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

REPLY TO THE ATTENTION OF:

WW-16J

JUN 26 2014

Rebecca 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 20 lakes and one stream segment in the Upper Minnehaha Creek watershed, including supporting documentation and follow up information. The Upper Minnehaha Creek watershed is located in central Minnesota in Hennepin and Carver Counties. The TMDLs were calculated for *E. coli* and phosphorus. The TMDLs address the impairment of aquatic life and recreational uses.

EPA has determined that 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 21 TMDLs in the Upper Minnehaha Creek watershed. 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, addressing aquatic life and recreational use, 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
Chris Zadak, MPCA

wq-iw11-17g

TMDL: Upper Minnehaha Creek Watershed TMDLs, Hennepin and Carver Counties, MN
Date: JUN 26 2014

DECISION DOCUMENT
FOR THE UPPER MINNEHAHA CREEK WATERSHED TMDLS, HENNEPIN AND CARVER COUNTIES, MN

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:

The Upper Minnehaha Creek (UMC) watershed is located in Hennepin and Carver Counties, Minnesota, just west of Minneapolis. The watershed contains Lake Minnetonka and numerous small lakes, embayments and small creeks surrounding Lake Minnetonka. Lake Minnetonka discharges into Minnehaha Creek and flows eastward for 22 miles to the Mississippi River. On February 24, 2014, a TMDL was approved for Minnehaha Creek (bacteria) and Lake Hiawatha (phosphorus).

The UMC watershed drains an area of 104 square miles (30,272 acres) surrounding Lake Minnetonka. In 2001, the Minnesota Pollution Control Agency (MPCA) initiated a study of the watershed. As a result of the study, 17 lakes and embayments were placed on the MPCA 303(d) list of impaired waters in 2008 and 2010. Lake Minnetonka has numerous embayments, and MPCA has listed them as separate waterbodies since they have restricted waterflow and function as independent waterbodies. During the development of the TMDL study, MPCA determined that three additional lakes (School, Hadley, and Turbid) are impaired but were not on the approved 2012 MPCA 303(d) list. MPCA also developed TMDLs for these three lakes, and will include these waters on the 2014 303(d) list (Section 1.2 of the TMDL). In addition to the lakes, Painter Creek was also listed as impaired due to excessive pathogens. Table 1 below lists the waterbodies addressed by this TMDL, and Table 2 below lists the lake morphometry for the impaired lakes.

Table 1 Waterbodies Addressed by the UMC Watershed TMDL

Waterbody	AUID #	Pollutant	Impairment
Painter Creek	07010206-700	*E. coli*	pathogens
Dutch	27-0181-00	Total Phosphorus (TP)	Nutrient/Eutrophication, Biological Indicators
East Auburn	10-0044-02	TP	Nutrient/Eutrophication, Biological Indicators
Forest	27-0139-00	TP	Nutrient/Eutrophication, Biological Indicators
Gleason	27-0095-00	TP	Nutrient/Eutrophication, Biological Indicators
Holy Name	27-0158-00	TP	Nutrient/Eutrophication, Biological Indicators
Langdon	27-0182-00	TP	Nutrient/Eutrophication, Biological Indicators
Long	27-0160-00	TP	Nutrient/Eutrophication, Biological Indicators
Minnetonka (Halsted Bay)	27-0133-09	TP	Nutrient/Eutrophication, Biological Indicators
Minnetonka (Jennings Bay)	27-0133-15	TP	Nutrient/Eutrophication, Biological Indicators
Minnetonka (Stubbs Bay)	27-0133-12	TP	Nutrient/Eutrophication, Biological Indicators
Minnetonka (West Arm)	27-0133-14	TP	Nutrient/Eutrophication, Biological Indicators
Mooney	27-0134-00	TP	Nutrient/Eutrophication, Biological Indicators
Stone	10-0056-00	TP	Nutrient/Eutrophication, Biological Indicators
Tamarack	10-0010-00	TP	Nutrient/Eutrophication, Biological Indicators
Tanager	27-0141-00	TP	Nutrient/Eutrophication, Biological Indicators
Wolsfeld	27-0157-00	TP	Nutrient/Eutrophication, Biological Indicators
Snyder	27-0108-00	TP	Nutrient/Eutrophication, Biological Indicators
School (1)	27-0151-00	TP	Nutrient/Eutrophication, Biological Indicators
Hadley (1)	27-0109-00	TP	Nutrient/Eutrophication, Biological Indicators
Turbid (1)	10-0051-00	TP	Nutrient/Eutrophication, Biological Indicators

(1) These lakes are on the draft 2014 303(d) list of impaired waters.

Table 2 Lake Morphometry

Waterbody	Surface area (acres)	Average depth (feet)	Max. depth (feet)	Littoral area (%)	Depth class	Drainage area* (acres)
Dutch	176.0	14. 0	42	59	Deep	1567
East Auburn	147.9	12.0	40	28	Deep	7307
Forest	89.5	14.0	38	59	Deep	855
Gleason	168.	8 6.0	15	100	Shallow	2437
Holy Name	70.0	5.0	8	100	Shallow	388
Langdon	142.4	8.0	32	87	Shallow	913
Long	286.5	14.0	35	54	Deep	5968
Minnetonka (Halsted Bay)	561.1	13.2	32	57	Deep	18760
Minnetonka (Jennings Bay)	305.6	12.0	22	59	Deep	11121
Minnetonka (Stubbs Bay)	198.5	14.0	36	56	Deep	1748
Minnetonka (West Arm)	822.3	13.0	29	71	Deep	12967
Mooney	113.0	5.0	10	100	Shallow	486
Stone	99.3	10.2	30	72	Deep	782
Tamarack	30.0	25.4	82	38	Deep	179
Tanager	53.7	10.0	18	80	Deep	7566
Wolsfeld	40.3	9.5	27	76	Deep	1553
Snyder	12.0	6.0	13	100	Shallow	362
School	11.1	8.1	15	81	Shallow	541
Hadley **	35. 3	17.0	35	unknown	Deep	502
Turbid	39. 9	10.4	35	65	Deep	493

* excludes lake surface
** estimated

Land Use:
The UMC watershed is a primarily mixed watershed, with varying amounts of single family, park and recreation, undeveloped land, and agricultural land in each lake's watershed. Appendix B of the TMDL contains the land use maps for each waterbody. The overall land use for the UMC watershed is in Table 3 below.

MPCA does not anticipate changes in phosphorus loading due to changes in land use within the UMC watershed. Virtually all the land in the watershed addressed by this TMDL is in Municipal Separate Storm Sewer System (MS4) areas, and therefore any changes in land use will be subject to the wasteload allocations (WLAs) calculated for each MS4 (Section 4 of the TMDL).

Table 3 Land Use in the UMC Watershed

2010 Land Use	Area (acres)	Percent
Agricultural	7527	16
Open Water	6402	13
Park, Recreational, Preserve	6647	14
Single Family Detached	10096	21
Undeveloped	13444	28
Other	3644	8
Total	47760	100

Problem Identification:
Lakes: MPCA and the Minnehaha Creek Watershed District (MCWD) have been monitoring the Minnehaha Creek basin for several years. Most of the lakes were originally listed on the Minnesota 303(d) list in 2008 and 2010. These listings were for nutrient/eutrophication, biological indicators due to excessive nutrients (phosphorus). In addition, three lakes have been newly identified as impaired, and included on the draft 2014 303(d) list.

MPCA reviewed data from 2000-2011 for use in the TMDL for most of the lakes, although a small set of lakes only had data from 2005-2011 (Section 3.5.1 of the TMDL). Tables 3.3 and 3.4 of the TMDL summarize the data for each lake, and the in-lake "average" condition from June to September. All the lakes showed exceedences of the TP criteria, and generally exceeded the chl-a and Secchi depth criteria. MPCA noted that although Tamarack Lake did not exceed the TP criteria for the time period 2005-2011, a review of the longer-term data from 2001-2011 showed the average TP concentration exceeded the TP criteria, and therefore developed a TMDL for the lake.

Painter Creek: Painter Creek was added to the 2010 303(d) list for being impaired due to excessive bacteria. MPCA utilized data from four sample stations on Painter Creek to determine that the monthly *E. coli* concentrations in the creek exceeded the *E. coli* criteria. Monthly geometric mean values were exceeded in July, August, and September at almost all sites, and the most downstream sample station exceeded the *E. coli* criteria in October (Table 3.5 of the TMDL). MPCA also analyzed data from two upstream sample sites, and determined that none of the upstream sites had exceedences of the *E. coli* criteria.

Pollutants:
Bacteria: Bacteria exceedances can negatively impact recreational uses (fishing, swimming, wading, boating, etc.) and public health. At elevated levels, bacteria may cause illness within humans who have contact with or ingest bacteria laden water. Recreation-based contact can lead to ear, nose, and throat infections, and stomach illness.

Phosphorus: While total phosphorus (TP) is an essential nutrient for aquatic life, elevated concentrations of TP can lead to nuisance algal blooms that negatively impact aquatic life and recreation (swimming, boating, fishing, etc.). Algal decomposition depletes oxygen levels which stresses benthic macroinvertebrates and fish. Excess algae can shade the water column which limits the distribution of aquatic vegetation. Aquatic vegetation stabilizes bottom sediments, and also is an important habitat for macroinvertebrates and fish. Furthermore, depletion of oxygen can cause phosphorus release from bottom sediments (i.e. internal loading).

Degradations in aquatic habitats or water quality (ex. low dissolved oxygen) can negatively impact aquatic life use. Increased turbidity, brought on by elevated levels of nutrients within the water column, can reduce dissolved oxygen in the water column, and cause large shifts in dissolved oxygen and pH throughout the day. Shifting chemical conditions within the water column may stress aquatic biota (fish and macroinvertebrate species). In some instances, degradations in aquatic habitats or water quality have reduced fish populations or altered fish communities from those communities supporting sport fish species to communities which support more tolerant rough fish species.

Priority Ranking:
The UMC watershed was given priority for TMDL development due to the impairment impacts on public health and aquatic life, the public value of the impaired water resource, the likelihood of completing the TMDL in an expedient manner, the inclusion of a strong base of existing data and the restorability of the water body, the technical capability and the willingness of local partners to assist with the TMDL, and the appropriate sequencing of TMDLs within a watershed or basin. The Lake Minnetonka and Minnehaha Creek watershed are popular locations for aquatic recreation. Water quality degradation has led to efforts to improve the overall water quality within the Upper Minnehaha Creek watershed, and to the development of a TMDL.

Pollutants of Concern:
The pollutants of concern are *E. coli* (Painter Creek) and phosphorus (20 lakes).

Source Identification (point and nonpoint sources):
Point Source Identification*:* The potential point sources for the Painter Creek bacteria TMDL are:

National Pollutant Discharge Elimination Systems (NPDES) permitted facilities:. There are no NPDES individually permitted wastewater facilities within the Painter Creek watershed which discharge bacteria.

Municipal Separate Storm Sewer System (MS4) communities: There are six regulated MS4 permittees within the Painter Creek watershed (Table 4 of this Decision Document). Stormwater from MS4s can transport bacteria to surface water bodies during or shortly after storm events.

Table 4: Regulated MS4 Permittees in the Painter Creek watershed

Permittee	NPDES Permit ID
Hennepin County MS4	MS400138
Independence City MS4	MS400095
Maple Plain City MS4	MS400103
Medina City MS4	MS400105
Minnetrista City MS4	MS400106
Orono City MS4	MS400111

Combined Sewer Overflows (CSOs): There are no CSO communities in the Painter Creek watershed.

Concentrated Animal Feedlot Operations (CAFOs): There are no CAFOs within the Painter Creek watershed.

The potential point sources for the UMC lake nutrient TMDLs are:

NPDES permitted facilities: There is one NPDES individually permitted groundwater remediation facility within the UMC watershed which discharges phosphorus.

MS4 communities: There are nineteen MS4 communities within the UMC watershed (Table 5 of this Decision Document; Table 4.4 of the TMDL). Stormwater from MS4s can transport phosphorus to surface water bodies during or shortly after storm events. Each of the MS4 communities within Table 5 of this Decision Document was assigned a portion of the WLA.

Table 5: Regulated MS4 Permittees in the UMC watershed lakes nutrient TMDL

Regulated MS4 Permittees	NPDES Permit ID
Carver County MS4	MS400070
Chanhassen City MS4	MS400079
Hennepin County MS4	MS400138
Independence City MS4	MS400095
Laketown Township MS4	MS400142
Long Lake City MS4	MS400101
Maple Plain City MS4	MS400103
Medina City MS4	MS400105
Minnehaha Creek WD MS4	MS400182
Minnetonka City MS4	MS400035
Minnetrista City MS4	MS400106
MNDOT Metro District MS4	MS400170
Mound City MS4	MS400108
Orono City MS4	MS400111
Plymouth City MS4	MS400112
Spring Park City MS4	MS400123
St Bonifacius City MS4	MS400124
Victoria City MS4	MS400126
Wayzata City MS4	MS400058

Permitted Construction and Industrial Areas: Construction and industrial sites may contribute phosphorus via sediment runoff during stormwater events. These areas within the UMC watershed must comply with the requirements of the MPCA's NPDES Stormwater Program. The NPDES program requires construction and industrial sites to create SWPPPs which summarize how stormwater pollutant discharges will be minimized from construction and industrial sites. Under the MPCA's Stormwater General Permit (MNR100001) and applicable local construction stormwater ordinances, managers of sites under construction or industrial stormwater permits must review the adequacy of local SWPPPs to ensure that each plan complies with the applicable requirements in the State permits and local ordinances.

CSOs: There are no CSO communities in the UMC watershed.

CAFOs: There are no CAFOs within the UMC watershed.

Nonpoint Source Identification*:* The potential nonpoint sources for the Painter Creek bacteria TMDL are:

Non-regulated stormwater runoff: Non-regulated stormwater runoff can add bacteria to Painter Creek. The sources of bacteria in stormwater include livestock wastes from small farms along the creek. MPCA performed a survey of the watershed to determine the potential for livestock waste to enter Painter Creek. This survey indicated that several small hobby farms and other small farmsteads have livestock grazing alongside Painter Creek (Table 3.9, Appendix C of the TMDL). While limited in number, MPCA believes the manure from these animals is very likely washing off the land surface during rain events, and contributing to the impairment of Painter Creek.

Wildlife: Wildlife is a known source of bacteria in water bodies as many animals spend time in or around water bodies. Deer, geese, ducks, raccoons, and other animals all create potential sources of bacteria. Wildlife contributes to the potential impact of contaminated runoff from animal habitats, such as park areas, forest, and rural areas.

Failing septic systems: MPCA noted that failing septic systems, where waste material can pond at the surface and eventually flow into the creek or be washed in during precipitation events, are potential sources of *E. coli*. However, MPCA determined that there are few houses in the vicinity of Painter Creek, and therefore it is unlikely that failing septic systems are a significant source of bacteria (Table 3.9 of the TMDL).

The potential nonpoint sources for the UMC lake nutrient TMDLs are:

Upstream nutrient load from lakes: Several of the lakes addressed in the TMDL document receive flow from upstream lakes. Some of the upstream lakes are themselves impaired, others are meeting Water Quality Standards (WQS). MPCA discussed how the upstream loads were accounted for in the TMDL calculations in Section 4.1.1.3 of the TMDL.

Non-regulated stormwater runoff: Non-regulated stormwater runoff can add phosphorus to the watershed. The sources of phosphorus in stormwater include: decaying vegetation (leaves, grass clippings, etc.), domestic and wild animal wastes, soil particles, and phosphorus-containing fertilizers.

Atmospheric deposition: Phosphorus may be added via particulate deposition. Particles from the atmosphere may fall onto lake surfaces or other surfaces within the UMC watershed. Phosphorus can be bound to these particles which may add to the phosphorus inputs to surface water environments.

Groundwater discharge: Phosphorus can be added to the lake's water column through groundwater discharge. Phosphorus concentrations in groundwater are usually below the water quality standards for phosphorus. In those instances where significant groundwater discharge into lake environments is occurring, phosphorus inputs can impact the phosphorus budgeting of the water body. Appendix D of the TMDL explains the process MPCA used to determine if groundwater was a source of phosphorus to each of the lakes.

Wildlife: Wildlife is a known source of nutrients in water bodies as many animals spend time in or around water bodies. Deer, geese, ducks, raccoons, and other animals all create potential sources of nutrients. Wildlife contributes to the potential impact of contaminated runoff from animal habitats, such as park areas, forest, and rural areas.

Internal loading: The release of phosphorus from lake sediments via physical disturbance from benthic fish (rough fish, ex. carp), from wind mixing the water column, and from decaying curly-leaf pondweeds may all contribute internal phosphorus loading to the lakes in the UMC watershed. Phosphorus may build up in the bottom waters of the lake and may be resuspended or mixed into the water column when the thermocline decreases and the lake water mixes.

Future Growth:
Almost all of the UMC watershed is covered under MS4 permits. MPCA expects little change in the allocations between point and nonpoint sources. There may be changes in allocations between MS4 entities as land is annexed. These changes will be addressed in the MS4 permits, and any changes in allocations will need to comply with the respective WLA and LA values calculated in the UMC watershed TMDLs.

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 Uses:
Minnesota Rule Chapter 7050 designates uses for waters of the state. The UMC lakes and Painter Creek are all designated as Class 2B water for aquatic recreation use (boating, swimming, fishing, etc.). The Class 2 aquatic recreation designated use is described in Minnesota Rule 7050.0140 (3):

> *"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."*

Standards:
Narrative Criteria: Minnesota Rule 7050.0150 (3) set forth narrative criteria for Class 2 waters of the State:

> *"For all Class 2 waters, the aquatic habitat, which includes the waters of the state and stream bed, shall not be degraded in any material manner, there shall be no material increase in undesirable slime growths or aquatic plants, including*

algae, nor shall there be any significant increase in harmful pesticide or other residues in the waters, sediments, and aquatic flora and fauna; the normal fishery and lower aquatic biota upon which it is dependent and the use thereof shall not be seriously impaired or endangered, the species composition shall not be altered materially, and the propagation or migration of the fish and other biota normally present shall not be prevented or hindered by the discharge of any sewage, industrial waste, or other wastes to the waters."

Numeric criteria:

Bacteria:

Through adoption of WQS into Minnesota's administrative rules (principally Chapters 7050 and 7052), MPCA has identified designated uses to be protected in each of its drainage basins and the criteria necessary to protect these uses. The bacteria water quality standards which apply to Painter Creek are:

Table 6: Bacteria Water Quality Standards Applicable in the Painter Creek TMDL

Parameter	Units	Water Quality Standard
E. coli [1]	# / 100 mL	1,260 in < 10% of samples [2]
		Geometric Mean < 126 [3]

[1] = *E. coli* standards apply only between April 1 and October 31

[2] = Standard shall not be exceeded by more than 10% of the samples taken within any calendar month

[3] = Geometric mean based on minimum of 5 samples taken within any calendar month

Target:

The target is the standard as stated above, for both the geometric mean portion and the daily maximum portion, which is applicable from April 1st through October 31st. However, the focus of this TMDL is on the "chronic" geometric mean standard of 126 cfu/100ml. MPCA believes that utilizing the 126 cfu/100 mL portion of the water quality standard will result in the greatest bacteria reductions within the UMC watershed. Additionally, MPCA believes that the geometric mean is the more relevant value in determining water quality. MPCA stated that while the TMDL will focus on the geometric mean portion of the water quality standard, both parts of the water quality standard must be met.

Phosphorus:

Numeric criteria for total phosphorus, chlorophyll-a (chl-a), and Secchi Disk (SD) depth are set forth in Minnesota Rules 7050.0222. These three parameters are the eutrophication standards that must be achieved to attain the aquatic recreation designated use. The numeric eutrophication standards which are applicable to the lakes are those set forth for Class 2B shallow and deep lakes in the NCHF Ecoregion (Table 7 of this Decision Document). Table 2 of this Decision Document denotes which lakes are defined as shallow and which are defined as deep. In developing the lake nutrient standards for Minnesota lakes, the MPCA evaluated data from a large cross-section of lakes within each of the State's ecoregions. Clear relationships were established between the causal factor, TP, and the response variables, chl-a and SD.

Table 7: MPCA Eutrophication Criteria for shallow and deep lakes in the NCHF Ecoregion

Parameter	Eutrophication Standard (shallow)	Eutrophication Standard (deep)
Total Phosphorus (µg/L)	TP ≤ 60	TP ≤ 40
Chlorophyll-a (µg/L)	chl-a ≤ 20	chl-a ≤ 14
Secchi Depth (m)	SD ≥ 1.0	SD ≥ 1.4

Target:
MPCA selected a target of 40 µg/L of TP (deep lakes) or 60 µg/L of TP (shallow lakes) to develop the lake nutrient TMDLs.

MPCA selected total phosphorus as the appropriate parameter to address eutrophication problems in the lakes because of the interrelationships between TP and chl-a, as well as SD. Algal abundance is measured by chl-a, which is a pigment found in algal cells. As more phosphorus becomes available, algae growth can increase. Increased algae in the water column will decrease water clarity that is measured by SD.

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

Comment:

The approach utilized by the MPCA to calculate the loading capacity for Painter Creek for bacteria and the UMC lakes for nutrients was described in Section 4 of the final TMDL document.

Painter Creek bacteria TMDL:

For the Painter Creek TMDL, a geometric mean of 126 cfu/100 ml *E. coli* for five samples equally spaced over a 30-day period was used to calculate the loading capacity of the TMDL. MPCA believes the geometric mean portion of the WQS provides the best overall characterization of the status of the watershed. The EPA agrees with this assertion, as stated in the preamble of *The Water Quality Standards for Coastal and Great Lakes Recreation Waters Final Rule* (69 FR 67218-67243, November 16, 2004) on page 67224, "...the geometric mean is the more relevant value for ensuring that appropriate actions are taken to protect and improve water quality because it is a more reliable measure, being less subject to random variation, and more directly linked to the underlying studies on which the 1986 bacteria criteria were based."

MPCA stated that while the bacteria TMDLs will focus on the geometric mean portion of the water quality standard (i.e., the chronic WQS of 126 cfu/100mL), attainment of the WQS involves the water body meeting both the chronic (126 cfu/100 mL) and acute (1,260 cfu/100 mL) portions of the water quality standard. EPA finds these assumptions to be reasonable.

Typically loading capacities are expressed as a mass per time (e.g. pounds per day). However, for *E. coli* loading capacity calculations, mass is not always an appropriate measure because *E. coli* is expressed in terms of organism counts. This approach is consistent with the EPA's regulations which define "load" as "an amount of matter that is introduced into a receiving water" (40 CFR §130.2). To establish the loading capacities for the Painter Creek bacteria TMDL, MPCA used Minnesota's water quality standards for *E. coli* (126 cfu/100 mL). A loading capacity is, "the greatest amount of loading that a water can receive without violating water quality standards." (40 CFR §130.2). Therefore, a loading capacity set at the WQS will assure that the water does not violate WQS. MPCA's *E. coli* TMDL approach is based upon the premise that all discharges (point and nonpoint) must meet the WQS when entering the water body. If all sources meet the WQS at discharge, then the water body should meet the WQS and the designated use.

A flow duration curve (FDC) was created for the Minnehaha Creek watershed (Figure 4.2 of the TMDL). The FDC was developed from flow data from a sampling site on Painter Creek (CPA01). Daily stream flows were necessary to implement the load duration curve (LDC) approach. Flow data from the recreational season (April 1 to October1) from 2000 to 2011 were used.

The FDC was transformed into a LDC by multiplying individual flow values by the WQS (126 cfu/100 mL) and then multiplying that value by a conversion factor. The resulting points are plotted onto a load duration curve graph. The LDC graph for the Painter Creek bacteria TMDL has flow duration interval (percentage of time flow exceeded) on the X-axis and *E. coli* loads (number of bacteria per unit time) on the Y-axis. The Painter Creek LDC used *E. coli* measurements in billions of bacteria per day. The curved line on a LDC graph represents the TMDL for the respective flow conditions observed at that location.

E. coli values from the monitoring site were converted to individual sampling loads by multiplying the sample concentration by the instantaneous flow measurement observed/estimated at the time of sample collection. The individual sampling loads were plotted on the same figure with the LDC (Figure 4.3 of the TMDL).

The LDC plots were subdivided into five flow regimes; high flows (exceeded 0–10% of the time), moist conditions (exceeded 10–40% of the time), mid-range flows (exceeded 40–60% of the time), dry conditions (exceeded 60–90% of the time), and low flows (exceeded 90–100% of the time). LDC plots can be organized to display individual sampling loads and the calculated LDC. Watershed managers can interpret these plots (individual sampling points plotted with the LDC) to understand the relationship between flow conditions and water quality exceedances within the watershed. Individual sampling loads which plot above the LDC represent violations of the WQS and the allowable load under those flow conditions at those locations. The difference between individual sampling loads plotting above the LDC and the LDC, measured at the same flow is the amount of reduction necessary to meet WQS.

The strengths of using the LDC method are that critical conditions and seasonal variation are considered in the creation of the FDC by plotting hydrologic conditions over the flows measured during the recreation season. Additionally, the LDC methodology is relatively easy to use and cost-effective. The weaknesses of the LDC method are that nonpoint source allocations cannot be assigned to specific sources, and specific source reductions are not quantified. Overall, MPCA believes and EPA concurs that the strengths outweigh the weaknesses for the LDC method.

Implementing the results shown by the LDC requires watershed managers to understand the sources contributing to the water quality impairment and which Best Management Practices (BMPs) may be the most effective for reducing bacteria loads based on flow magnitudes. Different sources will contribute bacteria loads under varying flow conditions. For example, if exceedances are significant during high flow events this would suggest storm events are the cause and implementation efforts can target BMPs that will reduce stormwater runoff and consequently bacteria loading into surface waters. This allows for a more efficient implementation effort.

A TMDL for Painter Creek was calculated and WLAs were assigned to MS4 communities as appropriate. There are six regulated MS4 permittees within the Painter Creek watershed (Table 4 of this Decision Document). Each of these MS4 permittees received an individual WLA under the bacteria TMDL. The load allocation was calculated after the determination of the WLA, and the Margin of Safety (10% of the loading capacity). Other load allocations (ex. non-regulated stormwater runoff , wildlife inputs etc.) were not split amongst individual nonpoint contributors. Instead, load allocations were combined together into a non-MS4 stormwater source. MPCA noted that loads calculated under the High and Wet flow regime are below the LDC line, indicating the average loading under these conditions is meeting WQS. MPCA identified this unused capacity as "Unallocated Load", and did not assign this load to a source (Section 4.2.2 of the TMDL).

Table 8 of this Decision Document reports five points (the midpoints of the designated flow regime) on the loading capacity curve. However, it should be understood that the components of the TMDL equation could be illustrated for any point on the entire loading capacity curve. The load duration curve method can be used to display collected bacteria monitoring data and allows for the estimation of load reductions necessary for attainment of the bacteria water quality standard. Using this method, daily loads were developed based upon the flow in the water body. Loading capacities were determined for the segment for multiple flow regimes. This allows the TMDL to be represented by an allowable daily load across all flow conditions. Table 8 of this Decision Document identifies the loading capacity for the water body at each flow regime. Although there are numeric loads for each flow regime, the LDC is what is being approved for this TMDL.

Table 8: Painter Creek bacteria TMDL

	Load Duration Curve Zone				
	High	***Moist***	***Mid***	***Dry***	***Low***
WLA	*(billion - organisms per day)*				
Medina City MS4 (MS400105)	7.85	3.94	5.22	0.778	0.00903
Orono City MS4 (MS400111)	3.56	1.79	2.37	0.493	0.00572
Hennepin County (MS400138)	0.0361	0.0181	0.0240	0.00318	0.0000369
Minnetrista City MS4 (MS400106)	4.15	2.08	2.76	0.508	0.00590
Independence City MS4 (MS400095)	11.8	5.92	7.85	1.04	0.0120
Maple Plain City MS4 (MS400103)	1.56	0.783	1.04	0.103	0.00120
WLA TOTAL	28.9	14.5	19.3	2.92	0.0339
LA	*(billion - organisms per day)*				
LA TOTAL	1.86	0.933	0.470	0.188	0.00218
Unallocated Load	67.9	30.5	0	0	0
MOS *(explicit 10%)*	11.0	5.10	2.19	0.345	0.00401
TMDL	**110**	**51**	**21.9**	**3.45**	**0.0401**
Estimated load reduction	**0%**	**0%**	**0%**	**31%**	**37%**

EPA concurs with the data analysis and LDC approach utilized by MPCA in its calculation of loading capacities, wasteload allocations, load allocations and the margin of safety for the Painter Creek bacteria TMDLs. The methods used for determining the TMDL are consistent with U.S. EPA technical memos.[1]

Lake nutrient TMDLs:

The Upper Minnehaha Creek watershed is a series of interconnected lakes and streams in and around Lake Minnetonka (Figure 1-1 of the TMDL). To develop the TMDLs for the lakes, MPCA reviewed sampling data for several stream sampling sites in the watershed to determine watershed loading for each lake. For the unmonitored watersheds, MPCA used average runoff volumes and TP concentrations based upon averages across the watershed.

For East Auburn, Stone, and Turbid lakes, no monitoring data was available near these lakes. MPCA used a XP-SWMM model to estimate runoff volumes. XP-SWMM is a stormwater model that allows the user to link precipitation run-off into stormwater systems and then to "route" water through various flow structures and BMPs, and to track changes in flows and pollutant loads. MPCA also utilized P8 (Program for Predicting Polluting Particle Passage thru Pits, Puddles, & Ponds). P8 is a model for predicting the generation and transport of stormwater runoff pollutants in urban watersheds. Continuous water-balance and mass-balance

[1] U.S. Environmental Protection Agency. August 2007. *An Approach for Using Load Duration Curves in the Development of TMDLs*. Office of Water. EPA-841-B-07-006. Washington, D.C.

calculations are performed on a user-defined system, and the model generates loadings on a monthly basis (Section 4.1.1.1 of the TMDL).

To account for the sources of TP in the watershed, MPCA included the impacts of TP from upstream lakes as necessary. Section 4.1.1.3 of the TMDL discusses how improvements in an upstream lake (or lakes) were required to reduce TP loads affecting downstream lakes. To account for the lakes, reductions were applied to the upstream lakes and then loads "routed" downstream until all lakes met WQS. MPCA also accounted for groundwater impacts in each lake, and developed a process to determine if a lake was either a source or a sink for groundwater, and then a TP concentration for groundwater was assumed (Appendix D of the TMDL). Internal loading was also calculated for each lake (Appendix E of the TMDL).

BATHTUB: Once the watershed loading calculations were developed for each lake, MPCA used BATHTUB to determine the water quality based upon the TP loading. The BATHTUB model applies a series of empirical equations derived from assessments of lake data and performs steady state water and nutrient calculations based on lake morphometry and tributary inputs. The BATHTUB model requires fairly simple inputs to predict phosphorus loading. The model accounts for pollutant transport, sedimentation, and nutrient cycling. The model was used to determine both the current load (Appendix F of the TMDL) and the load needed to meet water quality standards for each lake (Section 4.1 of the TMDL).

The Canfield-Bachmann subroutine was used in the BATHTUB model to determine how each lake responded to the TP loading. The model parameters were adjusted until the model predictions fit the sample data. Once the data were calibrated, the source loads were reduced until the in-lake concentration met the appropriate WQS (Section 4.1.1.7 of the TMDL)

The BATHTUB model was modified to account for the internal loading of phosphorus in the lakes. This was done iteratively until the modeled and actual values were within 10%. Calibration and validation were also done using both wet and dry year precipitation rates. Loads were based upon average precipitation years, which vary depending on the lake. Detailed TMDL modeling information is provided in Section 5 and Appendices B and C of the TMDL.

MPCA subdivided the loading capacity among the WLA, LA and MOS components of the TMDL (Tables 9-28 of this Decision Document). These calculations were based on the critical condition, the summer growing season, which is typically when the water quality in the lake is degraded and phosphorus loading impacts are the greatest. TMDL allocations assigned during the summer growing season will protect the lakes during the worst water quality conditions of the year. The MPCA assumed that the loading capacities established by the TMDL will be protective of water quality during the remainder of the calendar year (October through May).

EPA supports the data analysis and modeling approach utilized by MPCA in their calculation of wasteload allocations, load allocations and the margin of safety for the UMC lakes TMDLs. Additionally, EPA concurs with the loading capacities calculated by the MPCA in the UMC lakes TMDLs. EPA finds MPCA's approach for calculating the loading capacities to be reasonable and consistent with EPA guidance.

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

4. Load Allocations (LA)

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:
Load allocations are addressed in Section 4 of the final TMDL document.

Painter Creek bacteria TMDL:
The *E. coli* LA for Painter Creek is in Table 8 of this Decision Document. MPCA recognized the load for the Painter Creek bacteria TMDL as originating mainly from dry-weather sources such as livestock in the stream as well as non-regulated runoff such as from small farm/livestock operations and wildlife. Detailed information on the bacteria sources in the Painter Creek watershed are in Appendix C of the TMDL.

Lake nutrient TMDLs:
MPCA recognized the LA for the lake nutrient TMDLs as originating from a variety of nonpoint sources, including upstream nonpoint source loads (for some lakes) atmospheric deposition, groundwater, subsurface septic treatment systems (SSTS), non-regulated stormwater runoff and internal loads (for some lakes). The LA was subdivided into loads assigned the various sources depending on their presence (Table 9-28 of this Decision Document).

MPCA determined the internal loading for the lakes based upon lake data if available, or a formula if specific data were not available. Appendix C of the TMDL explains the process MPCA used. MPCA determined that some lakes are not affected by internal loads of TP, and thus no loading was allocated to that source. MPCA also analyzed watershed data to determine if groundwater was a source of TP in each lake. MPCA reviewed lake elevation data and compared the information to the groundwater elevations from State geological records, and determined which lakes were receiving input from groundwater. Appendix D of the TMDL explains the process MPCA used to determine the groundwater impacts.

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

5. Wasteload Allocations (WLAs)

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

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

Comment:

Painter Creek bacteria TMDL:

MPCA determined individual WLAs for the six MS4 permittees in the Painter Creek watershed (Table 8 of this Decision Document). The MS4 WLAs were based upon the land area under the jurisdiction of the MS4 permit as shown in Appendices G and H of the TMDL. In addition, MPCA also reviewed the land use types within the MS4 areas, and excluded any lands that were agricultural or wetlands (and considered unlikely to be developed). Any bacteria loads from these land uses were included in the LA. There are no CSOs or CAFOs within the Painter Creek watershed, therefore, CSOs and CAFOs were not given an allocation (WLA = 0).

Lake nutrient TMDLs:

MPCA assigned a portion of the WLA to one NPDES permitted facility and to nineteen regulated MS4 permittees within the UMC lakes nutrient TMDLs, and set aside a percentage of each TMDL's loading capacity for construction and industrial stormwater. Table 5 of this Decision Document lists all the MS4 permittees that were assigned WLAs in the nutrient TMDLs. Tables 9-28 of this Decision Document provided the WLAs for each MS4 permittee in each of the 20 lakes addressed by this TMDL.

WLA were assigned based on the necessary TP load reductions for achieving the TP site-specific water quality target. To determine the MS4 WLAs, MPCA first determined the land area for each watershed that was under an MS4 permit. MPCA, in conjunction with the local stakeholders, then determined the land area that was agricultural in use or was wetlands and unlikely to be developed. Since these land uses do not drain to a regulated conveyance, loadings from these land uses were moved into the LA category. MPCA also considered the amount of impervious cover present in each MS4 jurisdiction, and targeted a rainfall event of 1.3 inches to determine run-off rates. MPCA noted on page H-4 of Appendix H of the TMDL that:

> "The 1.3-inch rainfall event was chosen for this calculation based on research findings (Pitt, 1999):
>
> - Rains of less than 0.5" are relatively low in pollutants but are key conveyances of bacteria. Those small events should be captured and infiltrated.
> - Rains between 0.5" and 1.5" convey 75% of the annual pollutant load.
> - Rains greater than 1.5" are responsible for only a small percent of the annual pollutant load.
>
> Events of almost 1.3-inches convey approximately 85% of the annual total suspended solids (TSS) load and almost 90% of the annual TP load (Figure H.1)."

The one individual NPDES facility received a portion of the TP WLA for the Lake Minnetonka (West Arm) nutrient TMDL (Table 19 of this Decision Document). The facility (Nilfisk-Advance Inc., MN006648) operates a groundwater remediation system and discharges treated groundwater (Section 4.1.3 of the TMDL). The WLA allocation is based upon the maximum permitted flow rate (0.144 MGD) multiplied by the TP effluent concentration (0.0018 mg/L TP). MPCA increased the TP effluent by 50% to account for possible variability. The WLA for Nilfisk-Advance Inc. is 8 lbs/yr (0.0216 lbs/day).

MPCA set aside 1% of the loading capacity to account for TP loading from construction and industrial stormwater. This WLA accounts for any construction stormwater or industrial stormwater generated within the TMDL watersheds (Section 4.1.3 of the TMDL)

MPCA explained that BMPs and other stormwater control measures should be implemented at active construction sites to limit the discharge of pollutants of concern. BMPs and other stormwater control measures which should be implemented at construction sites are defined in the State's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001). If a construction site owner/operator obtains coverage under the NPDES/SDS General Stormwater Permit and properly selects, installs and maintains all BMPs required under the permit, including those related to impaired waters discharges and any applicable additional requirements found in Appendix A of the Construction General Permit, the stormwater discharges would be expected to be consistent with the WLA in this TMDL.

The WLA for stormwater discharges from sites where there is industrial activity reflects the number of sites in the watershed for which NPDES industrial stormwater permit coverage is required, and the BMPs and other stormwater control measures that should be implemented at the sites to limit the discharge of pollutants of concern. BMPs and other stormwater control measures which should be implemented at the industrial sites are defined in the State's NPDES/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). If a facility owner/operator obtains coverage under the appropriate NPDES/SDS General Stormwater Permit and properly selects, installs and maintains all BMPs required under the permit, the stormwater discharges would be expected to be consistent with the WLA in this TMDL.

There are no CSOs or CAFOs within the UMC watershed, therefore, CSOs and CAFOs were not given an allocation (WLA = 0).

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

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:

Painter Creek bacteria TMDL:

The Painter Creek bacteria TMDL incorporated an explicit MOS of 10% of the total loading capacity. The MOS reserved 10% of the loading capacity and allocated the remaining loads to point (WLA) and nonpoint sources (LA) (Table 8 of this Decision Document). The use of the LDC approach minimized variability associated with the development of the Painter Creek bacteria TMDL because the calculation of the loading capacity was a function of flow multiplied by the target value. The MOS was set at 10% to account for uncertainty due to field sampling error and assumptions made during the TMDL development process.

Challenges associated with quantifying MS4 stormwater *E. coli* loads include the dynamics and complexity of bacteria in urban streams. Factors such as die-off and re-growth contribute to general uncertainty that makes quantifying stormwater bacteria loads particularly difficult. The MOS for the Painter Creek bacteria TMDL 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.

Lake nutrient TMDLs:

The UMC lake nutrient TMDLs incorporated an explicit MOS of 5% of the total loading capacity. The MOS reserved 5% of the loading capacity and allocated the remaining loads to point (WLA) and nonpoint sources (LA) (Tables 9-28 of this Decision Document). MPCA noted that the 5% is reasonable due to the quantity of watershed and in-lake monitoring data available. The MCWD has been sampling these lakes for many years. Together with the monitoring data from MPCA, there is significant long-term sampling data to appropriately characterize the lakes, and therefore no additional MOS is needed.

The EPA finds that the TMDL document submitted by the MPCA contains an appropriate MOS satisfying the requirements of the sixth criterion.

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:

The bacteria and nutrient TMDLs incorporated seasonal variation into the development of the Painter Creek and lake nutrient TMDLs via the following methods:

Painter Creek bacteria TMDL:

Bacterial loads vary by season, typically reaching higher numbers in the dry summer months when low flows and bacterial growth rates contribute to their abundance, and reaching relatively lower values in colder months when bacterial growth rates attenuate and loading events, driven by stormwater runoff events, aren't as frequent. Bacterial WQS need to be met between April 1st to October 31st, regardless of the flow condition. The development of the LDC utilized flow measurements from local flow gages. These flow measurements were collected over a variety of flow conditions observed during the recreation season. The LDC developed from these flow records represents a range of flow conditions within the Painter Creek watershed and thereby accounted for seasonal variability over the recreation season. TMDL loads were based on sampling that occurred during the recreational season in 2005-2011.

Critical conditions for *E. coli* loading occur in the dry summer months. This is typically when stream flows are lowest, and bacterial growth rates can be high. By meeting the water quality targets during the summer months, it can reasonably be assumed that the loading capacity values will be protective of water quality during the remainder of the calendar year (November through March).

Lake nutrient TMDL:

Nutrient influxes to the UMC lakes typically occur during wet weather events. Critical conditions that impact the response of the lakes to nutrient inputs occur during periods of low flow. During low flow periods, nutrients accumulate, there is less assimilative capacity within the water body, and nutrients are generally not transported through the water body at the same rate as under normal flow conditions. Increased algal growth during low flow periods can deplete dissolved oxygen within the water column.

The nutrient targets employed in the UMC lake nutrient TMDLs were based on the average nutrient values collected during the growing season (June 1 to September 30). The water quality criteria were designed to meet the period of the year where the frequency and severity of algal growth is the greatest, the mid-late summer. The mid-late summer time period is typically when eutrophication standards are exceeded and water quality in the lakes is deficient. By calibrating the TMDL development efforts to protect water bodies during the worst water quality conditions of the year, MPCA assumes that the loading capacities established by the TMDLs will be protective of water quality during the remainder of the calendar year (October through May).

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

8. Reasonable Assurance

When a TMDL is developed for waters impaired by point sources only, the issuance of a 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:
The UMC TMDLs discuss reasonable assurance activities in Section 5 of the final TMDL document. There are several groups which will have a role in ensuring that bacteria and phosphorus reductions within the Minnehaha Creek watershed move forward in the coming years. The main entities responsible for overseeing the pollutant reduction activities will be the MPCA and the Minnehaha Creek Watershed District. There are two separate but complementary frameworks in place to ensure progress toward achieving the water quality targets identified in this TMDL. One of those frameworks involves the relationship between MPCA and the regulated MS4 communities through the MPCA's Stormwater Program. The second framework covers the relationship between the MCWD and local government units (LGUs) (i.e., MS4 communities) in the UMC TMDL study area. The responsibilities of the second framework are described in MCWD's Water Resources Management Plan and the LGUs' local water management plans.

MPCA and MS4 communities in the UMC watershed:
MPCA is responsible for applying federal and state regulations to protect and enhance water quality within the UMC TMDL study area. MPCA oversees all regulated MS4 entities (ex. cities of Plymouth, Wayzata etc., MNDOT, Hennepin County, and the MCWD) in stormwater management activities. Within the UMC TMDL study area there are Phase II MS4 permittees. Phase II MS4 NPDES permits require regulated municipalities to implement BMPs to reduce pollutants in stormwater runoff to the Maximum Extent Practicable (MEP).

All regulated MS4 communities are required to satisfy the requirements of the MS4 general permit. The MS4 general permit requires the permittee to develop a SWPPP which addresses all permit requirements, including the following six minimum control measures:

- Public education and outreach;
- Public participation;
- Illicit Discharge Detection and Elimination (IDDE) Program;
- Construction-site runoff controls;
- Post-construction runoff controls; and
- Pollution prevention and municipal good housekeeping measures.

A SWPPP is a management plan that describes the MS4 permittee's activities for managing stormwater within their jurisdiction or regulated area. In the event a TMDL study has been completed, approved by EPA prior to the effective date of the general permit, and assigns a wasteload allocation to an MS4 permittee, that permittee must document the WLA in their application and provide an outline of the best management practices to be implemented in the current permit term to address any needed reduction in loading from the MS4.

MPCA requires applicants to submit their application materials and SWPPP documentation to MPCA for review. Prior to extension of coverage under the general permit, all application materials are placed on 30-day public notice by the MPCA, to ensure adequate opportunity for the public to comment on each permittee's stormwater management program. Upon extension of coverage by the MPCA, the permittees are to implement the activities described within their SWPPP, and submit annual reports to MPCA by June 30 of each year. These reports document the implementation activities which have been completed within the previous year, analyze implementation activities already undertaken, and outline any changes within the SWPPP from the previous year.

Various funding mechanisms will be utilized to execute the recommendations made in the implementation section of this TMDL. The MCWD is funded through local property taxes. This annual tax base comprises one of the main funding mechanisms for MCWD-sponsored implementation activities within the watershed. The MCWD utilizes this funding base to sponsor cost-share and grant programs to assist municipal partners with local water quality improvement projects.

The MCWD and LGUs may apply for other funding provided by the State of Minnesota. These funding opportunities are grants under the Clean Water Legacy Act (CWLA) and funding through the Clean Water Partnership program. The MCWD may also explore the funding mechanisms provided through the federal Section 319 grant program which provides cost share dollars to implement voluntary activities in the watershed.

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 develop TMDL implementation plans. TMDL implementation plans are expected to be developed within a year of TMDL approval and are required in order for local entities to apply for funding from the State. 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. The implementation plans are required to contain ranges of cost estimates for 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).

Reasonable assurance that the WLA set forth in the TMDLs will be implemented is provided by regulatory actions. According to 40 CFR 122.44(d)(1)(vii)(B), NPDES permit effluent limits must be consistent with assumptions and requirements of all WLAs in an approved TMDL. MPCA's stormwater program and the NPDES permit program are the implementing programs for ensuring effluent limits are consistent with the TMDL. The NPDES program requires construction and industrial sites to create a SWPPP that summarizes how stormwater will be minimized from the site.

Under MPCA's Stormwater program, permittees are required to review the adequacy of local SWPPPs to ensure that each plan meets WLA set in the UMC TMDLs. In the event that the SWPPP does not meet the WLA, the SWPPP will need to be modified pursuant to the effective date of the next General Permit. This applies to the MS4, Construction, and Industrial Stormwater General Permits.

MPCA and LGUs (MS4 communities) in the UMC watershed:
The MCWD was created under the Minnesota Watershed District Act of 1955. This act required the newly created watershed districts to integrate water management efforts among city, county and state agencies within the boundaries of the watershed district. The MCWD is the local unit of government responsible for managing and protecting the water resources of the Upper Minnehaha Creek watershed. The overall goals of restoring impaired water resources and protecting water resources in the UMC watershed from further degradation require active and collaborative partnerships between the MCWD and LGUs. The LGUs within the jurisdiction of the MCWD include all the cities and townships whose jurisdiction areas are within the boundaries of the Upper Minnehaha Creek TMDL study area.

Throughout the development of the UMC TMDLs the MCWD has actively engaged in partnering efforts with their LGUs partners. In addition to meeting with and collaborating on individual implementation efforts with each LGU, the MCWD was advancing its own implementation efforts toward meeting the watershed pollutant reduction goals described in MCWD's *Comprehensive Water Resources Management Plan of 2007* (referred to as the '*2007 MCWD Plan*'). The 2007 MCWD Plan includes phosphorus load reduction efforts which focus on three main components:

- The MCWD regulatory program;
- The MCWD's work with LGUs to meet the goals and requirements of the LGU's water management plan; and
- MCWD sponsored capital projects (i.e., MCWD implementation activities within the UMC watershed).

In addition to the reductions assigned to the LGUs via the TMDL efforts, reductions in pollutant loads were anticipated through implementation of the MCWD's regulatory program. Under MN Statutes 103B.231, each LGU is required to prepare its own local water management plan, capital improvement program, and official controls as necessary to bring local water management into conformance with the overall watershed plan. In the case of this TMDL effort, each LGU must devise or update its local water management plan, capital improvement program and official controls program to meet the goals of the MCWD's watershed plan (the 2007 MCWD Plan). All LGU water management plans are reviewed and ultimately approved by the MCWD. In the UMC watershed, each LGU must identify and describe specific steps the LGU will undertake to accomplish the goals of the 2007 MCWD Plan.

The MCWD will be updating the phosphorus and bacteria loads described in its *Comprehensive Water Resources Management Plan of 2007* once the final TMDL has been approved by EPA. Specifically, the updated MCWD Plan will incorporate the reductions described in the Upper Minnehaha Creek phosphorus and bacteria TMDLs. The MCWD will also include other appropriate revisions to the 2007 MCWD Plan in order to update this document and make it more current to conditions in the UMC watershed since 2007.

The MCWD provides the LGUs with the flexibility to determine the most efficient and cost-effective means of achieving the reductions described in the UMC TMDLs. The LGUs annually report to the MCWD their progress toward accomplishing their load reductions. This existing framework for identifying reduction strategies and tracking progress toward achieving water quality goals closely parallels the framework for tracking progress toward TMDL goals through the MPCA's Stormwater Program. With the completion of the UMC TMDLs, the MCWD will serve to coordinate implementation efforts among LGUs and help ensure progress toward the TMDL targets.

The MCWD has also been working on MCWD-funded capital improvement projects within the UMC watershed. These capital improvement projects are aimed at achieving the water quality targets and the pollutant reductions described in the 2007 MCWD Plan. The MCWD anticipates that it will continue to support its own capital improvement projects and partner with LGUs to install and maintain other implementation efforts in the UMC watershed. Certain partnerships between the MCWD and individual LGUs were strengthened through the discussions at TMDL meetings held during the development of the UMC TMDL.

The 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.

Comment:
The final TMDL document outlines the water monitoring efforts in the UMC watershed (Section 6 of the TMDL). Water quality monitoring is a critical component of the adaptive management strategy employed as part of the implementation planning efforts for the Upper Minnehaha Creek watershed. Adaptive implementation is an iterative implementation process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. This process involves the review of annual progress made toward key milestones and the potential revision of implementation activities to meet the TMDL target loads. By using the adaptive implementation approach, the MCWD can utilize the new information available from water quality monitoring activities following initial TMDL implementation efforts to appropriately target the next suite of implementation activities.

Follow-up monitoring is integral to the adaptive implementation approach. Monitoring addresses uncertainty in the efficacy of implementation actions and can provide assurance that implementation measures are succeeding in attaining water quality standards, as well as inform the ongoing TMDL implementation strategy. To assess progress toward meeting the phosphorus and bacteria TMDL targets, routine monitoring of the lakes and Painter Creek will continue to be a part of the MCWD annual Hydrologic Data program. The MCWD will also continue to partner with the several agencies and local groups as it monitors water quality in the various lakes in the watershed.

The 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.

Comment:
Implementation strategies are outlined in Section 7 of the final TMDL document. The MPCA presented a variety of possible implementation activities which could be undertaken within the UMC watershed.

Painter Creek bacteria TMDL implementation strategies:
Urban/residential stormwater reduction strategies: The land use in the UMC watershed is composed of a mix of agricultural and suburban areas with limited levels of impervious cover (ex. roads, sidewalks, roofs etc.). MPCA believes that reducing bacteria sources near Painter Creek will improve water quality. During the development of the TMDL, it became apparent that the Painter Creek watershed was impacted by bacteria loads under dry to low flow conditions.

Bacteria are a unique pollutant since they are living organisms. There are many challenges for quantifying them and estimating loads and, likewise, there are challenges with respect to reducing excess loads. With our current understanding the best approaches for addressing excess bacteria loads appear to fall into categories of source reduction or volume control practices. These practices include, but are not limited to:

- Pet waste management and disposal ordinances
  - Education
  - Disposal options
  - Enforcement
- Illicit discharge ordinances
  - Banning non-stormwater discharges from storm sewer systems
  - Enforcement
- Illicit discharge detection and elimination program enhancement
  - Incorporate into existing BMP inspection program
  - Municipal staff trained to recognize illicit discharges
  - Reporting system for staff and public

Pasture and Manure Management BMPs: Controlling bacterial sources, especially manure from small farms in the Painter Creek watershed, was identified as a significant implementation activity by MPCA. Livestock exclusion from streams, alternate watering facilities, and manure stockpile controls will reduce bacteria loads entering the creek.

Riparian Area Management Practices: Protection of streambanks within the watershed through planting of vegetated/buffer areas with grasses, legumes, shrubs or trees will mitigate bacteria inputs into surface waters. These areas will filter runoff before the runoff enters into Painter Creek.

Public Education Efforts: Public programs will be developed to provide guidance to the general public on bacteria reduction efforts and their impact on water quality. These educational efforts could also be used to inform the general public on what they can do to protect the overall health of Painter Creek.

Lake nutrient TMDL implementation strategies:
Urban/Residential nutrient reduction strategies: Urban BMPs should focus on volume reduction, under the presumption that decreased stormwater flows will also result in reduced TP loads. Controlling runoff associated with development typically consists of end-of-pipe measures such as stormwater detention and retention, or on-site (decentralized) stormwater management, which increases infiltration and reduces runoff generation by decreasing imperviousness. Decentralized BMPs that promote infiltration and filtration, also referred to as green infrastructure, include bioretention, bioswales, rain gardens, green roofs, infiltration basins and trenches, underground storage, permeable pavement, and stormwater wetlands. Reducing peak flow stormwater inputs within the UMC watershed may be accomplished via reducing impervious cover or employing other low impact development/ green technologies which allow stormwater to infiltrate, evaporate or evapotranspire before reaching the stormwater conveyance system.

Residences and commercial properties adjacent to the lakes should also be encouraged to restore the immediate lake side areas with native plants and create buffer areas to capture runoff and prevent erosion. Property owners with yards extending down to the lake should be encouraged to reduce lawn fertilization efforts and to not deposit grass clippings or other organic yard wastes in areas where they could be washing into the lakes. Water quality educational programs should be utilized to inform the general public on nutrient reduction efforts and their impact on water quality.

Municipal activities: Municipal programs, such as street sweeping, can also aid in the reduction of nutrients to surface water bodies within the UMC watershed. Municipal partners can team with the MCWD to assess how best to utilize their monetary resources for installing new stormwater BMPs (ex. vegetated swales) or retro-fitting existing stormwater BMPs.

Reduction of Internal Load: MPCA recommends several actions that address internal loads of phosphorus in the lakes. These include alum dosing, hypolimnetic withdrawal of water, aeration, and control of aquatic plants and fish. By controlling the internal load of phosphorus, the response time of the lakes to watershed improvements will increase, thereby attaining the designated uses.

Public Education Efforts: Public programs will be developed to provide guidance to the general public on nutrient reduction efforts and their impact on water quality. These educational efforts could also be used to inform the general public on what they can do to protect the overall health of the lakes.

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

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 public participation section of the TMDL submittal is found in Section 8 of the TMDL document. Throughout the development of the UMC watershed TMDL the public was given various opportunities to participate in the TMDL process. The MPCA encouraged public participation through public meetings and small group discussions with stakeholders and representatives from the regulated MS4 communities within the UMC watershed.

The MPCA and MCWD held meetings with representatives from the regulated communities in 2012 and 2013. The goal of these meetings was to update these groups on the TMDL approach, to share UMC watershed water quality monitoring data, to solicit the representatives for input on potential allocation and implementation strategies, and to solicit information related to implementation activities already underway within the UMC watershed. This information was particularly important in developing the Reasonable Assurance analysis of the UMC watershed TMDL. Regulated MS4 communities and the MCWD will ultimately be responsible for the implementation efforts within the UMC watershed.

The draft TMDL was posted online by the MPCA at (http://www.pca.state.mn.us/water/tmdl). The 30-day public comment period began on December 30, 2013 and ended on January 30, 2014. The MPCA received six public comments and adequately addressed these comments. Comments were submitted by the Minnesota Department of Agriculture, the City of Minnetrista, Laketown Township, the City of Plymouth, the City of Victoria, and the Minnesota Department of Transportation – Metro District.

The comments from the Minnesota Department of Agriculture, City of Minnetrista, Laketown Township, the City of Plymouth, and the City of Victoria were minor comments (i.e., suggestions to change wording used within the draft TMDL document, locations of wetlands, additional citations to include, mapping inconsistencies, etc,). EPA believes that MPCA adequately addressed each of these comments and updated the final TMDL with appropriate language to address these comments.

The Minnesota Department of Transportation – Metro District (MNDOT) comments focused on the impairment status of Tamarack Lake, the 303(d) list status of School, Hadley, and Turbid lakes, and that Turbid Lake should be classified as a wetland, not a lake. MPCA noted that Tamarack Lake is impaired based upon a 10-year average, while the "average condition" used in the TMDL is based upon 7 years of data (to be consistent with other lakes). While the TMDL calculations show no reductions needed from the "average" condition, MPCA explained that the allocated loadings will ensure that water quality continues to improve and the lake can be delisted in the future.

Regarding the 303(d) list status for School, Hadley, and Turbid lakes, the EPA has encouraged states to develop TMDLs for waters that the state has concluded are impaired but are not yet on a formally approved 303(d) list. MPCA noted in their response that the lakes are clearly impaired, and MNDOT did not challenge the data used nor the assessment as impaired. EPA agrees that developing the TMDL at this time for these lakes is appropriate, and an effective use of state resources. Therefore, the EPA is approving the TMDLs for School, Hadley, and Turbid lakes.

MNDOT also noted that Turbid Lake is classified as a wetland by the Minnesota Department of Natural Resources (MDNR), and suggest that the MPCA and MDNR should be working to resolve this issue before proceeding with the TMDL. MPCA responded that while MDNR does classify waters, it pertains to MDNR's shoreline regulatory process. MPCA noted that MN rules 7050 and 7053 provide the authority for MPCA to determine the definitions of waterbodies for water quality assessment authority. EPA agrees with this response.

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

12. Submittal Letter

A submittal letter should be included with the TMDL submittal, and should specify whether the TMDL is being submitted for a *technical review* or *final review and approval*. Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final review and approval, should contain such identifying information as the name and location of the waterbody, and the pollutant(s) of concern.

Comment:

The EPA received the final Upper Minnehaha Creek TMDL document, submittal letter and accompanying documentation from the MPCA on March 31, 2014. The transmittal letter explicitly stated that the final Upper Minnehaha Creek TMDLs for phosphorus and bacteria were being submitted to EPA pursuant to Section 303(d) of the Clean Water Act for EPA review and approval. The letter clearly stated that this was a final TMDL submittal under Section 303(d) of CWA. The letter also contained the name of the watershed as it appears on Minnesota's 303(d) list, and the causes/pollutants of concern. This TMDL was submitted per the requirements under Section 303(d) of the Clean Water Act and 40 CFR 130.

The EPA is approving TMDLs for TP in three lakes that are not on MPCA's 2012 303(d) list. While developing the UMC TMDL project, MPCA determined that these additional lakes were impaired by TP. The lakes were clearly identified in the draft TMDL (dated December 2013). The public had the opportunity to comment on these additional impaired lakes in the TMDL during the MPCA public comment period. These segments were included in the final TMDL submitted to EPA. The TMDL report discusses the impairments for all the lakes in the watershed, and MPCA determined TMDL allocations and calculations for all lakes including the additional three lakes.

EPA believes it was reasonable for MPCA to develop TMDLs for the previously unlisted lakes in the watershed at the same time it was developing TMDLs for the listed lakes. Because the public has had the opportunity to comment on the decision to include these additional segments within the TMDL, as well as the calculations used to establish these TMDLs, and because the transmittal letter of the final TMDL states that the TMDL report is for the impairments in the UMC watershed, EPA believes it is appropriate to approve the additional three TMDLs at this time.

The EPA finds that the TMDL transmittal letter submitted for the Upper Minnehaha Creek by the MPCA satisfies the requirements of this twelfth element.

13. Conclusion

After a full and complete review, the EPA finds that the TMDLs for the Upper Minnehaha Creek watershed for phosphorus and *E. coli* satisfy all of the elements of approvable TMDLs. This approval is for 21 TMDLs, addressing 20 lakes for aquatic recreational use impairments due to phosphorus, and one water body for aquatic recreational use impairments due to bacteria (Table 1 of this Decision Document).

The EPA's approval of these TMDLs extends to the water bodies which are identified In Table 1 of this Decision Document with the exception of any portions of the water bodies that are within Indian Country, as defined in 18 U.S.C. Section 1151. The EPA is taking no action to approve or disapprove TMDLs for those waters at this time. The EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.

Table 9. TMDL Summary for Phosphorus for Dutch Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**591**	**1.62**	**347**	**0.950**	**262**	**44**
Wasteload	**Total WLA**	**319**	**0.874**	**126**	**0.346**	**193**	**60**
	Construction/Industrial SW	1	0.00406	1	0.00406	0.0	0
	Hennepin Co. (MS400138)	1	0.00354	0.5	0.00129	0.8	64
	Minnetrista (MS400106)	288	0.787	115	0.314	173	60
	Mound (MS400108)	29	0.0795	10	0.0268	19	66
Load	**Total LA**	**272**	**0.745**	**203**	**0.557**	**69**	**25**
	Non-MS4 runoff	10	0.0281	5	0.0127	6	55
	SSTS	46	0.125	0	0	46	100
	Upstream lakes	0	0	0	0	0	N
	Atmospheric deposition	42	0.115	42	0.115	0	0
	Groundwater	0	0	0	0	0	NA
	Internal load	174	0.476	157	0.429	17	10
MOS				**17**	**0.0475**		

Table 10. TMDL Summary for Phosphorus for East Auburn Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**2099**	**5.75**	**1551**	**4.25**	**626**	**30**
Wasteload	**Total WLA**	**1245**	**3.41**	**835**	**2.29**	**410**	**33**
	Construction/Industrial SW	10	0.0272	10	0.0272	0	0
	Carver County (MS400070)	1	0.00371	1	0.00371	0	0
	Laketown Township (MS400142)	2 0	.00605	2	0.00605	0	0
	MNDOT (MS400170)	27	0.0752	11	0.0306	16	59
	Victoria City (MS400126)	1204	3.30	810	2.22	394	33
Load	**Total LA**	**854**	**2.34**	**639**	**1.75**	**215**	**25**
	Non-MS4 runoff	92	0.252	82	0.224	10	11
	SSTS	6	0.0167	0	0	6	100
	Upstream lakes	680	1.86	480	1.31	199	29
	Atmospheric deposition	35	0.0968	35	0.0968	0	0
	Groundwater	0	0	0	0	0	NA
	Internal load	41	0.112	41	0.112	0	0
MOS				**78**	**0.212**		

Table 11. TMDL Summary for Phosphorus for Forest Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**327**	**0.896**	**189**	**0.518**	**147**	**45**
Wasteload	**Total WLA**	**194**	**0.530**	**78**	**0.213**	**116**	**60**
	Construction/Industrial SW	1	0.00248	1	0.00248	0	0
	Orono City MS4 (MS400111)	118	0.324	39	0.106	79	67
	Hennepin County (MS400138)	8	0.0228	3	0.00870	5	62
	Minnetrista City MS4 (MS400106)	66	0.181	35	0.0951	31	47
Load	**Total LA**	**134**	**0.366**	**102**	**0.280**	**31**	**24**
	Non-MS4 runoff	8	0.0219	4	0.00991	4	55
	SSTS						
	Upstream lakes						
	Atmospheric deposition	21	0.0586	21	0.0586	0	0
	Groundwater						
	Internal load	104	0.285	77	0.211	27	26
MOS				**9**	**0.0259**		

Table 12. TMDL Summary for Phosphorus for Gleason Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**856**	**2.34**	**431**	**1.180**	**447**	**52**
Wasteload	**Total WLA**	**325**	**0.890**	**118**	**0.324**	**207**	**64**
	Construction/Industrial SW	1	0.00383	1	0.00383	0	0
	MNDOT (MS400170)	5	0.0135	3	0.007	2	47
	Hennepin County (MS400138)	10	0.0266	3	0.007	7	73
	Minnetonka City MS4 (MS400035)	2	0.00658	1	0.003	1	50
	Plymouth City MS4 (MS400112)	290	0.794	105	0.288	185	64
	Wayzata City MS4 (MS400058)	16	0.0437	5	0.014	11	69
	MCWD (MS400182)	0.5	0.00134	0.2	0.0006	0	57
Load	**Total LA**	**531**	**1.45**	**291**	**0.797**	**240**	**45**
	Non-MS4 runoff						
	SSTS						
	Upstream lakes	53	0.146	20	0	33	62
	Atmospheric deposition	40	0.111	40	0.111	0	0
	Groundwater	23	0.0642	23	0.0642	0	0
	Internal load	414	1.13	207	0.567	207	50
MOS				**22**	**0.0590**		

Table 13. TMDL Summary for Phosphorus for Holy Name Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**450**	**1.23**	**106**	**0.290**	**350**	**78**
Wasteload	**Total WLA**	**32**	**0.088**	**1**	**0.0031**	**31**	**96**
	Construction/Industrial SW	0.1	0.000392	0.1	0.000392	0	0
	Medina City MS4 (MS400105)	27	0.0732	1	0.00233	26	97
	Hennepin County (MS400138)	0.1	0.000162	0.0	0.00000319	0	98
	Plymouth City MS4 (MS400112)	5	0.0144	0.1	0.000375	5	97
Load	**Total LA**	**418**	**1.14**	**99**	**0.272**	**319**	**76**
	Non-MS4 runoff	39	0.108	8	0.0216	32	80
	SSTS						
	Upstream lakes						
	Atmospheric deposition	17	0.0458	17	0.0458	0	0
	Groundwater						
	Internal load	362	0.991	75	0.205	287	79
MOS				**5**	**0.0145**		

Table 14. TMDL Summary for Phosphorus for Langdon Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**393**	**1.08**	**325**	**0.891**	**84**	**21**
Wasteload	**Total WLA**	**166**	**0.454**	**121**	**0.332**	**44**	**27**
	Construction/Industrial SW	1	0.00383	1	0.00383	0	0
	Minnetrista City MS4 (MS400106)	65	0.178	58	0.159	7	11
	Hennepin County (MS400138)	7	0.0195	4	0.0108	3	45
	Mound (MS400108)	92	0.252	58	0.158	34	37
Load	**Total LA**	**228**	**0.623**	**188**	**0.514**	**40**	**17**
	Non-MS4 runoff	3	0.00716	2	0.00600	0.4	16
	SSTS						
	Upstream lakes						
	Atmospheric deposition	34	0.0932	34	0.0932	0	0
	Groundwater						
	Internal load	191	0.523	152	0.415	39	21
MOS				**16**	**0.0445**		

Table 15. TMDL Summary for Phosphorus for Long Lake

		Existing TP Load		**Allowable TP load**		**Estimated Load Reduction**	
		lbs/yr	**lbs/day**	**lbs/yr**	**lbs/day**	**lbs/yr**	**%**
Total Load		**1465**	**4.01**	**761**	**2.08**	**742**	**51**
Wasteload	**Total WLA**	**665**	**1.82**	**255**	**0.697**	**411**	**62**
	Construction/Industrial SW	3	0.00812	3	0.00812	0	0
	Orono City MS4 (MS400111)	224	0.614	100	0.273	125	56
	Hennepin County (MS400138)	41	0.113	5	0.0150	36	87
	Plymouth City MS4 (MS400112)	0.0	0.000	0.0	0.000	0.0	0
	Long Lake City MS4 (MS400101)	164	0.449	29	0.0790	135	82
	Medina City MS4 (MS400105)	216	0.591	113	0.309	103	48
	MNDOT (MS400170)	17	0.0470	5	0.0132	12	72
Load	**Total LA**	**800**	**2.19**	**468**	**1.28**	**332**	**41**
	Non-MS4 runoff	8	0.0226	4	0.00999	5	56
	SSTS						
	Upstream lakes	363	0.994	97	0.265	266	73
	Atmospheric deposition	69	0.188	69	0.188	0	0
	Groundwater	39	0.106	39	0.106	0	0
	Internal load	322	0.881	261	0.713	61	19
MOS				**38**	**0.104**		

Table 16. TMDL Summary for Phosphorus for Halsted Bay

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**6171**	**16.9**	**2064**	**5.65**	**4210**	**68**
Wasteload	**Total WLA**	**2858**	**7.82**	771	**2.11**	**2087**	**73**
	Construction/Industrial SW	10	0.0282	10	0.0282	0	0
	Minnetrista City MS4 (MS400106)	1289	3.53	382	1.04	907	70
	Hennepin County (MS400138)	15	0.0399	6	0.0160	9	60
	Mound (MS400108)	11	0.0310	5	0.0130	6.6	58
	St Bonifacius City (MS400124)	183	0.502	77	0.211	106	58
	MCWD (MS400182)	9	0.0246	2	0.00583	7	76
	Victoria City (MS400126)	0.4	0.00117	0.0	0.000	0.4	93
	Laketown Township (MS400142)	1324	3.62	285	0.781	1038	78
	MNDOT (MS400170)	16	0.0444	4	0.0104	12	76
Load	**Total LA**	**3314**	**9.07**	**1190**	**3.26**	**2123**	**64**
	Non-MS4 runoff	511	1.40	157	0.430	354	69
	SSTS						
	Upstream lakes						
	Atmospheric deposition	134	0.367	134	0.367	0	0
	Groundwater	141	0.386	141	0.386	0	0
	Internal load	2527	6.92	758	2.08	1769	70
MOS				**103**	**0.283**		

Table 17. TMDL Summary for Phosphorus for Jennings Bay

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**3505**	**9.60**	**1039**	**2.84**	**2518**	**72**
Wasteload	**Total WLA**	**2159**	**5.91**	**596**	**1.63**	**1563**	**72**
	Construction/Industrial SW	7	0.0189	7	0.0189	0	0
	Minnetrista City MS4 (MS400106)	418	1.14	139	0.381	279	67
	Hennepin County (MS400138)	7	0.0203	2	0.00589	5.3	71
	Mound (MS400108)	31	0.0859	8	0.0232	23	73
	Medina City MS4 (MS400105)	538	1.47	140	0.383	398	74
	Orono City MS4 (MS400111)	244	0.669	92	0.251	153	62
	Independence City MS4 (MS400095)	806	2.21	189	0.517	617	77
	Maple Plain City MS4 (MS400103)	107	0.294	18	0.0506	88.8	83
Load	**Total LA**	**1346**	**3.69**	**391**	**1.07**	**955**	**71**
	Non-MS4 runoff	144	0.394	43	0.119	101	70
	SSTS						
	Upstream lakes	210	0.574	77	0.211	132	63
	Atmospheric deposition	73	0.200	73	0.200	0	0
	Groundwater						
	Internal load	920	2.52	198	0.541	722	79
MOS				**52**	**0.142**		

Table 18. TMDL Summary for Phosphorus for Stubbs Bay

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**585**	**1.60**	**406**	**1.11**	**199**	**34**
Wasteload	**Total WLA**	**275**	**0.754**	**134**	**0.366**	**142**	**51**
	Construction/Industrial SW	2	0.00463	2	0.00463	0	0
	MNDOT (MS400170)	0.5	0.00129	0.1	0.000356	0.3	72
	Hennepin County (MS400138)	5	0.0131	3	0.00719	2	45
	Orono City MS4 (MS400111)	269	0.735	129	0.354	139	52
Load	**Total LA**	**309**	**0.847**	**252**	**0.690**	**57**	**19**
	Non-MS4 runoff	27	0.0734	15	0.0413	12	44
	SSTS	46	0.125	0	0.000	46	100
	Upstream lakes						
	Atmospheric deposition	47	0.130	47	0.130	0	0
	Groundwater	50	0.137	50	0.137	0	0
	Internal load	140	0.382	140	0.382	0	0
MOS				**20**	**0.0556**		

Table 19. TMDL Summary for Phosphorus for West Arm

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**3421**	**9.37**	**1915**	**5.24**	**1602**	**47**
Wasteload	**Total WLA**	**156**	**0.427**	**19**	**0.0513**	**137**	**88**
	Construction/Industrial SW	1	0.00292	1	0.00292	0	0
	Minnetrista City MS4 (MS400106)	0.7	0.00179	0.0	0.0000411	0.6	98
	Hennepin County (MS400138)	19	0.0527	1	0.00265	18	95
	Orono City MS4 (MS400111)	31	0.0845	3	0.00849	28	90
	Mound (MS400108)	53	0.144	4	0.0099	49	93
	Spring Park City MS4 (MS400123)	43	0.118	2	0.00542	41	95
	Nilfisk-Advance Inc. (MN006648)	8	0.0219	8	0.0219	0	0
Load	**Total LA**	**3265**	**8.94**	**1800**	**4.93**	**1465**	**45**
	Non-MS4 runoff	0.2	0.000522	0.1	0.000378	0.1	27
	SSTS						
	Upstream lakes	1403	3.84	607	1.66	795	57
	Atmospheric deposition	197	0.538	197	0.538	0	0
	Groundwater						
	Internal load	1665	4.560	996	2.73	669	40
MOS				**96**	**0.262**		

Table 20. TMDL Summary for Phosphorus for Mooney Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**209**	**0.572**	**134**	**0.368**	**81**	**39**
Wasteload	**Total WLA**	**65**	**0.178**	**7**	**0.0181**	**58**	**90**
	Construction/Industrial SW	0.2	0.000418	0.2	0.000418	0	0
	Medina City MS4 (MS400105)	8	0.0229	1	0.00355	7	84
	Hennepin County (MS400138)	0.7	0.00180	0.1	0.000200	0.6	89
	Orono City MS4 (MS400111)	1	0.00337	0.4	0.00109	1	68
	Plymouth City MS4 (MS400112)	55	0.150	5	0.0129	50	91
Load	**Total LA**	**144**	**0.394**	**121**	**0.331**	**23**	**16**
	Non-MS4 runoff	9	0.0258	2	0.00529	7.5	79
	SSTS	11	0.0292	0	0.000	11	100
	Upstream lakes						
	Atmospheric deposition	27	0.0740	27	0.0740	0	0
	Groundwater						
	Internal load	97	0.265	92	0.252	5	5
MOS				7	**0.0184**		

Table 21. TMDL Summary for Phosphorus for Stone Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**206**	**0.563**	**186**	**0.508**	**29**	**14**
Wasteload	**Total WLA**	**34**	**0.0937**	**34**	**0.0937**	**0**	**0**
	Construction/Industrial SW	0.5	0.00142	0.5	0.00142	0	0
	Minnetrista City MS4 (MS400106)	9	0.0239	9	0.0239	0	0
	Hennepin County (MS400138)	0.1	0.000276	0.1	0.000276	0	0
	Victoria City (MS400126)	2	0.00479	2	0.00479	0	0
	Laketown Township (MS400142)	23	0.0633	23	0.0633	0	0
Load	**Total LA**	**171**	**0.469**	**142**	**0.389**	**29**	**17**
	Non-MS4 runoff	18	0.0484	18	0.0484	0	0
	SSTS						
	Upstream lakes						
	Atmospheric deposition	24	0.0650	24	0.0650	0	0
	Groundwater						
	Internal load	130	0.356	101	0.276	29	23
MOS				**9**	**0.0254**		

Table 22. TMDL Summary for Phosphorus for Tamarack Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**73**	**0.201**	**73**	**0.201**	**0**	**0**
Wasteload	**Total WLA**	**6**	**0.0171**	**6**	**0.0171**	**0**	**0**
	Construction/Industrial SW	0.2	0.000591	0.2	0.000591	0	0
	Carver County (MS400070)	0.1	0.000312	0.1	0.000312	0	0
	Victoria City (MS400126)	4	0.01205	4	0.01205	0	0
	MNDOT (MS400170)	1	0.00325	1	0.00325	0	0
	Chanhassen City MS4 (MS400079)	0.3	0.000918	0.3	0.000918	0	0
Load	**Total LA**	**67**	**0.184**	**67**	**0.184**	**0**	**0**
	Non-MS4 runoff	15	0.0420	15	0.0420	0	0
	SSTS						
	Upstream lakes						
	Atmospheric deposition	7	0.0196	7	0.0196	0	0
	Groundwater						
	Internal load	45	0.122	45	0.122	0	0
MOS				**NA**	**NA**		

Table 23. TMDL Summary for Phosphorus for Tanager Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**1178**	**3.22**	**447**	**1.22**	**753**	**64**
Wasteload	**Total WLA**	**174**	**0.477**	**68**	**0.187**	**106**	**61**
	Construction/Industrial SW	0.9	0.00249	0.9	0.00249	0	0
	Orono City MS4 (MS400111)	114	0.312	55	0.151	59	51
	Hennepin County (MS400138)	7	0.0180	2	0.00562	5	69
	MNDOT (MS400170)	7	0.0197	1	0.00333	6	83
	Long Lake City MS4 (MS400101)	46	0.125	9	0.0242	37	81
Load	**Total LA**	**1003**	**2.75**	**356**	**0.975**	**647**	**64**
	Non-MS4 runoff	0.2	0.000640	0.1	0.000335	0.1	48
	SSTS						
	Upstream lakes	737	2.02	258	0.705	480	65
	Atmospheric deposition	13	0.0352	13	0.0352	0	0
	Groundwater	14	0.0382	14	0.0382	0	0
	Internal load	239	0.654	72	0.196	167	70
MOS				**22**	**0.0612**		

Table 24. TMDL Summary for Phosphorus for Wolsfeld Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**361**	**0.989**	**136**	**0.372**	**232**	**64**
Wasteload	**Total WLA**	**96**	**0.263**	**17**	**0.0470**	79	**82**
	Construction/Industrial SW	0.5	0.00126	0.5	0.00126	0	0
	Orono City MS4 (MS400111)	3	0.00945	1	0.00180	3	81
	Hennepin County (MS400138)	0.0	0.000	0.0	0.000	0.0	80
	Medina City MS4 (MS400105)	92	0.252	16	0.0440	76	83
Load	**Total LA**	**265**	**0.725**	**112**	**0.306**	**153**	**58**
	Non-MS4 runoff	88	0.242	22	0.0607	66	75
	SSTS	3	0.00833	0	0.000	3	100
	Upstream lakes	102	0.279	38	0.105	63	62
	Atmospheric deposition	10	0.0264	10	0.0264	0	0
	Groundwater	3	0.00687	3	0.00687	0	0
	Internal load	59	0.162	39	0.107	20	34
MOS				7	**0.0186**		

Table 25. TMDL Summary for Phosphorus for Snyder Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**69**	**0.188**	**49**	**0.134**	**22**	**32**
Wasteload	**Total WLA**	**11**	**0.0313**	**8**	**0.0209**	**4**	**33**
	Construction/Industrial SW	0.1	0.000277	0.1	0.000277	0.0	0
	Plymouth City MS4 (MS400112)	10	0.0286	7	0.0191	3	33
	Hennepin County (MS400138)	0.9	0.00245	0.5	0.00146	0.4	40
Load	**Total LA**	**57**	**0.156**	**39**	**0.106**	**18**	**32**
	Non-MS4 runoff						
	SSTS						
	Upstream lakes	37	0.100	18	0.0505	18	50
	Atmospheric deposition	3	0.00786	3	0.00786	0	0
	Groundwater						
	Internal load	18	0.0480	18	0.0480	0	0
MOS				**2**	**0.00670**		

Table 26. TMDL Summary for Phosphorus for School Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**242**	**0.661**	**69**	**0.189**	**176**	**73**
Wasteload	**Total WLA**	**39**	**0.108**	**8**	**0.0207**	**32**	**81**
	Construction/Industrial SW	0.3	0.000766	0.3	0.000766	0	0
	Medina City MS4 (MS400105)	39	0.107	7	0.0199	32	81
Load	**Total LA**	**202**	**0.553**	**58**	**0.159**	**144**	**71**
	Non-MS4 runoff	60	0.165	17	0.0465	43	72
	SSTS	11	0.0291	0	0.000	11	100
	Upstream lakes						
	Atmospheric deposition	3	0.00727	3	0.00727	0	0
	Groundwater						
	Internal load	128	0.351	39	0.105	90	70
MOS				**3**	**0.00946**		

Table 27. TMDL Summary for Phosphorus for Hadley Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**157**	**0.429**	**89**	**0.243**	**72**	**46**
Wasteload	**Total WLA**	**61**	**0.166**	**36**	**0.0973**	**25**	**41**
	Construction/Industrial SW	0.4	0.00109	0.4	0.00109	0	0
	Orono City MS4 (MS400111)	0.2	0.000445	0.1	0.000304	0	32
	Hennepin County (MS400138)	6	0.0168	2	0.00660	4	61
	Plymouth City MS4 (MS400112)	54	0.147	33	0.0893	21	39
Load	**Total LA**	**96**	**0.263**	**49**	**0.134**	**47**	**49**
	Non-MS4 runoff						
	SSTS						
	Upstream lakes						
	Atmospheric deposition	8	0.0231	8	0.0231	0	0
	Groundwater						
	Internal load	88	0.240	40	0.110	47	54
MOS				**4**	**0.012**		

Table 28. TMDL Summary for Phosphorus for Turbid Lake

		Existing TP Load		Allowable TP load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
Total Load		**249**	**0.683**	**117**	**0.321**	**138**	**55**
Wasteload	**Total WLA**	**5**	**0.013**	**4**	**0.010**	**1**	**27**
	Construction/Industrial SW	0.8	0.00210	0.8	0.00210	0	0
	Laketown Township (MS400142)	4	0.011	3	0.008	1	32
Load	**Total LA**	**244**	**0.669**	**108**	**0.295**	**137**	**56**
	Non-MS4 runoff	84	0.2307	67	0.1845	17	20
	SSTS	15	0.0416	0	0.000	15	100
	Upstream lakes						
	Atmospheric deposition	10	0.0261	10	0.0261	0	0
	Groundwater						
	Internal load	135	0.371	31	0.0848	104	77
MOS				**6**	**0.0161**		