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

FEB - 5 2016

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 Goose Creek Watershed in eastern Minnesota, including supporting documentation and follow up information submitted by the Minnesota Pollution Control Agency (MPCA). The Goose Creek Watershed, which includes the northern portion of the Lower St. Croix River Major Watershed (07030005), is located in eastern Minnesota in the Minneapolis/St. Paul area of the upper Mississippi River Basin in Pine and Chisago Counties, Minnesota. The TMDLs were calculated for Total Phosphorus to address excess nutrients and *E. coli* to address bacteria. The TMDLs include Goose Creek, Rush Creek, and Rock Creek and their watersheds. Six lakes are located in the three watersheds, the North and South Bay of Goose Lake, East and West Rush Lake, Rock Lake, and Horseshoe Lake. The designated use impairment in the lakes and streams is aquatic recreational use, classified as Class 2B waters, defined as and protected for aquatic life (warm and cool water fisheries and associated biota) and recreation (all water recreation activities including bathing).

These TMDLs meet 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 TMDLs. This approval addresses six lakes for total phosphorus, and three creeks for *E. coli* bacteria, for a total of nine TMDLs. The statutory and regulatory requirements, and EPA's review of Minnesota's compliance with each requirement, are described in the enclosed decision document.

wq-iw6-13g

We wish to acknowledge Minnesota's effort in submitting these TMDLs, 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: Celine Lyman, MPCA
Christopher Klucas, MPCA

TMDL: Goose Creek Watershed TMDL, Minnesota
Date: February 2016

DECISION DOCUMENT FOR THE APPROVAL OF THE GOOSE CREEK WATERSHED TMDL, MINNESOTA

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 Total Maximum Daily Loads (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 National Pollutant Discharge Elimination System (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: The Minnesota Pollution Control Agency (MPCA) has submitted the Goose Creek Watershed TMDL which includes the northern portion of the Lower St. Croix River Major Watershed (07030005), located in eastern Minnesota in the Minneapolis/St. Paul area of the upper Mississippi River Basin. The TMDL includes the Goose Creek, Rush Creek, and Rock Creek Watersheds, which all flow to the Lower St. Croix River. There are a total of three creeks and six lakes located in the three watersheds. Table 1 below lists the lakes as the North and South Bay of Goose Lake, East and West Rush Lake, Rock Lake, and Horseshoe Lake; the Creeks include Goose, Rock and Rush. This project is for a total of six phosphorus TMDLs in these six lakes, and three E.coli TMDLs in each of the three creeks.

Table 1. Goose Creek Watershed Impaired Lakes and Streams

Affected Use: Pollutant/Stressor	AUID/ Lake ID	Stream or Lake Name	Location/Reach Description	Designated Use Class	Listing Year	Target Start/ Completion
Aquatic Recreation: Nutrient/Eutrophication Biological Indicators (Phosphorus)	13-0083-01	Goose Lake (North Bay)	5 miles SW of Rush City	2B, 3C	2008	2012/2015
	13-0083-02	Goose Lake (South Bay)	6 miles SW of Rush City	2B, 3C	2008	
	13-0073-00	Horseshoe Lake	4 miles WNW of Harris	2B, 3C	2010	
	58-0117-00	Rock Lake	Pine City	2B, 3C	2016*	
	13-0069-02	Rush Lake (West)	6 miles W of Rush City	2B, 3C	2008	
	13-0069-01	Rush Lake (East)	5 miles W of Rush City	2B, 3C	2008	
Aquatic Recreation: *Escherichia coli*	07030005-510	Goose Creek	Goose Lake to St. Croix River	2B, 3C	2012	
	07030005-584	Rock Creek	Rock Lake to St. Croix River	1B, 2Bd, 3C	2012	
	07030005-509	Rush Creek	Rush Lake to St. Croix River	1B, 2Bd, 3C	2010	

* Expected to be listed on the 2016 or 2018 303(d) Impaired Waters List.

The watersheds are located in the North Central Hardwood Forest Ecoregion and are shown in Tables 4 and 5 below, taken from Sections 3.1 and 3.2 of the TMDL. The lake characteristics described include surface area, littoral area, volume, mean depth, maximum depth, watershed area, and the ratio of the watershed area to the surface area. Two lakes (Goose Lake North Basin and Rock Lake) are categorized as shallow by Minnesota's definition, less than 15 feet in depth. The creek characteristics include the direct drainage area, total watershed area, and the upstream impaired waterbody.

Table 4. Impaired lake physical characteristics. Note that the watershed area includes the surface area of the lake.

Lake	Surface area (ac)	Littoral area (% total area)	Volume (acre-feet)	Mean depth (feet)	Maximum depth (feet)	Watershed area (incl. lake area) (ac)	Watershed area : Surface area
Goose Lake (North Bay)	272	100	1,373	5.1	9	9,293	34:1
Goose Lake (South Bay)	447	45	6,409	14.3	55	7,696	17:1
Horseshoe Lake	224	59	2,917	13.0	53	4,055	18:1
Rock Lake	81	81	766	9.5	32	6,264	77:1
Rush Lake (West)	1,579	53	19,999	12.7	42	15,509	10:1
Rush Lake (East)	1,484	76	12,997	8.8	24	22,557	15:1

Table 5. Impaired stream direct drainage and total watershed areas

AUID	Name	Direct Drainage Area (ac)	Total Watershed Area (ac)	Upstream Impaired Water body
07030005-510	Goose Creek	31,461	44,809	Goose Lake (North Bay)
07030005-584	Rock Creek	29,818	36,141	Rock Lake
07030005-509	Rush Creek	14,600	36,514	Rush Lake (East)

Land use: The land use for the lake watersheds is described in Section 3.4 of the TMDL, shown in Table 6 below. Overall, the highest percentage of land use for each lake drainage area is cropland use ranging from 18.9 – 29.8%, and grass/pasture/hay use ranging from 17.0 - 41.1%, followed by open water, wetlands, and wooded; the smallest percentage of land use is developed land ranging from 4.5 - 6.7%.

Stream drainage area land uses are presented using single and combined watersheds and show a wider percentage range in some land uses depending on which portion of the watershed is evaluated (Table 7 below). Overall, the total watershed land use of all three watersheds combined in the TMDL document is grass/pasture/hay use 27.9%, cropland 26.5%, the smallest percentage of land use is open water at 3.9%. When comparing single watersheds, the woodlands, cropland and grass/pasture/hay land use category percentages may vary greatly.

Table 6. Land cover by impaired lake subwatershed (NLCD 2006)

Land Cover Type	Goose Lake North Bay	Goose Lake South Bay	Horseshoe	Rock	West Rush	East Rush
Open Water	16.7%	7.7%	6.4%	1.6%	11.4%	21.8%
Developed	4.5%	6.0%	6.1%	6.7%	5.2%	4.6%
Woodland	8.7%	16.7%	20.4%	6.4%	11.2%	8.8%
Grass/Pasture/Hay	24.8%	31.3%	29.7%	41.1%	29.5%	17.0%
Cropland	23.0%	18.9%	24.2%	29.8%	20.4%	24.3%
Wetland	22.3%	19.5%	13.3%	14.5%	22.3%	23.5%

Table 7. Land cover by stream subwatershed (NLCD 2006)

Land Cover Type	Rock Creek	Rock - St. Croix	Rush Creek	Rush/ Goose - St. Croix	Goose Creek	Total Watershed
Open Water	0.3%	1.8%	9.3%	4.3%	3.5%	3.9%
Developed	6.5%	3.3%	6.7%	4.2%	6.4%	5.8%
Woodland	7.8%	41.4%	13.2%	42.9%	21.0%	19.4%
Grass/Pasture/Hay	37.4%	10.7%	27.9%	12.6%	28.4%	27.9%
Cropland	38.6%	10.0%	24.0%	13.5%	22.8%	26.5%
Wetland	9.3%	32.8%	18.9%	22.6%	18.0%	16.5%

Problem Identification: Section 1.4.2 of the TMDL states that there is eutrophication in the lakes, causing excessive algal growth and decreased transparency which affects the aquatic life use. Section 3.5 continues to describe that the lakes are impaired for the aquatic recreation designated use of fishing, swimming, canoeing, including bathing due to excess **nutrients (phosphorus).** Rather than only phosphorus being used to determine impairment, two more parameters are measured in addition to phosphorus: chlorophyll-a and Secchi depth. Growing season means were calculated for all three parameters from June-September, and exceedance of standards occurred for all three when compared to the standards for both deep and shallow lakes. In some of the lakes there is a resultant low dissolved oxygen (DO) level with depth, and fish kills have been recorded due to the low DO as shown in the Appendix of the TMDL.

Section 3.5.1 states that information for macrophytes and fish was gathered in the lakes then compiled by the DNR and volunteers. Curlyleaf pondweed is an invasive species and can have adverse effects on WQ and native plant species, and can increase with increases in phosphorus (Section 14.2.3 in the TMDL).

The streams are impaired for aquatic recreation use by ***E.coli*** and had the highest concentrations between June and August. Section 2.2 of the TMDL describes the problems occurring from excess *E. coli* in water. Pathogenic bacteria, viruses and protozoa are health risks to humans causing illness, gastrointestinal problems, skin irritation and other symptoms.

Pollutant of Concern: The pollutants of concern are excess **nutrients** and ***E. coli.*** Phosphorus was identified as causing eutrophication of the lakes which show high values of phosphorus, chlorophyll-a, and Secchi transparency depths below the standards. ***E. coli*** was identified as the pollutant causing bacteria exceedance.

Source Identification for Phosphorus: Section 3.6.1 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.

Point sources of Phosphorus in the watershed are described in Section 4.1.3 of the TMDL and include:

- Regulated Construction Stormwater (4.1.3.1) – regulations are applicable when more than one acre of soil is disturbed, or less than one acre is disturbed but is part of a larger

common plan, or less than one acre and the MPCA has determined that the activity may be at risk to water resources. Overall, this source is minimal in the TMDL watershed. A categorical WLA is assigned to all of these sources. In each of Chisago and Pine Counties, the percentage of total county area annually affected by construction activity is 0.07% and 0.01%, respectively;

- Regulated Industrial Stormwater (4.1.3.2) – this stormwater is regulated by NPDES permits, if the activity has the potential for stormwater discharges; it is a small fraction of the watershed area and loading; it can be aggregated as a categorical WLA;
- Municipal separate storm sewer systems (MS4s) (4.1.3.3) – An MS4 is a system of conveyances such as roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, storm drains. MS4 permits are mandatory for locations based on the census population of at least 50,000 and a density of at least 1,000 per square mile. There are no MS4s or roads under MS4 permit coverage in the impaired watersheds;
- Other regulated wastewater (4.1.3.4) – there is no other regulated wastewater in the impaired lake subwatersheds;
- Feedlots requiring permit coverage (4.1.3.5) – there are animal feeding operations (AFOs) but none are large enough for MPCA permit requirements. An AFO is the confined holding of animals where manure may accumulate and where vegetative cover cannot be maintained due to the density of animals. The animal feedlots that trigger a permit are those that have a capacity of 1,000 animal units or more, or meet or exceed the EPA's Concentrated Animal Feeding Operations (CAFO) threshold and discharge to Waters of the United States.

Nonpoint sources of Phosphorus were evaluated in Section 3.6.1.1 of the TMDL and include watershed runoff, loading from upstream waters, runoff from feedlots not requiring NPDES permit coverage, shoreline septic systems, atmospheric deposition, and internal lake loading:

- direct watershed runoff – runoff from the watershed drainage area to impaired lakes and streams. Calculations included overland runoff flow and phosphorus load via land cover, soil type, runoff curve numbers, annual rainfall, event mean concentrations, soil erosion rates, feedlots, and septic system information;
- loading from upstream lakes – four of the six lakes addressed in the TMDL have direct hydrologic connectivity to upstream waters: Goose Lake (South Bay) is upstream of Goose Lake (North Bay), Mandall Lake is upstream of Goose Lake (South Bay), Little Horseshoe Lake is upstream of Horseshoe Lake, and Rush Lake (West) is upstream of Rush Lake (East);
- runoff from feedlots not requiring permits – applicable to locations with less than 1,000 animal units. The potential runoff is from precipitation and snow melt;
- subsurface sewage treatment systems (SSTS) - were estimated based on assumptions and county-specific estimates of failing private septic system on shorelines. Chisago County found that 18% were found to be failing (of 64% inspected). Pine County inspected 47% of all systems in the county and 64% were found to be failing, applicable to Rock Lake. The Chisago County failure rate (18%) applies to the other five lakes;

- atmospheric deposition – phosphorus bound to particulates settling out of the atmosphere to surface waters; and,
- internal loading – release from bottom sediments occurs through various mechanisms, 1) when anoxic conditions in the bottom of the lake release phosphorus into the water column, 2) physical disturbance (fish, wind, boats), especially in shallow lakes, or 3) release of phosphorus from decay of curly leaf pondweed when it dies back in mid-summer. Release rates vary, based on the shallowness of the lake where sediments can be easily disturbed by wind and physical disturbance. Due to the difficulty of estimating internal loading from physical disturbance and decaying pondweed, these two mechanisms were not included in the internal loading of phosphorus.

Source Identification for Bacteria: Section 3.6.2 of the TMDL states that both point and nonpoint sources contribute to elevated *E. coli* in the streams, but the watersheds are dominated by nonpoint sources. Analysis used windshield surveys, desktop analysis, and human and animal population calculations. Population estimates were linked to individual land uses in GIS, such as a duck population that is assigned to open water land uses. Bacteria estimates are based on bacteria content and excretion rates.

Point sources of E. coli (Section 3.6.2.1) include:

- Wastewater Treatment Facilities (WWTF) – fecal coliform is tested on a weekly basis, and dischargers to Class 2 waters are required to disinfect from April through October. Bacteria loads were estimated based on the design flow and permitted bacteria effluent limit. Facilities in the watershed include the Harris WWTP (Lower Goose Creek watershed), and the Rush City WWTP and Shorewood Park Sanitary District, both in the Rush Creek watershed.
- Land application of biosolids - application of biosolids from WWTFs is highly regulated, monitored, and tracked. Land application is not included as a source of bacteria because the regulations for land application result in minimal possibility of mobilization of bacteria.

Nonpoint sources of E. coli (Section 3.6.2.2) were evaluated and include:

- SSTS – The nonpoint portion of the human source is located in the rural areas connected to SSTS. Populations were determined using 2010 Census block group data. In urban areas the blocks are city blocks using street boundaries, and in rural areas the census blocks may vary in size and not use street boundaries. Total populations and households were used for calculations; there are sewered communities in urban areas and unsewered communities with SSTS in the watershed.
- Combined Sewer Overflows (CSOs) – Overflow events from pipes occur when heavy rain or melting snow causes the sanitary sewage to overflow. There are no CSOs in these watersheds.
- Illicit Discharges from Unsewered Communities – failing septic systems occur throughout small communities. There may be inadequate septic design or discharges from failing systems in unsewered communities with illegal straight pipe discharges. Minnesota has identified the percent of systems in unsewered communities and Table 21 in the TMDL is

an estimate of the percent of Imminent Threat to Public Health & Safety Systems (ITPHSS) by County, with Chisago County at a 0% estimate and Pine County at 26%.

- Land Application of Septage – "Disposal contractors are required to properly treat and disinfect septage through processing or lime stabilization. Treated septage may then be disposed of onto agricultural and forest lands.... The MPCA does not directly regulate the land application of septage, but management guidelines entail site suitability requirements with respect to soil conditions, slope, and minimum separation distances.... application of septage was not included as a source of fecal pollution in this study..."
- Companion Animals – Dog waste may be a significant source in the immediate vicinity, but are only minor contributors on a watershed scale.
- Livestock – windshield survey estimates were completed during the summer of 2014. Cows, horses, goats and sheep were quantified. All of the subbasins (22) had grazing cows and horses, one subbasin had goats, and five had sheep. One subbasin had confined cows.
- Animal Feeding Operations – "The primary goal of the state program for animal feeding operations (AFO) is to ensure that surface waters are not contaminated by the runoff from feeding facilities, manure storage or stockpiles, and cropland with improperly applied manure...Livestock manure is often either surface applied or incorporated into farm fields as a fertilizer and soil amendment...entering waterways from overland runoff and drain tile intakes...concentrations of fecal bacteria leaving fields with incorporated manure and open tile intakes." There is one AFO in the Goose Creek Watershed and the manure is applied to locations in the Rush Creek watershed.
- Grazing – the number of grazing animals was determined by windshield survey. Though there are buffer strip requirements to have permanent vegetation 50 feet wide to protect lakes, rivers, and streams, and ditches require 16.5 foot buffer strips on each side, there is limited enforcement statewide. The watershed has grazing cattle, sheep and goats.
- Wildlife – wildlife numbers were estimated from permit areas and zones from DNR population data, and include breeding ducks, deer, geese, pigeons, and raccoons. Bacteria loads were calculated based on population and bacteria production rates of wildlife.

Priority Ranking: Section 1.3 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 the impairment impacts on public health and aquatic life, public value of the impaired water, likelihood of completing the TMDL and restoring the water, local technical capability and willingness to assist with the TMDL, and sequencing of TMDLs within a watershed.

Future growth: Section 5 of the TMDL states that changes may occur in the TMDL in the future when certain conditions change in the watershed, such as:

- new development within an MS4 so a transfer from LA to WLA may occur;
- changes from one MS4 to another;
- change from non-regulated MS4s to regulated MS4s;
- changes for expansion (i.e., a new highway in a newly expanded urban area); and,
- new MS4s or stormwater-related point sources.

There are also procedures in place where expanding wastewater effluent discharges to a waterbody that has an approved TMDL, and may involve a permit reissuance or modification.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the first criterion.

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 of the TMDL states that the listed lakes and rivers are classified as Class 2B, to protect the use of aquatic life and aquatic recreation. Minnesota Rules Chapter 7050.0140, Subp. 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 Minnesota Rules 7050.0222, Subp. 4: "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 for Phosphorus: MPCA lake standards differ based on classification as deep or shallow lakes using a maximum depth for shallow lakes at < 15 feet, or if the littoral area where depth is < 15 feet covers at least 80% of the lake's surface area; it also uses the ecoregional location (North Central Hardwoods Ecoregion) to determine standards for a waterbody. Three criteria are included in the nutrient standards for the six lakes, total phosphorus (the causal factor) and chlorophyll-a and Secchi disc depth (response factors). Standards must be exceeded in the

growing season from June – September to be listed as impaired (Minnesota Rules 7050.0150, Subp. 5). Four lakes are deep and two are shallow in the TMDL watershed. The numeric criteria are shown below in Table 2 from the TMDL, and are the targets for TMDL development.

Table 2. Lake Eutrophication Standards

Ecoregion	TP (µg/L)	Chl-a (µg/L)	Secchi (m)
North Central Hardwood Forests: General (Deep) Including: Goose Lake (South Basin), Horseshoe Lake, Rush Lake (West), Rush Lake (East)	< 40	< 14	> 1.4
North Central Hardwood Forests: Shallow Lakes Including: Goose Lake (North Basin), Rock Lake	< 60	< 20	> 1.0

Standards for E. coli: the three streams are impaired for the aquatic recreation use by bacteria and Minnesota uses *E. coli* as the bacteria indicator. The standards for *E. coli* are found in Minnesota Rules 7050.0222; the primary contact standards apply from April 1 through October 31. The table below is a portion of Table 3 in the TMDL document and only includes *E. coli* standards because they were used in the development of these TMDLs. These standards are the targets for TMDL development.

Table 3 (excerpt). Current numeric water quality standards of bacteria for the beneficial use of aquatic recreation (primary and secondary body contact).

Current Standard	Units	Notes
E. coli	126 orgs per 100 ml	Geometric mean of ≥5 samples per month (April - October)
E. coli	1,260 orgs per 100 ml	<10% of all samples per month (April - October) that individually exceed

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the second criterion.

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 six lakes and three creeks. The WLAs are for construction and industrial stormwater permits; there are no MS4 or highway WLAs in the TMDL watershed. The LAs are for watershed runoff, failing septics, lake outflows, internal loading, and atmospheric sources.

Table 31. Goose Lake North TP TMDL and Allocations

Goose Lake North Load Component		Existing	TMDL		Reduction[2]	
		(lb/yr)	(lb/yr)	(lb/day)	(lb/yr)	(%)
Wasteload Allocations	Construction stormwater (MNR100001)	0.455	0.455	0.00125	0.0	0%
	Industrial stormwater (MNR50000)	0.455	0.455	0.00125	0.0	0%
	Total WLA	**0.9**	**0.9**	**0.00249**	**0.0**	
Load Allocations[1]	*Watershed runoff*	*583.3*	*236.7*	*0.648*	*346.6*	*60%*
	Failing septics	*7.7*	*0.0*	*0.000*	*7.7*	*100%*
	Goose Lake South Outflow	*663.1*	*428.8*	*1.175*	*234.3*	*35%*
	Internal loan	*3,993.2*	*539.5*	*1.478*	*3,453.7*	*86%*
	Total Watershed/In-lake	5,247.4	1,205.0	3.301	4,042.3	77%
	Atmospheric	65.5	65.5	0.179	0.0	0%
	Total LA	**5,312.8**	**1,270.5**	**3.480**	**4,042.3**	
MOS			**141.3**	**0.387**		
TOTAL		**5,313.7**	**1,412.7**	**3.869**	**4,042.3**	**76%**

[1] LA components are broken down for guidance in implementation planning; loading goals for these components may change through the adaptive implementation process, but the total LA for each lake will not be modified from the total listed in the table above.

[2] Net reduction from current load to TMDL is 3,901 lbs/yr; but gross load reduction from all sources must accommodate the MOS as well, and hence is 3,901 + 141.3 = 4,042.3 lbs/yr.

Table 32. Goose Lake South TP TMDL and Allocations

Goose Lake South Load Component		Existing	TMDL		Reduction[2]	
		(lb/yr)	(lb/yr)	(lb/day)	(lb/yr)	(%)
Wasteload Allocations	Construction stormwater (MNR100001)	0.42	0.42	0.0012	0.0	0%
	Industrial stormwater (MNR50000)	0.42	0.42	0.0012	0.0	0%
	Total WLA	**0.8**	**0.8**	**0.0023**	**0.0**	
Load Allocations[1]	*Watershed runoff*	*1,202.0*	*636.8*	*1.800*	*565.2*	*47%*
	Failing septics	*11.0*	*0.0*	*0.000*	*11.0*	*100%*
	Natural Lake Outflow	*502.9*	*237.7*	*0.651*	*265.2*	*53%*
	Internal load	*228.8*	*187.6*	*0.541*	*41.3*	*18%*
	Total Watershed/In-lake	1,944.7	1,052.1	2.882	892.7	46%
	Atmospheric	107.8	107.8	0.295	0.0	0%
	Total LA	**2,052.5**	**1,159.9**	**3.177**	**892.7**	
MOS			**129.0**	**0.353**		
TOTAL		**2,053.4**	**1,289.7**	**3.532**	**892.7**	**43%**

[1] LA components are broken down for guidance in implementation planning; loading goals for these components may change through the adaptive implementation process, but the total LA for each lake will not be modified from the total listed in the table above.

[2] Net reduction from current load to TMDL is 763.7 lbs/yr; but gross load reduction from all sources must accommodate the MOS as well, and hence is 763.7 + 129.0 = 892.6 lbs/yr.

Table 33. Horseshoe Lake TP TMDL and Allocations

Horseshoe Lake Load Component		Existing	TMDL		Reduction[2]	
		(lb/yr)	(lb/yr)	(lb/day)	(lb/yr)	(%)
Wasteload Allocations	Construction stormwater (MNR100001)	0.494	0.494	0.0014	0.0	0%
	Industrial stormwater (MNR50000)	0.494	0.494	0.0014	0.0	0%
	Total WLA	**1.0**	**1.0**	**0.0028**	**0.0**	
Load Allocations[1]	*Watershed runoff*	*1,275.5*	*722.8*	*1.980*	*552.7*	*44%*
	Failing septics	*9.9*	*0.0*	*0.000*	*9.9*	*100%*
	Little Horseshoe Lake Outflow	*35.7*	*25.8*	*0.071*	*9.8*	*27%*
	Total Watershed/In-lake	1,321.1	748.6	2.051	572.5	43%
	Atmospheric	54.0	54.0	0.148	0.0	0%
	Total LA	**1,375.1**	**802.6**	**2.199**	**572.5**	
MOS			**89.3**	**0.245**		
TOTAL		**1,376.1**	**892.9**	**2.447**	**572.5**	**42%**

[1] LA components are broken down for guidance in implementation planning; loading goals for these components may change through the adaptive implementation process, but the total LA for each lake will not be modified from the total listed in the table above.

[2] Net reduction from current load to TMDL is 483.2 lbs/yr; but gross load reduction from all sources must accommodate the MOS as well, and hence is 482.3 + 89.3 = 572.5 lbs/yr.

4.1.6.4 Rock Lake (58-0117-00) Phosphorus TMDL

Rock Lake Load Component		Existing	TMDL		Reduction[2]	
		(lb/yr)	(lb/yr)	(lb/day)	(lb/yr)	(%)
Wasteload Allocations	Construction stormwater (MNR100001)	0.12	0.12	0.0003	0.0	0%
	Industrial stormwater (MNR50000)	0.12	0.12	0.0003	0.0	0%
	Total WLA	**0.2**	**0.2**	**0.0006**	**0.0**	
Load Allocations[1]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Total Watershed/In-lake	7,694.5	1,053.8	2.890	6,640.7	86%
	Atmospheric	19.6	19.6	0.054	0.0	0%
	Total LA	**7,714.1**	**1,073.4**	**2.944**	**6,640.7**	
	MOS		**119.3**	**0.327**		
	TOTAL	**7,714.3**	**1,192.9**	**3.272**	**6,640.7**	**86%**

[1] LA components are broken down for guidance in implementation planning; loading goals for these components may change through the adaptive implementation process, but the total LA for each lake will not be modified from the total listed in the table above.

[2] Net reduction from current load to TMDL is 6,521.4 lbs/yr; but gross load reduction from all sources must accommodate the MOS as well, and hence is 6,521.4 + 119.3 = 6,640.7 lbs/yr.

Table 34. Rush Lake West TP TMDL and Allocations

Rush Lake West Load Component		Existing	TMDL		Reduction[2]	
		(lb/yr)	(lb/yr)	(lb/day)	(lb/yr)	(%)
Wasteload Allocations	Construction stormwater (MNR100001)	1.5	1.5	0.004	0.0	0%
	Industrial stormwater (MNR50000)	1.5	1.5	0.004	0.0	0%
	Total WLA	**3.0**	**3.0**	**0.008**	**0.0**	
Load Allocations[1]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Total Watershed/In-lake	6,408.7	2,592.7	7.103	3,816.0	60%
	Atmospheric	880.5	880.5	1.043	0.0	0%
	Total LA	**6,789.2**	**2,973.2**	**8.146**	**3,816.0**	
	MOS		**330.7**	**0.906**		
	TOTAL	**6,792.2**	**3,306.9**	**9.060**	**3,816.0**	**56%**

[illegible]

Table 35. Rush Lake East TP TMDL and Allocations

Rush Lake East Load Component		Existing (lb/yr)	TMDL (lb/yr)	TMDL (lb/day)	Reduction[3] (lb/yr)	Reduction[3] (%)
Wasteload Allocations	Construction stormwater (MNR100001)	1.1	1.1	0.003	0.0	0%
	Industrial stormwater (MNR050001)	1.1	1.1	0.003	0.0	0%
	Total WLA	**2.2**	**2.2**	**0.006**	**0.0**	
Load Allocations[1]	Goose Lake (North) outflow	4,734.7	1,744.2	4.780	1,203.0	41%
	Horseshoe Lake outflow	1,261.1	464.5	1.273	320.5	41%
	Watershed runoff (unmonitored)	1,444.9	481.3	1.319	243.1	17%
	Stream bank	1,299.7	434.7	1.191	281.1	19%
	Total Watershed/In-lake	5,376.6	2,525.8	6.921	2,847.0	53%
	Atmospheric	357.6	357.6	0.980	0.0	0%
	Total LA	**5,734.4**	**2,887.4**	**7.911**	**2,847.0**	
	MOS		**321.0**	**0.879**		
	TOTAL	**5,736.6**	**3,210.6**	**8.796**	**2,847.0**	**50%**

[1] LA components are broken down for guidance in implementation planning; loading goals for these components may change through the adaptive implementation process, but the total LA for each lake will not be modified from the total listed in the table above.

[2] The load from Rush Lake West under the TMDL scenario assumes it meets its water quality standards.

[3] Net reduction from current load to TMDL is 2,526 lb/yr, but gross load reductions from all sources must accommodate the MOS as well, and hence is 2,526 + 321.0 = 2,847.0 lb/yr.

Table 37. Goose Creek *E. coli* TMDL and allocations

Goose Creek 07030005-510 Load Component		Flow Regime: Very High	High	Mid	Low	Very Low
		Billion organisms per day				
Existing Load		34.1	179.7	118.9	36.0	8.5
Wasteload Allocations	*Harris WWTP MN00500330*	0.6	0.6	0.6	0.6	0.6
	Total WLA	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
Load Allocations	*Goose Lake (North) outflow*	61.3	29.8	8.4	4.8	1.7
	Horseshoe Lake outflow	26.9	9.1	3.7	1.9	0.8
	Watershed runoff	247.8	88.9	26.9	11.7	4.2
	Total LA	**336.0**	**119.8**	**38.6**	**17.5**	**7.2**
MOS		37.4	13.4	4.3	2.0	0.9
Total Loading Capacity		374.0	133.8	43.5	20.1	8.7
Estimated Load Reduction		0 0%	45.9 26%	75.4 63%	16.9 44%	0 0%

*Existing loads estimated with limited water quality monitoring data

Table 38. Rush Creek *E. coli* TMDL and allocations

Rush Creek 07030005-509 Load Component		Flow Regime				
		Very High	High	Mid	Low	Very Low
		Billion organisms per day				
Existing Load		20.5*	207.2	89.1	87.9	10.5
Wasteload Allocations	Sharewood Park Sanitary District, MN0051390	0.1	0.1	0.1	0.1	0.1
	Rush City WWTP, MN0021342	1.9	1.9	1.9	1.9	1.9
	Total WLA	2.0	2.0	2.0	2.0	2.0
Load Allocations	Rush Lake (East)	177.4	97.2	50.5	23.8	8.1
	Watershed runoff	178.5	66.1	35.9	14.6	2.9
	Total LA	355.9	165.8	84.4	37.4	11.0
MOS		36.1	18.7	9.6	4.4	1.5
Total Loading Capacity		361.0	186.5	96.0	43.8	14.5
Estimated Load Reduction		0.0	20.7	0.0	65.6	0.0
		0%	15%	0%	54%	0%

* Existing loads estimated with limited water quality monitoring data

Table 39. Rock Creek E. coli TMDL and allocations

Rock Creek 07030005-584 Load Component		Flow Regime				
		Very High	High	Mid	Low	Very Low
		Billion organisms per day				
Existing Load*		958.5	945.9	133.9	44.9	7.5
Load Allocations	Rock Lake outflow	181.6	91.4	10.7	5.5	3.7
	Watershed runoff	735.5	121.2	36.9	18.6	14.4
	Total LA	935.1	152.6	47.2	24.1	18.0
MOS		103.9	17.0	5.2	2.7	2.0
Total Loading Capacity		1039.0	169.6	52.4	26.8	20.0
Estimated Load Reduction		0.0	776.3	81.49	17.5	0.0
		0%	82%	61%	39%	0%

* Existing loads estimated with limited water quality monitoring data at all flow regimes

Methodology for Lakes - The approach for the phosphorus TMDLs in the lakes is the BATHTUB Version 6.1 steady state mass balance model, described in Section 4.1 of the TMDL. The modeling process uses segments (for lakes and reservoirs) and tributaries to the lakes to determine inputs and outputs for the mass balance simulation. Inputs of phosphorus into the model include tributaries, watershed runoff, atmospheric deposition, internal sources and groundwater; outputs occur from the lake outlet, evaporation, and phosphorus sedimentation and retention in lake sediments. Within BATHTUB, the Canfield-Bachmann equation was used in the lakes, except for Rock Lake, for determination of sedimentation rates.

Load Allocation Methodology for Lakes - Section 3.6.1 of the TMDL states that the loading is from direct watershed runoff, upstream lakes, feedlot runoff, SSTS, atmospheric deposition, and internal lake loading, described in detail above in Section 1 of this document. The loading is calculated using several methods depending on the source, and uses a combination of BATHTUB modeling, a spreadsheet tool, and regression equations described below.

- Direct Drainage Watershed Runoff – the EPA Spreadsheet Tool for Estimating Pollutant Load (STEPL) was used to estimate phosphorus volumes and loads from the drainage areas of lakes and streams.

- Upstream Lakes – 15-year mean phosphorus concentrations were used and BATHTUB flow estimates to calculate the loads. Some of the lakes required BATHTUB water quality estimates to be used where there was no in-lake water quality measurement at Little Horseshoe Lake (flowing into Horseshoe Lake), Rabour Lake (upstream of Mandall Lake), and Mandall Lake (upstream of Goose Lake South Bay).

- Runoff from Feedlots Not Requiring NPDES Permit Coverage – The TP load was calculated using assumptions from the *Detailed Assessment of Phosphorus Sources to Minnesota Watersheds*[1] and windshield surveys. There is one AFO in the Goose Creek Watershed and the manure is applied to locations in the Rush Creek watershed.

- Subsurface Sewage Treatment Systems – Phosphorus was calculated based on *Detailed Assessment of Phosphorus Sources to Minnesota Watersheds*[2] and the failure rate of the septic systems as listed by Chisago County (for five lakes) and Pine County (for Rock Lake) in 2012. In Chisago County, 18% of the systems that were inspected failed and 64% of the systems that were inspected in Pine County failed. SSTS are given a 100% reduction in the TMDL tables above.

- Atmospheric Deposition – The atmospheric deposition was calculated for the watershed based on MPCA's calculation from previous studies in the St. Croix River Basin. Calculations used the rates determined from the other nearby studies and applied them to the surface area.

- Internal loading – within the lake, loading can occur by any combination of: 1) chemical reactions of sediments; 2) physical disturbance; and 3) decaying plant matter. For the internal loading due to anoxic conditions in the sediment, calculations use the phosphorus release rates (RR), a lake anoxic factor (AF), and the lake area. Iron-bound phosphorus is also analyzed. Regression equations were used to determine internal loading from the lake sediments as phosphorus goes back into solution. Nürnberg regression equations were developed to calculate phosphorus RRs from measured RRs and sediment phosphorus concentrations from a large set of North American lakes. The processes of physical disturbance and decaying plant matter could not be quantified for this project. Estimates from BATHTUB are usually smaller than calibrated values, because the model dataset is less representative of smaller lakes that experience a greater influence from wind and other physical disturbances, and curlyleaf pondweed that contribute more sediment phosphorus in Rock Lake and Goose Lake North.

[1] MPCA 2004, http://www.pca.state.mn.us/index.php/view-document.html?gid=3980
[2] Ibid.

Wasteload Allocation Methodology for Lakes - Section 4.1.3 of the TMDL states that the loadings from regulated construction stormwater and regulated industrial stormwater are given a categorical WLA. There are no MS4s, regulated wastewater, or permitted feedlots in the TMDL watershed.

Load Allocation Methodology for Streams – Section 4.2 of the TMDL describes the methodology for developing the allocations for bacteria using the Load Duration Curve (LDC). LDCs are developed using flow and pollutant values. A standard curve is developed by applying the criteria to the stream flow duration curve and represents the maximum allowed instream load. Flow data were from MPCA streamflow gages, and *E. coli* standards were used for bacteria values. Long term flow data are used to represent a wide range of flows, then loading capacities are determined for five flow regimes from high flows through low flows. Flow records were used from MPCA gages at Goose Creek, Rush Creek, and Rock Creek. Appendix C in the TMDL states that historical precipitation data that was used ranged from the 10^{th} to the 99^{th} percentile from 2006-2010.

Figure 13 below is taken from the TMDL and illustrates the five flow regimes, very high, high, mid-range, low and very low flow. The points above the curve exceed the *E. coli* standard of 126 org/100ml. Exceedences occur in most months except April, and data are too sparse in October to make an evaluation.

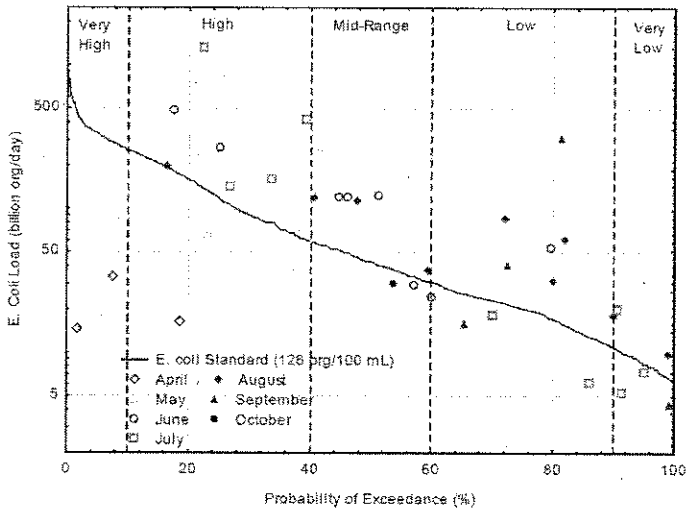

Figure 13. *E. coli* load duration curve for Goose Creek (07030005-510)

Wasteload Allocation Methodology for Streams - Section 4.2.3 of the TMDL states that there is one MS4 community (the city of North Branch) but its land area located within the project area is not covered by the MS4 permit. There are no feedlots large enough to need permits in the TMDL watershed area. There are several facilities with *E. coli* in their discharge permits shown below in Table 36, Shorewood Park Sanitary District, Harris WWTF, and Rush City WWTF.

Table 36. NPDES Permitted Facilities with *E. coli* effluent limits located in the Goose Creek Watershed TMDL Project Area

Facility Name	NPDES Permit	TMDL	Design Flow (MGD)	Effluent Limit, Concentration (org/100 mL)	WLA (bill org/day)
Shorewood Park Sanitary District	MNG580212	Rush Creek	0.395	126	0.1
Harris WWTF	MN0050130	Goose Creek	0.121	126	0.6
Rush City WWTF	MNG580212	Rush Creek	0.015	126	1.9

* Daily WLAs for Minnesota facilities in the SM1 category are calculated from the 2 mg/L concentration assumption and the maximum permitted effluent flow rate of 6"/day over the area of the facility's discharging cell(s). These controlled discharge facilities are designed to store 180 days' worth of influent flow and /or low receiving water temperature. Since these facilities discharge intermittently, their daily WLAs do not represent their annual WLAs divided by the days in a year. Rather they reflect the permitted daily effluent loads as described above.

Critical Conditions: Loading changes greatly over the course of a year, including runoff from snowmelt in the spring, the summer growing season, periodic storm events, and changing agricultural landscapes in the fall. Section 4.1.5 of the TMDL states that the critical condition for phosphorus is accounted for in the allocations in the summer growing season, when there is internal phosphorus loading from shallow lakes, increased temperature resulting in greater algal growth which increases chlorophyll-a; eutrophication standards are developed based on the critical conditions in the growing season, June through September. Section 4.2.5 of the TMDL states that the critical condition is accounted for in the modeling effort for *E. coli* because all seasonal conditions were incorporated into the process, and the *E. coli* standards are applicable for the critical times when recreation occurs in April through October.

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 above in the tables in Section 3, Loading Capacity, for lake outflows, watershed runoff, failing septics, and internal loading.

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:
Wasteload Allocations are presented above in the tables in Section 3, Loading Capacity. The WLAs for phosphorus are from only categorical industrial and construction sites. The average annual fraction of the watershed under construction over the past five years was calculated using construction permit data, area weighted based on the fraction of the subwatershed located in each county. This percentage was multiplied by the watershed runoff load component to determine the construction stormwater WLA (Section 4.1.3.1 of the TMDL). Industrial stormwater was set equal to the construction stormwater since they are both such a small fraction of the watershed area.

The WLAs for *E. coli* are from three facilities, calculated using flow multiplied by the water quality standards for *E. coli*.

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.

Comment:
Section 4.1.4 of the TMDL states that 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. MPCA states in TMDL that the explicit 10% MOS is supported by the good agreement of simulated and observed values for TP loading and flow.

For *E. coli*, extrapolation of flows is necessary to do the LDC analysis, such as area-weighting and regression equations. This, as well as the bacteria regrowth in sediments, die-off, and natural background is not accounted for. The explicit 10% MOS helps to account for these variables.

The MOS for the bacteria TMDLs also incorporated certain conservative assumptions in the calculation of the TMDLs. No rate of decay, or die-off rate of pathogen species, was used in the TMDL calculations or in the creation of load duration curves for E. coli. Bacteria have a limited capability of surviving outside their hosts, and normally a rate of decay would be incorporated. MPCA determined that it was more conservative to use the WQS (126 cfu/100 mL) and not to apply a rate of decay, which could result in a discharge limit greater than the WQS.

As stated in EPA's Protocol for Developing Pathogen TMDLs (EPA 841-R-00-002), many different factors affect the survival of pathogens, including the physical condition of the water. These factors include, but are not limited to sunlight, temperature, salinity, and nutrient deficiencies. These factors vary depending on the environmental condition/circumstances of the water, and therefore it would be difficult to assert that the rate of decay caused by any given combination of these environmental variables was sufficient enough to meet the WQS of 126 cfu/100 mL. Thus, it is more conservative to apply the State's WQS as the MOS, because this standard must be met at all times under all environmental conditions.

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)).

Comment:
Seasonal variation was considered as described in Section 4.1.5 and 4.2.5 of the TMDL. In an average year, there is a large influx of phosphorus into the lakes in the spring. If there are not many runoff events during the growing season months of June through September, a great increase in chlorophyll-a in the warm waters in August or September may occur due to higher temperatures yielding greater algal growth. Increased phosphorus internal loading may occur in shallow lakes. The MPCA takes this seasonal variation into account and load reductions are to meet standards over the course of the growing season from June through September. For *E. coli*, the seasonal variation was described previously: spring snowmelt, summer growing season, and

landscape changes in the fall, and are all included in developing the allocations. Further, all flow conditions were including in the analyses, including baseflow.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the seventh criterion.

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 6 of the TMDL submittal states that there is reasonable assurance that the TMDL will be implemented through both non-regulatory and regulatory means. Land owners implement many Best Management Practices (BMPs), such as conservation tillage, buffer strips, urban BMPs, gully stabilizations, prescribed grazing, manure management. Funding of implementation projects includes grants from the Clean Water, Land, and Legacy Amendment. Section 319 and US Department of Agriculture programs provide cost-share dollars. Funding will be listed in the Goose Creek Watershed Restoration and Protection Strategies (WRAPS). The WRAPS will use GIS tools and the Natural Resource Conservation Service (NRCS) watershed tools to decide where BMPs should be considered. Follow-up monitoring and adaptive management will be ongoing in the watershed to ensure water quality goals are achieved.

General construction permits and regulated industrial stormwater each have BMPs required under their permits, as do MS4s. WWTFs that discharge to waters of the state have permits to meet water quality standards to protect public health and aquatic life, as well as having permit limits for land application of biosolids. Though there are no large feedlots that would require a permit, Section 3.6.2.2 of the TMDL describes the practices applicable to smaller feedlots to ensure that

the surface waters are not contaminated by surface runoff due to improperly applied manure, that there are proper manure stockpiles, storage, and application, and that distances from open tile intakes are maintained. The primary transport is from surface runoff or drain tile intakes. Minnesota has rules for setback requirements for AFOs based on phosphorus transport.

The CWLA was passed in Minnesota in 2006 for the purposes of protecting, restoring, and preserving Minnesota water. The CWLA provides the protocols and practices to be followed in order to protect, enhance, and restore water quality in Minnesota.

The CWLA outlines how MPCA, public agencies and private entities should coordinate in their efforts toward improving land use management practices and water management. The CWLA anticipates that all agencies (i.e., MPCA, public agencies, local authorities and private entities, etc.) will cooperate regarding planning and restoration efforts. Cooperative efforts would likely include informal and formal agreements to jointly use technical, educational, and financial resources.

The CWLA also provides details on public and stakeholder participation, and how the funding will be used. In part to attain these goals, the CWLA requires MPCA to develop Watershed Restoration and Protection Strategies (WRAPS). The WRAPS are required to contain such elements as the identification of impaired waters, watershed modeling outputs, point and nonpoint sources, load reductions, etc. (Chapter 114D.26; CWLA). The WRAPS also contain an implementation table of strategies and actions that are capable of achieving the needed load reductions, for both point and nonpoint sources (Chapter 114D.26, Subd. 1(8); CWLA). Implementation plans developed for the TMDLs are included in the table, and are considered "priority areas" under the WRAPS process (Watershed Restoration and Protection Strategy Report Template, MPCA). This table includes not only needed actions but a timeline for achieving water quality targets, the reductions needed from both point and nonpoint sources, the governmental units responsible, and interim milestones for achieving the actions. MPCA has developed guidance on what is required in the WRAPS (Watershed Restoration and Protection Strategy Report Template, MPCA).

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 2014 Clean Water Fund Competitive Grants Request for Proposal (RFP); Minnesota Board of Soil and Water Resources, 2014).

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the eighth criterion.

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.

Comment:
Section 7.1 of the TMDL states that stream monitoring has occurred at many sites in Chisago and Pine Counties, but there is not a watershed-wide monitoring program. The water quality sampling has covered a wide range of variables, including continuous flow, total suspended solids, TP, total Kjeldahl nitrogen, *E. coli*, and nitrates. Additional monitoring was specifically focused around Goose and Rush Lakes from 2009-2010 by the Soil and Water Conservation District (SWCD) and volunteers from the Goose Chain of Lakes Association and the Rush Lake Improvement Association. In the future the counties and the SWCDs will monitor for nutrients, *E. coli* and flow; alternatively, if not funded, the monitoring will be done following MPCA's 10 year monitoring cycle.

Section 7.2 of the TMDL states that lake monitoring has occurred through volunteers and staff and is planned to continue on a monthly basis. The lakes are generally monitored for TP, chlorophyll-a and Secchi disk transparency. The Department of Natural Resources Section of Fisheries monitors for macrophytes, habitat, and fish surveys; full lake surveys occur about every 10 years. Methods include emergent and floating leaf macrophyte bed delineation, submerged vegetation sampling, and assessment of habitat conditions of developed lake lots. An Index of Biological Integrity is being developed for plants, and fish surveys are conducted every five years on large lakes, every 10 years on small ones.

BMP monitoring will occur to evaluate the BMP effectiveness and then extrapolated to other locations with similar criteria. These criteria may be land use, soil type, other characteristics, and monitoring feasibility.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the ninth criterion.

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.

Comment:
Section 8 of the TMDL states that the implementation for permitted sources would include the construction stormwater and industrial stormwater permits. There are BMPs and other

stormwater controls within the general stormwater permits. The permits would be consistent with the Wasteload Allocations within this TMDL. The possible control measures for the sites are defined in the State's NPDES/State Disposal System (SDS) Industrial Stormwater Multi-Sector General Permit (MNR050000), or NPDES/SDS General Permit for Construction Sand & Gravel, Rock Quarrying and Hot Mix Asphalt Production facilities (MNG490000).

For nonpoint sources, the prioritization of BMPs would include lake and stream reductions before any major in-lake treatments would occur. Subwatershed assessments, mapping and GIS would be used for BMPs, and using the WRAPS process, the GIS Stream Power Index (SPI), flow Accumulation, NRCS watershed tools and other Digital Terrain Analysis tools would be used to optimize locations. The Chisago and Pine County SWCDs would provide technical assistance to landowners for their projects, including training. Programs are available to assist stakeholders, such as State cost-share and Environmental Quality Incentives Program (EQIP) and the Conservation Reserve Program (CRP). The practices may include stormwater bioretention, septic system upgrades, feedlot improvements, invasive species control, wastewater treatment practices, agricultural and rural BMPs (from the WRAPS), and internal loading reduction.

Section 8.2 of the TMDL states that evaluation will occur every five years for the next 25 years to see what should occur or be adapted in the next five year increment. Subwatersheds have ongoing assessments already in place with the Chisago SWCD for Rush Creek, East Rush Lake (east side), and the City of Harris.

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.

Comment:
The TMDL was public noticed from November 2, 2015 to December 4, 2015. Copies of the draft TMDL were made available upon request and on the Internet web site: https://www.pca.state.mn.us/sites/default/files/wq-iw6-13b.pdf. MPCA received two public

comment letters during the public comment period. One letter was from the Minnesota Department of Agriculture requesting details of the STEPL modeling methodology, TMDL corrections and improvements, drainage water management and AFO clarification, the targeting of areas in the WRAPS reports, and the addition/deletion of references. MPCA adequately addressed the comments with further details regarding STEPL, clarification of references, and links to the Chisago SWCD's website to clarify BMP targeting. The second letter was from the St. Croix Basin Water Resources Planning Team in support of the TMDL and the WRAPS for the Goose Creek watershed. There were also comments sent to MPCA by the EPA before the public comment period and MPCA adequately addressed EPA comments. Comments made by participants during the public comment meeting were included and addressed in the public participation section of the TMDL.

There is also ongoing education and civic engagement with local citizens. MPCA will continue with press releases, meetings, workshops, focus groups, trainings, and websites.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the eleventh criterion.

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 Goose Creek Watershed TMDL on January 13, 2016, accompanied by a submittal letter dated January 11, 2016. In the submittal letter, MPCA states that the submission includes the final TMDLs for excess nutrients and *E. coli*. The lakes and streams are impaired for aquatic life and recreational use by excess nutrients (phosphorus) and *E. coli*.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the twelfth criterion.

13. Conclusion

After a full and complete review, EPA finds that the phosphorus and *E. coli* TMDLs for the Goose Creek Watershed TMDL satisfies all of the elements of an approvable TMDL. This approval addresses six lakes for phosphorus, and three creeks for *E. coli* bacteria, for a total of nine TMDLs.

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.