of revising rules establishing the numeric translators for nutrients, including phosphorus. The proposed targets will affect North and South Twin Lakes, resulting in phosphorus targets changing from 40 ug/l to 60 ug/l. The TMDL Study also includes TMDLs developed for South Twin and North Twin Lakes based on the proposed standards outlined above. Upon approval of the proposed standards, MPCA shall notify EPA Region 5 in writing. At the time MPCA notifies U.S. EPA that the proposed phosphorus standard is final and effective, U.S. EPA will consider the phosphorus TMDLs presented in Table 6 of this decision document (Table 7.3 of the TMDL Study) as the approved phosphorus TMDLs for the Twin and Ryan Lakes.

wq-iw8-05g

We appreciate your hard work in this area and the submittal of the TMDLs as required. If you have any questions, please contact Kevin Pierard, Chief of the Watersheds and Wetlands Branch, at 312-886-4448.

Sincerely yours,

Robert D. Tolpa
Acting Director, Water Division

Enclosure

cc: Jeff Risberg, MPCA
Dave L. Johnson, MPCA
Tim Larson, MPCA

TMDL: Twin and Ryan Lakes Nutrient TMDL, Minnesota
Date: NOV 09 2007

DECISION DOCUMENT
TWIN AND RYAN LAKES, MINNESOTA
NUTRIENT TMDLs

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, agriculture);
(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; chlorophyl *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comments:

Location Description: The Minnesota Pollution Control Agency (MPCA) developed nutrient TMDLs for the Twin and Ryan Lakes in Hennepin County, Minnesota. By implementing measures to reduce nutrient loading, the TMDLs will address impairments of aquatic recreation beneficial use in the watershed. Table 1, below, identifies the waterbody segments covered by the TMDL Study as they appear on the Minnesota 2006 303(d) list. Minnesota's priority rankings for TMDL waters are reflected by the target dates for start and completion of TMDL studies. For the Twin and Ryan Lakes the target start and completion dates are 2003 and 2005, respectively.

Table 1. 2006 303(d) List Summary (Table 2.1 of the TMDL Study).

Lake	DNR Lake #	Listing Year	Affected use	Pollutant or Stressor	Target TMDL Start	Target TMDL Completion
Twin-Middle	27-0042-02	2002	Aquatic recreation	Excess nutrients	2003	2005
Twin-North	27-0042-01	2002	Aquatic recreation	Excess nutrients	2003	2005
Twin-South	27-0042-03	2002	Aquatic recreation	Excess nutrients	2003	2005
Ryan Lake	27-0058-00	2002	Aquatic recreation	Excess nutrients	2003	2005

Twin and Ryan Lakes, in the northwest Twin Cities metropolitan area, are a chain of lakes that discharge into Shingle Creek and eventually into the Mississippi River. The chain of lakes drain approximately 5,550 acres of fully developed urban and suburban land (TMDL Study, page iv). The lakes are connected by channels of varying length. North Twin Lake, the most upstream lake, drains into Middle Twin Lake which outlets to South Twin Lake through the Narrows. South Twin Lake drains east through Ryan Creek to Ryan Lake. Ryan Lake outlets to Shingle Creek. The individual lake subwatersheds are outlined in Figure 3.2 of the TMDL Study. A brief description of each lake is provided below. Table 2, below, summarizes the lake characteristics for the chain of lakes.

Table 2. Lake Characteristics of the Twin-Ryan Lakes (Table 3.2 of the TMDL Study).

Parameter	North Twin Lake	Middle Twin Lake	South Twin Lake	Ryan Lake
Surface Area (ac)	118	54	30	15
Average Depth (ft)	3.8	14.5	6.9	15
Maximum Depth (ft)	10	42	21	36
Volume (ac-ft)	448	786	208	235
Residence Time (years)	0.28	0.43	0.10	0.06
Littoral Area (ac)	118	31.6	25.4	10
Watershed (ac) (cumulative)	3,657	354 (4,011)	1,248 (5,259)	291 (5,550)

North Twin Lake: Also known as Upper Twin Lake, North Twin Lake has a surface area of 118 acres, drains an area of approximately 3,657 acres, and has an average depth of 3.8 feet. The lake receives stormwater, conveyed mostly through a network of storm sewers, ponds and channels. North Twin Lake is shallow with a maximum depth of 10 feet. The entire lake is within the littoral zone (less than 15 feet deep), where the majority of aquatic plant growth occurs (TMDL Study, page 3-1 & 3-4). According to TMDL Study the greatest water quality problems occur in North Twin Lake. The lake is eutrophic, meaning excess nutrients, in this case phosphorus, are present stimulating excessive plant growth (algae and nuisance plants weeds). This enhanced plant growth, often referred to as an algal bloom, reduces dissolved oxygen in the water when dead plant material decomposes and can cause other organisms to die. North Twin Lake receives excess phosphorus from watershed runoff loading and internal loading (recycling of phosphorus in lake sediment).

Middle Twin Lake: Middle Twin Lake has a surface area of 54 acres, drains an area of approximately 354 acres, and has an average depth of 14.5 feet. The lake has a maximum depth of 42 feet and approximately 59% of the lake is within the littoral zone. The lake receives stormwater through local storm sewers and overland runoff in the subwatershed. Middle Twin Lake drains a total surface area of 4,011 acres, including the upstream North Twin Lake subwatershed.

South Twin Lake: South Twin Lake, also known as Lower Twin Lake, has a surface area of 30 acres, drains an area of approximately 1,248 acres, and has an average depth of 6.9 feet. The lake has a maximum depth of 21 feet and approximately 85% of the lake is within the littoral zone. The lake receives stormwater through local storm sewers, natural ponds, and overland runoff in the subwatershed. South Twin Lake drains a total surface area of 5,259 acres, including the upstream North Twin Lake and Middle Twin Lake subwatersheds. South Twin Lake is eutrophic due mostly to internal loading (TMDL Study, page iv).

Ryan Lake: Ryan Lake has a surface area of 15 acres, drains an area of approximately 291 acres, and has an average depth of 15 feet. The lake has a maximum depth of 26 feet and approximately 10% of the lake is within the littoral zone. The lake receives stormwater through local storm sewers, natural ponds, and overland runoff in the subwatershed. Ryan Lake receives runoff from upper lake watersheds when the elevation of South Twin Lake exceeds the weir elevation at France Avenue, mainly in the spring and after large rain events (TMDL Study, page 3-5). Ryan Lake drains a total surface area of 5,550 acres, including the upstream North Twin Lake, Middle Twin Lake, and South Twin Lake subwatersheds. Ryan Lake has relatively good water quality for an urban lake and is mesotrophic, meaning it has an intermediate level of nutrient production. Ryan Lake outlets to Shingle Creek through a pipe and open channel system.

Topography and Land Use: The watershed is flat in the east to gently rolling in the west, with about 30 feet of total relief. The Twin and Ryan Lakes chain is about 853 feet above mean sea level. Surficial geology consists of Upper Terrace outwash underlain with St. Peter Sandstone as the bedrock layer. Soils are generally classified as loamy urban disturbed in the east transitioning to a clayey loam in the western part of the watershed.

Based on 2000 data, land use in the watershed is mainly (59%) single family and residential use. Land use is summarized in Table 3.3 of the TMDL Study. The lakes are highly used recreational waters that support fishing, swimming, and provide aesthetic value. Recreational features in the watershed include parks, trails, boat launches, and beaches (TMDL Study, pages 3-8 and 3-9).

The cities of Brooklyn Center, Crystal, Minneapolis and Robbinsdale are immediately adjacent to the lakes, and the watershed drainage area also includes portions of Brooklyn Park and New Hope.

Pollutant of concern: The pollutant of concern for this TMDL is phosphorus. Levels of phosphorus are above water quality targets, limiting all types of aquatic recreation, including fishing and swimming. Excess phosphorus stimulates excessive plant growth (algae and nuisance plants weeds). This enhanced plant growth reduces dissolved oxygen in the water when dead plant material decomposes and can cause other organisms to die. For informational purposes, the TMDL Study also includes water quality data and information for the nutrient indicators chlorophyll-a and Secchi depth. Chlorophyll-a is a primary pigment in aquatic algae. Chlorophyll-a levels correlate well with algal production. Secchi depth is an indicator for water clarity and quality and is measured by lowering a probe into the water until it can no longer be seen from the surface (TMDL Study, page 3-10).

For the TMDL Study, monitoring data from 1996 and 1999 and modeling were used to estimate current phosphorus loadings to the lakes. The current phosphorus loadings, based on BATHTUB modeling (see Section 3 of this decision document), are summarized in Table 3 below. Detailed information regarding water quality monitoring and assessment can be found in Section 5 of the TMDL Study.

Pollutant sources: Sources identified in the TMDL report as contributing to the nutrient impairment include watershed (tributary) loads, upstream loads, atmospheric deposition, and internal loading. A brief summary of each source category is provided below. A more detailed discussion of sources can be found in Section 6.3 of the TMDL Study. Specific sources identified in the TMDL Study include NPDES permitted stormwater facilities and MDNR Wetland 639W.

NPDES permitted facilities: There are eight NPDES permitted stormwater discharges to the Twin and Ryan Lakes. The City of Minneapolis has an NPDES permit for stormwater, MN0061018, and there are a number of small municipal storm sewer systems (MS4), as well as Hennepin County and the Minnesota DOT Metro District that are covered under a Phase II General NPDES Stormwater Permit (MNR040000). The 8 permitted stormwater facilities in the watershed are listed in Table 8 of this decision document and Table 7.1 of the TMDL Study.

There is also an industrial NPDES permit (MNG250048) for Robinson Rubber Products Inc., that discharges to Twin and Ryan Lakes. MPCA indicated that no phosphorus data is available for this discharger. Since the discharge is for non-contact cooling water, MPCA does not consider this discharger to be a source of phosphorus.

MDNR Wetland 639W: Based on the TMDL Study much of the phosphorus loading to North Twin Lake is a direct result of loading from Wetland 639W, located just upstream of North Twin

Lake. Minnesota recognizes that wetlands, traditionally known as being sinks for phosphorus, are sources of phosphorus in urban watersheds (TMDL Study, page 4-3).

The current phosphorus loadings for each lake subwatershed, per source category, are summarized in Table 3 below.

- Watershed (tributary): Nutrient load from all storm water runoff from the watershed and wetland 639W.
- Upstream (Advective): Nutrient load passing downstream as water flows from lake to lake via connecting channels.
- Atmospheric: Nutrient load resulting from atmospheric deposition.
- Internal: Nutrient load resulting from recycling of phosphorus in lake sediment. For example, certain types of fish can uproot bottom plants re-suspending sediments and nutrients into the water column, resulting in increased algal blooms (TMDL Study, page 3-15).

Future growth trends: As stated in Section 7.5 of the TMDL Study (page 7-10), future growth will not effect this TMDL. The watershed is almost entirely built out and no new permitted point sources are expected.

Table 3. Current Total Phosphorus Budget for the Twin and Ryan Lakes Watershed (Table 6.4 of TMDL Study)

		Source	1999 Annual TP Load (kg/yr)	1996 Annual TP Load (kg/yr)
North Twin Lake	Wasteload	Watershed Load	591	467
		Upstream Load	0	0
	Load	Atmospheric Load	15	17
		Internal Load	115	115
		TOTAL LOAD	721	599
Middle Twin Lake	Wasteload	Watershed Load	87	70
		Upstream Load	102	82
	Load	Atmospheric Load	9	9
		Internal Load	54	54
		TOTAL LOAD	252	215
South Twin Lake	Wasteload	Watershed Load	156	148
		Upstream Load	160	133
	Load	Atmospheric Load	5	5
		Internal Load	40	40
		TOTAL LOAD	361	326
Ryan Lake	Wasteload	Watershed Load	86	84
		Upstream Load	143	127
	Load	Atmospheric Load	3	3
		Internal Load	40	40
		TOTAL LOAD	272	254

EPA finds that the TMDL document submitted by MPCA 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 antidegradation 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:

Section 2.0 of the TMDL Study describes designated uses and numeric criteria applicable to this watershed.

Use Designation: The Twin and Ryan Lakes are classified as Class 2B waters (MN. R. 7050.0430). The designated use addressed by this TMDL Study is aquatic recreation for 2B waters. Class 2 waters include waters which "do or may support fish, other aquatic life, bathing, boating, or other recreational purposes..." (Minnesota Rules 7050.0150(3)).

Narrative Standards: Minnesota has narrative criteria for nutrients that limit the quantity of nutrients entering waters. Minnesota Rules 7050.0150(3) state that in all Class 2 waters of the State "there shall be no material increase in undesirable slime growth or aquatic plants including algae...".

Targets: In accordance with Minnesota Rules 7050.0150(5), to evaluate whether a waterbody is in an impaired condition the MPCA has developed "numeric translators" for the narrative standard referenced above. MPCA uses the numeric nutrient translators to establish numeric targets for phosphorus. The nutrient translators are provided in Table 2.2 of the TMDL Study. For the Twin and Ryan Lakes TMDL the numeric phosphorus target is 40 ug/l.

The State of Minnesota is in the process of revising its rules for phosphorus to establish numeric translators for nutrients, including phosphorus. The proposed rules would take into account nutrient cycling differences and lake depth, establishing targets for shallow and deep lakes (TMDL Study, page 2-2). The proposed targets will effect North and South Twin Lakes, resulting in phosphorus targets changing from 40 ug/l to 60 ug/l. The proposed rule for phosphorus will not affect Middle Twin and Ryan Lakes, as the current numeric target is the

same as what MPCA proposes in its rule. Both the current and proposed numeric translators are based on known relationships between phosphorus levels and algae growth.

The Study establishes TMDLs for the Twin and Ryan Lakes based on the current numeric translator for total phosphorus for Class 2B waters in the North Central Hardwood Forest ecoregion (40 ug/l). See Table 2.2 of the TMDL Study. As discussed above, South Twin and North Twin Lakes would be subject to the proposed numeric translator target of 60 ug/l once the proposed standards are approved. The TMDL Study also includes TMDLs developed for South Twin and North Twin Lakes based on the proposed standards outlined in Table 4 below. For comparison purposes, Table 4 also includes average total phosphorus concentrations for each lake. The average total phosphorus concentrations are based on 1999 data, considered representative of average precipitation year conditions. Upon promulgation of the proposed standards MPCA will notify the EPA TMDL Program.

Table 4. Proposed Standards: Total Phosphorus Numeric Translators compared with 1999 total phosphorus concentrations.

	Current TP Standard (µg/L)	**Proposed TP Standard (µg/L)**	**Average TP Concentrations (1999 data)* (ug/l)**
North Twin Lake	40	60	140
Middle Twin Lake	40	40	45
South Twin Lake	40	60	67
Ryan Lake	40	40	44

* 1999 Data was not reported for Ryan Lake. Average TP concentration data is based on most recent sampling year (2003).

EPA finds that the TMDL document submitted by MPCA 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 steam 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:

Modeling summary: The loading capacity determinations used for the Twin and Ryan Lakes are based on three models including XP-SWMM, P8, and BATHTUB using data from 1999. Watershed hydraulics (flow) and runoff volume modeling was completed using the XP-SWMM model. The model was calibrated using existing monitoring data from 1999-2002. The P8 model was used to develop precipitation input and to calibrate runoff volumes predicted in the EX-SWMM model. The P8 model was also used to predict watershed loads from stormwater runoff. The Canfield-Bachman component of the BATHTUB Model incorporated P8 loading and runoff volume estimates and was used to develop phosphorus loads for the Twin and Ryan Lakes TMDLs.

BATHTUB models apply a series of empirical equations derived from assessments of lake data and perform steady state water and nutrient calculations based on lake morphometry and tributary inputs. The BATHTUB model requires fairly simple inputs to predict phosphorus loading. The model accounts for pollutant transport, sedimentation, and nutrient cycling. Detailed TMDL modeling information is provided in Section 6 and Appendix C of the TMDL Study. EPA's Watershed Planning – Analysis Tools Website provides a summary of the P8 and XP-SWMM models (http://iaspub.epa.gov/watershedplan/informationSource.do?pageId=):

> *P8 is a model for predicting the generation and transport of stormwater runoff pollutants in urban watersheds. Continuous water-balance and mass-balance calculations are performed on a user-defined system consisting of the following elements: - Watersheds (nonpoint source areas) - Devices (runoff storage/treatment areas or BMPs) - Particle Classes - Water Quality Components. Simulations are driven by continuous hourly rainfall and daily air temperature time series. The model has been developed for use by engineers and planners in designing and evaluating runoff treatment schemes for existing or proposed urban developments.*
>
> *XP-SWMM is a comprehensive software package for modeling stormwater, sanitary and river systems. XP-SWMM is used by scientists, engineers and managers to develop link-node (1D) and spatially distributed hydraulic models (2D). It simulates natural rainfall-runoff processes and the performance of engineered systems that manage our water resources.*

Loading Capacity: The loading capacity developed to meet the current phosphorus standard of 40 ug/l for each of the lakes is presented in Table 5 below. The loading capacity is the combination of the wasteload allocation, load allocation, and margin of safety. Thus, the loading capacity is equal to the TMDL assigned for each waterbody. The loading capacity developed to meet the proposed shallow lake phosphorus standard of 60 ug/l for North Twin and South Twin Lakes is presented in Table 6 below.

Table 5. TMDLs for Total Phosphorus Expressed as Daily Loads for North Twin, Middle Twin, South Twin, and Ryan Lakes, Assuming Current Total Phosphorus Standard of 40 ug/l for all Lakes (Table 7.2 of TMDL Study).

Critical Conditions	Lake	Wasteload TP Allocation (kg/day)[1]	Load TP Allocation (kg/day)	Margin of Safety	Total Phosphorus TMDL (kg/day)
Average Precipitation Year	North Twin Lake[2]	0.9	0.5	Implicit	1.4
	Middle Twin Lake	0.4	0.2	Implicit	0.6
	South Twin Lake	1.5	0.1	Implicit	1.6
	Ryan Lake	0.5	0.1	Implicit	0.6
Wet Precipitation Year	North Twin Lake[2]	1.7	0.5	Implicit	2.2
	Middle Twin Lake	0.7	0.2	Implicit	0.9
	South Twin Lake	2.3	0.1	Implicit	2.4
	Ryan Lake	0.8	0.1	Implicit	0.9
Dry Precipitation Year	North Twin Lake[2]	0.8	0.5	Implicit	1.3
	Middle Twin Lake	0.3	0.2	Implicit	0.5
	South Twin Lake	1.5	0.1	Implicit	1.6
	Ryan Lake	0.4	0.1	Implicit	0.5

[1] The wasteload allocation is allocated to NPDES-permitted facilities in accordance with Table 7.1 of the TMDL Study.
[2] The load allocation includes 15% of the stormwater load due to loading from wetland 639W.

Table 6. TMDLs for Total Phosphorus Expressed as Daily Loads for North Twin, Middle Twin, South Twin, and Ryan Lakes, Assuming Shallow Lake Standards for Total Phosphorus of 60 ug/l for North and South Twin Lakes (Table 7.3 of TMDL Study).

Critical Conditions	Lake	Wasteload TP Allocation (kg/day)[1]	Load TP Allocation (kg/day)	Margin of Safety	Total Phosphorus TMDL (kg/day)
Average Precipitation Year	North Twin Lake[2]	1.6	0.7	Implicit	2.3
	Middle Twin Lake	0.4	0.2	Implicit	0.6
	South Twin Lake	2.1	0.4	Implicit	2.5
	Ryan Lake	0.5	0.1	Implicit	0.6
Wet Precipitation Year	North Twin Lake[2]	2.7	0.7	Implicit	3.4
	Middle Twin Lake	0.7	0.2	Implicit	0.9
	South Twin Lake	3.3	0.4	Implicit	3.7
	Ryan Lake	0.8	0.1	Implicit	0.9
Dry Precipitation Year	North Twin Lake[2]	1.4	0.7	Implicit	2.1
	Middle Twin Lake	0.3	0.2	Implicit	0.5
	South Twin Lake	2.1	0.4	Implicit	2.5
	Ryan Lake	0.4	0.1	Implicit	0.5

[1] The wasteload allocation is allocated to NPDES-permitted facilities in accordance with Table 7.1 of the TMDL Study.
[2] The load allocation includes 15% of the stormwater load due to loading from wetland 639W.

The TMDLs presented in Tables 5 and 6 above are daily expressions of modeled annual TMDL allocations, provided in the Implementation Section of the TMDL Study, Tables 9.1 and 9.3. Since the focus of implementation will be on reducing annual phosphorus loads to the lakes, through the installation of stormwater BMPs (TMDL Study, page 9-2), the TMDLs are also expressed as annual loads for both the current and proposed standards.

At the time MPCA notifies EPA that the proposed phosphorus standard is final and effective, EPA will consider the phosphorus TMDLs presented in Table 6 of this decision document (Table 7.3 of the TMDL Study) as the approved phosphorus TMDLs for the Twin and Ryan Lakes.

Critical conditions: The critical condition for the Twin and Ryan Lakes is the summer growing season for wet, dry, and average precipitation years (TMDL Study, page 7-2). Excessive nutrient problems such as algal blooms and fish kills are most prevalent in Minnesota during the summer recreational season (June through September). The numeric targets developed by MPCA focused on summer season as the critical condition. Details regarding critical condition are included in Section 7.1.3 of the TMDL Study.

The annual precipitation conditions are based on actual precipitation received during the monitoring period. The wet year TMDL was calculated from the lake response model for the wettest year in the record, 2002. The dry year was calculated from the driest year, 1996. The average year was 1999, when actual annual precipitation was close to the long-term average annual precipitation for the region.

For purposes of potential regulatory actions (under the NPDES permitting authority), the TMDL allocations for total phosphorus to North Twin, Middle Twin, South Twin, and Ryan Lakes will be based on the loads calculated for the average, wet, and dry precipitation years. Using the all three precipitation conditions results in an implementation plan that recommends a suite of best management practices designed to be protective under all hydrologic conditions. New development and redevelopment BMPs are required under Shingle Creek Watershed Commission rules to meet NURP and state of Minnesota design standards, and retrofit BMPs will be designed where possible to meet National Urban Runoff Program (NURP) standards or be designed to achieve the maximum possible load reduction. The MS4 general permit requires compliance for Wasteload Allocations (WLAs) for all three precipitation conditions (email correspondence, B. Peichel (MPCA), 11/7/2007).

EPA finds that the TMDL document submitted by MPCA 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:

Load allocations for each of the lakes are provided in Tables 5 and 6 of this decision document and in Tables 7.2 and 7.3 of the TMDL Study. For each lake the load allocation is the same for average, dry and wet precipitation years.

As discussed in Section 3 above, at the time MPCA notifies EPA that the proposed phosphorus standard is final and effective, the gross WLAs for North Twin Lake and South Twin Lake will increase as set forth in Table 6 of this decision document (Table 7.3 of the TMDL Study).

The load allocations for the Twin and Ryan Lakes were developed for atmospheric deposition, internal loading, and additional loading from a degraded wetland complex (639W) as a gross load. Atmospheric deposition loading was based on published deposition rates for nearby lakes. Atmospheric deposition rates used for this TMDL are included in Table 6.3 of the TMDL Study. Internal loading rates were based on lake-specific estimates that considered lake stratification, growing season length, and mass balance calculations.

For implementation purposes, specific annual load allocations and required reductions were developed for atmospheric deposition and internal loading. These allocations and reductions are provided in the Implementation Section of the TMDL Study (Tables 9.1, 9.2, 9.3 and 9.4).

EPA finds that the TMDL document submitted by MPCA 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 permitees 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:

Wasteload allocations (WLAs) are discussed in Section 7.1 of the TMDL Study. WLAs are based on Canfield-Bachman model outputs as discussed in Section 3 above. WLAs for each of the lakes are provided in Tables 5 and 6 of this decision document and in Tables 7.2 and 7.3 of the TMDL Study. For implementation purposes, specific annual load allocations and required reductions were developed for stormwater loading. These allocations and reductions are provided in the Implementation Section of the TMDL Study (Tables 9.1, 9.2, 9.3 and 9.4).

The TMDLs assign all of the available WLA for each lake to NPDES-permitted stormwater sources. Only one permitted industrial discharger (MNG250048; non-contact cooling water discharge) was identified in the watershed. MPCA does not consider the industrial discharger to be a source of phosphorus and did not assign a WLA. Thus, EPA considers the WLA for this facility to be 0 kg/day. As stated in the TMDL Study (page 7-2) if, in the future, MPCA determines the industrial discharger to be a source of phosphorus, then the discharger will be assigned a WLA (TMDL Study, page 7-2).

MPCA determined that there was not enough information available to assign individual WLAs to NPDES-permitted stormwater sources in the watershed. As a result, the eight NPDES-permitted municipal stormwater sources identified in the TMDL Study are included in a gross WLA for phosphorus for each lake. The NPDES sources included under each lake's gross WLA are identified in Table 7 below.

Table 7. NPDES Permitted Facilities Included in Gross WLAs for Each Lake Watershed

NPDES Permit Number	North Twin Gross WLA	Middle Twin Gross WLA	South Twin Gross WLA	Ryan Gross WLA
MS400006-Brooklyn Center	✓	✓	✓	✓
MS400007- Brooklyn Park	✓	✓	✓	✓
MS400012-Crystal	✓	✓	✓	✓
MS40061018-Minneapolis	N/A	N/A	N/A	✓
MS400039-New Hope	✓	✓	✓	✓
MS400046-Robbinsdale	N/A	✓	✓	✓
MS400138-Hennepin	✓	✓	✓	✓
MS400170-MnDOT	N/A	✓	✓	✓
N/A = Not applicable – does not drain to lake				

The Shingle Creek Watershed Management Commission (SCWMC) has statutory authority to manage stormwater in the Shingle Creek watershed, including the Twin and Ryan Lakes subwatersheds (TMDL Study, page 10-1). Each of the permitted stormwater facilities identified in Table 7 above agreed to implement stormwater best management practices (BMPs) to the maximum extent practicable. SCWMC will develop an implementation plan that is consistent with the gross WLA provided in this TMDL Study (page 10-3).

As discussed in Section 3 above, at the time MPCA notifies EPA that the proposed phosphorus standard is final and effective, the gross WLAs for North Twin Lake and South Twin Lake will increase as set forth in Table 6 of this decision document (Table 7.3 of the TMDL Study).

EPA finds that the TMDL document submitted by MPCA 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:

The TMDLs for Twin and Ryan Lakes rely on an implicit margin of safety (MOS), based on conservative modeling assumptions. These assumptions include the use of low sedimentation rates in the Canfield-Bachman model, likely under-predicting sedimentation rates (TMDL Study, page 7-10). The model only considered adjustments in phosphorus loading to meet water quality standards, and did not consider variation in sedimentation rates. The low sedimentation rates used in the model results in the need for greater nutrient reductions to meet water quality standards.

EPA finds that the TMDL document submitted by MPCA 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 severity of nutrient-related algal growth in the Twin and Ryan Lakes is greatest in the summer months. The nutrient targets used in this TMDL were established to meet the most critical period (summer), therefore, the TMDLs will be protective of water quality during all other seasons (TMDL Study, page 7-9).

EPA finds that the TMDL document submitted by MPCA 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(s) 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:

Reasonable Assurance is discussed in detail in Section 10 of the TMDL Study. A summary is provided below:

Watershed Management: The Shingle Creek Watershed Management Commission (SCWMC) is responsible for the protecting and improving water resources in the Shingle Creek watershed. SCWMC is a joint powers organization with statutory authority to manage stormwater in the Twin and Ryan Lakes subwatersheds (TMDL Study, page 10-1). Under the Joint Powers Agreement, all nine cities within the watershed agreed to common goals and standards to be addressed by a watershed management plan. SCWMC developed several plans to further progress towards meeting water quality goals, including the Water Quality Plan (2007), a revised Capital Improvement Plan (2007), and a Cost Sharing Policy (2007). The TMDLs will guide development of revised plans (TMDL Study, page 10-2), including a TMDL implementation plan to be finalized by MPCA upon approval of the Twin and Ryan Lakes TMDLs (personal communication, Joe Bischoff, 10/30/2007). A summary of SCWMC's Water Quality Plan (WQP) is provided in the Implementation Section of the TMDL Study (Section 9). The WQP includes a 10-year plan for meeting water quality goals for each lake in the watershed. The WQP provides plans for monitoring, watershed management, capital improvement, and education and outreach.

In addition to funding provided by the nine cities in the watershed, SCWMC receives significant watershed management funding from MPCA, the Board of Water Resources, the Metropolitan Council, and the Minnesota Department of Natural Resources (TMDL Study, page 10-2).

NPDES MS4 Permits: The entire watershed is covered under NPDES regulation and Minnesota's General Permit requiring MS4s to amend their NPDES Storm Water Pollution Prevention Programs (SWPPPs) to ensure consistency with applicable TMDL WLA requirements. The General Stormwater Permit requires modification of SWPPPs within 18 months of approval of a TMDL. According to the TMDL Study, each of the permitted stormwater facilities identified in Table 7, above, will comply with this requirement (TMDL Study, page 10-3). The TMDL Study (page 10-3) states that SCWMC will develop an implementation plan that is consistent with the gross WLA provided in this TMDL Study. As discussed above, the TMDL implementation plan will be finalized by MPCA upon approval of the Twin and Ryan Lakes TMDLs. SCWMC's implementation plan will identify specific BMPs necessary to achieve the WLA and the individual SWPPPs will be modified accordingly (TMDL Study, page 10-3).

EPA finds that the TMDL document submitted by MPCA satisfies all requirements of this eighth element.

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:

SCWMC will lead monitoring and tracking of BMP effectiveness efforts in the watershed (email correspondence, J. Bischoff, 10/30/2007). SCWMC has an annual monitoring budget and conducts some routine monitoring in the watershed. SCWMC also supports a monitoring program operated by volunteer citizens who collect macroinvertebrate data and samples on a biweekly basis. Details regarding SCWMC's planned monitoring activities are included in the Shingle Creek Water Quality Plan (WQP). The 2006 WQP is available at http://www.shinglecreek.org/fwqp.pdf. SCWMC is in the process of posting an updated 2007 version of the WQP. A summary of planned lake monitoring parameters, frequency, and responsible parties is provided in Table 8 below.

Table 8. Planned Lake Monitoring Parameters And Frequency
(email correspondence, J. Bischoff, 10/30/2007)

Parameter	Sites	Frequency	Responsible Party	Analyses
Chlorophyll-a	**Surface**	Bi-weekly	SCWMC	Lab
Total P	Surface,bottom	Bi-weekly	SCWMC	Lab
Ortho P	Surface,bottom	Bi-weekly	SCWMC	Lab

Parameter	Sites	Frequency	Responsible Party	Analyses
TKN	Surface,bottom	Bi-weekly	SCWMC	Lab
Total Fe	Bottom	Bi-weekly	SCWMC	Lab
Temp/DO/conductivity profile	Profile	Bi-weekly	SCWMC	Field probe
Secchi depth	Profile	Bi-weekly	SCWMC	Field reading
Zooplankton	Counts	Spring, summer, fall	SCWMC	Field reading
Phytoplankton	Counts	Spring, summer, fall	SCWMC	Field reading
Fish		Summer, winter	DNR?	Field reading

EPA finds that the TMDL document submitted by MPCA 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 submitted TMDL Study does not contain a formal implementation plan, since it is not required as a condition for TMDL approval under the current U.S. EPA regulations. However, Section 9 of the TMDL Study does include an implementation framework and a summary of planned activities. As stated above, the formal TMDL implementation plan will be finalized by MPCA upon approval of the Twin and Ryan Lakes TMDLs. Based on the phosphorus loading reduction estimates provided in Section 9 of the TMDL Study (Tables 9.2 and 9.4), the final TMDL Implementation Plan will provide detailed plans for nutrient reductions. Potential activities, identified by SCWMC, for controlling nutrients in the Twin and Ryan Lakes Watershed are summarized below.

Potential Actions for Controlling Nutrients in the Twin and Ryan Lakes Watershed (Excerpt from TMDL Study, pages 9-4 & 9-5):

All Lakes

- Conduct aquatic plant surveys
- Shoreline restoration to improve runoff filtration
- Increase infiltration of direct runoff
- Increase frequency of street sweeping

North Twin Lake
- Rough fish removal
- Add water quality ponds
- Monitor and maintain ponds to sustain performance
- Install underground storm water treatment devices
- Restore DNR Wetland 639W

Middle Twin Lake
- Reductions in North Twin Lake will result in improved water quality

South Twin Lake
- Add water quality ponds
- Monitor and maintain ponds to sustain performance
- Install underground storm water treatment devices
- Consider alum treatment to address internal loading of phosphorus

Ryan Lake
- Increase treatment
- Monitor and maintain ponds to sustain performance
- Increase rain gardens, filtration
- Shoreline restoration and maintenance
- Conduct plant survey and prepare management plan
- Biological management

EPA reviews, but does not approve, implementation plans. EPA finds that this criterion has been adequately addressed.

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:

The Twin and Ryan Lakes TMDL project was administered locally through SCWMC. A technical advisory committee was established for the TMDL Study in order to involve interested stakeholders. The committee included local cities, SCWMC, representatives of MPCA and MDNR, the Metropolitan Council, and the US Geological Survey. All meetings were open to the public. The committee held meetings to discuss watershed TMDL efforts, including the Twin and Ryan Lake TMDL Study, on December 8, 2005, February 10, 2006, March 9, 2006, and June 27, 2007. A general stakeholder meeting was held for the Twin and Ryan Lakes TMDL Study on October 11, 2005.

MPCA placed the Draft Twin and Ryan Lakes TMDL Study on public notice from September 17, 2007 to October 15, 2007, to provide an opportunity for public comment. The draft TMDL was posted at: http://www.pca.state.mn.us/water/tmdl/tmdl-draft.html, the MPCA's TMDL web site. U.S. EPA sent MPCA comments on the Draft TMDL, and the comments were adequately addressed in the final TMDL. One set of comments were received during the TMDL public notice period. Public comments were addressed appropriately by MPCA.
EPA finds that the TMDL document submitted by MPCA 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:

MPCA's October 26, 2007 correspondence signed by Brad Moore, Commissioner, addressed to Kevin Pierard, Acting Director, U.S. EPA, Region 5, Water Division, states that the Twin and Ryan Lakes Nutrient TMDL Study (dated October 2007) for excess nutrients and supporting documentation and information are submitted under Section 303(d) of the Clean Water Act for U.S. EPA final review and approval.

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

13. Conclusion

After a full and complete review, EPA finds that the phosphorus TMDLs for the Twin and Ryan Lakes satisfy all of the elements of an approvable TMDL. This decision document addresses **4** TMDLs for **4** waterbody segments as identified on Minnesota's 2006 303(d) list (see summary table below).

Reach	MDNR Lake Assessment Unit ID	Affected use	TMDL Pollutant
North Twin Lake	27-0042-01	Aquatic recreation	Total Phosphorus
Middle Twin Lake	27-0042-02	Aquatic recreation	Total Phosphorus
South Twin Lake	27-0042-03	Aquatic recreation	Total Phosphorus
Ryan Lake	27-0058-00	Aquatic recreation	Total Phosphorus

EPA's approval of this TMDL does not extend to those waters that are within Indian Country, as defined in 18 U.S.C. Section 1151. EPA is taking no action to approve or disapprove TMDLs for those waters at this time. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.