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

SEP 18 2012

REPLY TO THE ATTENTION OF:

WW-16J

Rebecca J. Flood, Assistant Commissioner
Regional Environmental Management Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Dear Ms. Flood:

The U.S. Environmental Protection Agency has conducted a complete review of the final Total Maximum Daily Loads (TMDLs) for the lakes in the Carnelian-Marine-St.Croix Watershed in eastern Minnesota including supporting documentation and follow up information submitted by the Minnesota Pollution Control Agency (MPCA). These TMDLs are located in eastern Minnesota in Washington County just northeast of Minneapolis/St. Paul in the upper Mississippi River Basin. The lakes are located in Washington County, Minnesota and their watersheds drain to the St. Croix River. The lakes included in the TMDL project area are East Boot (82-0034-00), Fish (82-0064-00), Goose (82-0059-00), Hay (82-0065-00), Jellum's (82-0052-02), Long (82-0068-00), Loon (82-0015-02), Louise (82-0025-00), Mud (82-0026-02), and South Twin (82-0019-00). The TMDLs were calculated for Total Phosphorus to address excess nutrients. The designated use impairment in the lakes is aquatic recreational use, and the lakes are classified as Class 2B waters and are defined as and protected for aquatic life (warm and cool water fisheries and associated biota) and recreation (all water recreation activities including bathing).

This TMDL meets the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, EPA hereby approves Minnesota's 10 TMDLs at 10 lakes for total phosphorus. The statutory and regulatory requirements, and EPA's review of Minnesota's compliance with each requirement, are described in the enclosed decision document.

We wish to acknowledge Minnesota's effort in submitting these TMDLs, as well as the Carnelian-Marine-St. Croix Watershed District and Washington County's efforts in developing the TMDL, and look forward to future TMDL submissions by the State of Minnesota. If you have any questions, please contact Mr. Peter Swenson, Chief of the Watersheds and Wetlands Branch, at 312-886-0236.

Sincerely,

Tinka G. Hyde
Director, Water Division

Enclosure

cc: Dave L. Johnson, MPCA
Christopher Klucas, MPCA

TMDL: Carnelian-Marine-St. Croix Watershed District Multi-Lakes TMDL, Minnesota
Date:

DECISION DOCUMENT FOR THE APPROVAL OF THE CARNELIAN-MARINE-ST. CROIX WATERSHED DISTRICT MULTI-LAKES TMDL, MINNESOTA, 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, 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; chlorophyll-a and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comment:
Location Description/Spatial Extent: Section 1.2 of the TMDL states the TMDL document was submitted by the Minnesota Pollution Control Agency (MPCA), in cooperation with the Carnelian-Marine-St. Croix Watershed District (CMSCWD, the "District") , with contributions by the Washington Conservation District (WCD). These multi-lake TMDLs are located in eastern Minnesota (see Table 1 below), in Washington County just northeast of Minneapolis/St. Paul in the upper Mississippi River Basin. There are a total of ten lakes, six of which drain into the St. Croix River: Hay, Jellum's, Long, Loon, Mud, and South Twin Lake. The overall watershed drains 81.4 square miles and these six lakes eventually drain into the St. Croix River and Lake Pepin drainage, as a result, reductions for the six lakes will have an impact on reductions needed for the river and the lakes. The remaining four lakes are East Boot, Fish, Goose, and Louise, and are landlocked. Table 1 below lists the lakes and their IDs (excerpted from Table 1 in the TMDL). This project is for a total of 10 phosphorus TMDLs in 10 lakes.

Table 1. Impaired Waters Listings

Lake Name	Lake ID
East Boot	82-0034-00
Fish	82-0064-00
Goose	82-0059-00
Hay	82-0065-00
Jellum's	82-0052-02
Long	82-0068-00
Loon	82-0015-02
Louise	82-0025-00
Mud (Main Lake)	82-0026-02
South Twin	82-0019-00

All of the lakes are located in the North Central Hardwood Forest Ecoregion. Section 1.2.3 of the TMDL states that the topography is gently rolling as a result of glacial deposits, with many landlocked depressions. There are moraine and till deposits, a large outwash plain with very sandy soils, and bluffs and terraces that are characteristic of the historic St. Croix River. Eight of the ten lakes are classified as shallow lakes by the MPCA, either with a depth of less than 15 feet, or the littoral zone covering more than 80% of the lake. East Boot Lake and Goose Lake are classified as deep lakes.

Land use: The land use is described in the individual lake Sections 4 – 13 of the TMDL as a percentage of the acreage for each lake's drainage area. Land uses are summarized for each lake below in the Watershed Land Use Table, compiled from individual generalized land use tables in the TMDL using 2005 data. Overall, the highest percentage of land use for each lake drainage area is agricultural use, undeveloped, single family detached dwellings, and water. Three lakes have a percentage of their land use for parks, recreation, and preserves. Other small percentages of land use not shown in the table are for farmstead, industrial and utility, institutional, retail, and seasonal/vacation.

Watershed Land Use (2005), percentages by lake and drainage area

Lake	% Agricultural	% Undeveloped	% Single Family Detached	% Parks, Recreation, or preserve	% Water
East Boot	25.9	38.1	5.7	7.1	22.1
Fish	26.8	61.8	7.0	--	2.7
Goose	31.2	45.0	18.3	--	1.4
Hay	27.7	34.9	27.1	--	9.1
Jellum's	36.0	43.8	9.9	--	8.9
Long	32.2	54.3	9.7	--	0.5
Loon	32.8	19.1	14.2	28.7	0.5
Louise	40.3	32.8	9.1	11.7	2.3
Mud	44.4	47.0	0.2	--	8.4
South Twin	43.5	37.8	14.2	--	4.5

(from Tables 9,17, 25, 31, 41, 49, 57, 65, 73, and 81in the TMDL)

Problem Identification: Section 2.2 of the TMDL states that the lakes are impaired by phosphorus for the aquatic recreation designated use of fishing, swimming, canoeing, including bathing. Further, the increase in phosphorus leads to increases in chlorophyll-a and decreases in Secchi depths, indicating turbidity. Some contributions to phosphorus release are from fish stirring sediment from the bottom, or release of phosphorus from die off of curly leaf pondweed. However, many of the lakes are eutrophic and a few are hypereutrophic. Detailed sampling and evaluation of the planktonic community (zooplankton and algae) show there is a high proportion of eutrophic indicators in the algal community. Green and blue green algae (producing cyanotoxins) are prevalent and can harm animals and humans. Decreases in the zooplankton community affect both predation and algal growth, which results in unchecked growth of suspended algae.

Pollutant of Concern: The pollutant of concern is excess nutrients (phosphorus).

Source Identification: Section 3.1 of the TMDL states that both point and nonpoint sources contribute to elevated phosphorus conditions in the lakes, but the watersheds are dominated by nonpoint sources. South Twin Lake is located in the City of Stillwater which has a Municipal Separate Storm Sewer System (MS4) permit (MR040000); the City of Scandia, which surrounds Fish Lake, will have a MS4 permit in the near future. There are facilities within the watershed subject to either MPCA's general construction (MNR100001) or industrial stormwater (MNR50000) permits, but their contribution to the wasteload is very small and requires no reduction. There are no municipal, industrial, or CAFO permittees in the watershed.

The nonpoint sources are described in 3.1.2 of the TMDL as listed below. Methodology for the detailed calculations will be discussed in Section 3 of this document. The sources include:

- direct watershed runoff – runoff from the watershed drainage area, using climate, runoff volume, land use, land cover, and storm event variables;
- loading from upstream waters – only applicable for some of the lakes that have direct hydrologic connectivity to other lakes;
- runoff from feedlots not requiring permits – applicable to locations with less that 1000 animal units. The potential runoff is from precipitation and slow melt, and annual manure phosphorus generation multiplied per animal unit is calculated;
- atmospheric deposition – particulates settling out of the atmosphere to surface waters;
- subsurface sewage treatment systems (SSTS) – data provided by county records including number of houses within 50 feet of the lake that have conforming or failing septic systems;
- groundwater fluctuations in lakes – determined by correlation of groundwater level fluctuation to lake water levels, correlation of lake water levels to precipitation, surficial geology, in lake chemistry analysis, water quality, comparison to nearby groundwater levels , measurement of surface and groundwater inflow and outflow; overall groundwater influence is considered negligible in the watershed;
- internal loading – release from bottom sediments through various mechanisms, such as anoxic conditions, physical disturbance (fish, wind, boats), or release from decay of curly leaf pondweed.

Priority Ranking: Section 1.1 of the TMDL submittal states that the priority ranking is implicit in the TMDL schedule included in Minnesota's 303(d) list. Ranking criteria include: impairment impacts on public health and aquatic life; public value of the impaired water; likelihood of completing the TMDL and restoring the water; local interest and assistance with the TMDL; and sequencing of TMDLs within a watershed.

Future growth: Section 1.2.1 of the TMDL states that the population in Washington County is projected to increase. Table 2 below shows that all of the locations are expecting growth, particularly in the area around Hugo.

Table 2. Current population and population forecasts for Cities and Townships in CMSCWD

County	City or Township	Population				% Change 2000 to 2030
		2000	2010	2020	2030	
Washington	Grant	4,026	4,400	4,450	4,500	12%
Washington	Hugo	6,363	19,100	29,000	40,000	529%
Washington	Marine on St. Croix	602	760	880	1,000	66%
Washington	May Township	2,928	3,200	3,600	4,000	37%
Washington	Scandia	3,692	4,370	5,000	5,400	46%
Washington	Stillwater	15,323	19,100	21,300	19,900	30%
Washington	Stillwater Township	2,553	2,690	2,940	3,350	31%

Source: Metropolitan Council 2030 Regional Development Framework Population Forecasts (January 9, 2008)

EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning 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.

Comment:
Designated Use: Section 2.1 states that the listed lakes are classified as Class 2B, 3C, 4A, 4B, 5, and 6 waters, and the most protective is Class 2, for aquatic life and recreation. MN Rules Chapter 7050.0140, Subpart 3, Water Use Classification for Waters of the State for Class 2 waters, aquatic life and recreation, states: "Aquatic life and recreation includes all waters of the state that support or may support fish, other aquatic life, bathing, boating, or other recreational purposes and for which quality control is or may be necessary to protect aquatic or terrestrial life or their habitats or the public health, safety, or welfare."

Class 2B is defined in Minn. Rules 7050.0222, Subp. 4 as follows: "The quality of Class 2B surface waters shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life, and their habitats. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable…."

Standards: Minnesota uses both the size of the waterbody (shallow or deep) and its ecoregional location to determine standards for a waterbody. Three criteria are included in the nutrient standards, total phosphorus (the causal factor) and chlorophyll-a and Secchi disc depth (response factors). MN R. 7050.0222(4) defines the numeric criteria shown below in Table 3.

Table 3. MN Eutrophication Standards

Parameter	North Central Hardwood Forest Ecoregion	
	Eutrophication Standard, Lakes and Reservoirs	Eutrophication Standard, Shallow Lakes
TP (µg/l)	TP < 40	TP < 60
Chlorophyll-a (µg/l)	chl < 14	chl < 20
Secchi transparency (m)	SD > 1.4	SD > 1.0
Lakes to which standards apply	East Boot, Goose	Fish, Hay, Jellum's, Long, Loon, Louise, Mud, South Twin

EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning 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.

Comment:
TMDL = Loading Capacity (LC) = WLA + LA + MOS. The loading capacities were calculated for each of the 10 lakes. The WLAs are for construction and industrial stormwater permits, and one MS4. The LAs are watershed, atmospheric, and internal lake sources.

For the TMDLs in each lake below, the dashed lines (--) in annual TP reduction do not indicate no MOS. The footnotes (**) of each table below explain that the annual TP reduction includes the MOS as determined in the annual TP TMDL allocation.

Table 15. East Boot Lake Existing Loads, TMDL Allocations, and Reductions Needed

Load Component	TP Existing	TP TMDL Allocation		TP Reduction	
	lb/yr	lb/yr	lb/day	lb/yr	%
WLA					
Construction stormwater (permit #MNR100001)	0.14	0.14	0.00038	0	0%
Industrial stormwater (permit # MNR50000)	0.14	0.14	0.00038	0	0%
Total WLA	0.28	0.28	0.00076	0	0%
LA*					
Watershed	47	24	0.066	23	49%
Atmospheric	12	12	0.033	0	0%
Internal	134	130	0.36	4.0	3.0%
Total LA	193	166	0.46	27	14%
MOS	–	19	0.052	–	–
Total	*193*	*185*	*0.51*	*27***	*14%*

*LA components are broken down for guidance in implementation planning; the LA should be considered categorical.
**27 lb/yr reduction takes into account MOS; 8 lb/yr reduction (=27-MOS) needed to reach total loading capacity

Table 23. Fish Lake Existing Loads, TMDL Allocations, and Reductions Needed

Load Component	TP Existing	TP TMDL Allocation		TP Reduction	
	lb/yr	lb/yr	lb/day	lb/yr	%
WLA					
Construction stormwater (permit #MNR100001)	0.22	0.22	0.00060	0	0%
Industrial stormwater (permit # MNR50000)	0.22	0.22	0.00060	0	0%
Total WLA	0.44	0.44	0.0012	0	0%
LA*					
Watershed	76	38	0.10	38	50%
Atmospheric	17	17	0.047	0	0%
Internal	113	82	0.22	31	27%
Total LA	*206*	*137*	*0.37*	*69*	*33%*
MOS	–	15	0.04	–	–
Total	*206*	*152*	*0.41*	*69***	*33%*

*LA components are broken down for guidance in implementation planning; the LA should be considered categorical.
**69 lb/yr reduction takes into account MOS; 54 lb/yr reduction (=69-MOS) needed to reach total loading capacity

Table 31. Goose Lake Existing Loads, TMDL Allocations, and Reductions Needed

Load Component	TP Existing	TP TMDL Allocation		TP Reduction	
	lb/yr	lb/yr	lb/day	lb/yr	%
WLA					
Construction stormwater (permit #MNR100001)	0.44	0.44	0.0012	0	0%
Industrial stormwater (permit # MNR50000)	0.44	0.44	0.0012	0	0%
Total WLA	0.88	0.88	0.0024	0	0%
LA*					
Watershed	151	76	0.21	75	50%
Atmospheric	23	23	0.063	0	0%
Internal	171	129	0.35	42	25%
Total LA	*345*	*228*	*0.62*	*117*	*34%*
MOS	–	25	0.07	–	–
Total	*346*	*254*	*0.69*	*117***	*34%*

*LA components are broken down for guidance in implementation planning; the LA should be considered categorical.
**117 lb/yr reduction takes into account MOS; 92 lb/yr reduction (=117-MOS) needed to reach total loading capacity

Table 39. Hay Lake Existing Loads, TMDL Allocations, and Reductions Needed

Load Component	TP Existing	TP TMDL Allocation		TP Reduction	
	lb/yr	lb/yr	lb/day	lb/yr	%
WLA					
Construction stormwater (permit #MNR100001)	0.19	0.19	0.00052	0	0%
Industrial stormwater (permit # MNR50000)	0.19	0.19	0.00052	0	0%
Total WLA	0.38	0.38	0.00104	0	0%
LA*					
Watershed	63	32	0.088	31	49%
Atmospheric	11	11	0.030	0	0%
Internal	63	48	0.13	15	24%
Total LA	*137*	*91*	0.25	*46*	34%
MOS	–	10	0.027	–	–
Total	*137*	*101*	*0.28*	*46***	*34%*

*LA components are broken down for guidance in implementation planning; the LA should be considered categorical.
**46 lb/yr reduction takes into account MOS; 36 lb/yr reduction (=46-MOS) needed to reach total loading capacity

Table 47. Jellum's Bay Existing Loads, TMDL Allocations, and Reductions Needed

Load Component	TP Existing	TP TMDL Allocation		TP Reduction	
	lb/yr	lb/yr	lb/day	lb/yr	%
WLA					
Construction stormwater (permit #MNR100001)	0.41	0.41	0.0011	0	0%
Industrial stormwater (permit # MNR50000)	0.41	0.41	0.0011	0	0%
Total WLA	0.82	0.82	0.0022	0	0%
LA*					
Watershed	80	70	0.19	10	13%
Atmospheric	17	17	0.047	0	0%
Internal	124	69	0.19	55	44%
Total LA	*221*	*156*	0.43	*65*	29%
MOS	–	18	0.049	–	–
Total	*222*	*175*	*0.48*	*65***	*29%*

*LA components are broken down for guidance in implementation planning; the LA should be considered categorical.
**65 lb/yr reduction takes into account MOS; 47 lb/yr reduction (=65-MOS) needed to reach total loading capacity

Table 55. Long Lake Existing Loads, TMDL Allocations, and Reductions Needed

Load Component	TP Existing	TP TMDL Allocation		TP Reduction	
	lb/yr	lb/yr	lb/day	lb/yr	%
WLA					
Construction stormwater (permit #MNR100001)	0.17	0.17	0.00047	0	0%
Industrial stormwater (permit # MNR50000)	0.17	0.17	0.00047	0	0%
Total WLA	0.34	0.34	0.00094	0	0%
LA*					
Watershed	52	26	0.071	26	50%
Atmospheric	11	11	0.030	0	0%
Internal	71	63	0.17	8	11%
Total LA	*134*	*100*	0.27	*34*	25%
MOS	–	11	0.030	–	–
Total	*134*	*111*	*0.30*	*34***	*25%*

*LA components are broken down for guidance in implementation planning; the LA should be considered categorical.
**34 lb/yr reduction takes into account MOS; 23 lb/yr reduction (=34-MOS) needed to reach total loading capacity

Table 63. Loon Lake Existing Loads, TMDL Allocations, and Reductions Needed

Load Component	TP Existing	TP TMDL Allocation		TP Reduction	
	lb/yr	lb/yr	lb/day	lb/yr	%
WLA					
Construction stormwater (permit #MNR100001)	0.31	0.31	0.00085	0	0%
Industrial stormwater (permit # MNR50000)	0.31	0.31	0.00085	0	0%
Total WLA	0.62	0.62	0.0017	0	0%
LA*					
Watershed	106	53	0.15	53	50%
Atmospheric	14	14	0.038	0	0%
Internal	210	156	0.43	54	26%
Total LA	*330*	*223*	0.62	*107*	32%
MOS	--	25	0.068	--	--
Total	*331*	*249*	*0.69*	*107***	*32%*

*LA components are broken down for guidance in implementation planning; the LA should be considered categorical.
**107 lb/yr reduction takes into account MOS; 82 lb/yr reduction (=107-MOS) needed to reach total loading capacity

Table 71. Lake Louise Existing Loads, TMDL Allocations, and Reductions Needed

Load Component	TP Existing	TP TMDL Allocation		TP Reduction	
	lb/yr	lb/yr	lb/day	lb/yr	%
WLA					
Construction stormwater (permit #MNR100001)	0.15	0.15	0.00041	0	0%
Industrial stormwater (permit # MNR50000)	0.15	0.15	0.00041	0	0%
Total WLA	0.30	0.30	0.00082	0	0%
LA*					
Watershed	51	26	0.071	25	49%
Atmospheric	12	12	0.033	0	0%
Internal	158	125	0.34	33	21%
Total LA	*221*	*163*	0.44	*58*	26%
MOS	--	18	0.049	--	--
Total	*221*	*181*	*0.49*	*58***	*26%*

*LA components are broken down for guidance in implementation planning; the LA should be considered categorical.
**58 lb/yr reduction takes into account MOS; 40 lb/yr reduction (=58-MOS) needed to reach total loading capacity

Table 79. Mud Lake Existing Loads, TMDL Allocations, and Reductions Needed

Load Component	TP Existing	TP TMDL Allocation		TP Reduction	
	lb/yr	lb/yr	lb/day	lb/yr	%
WLA					
Construction stormwater (permit #MNR100001)	0.080	0.080	0.00022	0	0%
Industrial stormwater (permit # MNR50000)	0.080	0.080	0.00022	0	0%
Total WLA	0.16	0.16	0.00044	0	0%
LA*					
Watershed	27	14	0.038	13	48%
Atmospheric	16	16	0.044	0	0%
Internal	127	111	0.30	16	13%
Total LA	*170*	*141*	0.38	*29*	17%
MOS	--	16	0.044	--	--
Total	*170*	*157*	*0.42*	*29***	*17%*

*LA components are broken down for guidance in implementation planning; the LA should be considered categorical.
**58 lb/yr reduction takes into account MOS; 40 lb/yr reduction (=58-MOS) needed to reach total loading capacity

Table 87. South Twin Lake Existing Loads, TMDL Allocations, and Reductions Needed

Load Component	TP Existing	TP TMDL Allocation		TP Reduction	
	lb/yr	lb/yr	lb/day	lb/yr	%
WLA					
Construction stormwater (permit #MNR100001)	0.060	0.060	0.00016	0	0%
Industrial stormwater (permit # MNR50000)	0.060	0.060	0.00016	0	0%
MS4 stormwater, Stillwater (permit #MNR040000)	6.0	3.0	0.0082	3.0	50%
Total WLA	6.1	3.1	0.00032	3.0	49%
LA*					
Watershed	16	8.0	0.022	8.0	50%
Atmospheric	15	15	0.041	0	0%
Internal	73	63	0.17	10	14%
Total LA	*104*	*86*	0.23	*18*	17%
MOS	—	10	0.027	—	—
Total	*110*	*99*	*0.26*	*21***	*19%*

*LA components are broken down for guidance in implementation planning; the LA should be considered categorical.
**21 lb/yr reduction takes into account MOS; 11 lb/yr reduction (=21-MOS) needed to reach total loading capacity

Methodology - The approach for this TMDL is to focus on the nonpoint source runoff and to achieve the more natural conditions that were present before the great increase in agricultural activity. Section 1.2.2 of the TMDL discusses past studies completed by the District that compared pre-settlement baseline trophic conditions in several lakes to current conditions after development. Sediment cores were taken from the deep portions of several lakes and TP concentrations were determined from fossil diatom assemblages. Section 4.3 of the TMDL states that increases in nutrient levels in East Boot Lake coincided with peaks in agricultural activity in the 1930s, which then decreased in the 1950s due to improved farm practices. TP doubled between 1901 and 1928, and started to decline around 1953.

In Section 2.2.2 of the TMDL, MPCA explored the unique relationship of phosphorus to shallow lake response because the biological components such as microbes, algae, macrophytes, zooplankton and other invertebrates, and fish are concentrated into a smaller space and there is more oxygen at depth as the light can penetrate shallower waters. The shallow water body exhibits two states, either a phytoplankton-dominated (algae) community with turbid water, or macrophyte-dominated (plant) community with clear water. The first condition is more harmful because the algae create more turbid conditions and can inhibit the growth of other organisms. The plants reduce the turbidity by stabilizing sediments and allowing more of the plant community and less of the algae to grow, and more phosphorus is used rather than being transported downstream. It should be noted that these interactions are not linear and the MPCA has determined thresholds where reductions in nutrients may not have apparent increase in biotic integrity until that threshold is reached. Responses to nutrients in one direction are not mirrored in the other direction (Figure 5 below); the shift between turbid and clear states does not occur at the same nutrient load value on the x-axis when reducing from high to low loading.

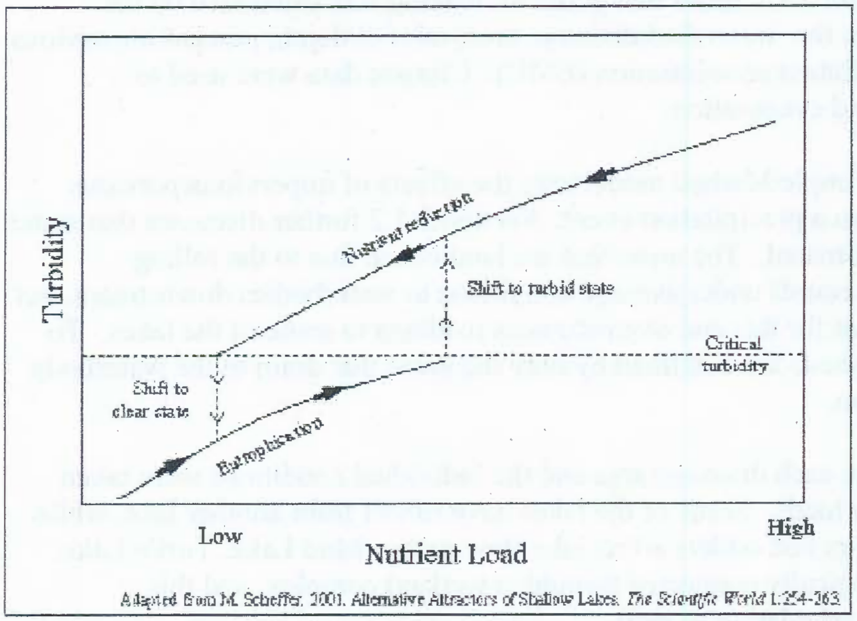

Figure 5. Alternative Stable States in Shallow Lakes.

Nonpoint source loading is from direct watershed runoff, upstream waters, small unpermitted feedlots, atmospheric deposition, SSTSs, groundwater, and internal lake loading. The loading is calculated using several methods depending on the source, and uses a combination of the Simple Method, FLUX modeling, BATHTUB (6.1), and regression equations to characterize relationships of phosphorus concentrations and phosphorus release rates. The Simple Method and FLUX were used to determine the phosphorus loads directly from watershed runoff (external sources), and BATHTUB was used to determine in-lake loads. BATHTUB is a steady-state mass-balance model that predicts surface water quality (Section 3.3.1 of the TMDL). Section 3.4 of the TMDL summarizes the methods.

1. The Simple Method estimates phosphorus loading to lakes based on land use and land cover data (impervious and pervious surfaces, respectively) to calculate runoff depth. The runoff depth is calculated for a precipitation event and results vary depending on the percentage of impervious cover. The average runoff depth was calculated for this drainage area to be 3.94 inches; the MN Hydrology Guide has depths ranging from 6 – 8 inches. Simple Method results from the land use and land cover were combined with phosphorus loading from all estimated external sources: feedlots, atmospheric deposition, SSTS, and upstream lake loading.
2. FLUX uses stream monitoring data to calculate an annual depth of runoff for the study area, and was used to separate the stream's baseflow from storm flow.
3. The BATHTUB model was calibrated to existing in-lake water quality data (10-year growing season means). All the external sources were inputs to BATHTUB, which linked phosphorus loading with in-lake water quality.

Direct Watershed Runoff – Section 3.1.2 states that pollutant loading was calculated by the Simple Method using values from the watershed drainage area, rainfall depth, percent impervious cover, and event mean runoff pollutant concentration (EMC). Climate data were used to determine annual precipitation and evaporation.

As summarized previously, the Simple Method model uses the effects of impervious/pervious surfaces in calculating runoff from a precipitation event. Section 3.1.2 further discusses that some phosphorus loads may be overestimated. The areas that are landlocked due to the rolling topography would not contribute runoff under average conditions to waterbodies downstream, but the Simple Method cannot account for this and overestimates loadings to some of the lakes. To reduce the overestimation, watersheds were defined by only the areas that drain to the waterbody under average annual precipitation.

Connectivity of the lakes varies in each drainage area and the individual conditions were taken into account when calculating the loads. Some of the lakes have runoff from another lake, while others are not interconnected; weirs and outlets affect lake flow paths. Mud Lake, Turtle Lake, and Big Marine Lake are hydrologically connected through a wetland complex, and this hydrology was considered in the calculation as well.

Monitored flow data from two average runoff years were used in the calibration process. Local data were used from Carnelian Creek rather than a statewide compilation so that the data were more accurate within the project area. FLUX was used to separate baseflow from storm flow, and the resulting average runoff depth was used for the Simple Method calculation.

Table 5 below from the TMDL shows the range of EMC value for different land uses and land covers. These values are estimates of the runoff due to a precipitation event and were determined by land use for impervious areas, land cover for pervious areas, literature, and previous studies.

Table 5. TP Event Mean Concentration (EMC) Values by Land Cover and Land Use

Land Cover (applied to pervious surfaces)	Phosphorus (mg/L)
Cropland	0.32
Exposed Earth	0.46
Forest/Shrub/Grassland	0.04
Open Water	0.01
Wetlands	0.01-0.04*
Land Use (applied to impervious surfaces)**	**Phosphorus (mg/L)**
Commercial	0.28
Farmsteads	0.46
Industrial	0.28
Institutional	0.28
Multi-Family Residential	0.32
Park and Recreation	0.40
Single Family Residential	0.46
Vacant/Agricultural	0.32

*Vary based on wetland type.
**Land use categories are from 2005 Generalized Land Use database. These land use EMCs only apply to areas identified by land cover (MLCCS) data as containing impervious surfaces.

Loading from Upstream Waters – Only East Boot Lake and Jellum's Bay have upstream lakes, West Boot Lake and Long Lake, contributing to their phosphorus loads. The Simple Method was again used, but the upstream lakes and their watersheds contributing to an impaired lake downstream were eliminated from the total load of the downstream lake so that allocations would be more accurate for each individual lake. Calculation of loads from contributing waterbodies is shown below in Table 6, taken from the TMDL.

Table 6. Summary of phosphorus loading from upstream waters

Receiving Water	Upstream Lake	Averaging Period	TP (µg/L)	Runoff Depth (in/yr)	Drainage Area (acres)*	Runoff Volume (AF/yr)	TP Load (lb/yr)
East Boot Lake	West Boot Lake	2000-2007	20	3.94	229	75.2	4.1
Jellum's Bay	Long Lake	2000-2008	81	3.94	259	84.9	19

*Calculations are from lake outlet; includes lake area and drainage area

Runoff from Feedlots Not Requiring NPDES Permit Coverage – The TP load was calculated with data from the MPCA using the number of animal units in unpermitted feedlots that were in the watershed of each lake, multiplying the number of animal units by the annual manure phosphorus generated for each type of livestock.

Atmospheric Deposition – The atmospheric deposition was calculated for the watershed based on MPCA's calculation from previous studies (2004). Calculations determine the phosphorus that is bound to particles in the atmosphere and settles out onto surface waters.

Subsurface Sewage Treatment Systems – Phosphorus was calculated based on Washington County information on septic systems, including the number of houses within 500 feet of the lake, SSTS conforming or failing, the number of people, and the average value for phosphorus production per person per year.

Groundwater – Section 3.1.2 of the TMDL states that groundwater is not a significant contributor to phosphorus loading. Calculations were used to determine the connectivity of groundwater to the lakes, and the amount of recharge, discharge, or flow-through occurring in each of the lakes. The following parameters and processes were reviewed:

- Correlation of lake water level to groundwater level fluctuations
- Correlation of lake water level to precipitation trends
- Surficial geology based on geomorphic region
- In-lake chemistry analysis
- Watershed area to water surface area ratio
- Water quality based on Trophic State Index
- Comparison to nearby groundwater levels
- Direct measurement of groundwater inflows and outflows
- Surface water inflow and outflow.

Internal loading – Regression equations were used to determine internal loading from the lake sediments, as phosphorus goes back into solution and becomes available for plant and algal growth. The release rate of lakebed sediment, the lake anoxic factor, and the lake area are used to determine the internal loading. Further, sediments were tested for both TP and bicarbonate dithionite extractable phosphorus (BD-P), which analyzes iron-bound phosphorus. The phosphorus release rates were calculated using two different sediment release equations; multiple equations increase confidence in the loading values. Several other conditions within the waterbody contribute to the loading, such as: physical disturbance by bottom-feeding fish, wind, or boats, and release from decaying curly-leaf pondweed. The physical disturbances and contribution from decay are difficult to estimate so only the release rates from sediments, the lake anoxic factor, and the lake area were used in calculations. Regression equations were used on the release rate of phosphorus from sediment and sediment concentration relationships.

Lake loading - Section 3.2 of the TMDL states that next steps to determine the lake TMDLs included the addition of lake bathymetry, water chemistry, fisheries, macrophytes, plankton, and sediment data. Sediment data were used for calculations of internal loading of phosphorus to the lake. Detailed input data are shown below (Table 7 from the TMDL). Water or phosphorus loss from the lake is from the outlet, groundwater, evaporation, and phosphorus sedimentation and retention. Long term averages were used for the calculations when annual or detailed water balance data were not available. When observed data are not available, default or estimated values from Minnesota lakes are used rather than the pre-selected values.

Table 7. Bathtub model input data

Lake	Surface Area (acres)	Lake Fetch (ft)	Av Depth (ft)	Observed Lake Quality (surface growing season mean)			Contributing Area[1]			Precip (in)	Evap (in)
				TP (µg/L)	Chl-a (µg/L)	Secchi (m)	Wtrshed Load (lb/yr)	Flow (ac-ft/yr)	TP (µg/L)		
East Boot	45.7	727	14.8	43.9	24.2	2.2	47	99	176	30.1	35.3
Fish	63.3	1354	3.9	112.7	69.2	0.8	76	140	199	30.0	35.1
Goose	85	1294	11	63.5	42.7	1.7	152	170	330	30.0	35.0
Hay	41.4	759	3.8	92.1	41.4	1.1	63	70	330	30.0	35.1
Jellum's	64	1215	5.9	97.3	52.4	1.0	81	181	165	30.1	35.1
Long	39.8	1097	4.4	81.2	42.8	1.1	52	72	269	30.1	35.1
Loon	52.8	862	5.6	135.8	109.3	0.5	107	129	306	30.1	35.4
Louise	46.1	524	4.0	119.9	51.7	1.0	50	72	257	30.1	35.4
Mud	60.3	2000	5.0	79.0	33.6	0.7	27	104	96	30.1	35.3
South Twin	55.9	684	5.3	72.8	38.9	1.1	22	27	296	30.2	35.5

[1] Contributing area includes direct watershed runoff, SSTS, and, for East Boot and Jellum's Bay, upstream lake loading.

BATHTUB did not explicitly model internal lake loading but these values were independently calculated using regression equations and added to the phosphorus budget. The phosphorus reduction needed to achieve phosphorus standards was subtracted from the current phosphorus load to determine each lake's TMDL. Resultant annual loading was divided by 365 to get daily loads.

Segments (lakes or reservoirs) and tributaries (inputs of flow and pollutants) are used in the BATHTUB application. Internal loading is implicit and estimates calculated from the lake sediment data are not directly entered into the model but are represented by internal processes such as anoxic conditions, physical disturbance, and decay of curly-leaf pondweed. The Canfield-Bachmann equation for mass balance in deep lakes was used because it simulated the best fit for the lakes. The equation is used to predict the relationship between in-lake phosphorus concentrations and phosphorus load inputs. After calibration, loads were determined that met standards, including a 10% margin of safety.

To determine the response of chlorophyll-a and Secchi depth to TP loads, MPCA initially used the Canfield-Bachmann empirical response model contained in BATHTUB. The results of these modeling efforts indicated that the chlorophyll-a and/or Secchi depth criteria would not be attained when the TP criteria were attained. During the review of the final TMDL, MPCA and EPA determined that the relationship between TP, chlorophyll-a and Secchi depth was more appropriately defined by using the State-derived dataset used in developing the State eutrophication criteria rather than the BATHTUB relationship dataset, which is based on national data.

MPCA indicated that it was more accurate to rely on the Minnesota-specific relationships between phosphorus, chlorophyll-a, and Secchi depth that were derived in developing Minnesota's lake eutrophication standards (Minn. Rule 7050). These relationships are based on a rich dataset encompassing a large cross-section of lakes within each of Minnesota's ecoregions (Heiskary and Wilson 2005). The dataset was sufficiently large to allow for the separate analysis of shallow- and deep-lake data, which was found to be appropriate for several of the ecoregions. Default empirical equations in the BATHTUB model do not allow for this specificity. MPCA believes that attainment of the TP criteria for these lakes will result in attainment of chlorophyll-a and Secchi depth. For this TMDL, EPA accepts the validity that all criteria would be met with the attainment of the phosphorus criteria (EPA memo dated 9/06/12).

Critical Conditions: The critical season is the summer growing season when the lakes are used the most for recreational purposes. Significant amounts of loading in lakes occur from runoff in the spring (Section 14.1 of the TMDL). Spring is also a factor in internal phosphorus loading and cycling because some lakes have conditions that are conducive to curly leaf pondweed growth beginning early in the season before ice-out (melting) (Section 16.3.2), and phosphorus is released from the decay of the pondweed. Other lake conditions indicate that there is nutrient cycling under the ice (Section 10.5.3). Later in the season, significant increases are observed in chlorophyll-a due to increased algal growth in August or September when temperatures are greater. Section 14 of the TMDL states that the critical condition is accounted for in the modeling effort because all seasonal conditions were incorporated into the process.

EPA finds MPCA's approach for calculating the LC to be reasonable and consistent with EPA guidance. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning 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.

Comment:
The Load Allocations are presented annually and daily for all ten lakes in Section 3 of this document. MPCA further calculated informal allocations for watershed runoff, atmospheric loading, and internal loading to provide additional information for implementation planning.

EPA finds MPCA's approach for calculating the LA to be reasonable and consistent with EPA guidance. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning 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.

Comment:
Annual and daily WLA are presented in Section 3 of this document. The City of Stillwater is the only MS4 permit in the study area (the future MS4 permit for the City of Scandia is included based on projected 2030 land use data). The City of Stillwater MS4 calculation also included 2030 land use data to approximate the area covered by the permit. The land uses regulated by the permit are single family residential, multi-family residential, community park and recreation, and South Twin Lake. Section 3.2.2 states that an area-weighted WLA used the 2030 land use data to determine the proportion of the watershed load that originates in the municipal areas. Construction stormwater and industrial stormwater are included in the overall WLA calculation but contribute a small amount to the total phosphorus. Construction area was estimated based on

an average annual percent of the county that had been permitted in the past six years, resulting in 0.58% of the total area. There are no industrial facilities in any of the lake watersheds, and a 0% reduction is anticipated from this source.

EPA finds MPCA's approach for calculating the WLA to be reasonable and consistent with EPA guidance. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning 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.

<u>Comment</u>:
An explicit 10% MOS was used in the modeling effort. MPCA set aside 10% of the loading capacity for each of the lakes for the MOS. As discussed in Section 3.3.1, MPCA believes the MOS is appropriate because in calibration, the adjustment of the correlation coefficients in the model (matching observed to simulated values) is within a reasonable range to be considered a "normal" calibration process. MPCA states in 3.3.2 of the TMDL that there was fairly good agreement of simulated and observed values for TP loading and flow. Further, the allocation methods included relevant processes in eutrophication and runoff calculations from impervious/pervious land cover within each watershed to more accurately simulate the loading. For these reasons, MPCA believes the 10% MOS provides sufficient MOS for these TMDLs.

EPA finds MPCA's approach for calculating the MOS to be reasonable and consistent with EPA guidance. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning 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)).

<u>Comment:</u>
Seasonal variation was considered in this TMDL as described in Section 14 of the TMDL. In an average year, there is a large influx of phosphorus into the lakes in the spring. There is also a great increase in chlorophyll-a in the warm waters in August or September when algal blooms

increase, and increased phosphorus from internal loading. The MPCA takes this variation into account and load reductions are to meet standards over the course of the growing season from June through September.

EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning 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.

Comment:
Section 18 of the TMDL submittal states that there is reasonable assurance that the TMDL will be implemented. CMSCWD and the WCD have been involved in current and past projects and contributed to evaluations of each lake. Section 1.2.2 describes paleolimnological investigations to compare past and current trophic conditions, groundwater studies to assist with understanding, management, and stewardship of groundwater and surface water, and a 2010 Watershed Management Plan. Funding of implementation projects includes Clean Water Fund grants and Section 319 funding. Follow-up monitoring and adaptive management will be ongoing in the watershed. Permitting will assist with the point sources, and Washington County will have septic system inspections with property transfer.

Clean Water Legacy Act (CWLA) is a statute passed in Minnesota in 2006 for the purposes of protecting, restoring, and preserving Minnesota water. The CWLA provides the process to be used in Minnesota to develop TMDL implementation plans, which detail the restoration activities needed to achieve the allocations in the TMDL. The TMDL implementation plans are required by the State to obtain funding from the Clean Water Fund. The Act discusses how MPCA and the involved public agencies and private entities will coordinate efforts regarding land use, land management, water management, etc. Cooperation is also expected between agencies and other entities regarding planning efforts, and various local authorities and responsibilities. This would also include informal and formal agreements and to jointly utilize technical educational, and financial resources. MPCA expects the implementation plans to be developed within a year of TMDL approval.

The CWLA also provides details on public and stakeholder participation, and how the funding will be used. The implementation plans are required to contain ranges of cost estimates for both point and nonpoint source load reductions, as well as monitoring efforts to determine effectiveness. MPCA has developed guidance on what is required in the implementation plans (Implementation Plan Review Combined Checklist and Comment, MPCA), which includes cost estimates, general timelines for implementation, and interim milestones and measures. The Minnesota Board of Soil and Water Resources administers the Clean Water Fund as well, and has developed a detailed grants policy explaining what is required to be eligible to receive Clean Water Fund money (FY '11 Clean Water Fund Competitive Grants Policy; Minnesota Board of Soil and Water Resources, 2011). Section 17.4 of the TMDL includes estimates of the cost of implementation of the TMDL as required by the Clean Water Legacy Act; cost estimates range from $1,500,000 to $6,500,000. There are implementation plans and actions by many entities, and water quality restoration will be lead by the CMSCWD and the WCD.

EPA finds that this criterion 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.

<u>Comment:</u>
Section 15 of the TMDL states that the ten lakes in the study area will be closely monitored by CMSCWD. Monitoring will be for both in-lake water quality and BMP effectiveness. The water quality sampling will cover a wide range of variables, including temperature, dissolved oxygen, pH, transparency, TP, TKN, chlorophyll-a, dissolved orthophosphate, iron, and planktonic and macrophyte samples.

EPA finds that this criterion has been adequately addressed.

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.

<u>Comment:</u>
Section 16.1.5 of the TMDL states that the implementation would include both watershed and in-lake load reductions, with special emphasis on achieving the clear water phase in the lakes. Internal loading is considered to be significant and affects physical, chemical, and biological conditions.

- Aquatic plant management will include the treatment (reduction) of curly leaf pondweed to assist in establishing a more diverse plant community;
- Reduction of curly-leaf pondweed will be monitored to be sure the decay does not add to the turbidity of the waters;
- In-lake treatment should be coordinated with watershed loading so that a clear-water state can be maintained.

Biological manipulation of the fish community in the lakes can add processes that increase the health of the lake. The benthic fish community may need reduction; they stir up bottom sediment and resuspend sediment and phosphorus. The zooplanktivores may over-graze the zooplankton which then increases algal production. The undesired communities may be reduced by adding predators, trapping, water level drawdown, or chemical treatment.

Alum treatment binds with phosphorus and precipitates it out of solution and preventing its release. This treatment works best when external inputs are reduced, benthic fish are removed, and fish barriers are installed.

Lake drawdown is effective for improvement of both water quality and aquatic habitat. Exposure of sediment improves aeration and germination of plants other than curly leaf pondweed, compacts sediment to improve support of rooted plants, increases oxygenation, and consolidates organic debris.

The table below is from 16.1.6 of the TMDL and shows the loading sources, issues, and reductions needed from external and internal sources for each lake. Each lake implementation plan should be more effective with the information provided in the implementation categories.

Table 88. Loading Issues Summary

Lake	Dominant Land Covers	Primary Load Sources and Issues	Internal Load Reduction Needed (lb/yr)	Watershed Load Reduction Needed (lb/yr)	Percentage of Watershed Load Reduction by Implementation Category						
					Regulations	New development standards	Redevelopment standards	Public projects	Private projects	Municipal O&M	Education
East Boot	Ag 20% Park 17% Undeveloped 55%	Inlake Feedlot 53% Stormwater 19%	4	23					100		*
Fish	Ag 27% Undeveloped 62%	Shallow – hypereutrophic Stormwater 73% Feedlots, unregistered	31	38					100		*
Goose	Ag 31% SFR 18% Undeveloped 45%	Inlake Stormwater 68% SSTS 19% Feedlots, unregistered	42	75		5		5	90		*
Hay	Ag 28% SFR 27% Undeveloped 35%	Very shallow lake Stormwater 67% SSTS 18% Feedlots, unregistered	15	31					100		*
Jellum's	Ag 36% Undeveloped 44%	Stormwater 57% Long Lake 19% Feedlots, unregistered	55	10					100		*
Long	Ag 32% Undeveloped 54%	Stormwater 66% SSTS 17% Feedlots, unregistered	8	26					100		*
Loon	Ag 33% Park 29% SFR 14% Undeveloped 19%	Inlake Shallow – hypereutrophic Stormwater 70% SSTS 18% Feedlots, unregistered	54	53					20		80
Louise	Ag 40% Park 12% Undeveloped 33%	Inlake Stormwater 67% SSTS 14% Feedlots, unregistered	33	25				10	90		*
Mud	Ag 44% Undeveloped 47%	Inlake Stormwater 60% SSTS 2% Feedlots, unregistered	16	13					100		*
South Twin	Ag 45% SFR 15% Undeveloped 39%	Inlake Stormwater 43% SSTS 16% Feedlots, unregistered	10	11				50	50		*

Implementation Timeline: 15-20 Years * Important but difficult to quantify

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.

Comment:
The TMDL was public noticed from April 16, 2012 to May 16, 2012. Copies of the draft TMDL were made available upon request and on the Internet web site: http://www.pca.state.mn.us/water/tmdl/tmdl-draft.html. MPCA received no public comments during the public comment period, though there is significant stakeholder involvement in the watershed through the CMSCWD. EPA comments included clarification of the MOS and correction of computational errors. MPCA adequately addressed EPA comments.

EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning 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.

Comment:
The EPA received the final Carnelian-Marine-St. Croix Watershed District Multi-Lakes TMDL on July 27, 2012 accompanied by a submittal letter dated July 17, 2012. In the submittal letter, MPCA states that the submission includes the final TMDLs for excess nutrients. The lakes are impaired for a healthy community of cool or warm water sport or commercial fish, aquatic life, and their habitat, and for recreational use and bathing by excess phosphorus.

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

13. Conclusion

After a full and complete review, EPA finds that the phosphorus TMDLs for Carnelian-Marine-St. Croix Watershed Multi-Lakes TMDL satisfies all of the elements of an approvable TMDL. This approval addresses 10 waterbodies for phosphorus contributing to excess nutrient impairment for a total of 10 TMDLs.

Table 1. Impaired Waters Listings

Lake Name	Lake ID
East Boot	82-0034-00
Fish	82-0064-00
Goose	82-0059-00
Hay	82-0065-00
Jellum's	82-0052-02
Long	82-0068-00
Loon	82-0015-02
Louise	82-0025-00
Mud (Main Lake)	82-0026-02
South Twin	82-0019-00

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.