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

FEB 2 4 2014

REPLY TO THE ATTENTION OF:
WW-16J

Rebecca J. Flood, Assistant Commissioner
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 Load (TMDL) addressing a bacteria impairment for Minnehaha Creek (07010206-539) and a TMDL addressing a nutrient impairment for Lake Hiawatha (DNR ID 27-0018-00), including support documentation and follow up information. Minnehaha Creek and Lake Hiawatha are located in central Minnesota in Hennepin County. The Minnehaha Creek bacteria TMDL and the Lake Hiawatha nutrient TMDL both address aquatic recreation use impairments.

In May 2013, the Minnesota Pollution Control Agency (MPCA) submitted a request to EPA for a site-specific water quality standard for Lake Hiawatha. This request included a site-specific water quality standard for total phosphorus (50 micrograms per liter, µg/L). EPA reviewed this request and other necessary documentation, and approved MPCA's request for a site-specific water quality standard for Lake Hiawatha on July 24, 2013. The approval of the site-specific water quality standards for total phosphorus allowed the MPCA to calculate TMDL loads for Lake Hiawatha to attain the site-specific water quality criterion for total phosphorus (50 µg/L). Those TMDL calculations are reflected in Table 8 of the Decision Document.

EPA has determined that the Minnehaha Creek and Lake Hiawatha TMDLs meet the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations set forth at 40 C.F.R. Part 130. Therefore, EPA approves Minnesota's bacteria TMDL for Minnehaha Creek and nutrient TMDL for Lake Hiawatha. The statutory and regulatory requirements, and EPA's review of Minnesota's compliance with each requirement, are described in the enclosed decision document.

wq-iw11-16g

We wish to acknowledge Minnesota's efforts in submitting these TMDLs and look forward to future TMDL submissions by the State of Minnesota. If you have any questions, please contact Mr. Peter Swenson, Chief of the Watersheds and Wetlands Branch, at 312-886-0236.

Sincerely,

Tinka G. Hyde
Director, Water Division

Enclosure

cc: Celine Lyman, MPCA
Chris Zadak, MPCA

TMDL: Minnehaha Creek (bacteria) & Lake Hiawatha (nutrient) TMDLs, Hennepin County, MN
Date: February 24, 2014

DECISION DOCUMENT FOR THE MINNEHAHA CREEK & LAKE HIAWATHA TMDLS, HENNEPIN COUNTY, 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:

Minnehaha Creek (07010206-539) and Lake Hiawatha (DNR ID 27-0018-00) are located in the Minnehaha Creek watershed in Hennepin County, Minnesota. The Minnehaha Creek and Lake Hiawatha (MCLH) watershed is south of Minneapolis, Minnesota within the boundaries of the North Central Hardwood Forest (NCHF) ecoregion. Minnehaha Creek flows from Lake Minnetonka at the outlet of Grays Bay eastward for 22-miles to the Mississippi River. Minnehaha Creek is the physical link that connects a network of urban lakes, parks, and open space that define the southwestern Twin Cities area.

Minnehaha Creek drains an area of 47.3 square miles (30,272 acres) below Lake Minnetonka. Minnehaha Creek is the main outlet for water from Lake Minnetonka. In the spring, during the snowmelt period, Minnehaha Creek accepts large volumes of water discharged from Lake Minnetonka via Grays Bay dam. In drier periods of the year, Lake Minnetonka typically will not discharge water into Minnehaha Creek. The Minnehaha Creek Watershed District (MCWD) established an operating schedule for the Grays Bay dam in 1980 so that water levels in Minnehaha Creek would mimic the historical discharge hydrograph produced by previous controls and the natural outlet of Lake Minnetonka.

Lake Hiawatha was a shallow wetland named Rice Lake before it was acquired by the Minneapolis Parks & Recreation Board (MPRB). The lake had stands of wild rice that grew in the shallow waters. The lake was renamed and major changes occurred to the shape and depth of Lake Hiawatha in the 1920s. The MPRB created the Hiawatha Golf Course, currently adjacent to Lake Hiawatha, using dredged materials from the Rice Lake wetland area. Minnehaha Creek drains through the southern end of Lake Hiawatha (Figure 5-10 of final TMDL document). Lake Hiawatha is considered to be 'in-line' to Minnehaha Creek and water levels in Lake Hiawatha fluctuate with the inflow of creek water from Minnehaha Creek.

Lake Hiawatha has a surface area of 53 acres (0.08 mi^2), a maximum depth of 28 feet (8.53 meters (m)), and an average depth of 16.45 feet (5.01 m) (Table 1 of this Decision Document). The MPCA classified Lake Hiawatha as a deep lake based upon the average depth of the lake being greater than 15 feet. Lake Hiawatha has a short residence time compared to most lakes in the Minneapolis area.

Table 1: Lake Hiawatha Characteristics

Characteristic	Units	
Surface area	*(acres)*	53
Average depth	*(feet)*	16.4
Maximum depth	*(feet)*	28
Littoral Area	*(acres)*	31.9
	(%)	60%
Volume	*(acre - feet)*	869
	(million – cubic feet)	37.9

Land Use:
The MCLH watershed is a primarily an urban watershed and the land use reflects those characteristics of an urban environment. A large percentage of land use (approximately 70%) in the MCLH watershed is classified by the Minnesota Land Cover Classification System (MLCCS) as impervious cover (Table 2 of this Decision Document). Other land use classifications in the MCLH watershed are forested lands and woodlands, open space (park lands, golf course lands), wetlands, lakes, streams and open water, and maintained natural areas. The Minnesota Pollution Control Agency (MPCA) does not anticipate the land use within the MCLH watershed to be altered significantly in the future because so much of MCLH watershed is already developed. The amount of developed land within the MCLH watershed is likely to remain fairly constant over the next several decades.

Development in the MCLH watershed has significantly changed the hydrology of the watershed, resulting in increased stormwater volumes and flow peaks compounded by reduced infiltration and base flow. Wetlands and depression storage that naturally extend the period of flow have largely been eliminated in the MCLH watershed. Large volumes of surface runoff are produced by impervious surfaces, but are discharged over a short period leaving the creek dry at times.

Table 2: Minnehaha Creek and Lake Hiawatha watershed land use

Land Use *	Area		Percent of Watershed
	(acres)	*(square miles)*	
0 to 10 percent impervious cover	185	0.3	1.0%
11 to 25 percent impervious cover	258	0.4	1.4%
26 to 50 percent impervious cover	2,900	4.5	16.2%
51 to 75 percent impervious cover	5,956	9.3	33.3%
76 to 100 percent impervious cover	3,206	5	17.9%
Forest & Woodland	1,871	2.9	10.5%
Open Space *(including parks & golf courses)*	1,514	2.4	8.5%
Lakes, Streams, & Open Water	548	0.9	3.1%
Maintained Natural Areas	57	0.1	0.3%
Wetlands	1,399	2.2	7.8%
Total	**17,893**	**28**	**100.0%**

*Land use data calculated from Minnesota Land Cover Classification System (MLCCS) GIS Layer

Problem Identification:
Minnehaha Creek was originally listed on the 2008 Minnesota 303(d) list for a bacteria impairment based on the fecal coliform indicator. Lake Hiawatha was originally listed on the 2002 Minnesota 303(d) list due to excessive nutrients (phosphorus). Both waters are on the draft 2014 Minnesota 303(d) list for impaired aquatic recreation due to bacteria (Minnehaha Creek) and nutrient (Lake Hiawatha) exceedances. Minnehaha Creek is also listed on the draft 2014 303(d) list for failing to meet water quality standards for aquatic macroinvertebrate and fish biology, chlorides and dissolved oxygen. These impairments will be addressed via other TMDL efforts in Minnehaha Creek; this project solely addresses Minnehaha Creek's bacteria impairment.

The MCWD and the MPRB have been monitoring water quality in Minnehaha Creek and Lake Hiawatha over the previous decade. The data set compiled by these two entities indicates that both of

these water bodies are not attaining their designated aquatic recreation uses due to exceedances of bacteria (Minnehaha Creek) and nutrient (Lake Hiawatha) criteria.

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.

Nutrients: 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:
Minnehaha Creek and Lake Hiawatha were 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. Minnehaha Creek and Lake Hiawatha are popular locations for aquatic recreation. Water quality degradation has led to efforts to improve the overall water quality within the Minnehaha Creek watershed, and to the development of a TMDL.

Pollutants of Concern:
The pollutants of concern are bacteria (Minnehaha Creek) and phosphorus (Lake Hiawatha).

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

National Pollutant Discharge Elimination Systems (NPDES) permitted facilities: NPDES permitted facilities may contribute bacteria loads to surface waters through discharges of treated wastewater. Permitted facilities must discharge treated wastewater according to their NPDES permit. There are no NPDES permitted facilities within the Minnehaha Creek watershed which discharge bacteria to

Minnehaha Creek. Therefore, individual NPDES permitted facilities were not assigned a portion of the wasteload allocation (WLA) for the Minnehaha Creek bacteria TMDL.

Municipal Separate Storm Sewer System (MS4) communities: There are nine regulated MS4 permittees within the MCLH watershed (Table 3 of this Decision Document). Eight of these nine MS4 permittees received a portion of the WLA under a categorical WLA for the bacteria TMDL. The categorical WLA allows those permittees covered under the categorical WLA to share the burden of reducing bacteria to achieve the TMDL loading capacity. The Minnesota Department of Transportation (MN-DOT) requested that their allocation of the bacteria TMDL be separated from the categorical WLA. MN-DOT was assigned an individual WLA for the bacteria TMDL (Table 7 of this Decision Document). Stormwater from MS4s can transport bacteria to surface water bodies during or shortly after storm events.

Table 3: Regulated MS4 Permittees in the MCLH watershed included within the bacteria categorical WLA and the MS4 Permittee assigned a separate WLA (MN-DOT) for the Minnehaha Creek bacteria TMDL

	NPDES Permit ID
Regulated MS4 Permittees included in the bacteria categorical WLA	
Plymouth	MS400112
Wayzata	MS400058
Minnetonka	MS400035
St. Louis Park	MS400053
Hopkins	MS400024
Edina	MS400016
City of Minneapolis	MN0061018
Hennepin County	MS400138
Regulated MS4 Permittee assigned an individual bacteria WLA	
MNDOT - Metro District	MS400170

Combined Sewer Overflows (CSOs): There are no CSO communities in the MCLH watershed. CSOs may deliver bacteria to waterways during or shortly after storm events.

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

The potential **point sources for the Lake Hiawatha nutrient TMDL** are:

NPDES permitted facilities: NPDES permitted facilities may contribute phosphorus loads to surface waters through discharges of treated wastewater. Permitted facilities must discharge treated wastewater according to their NPDES permit. There are three NPDES permitted facilities within the Minnehaha Creek watershed which were assigned a portion of the WLA for the Lake Hiawatha nutrient TMDL. Those facilities were;

- St. Louis Park GWP – Reilly Tar Site (MN0045489);
- St. Louis Park Wastewater Treatment Plant (MNG640084); and
- Kwong Tung Foods Inc. (MN0062723).

MS4 communities: There are nine MS4 communities within the MCLH watershed (Table 4 of this Decision Document). Stormwater from MS4s can transport phosphorus to surface water bodies during or

shortly after storm events. Each of the MS4 communities within Table 9 of this Decision Document was assigned a portion of the WLA.

Table 4: Regulated MS4 Permittees in the MCLH watershed assigned a portion of the WLA for the Lake Hiawatha nutrient TMDL

Regulated MS4 Permittees	NPDES Permit ID
Plymouth	MS400112
Wayzata	MS400058
Minnetonka	MS400035
St. Louis Park	MS400053
Hopkins	MS400024
Edina	MS400016
City of Minneapolis	MN0061018
Hennepin County	MS400138
MNDOT - Metro District	MS400170

Permitted Construction and Industrial Areas: Construction and industrial sites may contribute phosphorus via sediment runoff during stormwater events. These areas within the MCLH watershed must comply with the requirements of the MPCA's NPDES Stormwater Program. The NPDES program requires construction and industrial sites to create a Stormwater Pollution Prevention Plan (SWPPP) that summarizes how stormwater will be minimized from the site. MPCA expects that those MS4 communities with existing SWPPPs will update their SWPPP following the approval of the TMDL.

CSOs: There are no CSO communities in the MCLH watershed. CSOs may deliver phosphorus to waterways during or shortly after storm events.

CAFOs: There are no CAFOs within the MCLH watershed.

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

Upstream boundary bacteria load from areas above Grays Bay Dam: Non-regulated stormwater runoff which drains into Lake Minnetonka from areas above Grays Bay Dam may add bacteria to Minnehaha Creek. Bacteria inputs from nonpoint sources above Grays Bay Dam may be introduced to Minnehaha Creek when the gates of Grays Bay Dam are opened to discharge Lake Minnetonka waters into Minnehaha Creek. These discharge events from Grays Bay Dam occur at various times of the year (ex. during the spring snowmelt period).

Non-regulated stormwater runoff: Non-regulated stormwater runoff can add bacteria to Minnehaha Creek. The sources of bacteria in stormwater include pet wastes from urban areas that do not go directly to an MS4 conveyance system.

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 urban park areas, forest, and rural areas.

Bacteria liberated from wetland and streambed deposits: Bacteria can be liberated from streambeds and wetland areas during stormwater events. Increased flows within Minnehaha Creek due to stormwater events may liberate bacteria due to scouring of streambeds or wetland depositional areas. These circumstances may contribute bacteria into the water column.

The potential **nonpoint sources for the Lake Hiawatha nutrient TMDL** are:

Upstream boundary nutrient load from areas above Grays Bay Dam: Non-regulated stormwater runoff which drains into Lake Minnetonka from areas above Grays Bay Dam can add nutrients to Minnehaha Creek. This nutrient load is transported by the water flow in Minnehaha Creek and eventually this nutrient load may contribute to waters in Lake Hiawatha. Nonpoint source loading to Lake Minnetonka, from nonpoint sources above Grays Bay Dam, may be introduced to Minnehaha Creek when the gates of Grays Bay Dam are opened to discharge Lake Minnetonka waters into Minnehaha Creek. These discharge events from Grays Bay Dam occur at various times of the year (ex. during the spring snowmelt period).

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, atmospheric deposited 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 MCLH watershed. Phosphorus can be bound to these particles which may add to the phosphorus inputs to surface water environments.

Wetland Sources: Phosphorus may be added to surface waters by stormwater flows through wetland areas in the MCLH watershed. Storm events may mobilize phosphorus through the transport of suspended solids and other organic debris.

Forest Sources: Phosphorus may be added to surface waters via runoff from forested areas within the watershed. Runoff from forested areas may include debris from decomposing vegetation and organic soil particles.

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.

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 urban park areas, forest, and rural areas.

Internal loading: The release of phosphorus from lake sediments, the release of phosphorus via physical disturbance from benthic fish (rough fish, ex. carp), the release of phosphorus from wind mixing the water column, and the release of phosphorus from decaying curly-leaf pondweeds, may all contribute

internal phosphorus loading to Lake Hiawatha. 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:
Significant development is not expected in the MCLH watershed since much of the land within the MCLH watershed is already developed. MPCA estimates that the population within the MCLH watershed may slightly increase over the next few decades but the land use within the watershed is generally expected to remain unchanged. The WLA and load allocations for the Minnehaha Creek and Lake Hiawatha TMDLs were calculated for all current sources. Any expansion of point or nonpoint sources will need to comply with the respective WLA and LA values calculated in the Minnehaha Creek and Lake Hiawatha 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. Minnehaha Creek and Lake Hiawatha are both 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:

For bacteria impaired waters:

Water quality standards (WQS) are the fundamental benchmarks by which the quality of surface waters is measured. Within the State of Minnesota, WQS are developed pursuant to the Minnesota Statutes (MS) Chapter 115, Sections 03 and 44. Authority to adopt rules, regulations, and standards, as are necessary and feasible to protect the environment and health of the citizens of the State, is vested with the MPCA. 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 Minnehaha Creek are:

Table 5: Bacteria Water Quality Standards Applicable in the Minnehaha 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		

TMDL Targets:

For bacteria impaired waters:

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 MCLH 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, compliance is required with both parts of the water quality standard.

For nutrient impaired waters:

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 Lake Hiawatha are those set forth for Class 2B deep lakes in the NCHF Ecoregion (Table 6 of this Decision Document). 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.

Based on the empirical observations and analysis completed during the development of the Lake Hiawatha TMDL, MPCA believed there was a sound basis for a TP site-specific standard for Lake Hiawatha. This site-specific standard is 50 µg/L (the NCHF water quality standard is 40 µg/L). MPCA believes that attaining a site-specific standard of 50 µg/L will result in Lake Hiawatha meeting the existing water quality standard for the response variables, chl-a and SD (14 µg/L and 1.4 m, respectively). By achieving the water quality standards for the response variables, MPCA anticipates that nuisance algal blooms in Lake Hiawatha will be greatly reduced and Lake Hiawatha will exhibit desirable water clarity, i.e., meeting the designated beneficial uses of the lake. The site-specific standard of 50 µg/L was approved by R5's Water Quality Branch on July 24, 2013 (Attachment #1 and #2 to this Decision Document).

Table 6: Minnesota Eutrophication Standards for deep lakes within the NCHF ecoregion, applicable to Lake Hiawatha

Parameter	Eutrophication Standard
Total Phosphorus (µg/L)	TP < 50 [1]
Chlorophyll-a (µg/L)	chl-a < 14
Secchi Depth (m)	SD > 1.4
[1] = Approved Site-Specific Standard (July 24, 2013) to 50 µg/L, original Water Quality Standard 40 µg/L	

Site-Specific Standard Target:
MPCA selected a target of 50 µg/L of TP to develop the Lake Hiawatha nutrient TMDL.

MPCA selected total phosphorus as the appropriate parameter to address eutrophication problems at Lake Hiawatha 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 Minnehaha Creek for bacteria and Lake Hiawatha for nutrients was described in Sections 5 and 6 of the final TMDL document.

Minnehaha Creek bacteria TMDL:
For all *E. coli* TMDLs addressed by the Minnehaha Creek TMDL, a geometric mean of **126 cfu/100 ml** for five samples equally spaced over a 30-day period was used to set 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 believes that bacteria reductions necessary to restore water quality will occur in the MCLH watershed by calculating the bacteria TMDLs to the chronic water quality standard of 126 cfu/100 mL instead of the acute water quality standard of 1,260 cfu/100 mL. 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), compliance with 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 Minnehaha 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. The FDC was developed from flow frequency tables based on recorded and scaled flow volumes measured at a series of flow gages within the Minnehaha Creek watershed. Stream flow measurements from Minneapolis Metropolitan Council, the Minneapolis Parks & Recreation Board (MPRB) and the USGS flow gages were employed to estimate flows in the watershed. Flow data from these resources focused on dates within the recreation season (April 1 to October 31). Dates outside of the recreation season were excluded from the flow record. Daily stream flows were necessary to implement the load duration curve (LDC) approach.

FDC graphs have flow duration interval (percentage of time flow exceeded) on the X-axis and discharge (flow per unit time) on the Y-axis. The FDC were transformed into 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. LDC graphs, for the Minnehaha Creek bacteria TMDL, have flow duration interval (percentage of time flow exceeded) on the X-axis and *E. coli* concentrations (number of bacteria per unit time) on the Y-axis. The Minnehaha 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.

Water quality monitoring was completed in the Minnehaha Creek watershed between 2001-2011 and measured *E. coli* concentrations at the Chicago Avenue/21st Avenue sampling location within the watershed. *E. coli* values from these efforts 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.

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 Minnehaha Creek was calculated and WLAs were assigned to MS4 communities as appropriate. There are nine regulated MS4 permittees within the MCLH watershed (Table 3 of this Decision Document). Eight of these nine MS4 permittees received a portion of the WLA under a categorical WLA for the bacteria TMDL. MN-DOT requested that their allocation to be separated from the categorical WLA and MN-DOT was assigned an individual WLA for the bacteria TMDL (Table 7 of this Decision Document). The load allocation was calculated after the determination of the WLA, and the Margin of Safety (10% of the loading capacity). MPCA separated out a load allocation for the upstream load allocation from Lake Minnetonka which lies above Grays Bay Dam. MPCA explained that loading from this source should be accounted for as a nonpoint source load allocation for the Minnehaha Creek bacteria TMDL. 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.

Table 7 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 7 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 7: Minnehaha Creek bacteria TMDL

	Load Duration Curve Zone				
	High	***Moist***	***Mid***	***Dry***	***Low***
WLA	*(billion - organisms per day)*				
Regulated MS4 Permittees categorical WLA	588.20	285.10	103.90	27.74	7.94
MN-DOT	21.80	10.60	3.90	1.03	0.29
WLA TOTAL	610.00	295.70	107.80	28.77	8.23
LA	*(billion - organisms per day)*				
Non-MS4 stormwater	129.30	62.70	22.90	6.10	1.74
Upstream Boundary Load (above Grays Bay Dam)	32.00	12.40	7.00	2.03	2.36
LA TOTAL	161.30	75.10	29.90	8.13	4.10
MOS *(explicit 10%)*	85.70	41.20	15.30	4.10	1.37
TMDL	**857.00**	**412.00**	**153.00**	**41.00**	**13.70**

The reduction from current conditions needed to meet the bacteria water quality standards was estimated by subwatershed group (Table 8 of this Decision Document), where data were sufficient. MPCA divided Minnehaha Creek into eight subwatersheds (A to H in Figure 4-2 of the final TMDL document) in order to better characterize source inputs to the creek. The reductions were calculated from the geometric mean of bacteria measured in each subwatershed. The calculation used was:

(observed geometric mean – 126 cfu per 100 ml) / observed geometric mean)

MPCA states that these estimated reductions needed are intended to be approximate, and do not account for variability in flow. Also, bacteria itself can be a highly variable parameter. The estimates are intended to give a relative magnitude of reductions needed across individual subwatersheds (Figure 4-2 of the final TMDL document). Table 8 in this Decision Document summarizes the estimated reductions by subwatershed group and flow regime.

Table 8: Minnehaha Creek bacteria TMDL, Reduction Needs by Duration Curve Zone

Subwatershed Group	Name or Location	Duration Curve Zone (percent reduction)				
		High	*Moist*	*Mid*	*Dry*	*Low*
--	Grays Bay Dam	---	---	---	---	---
A	McGinty	---	---	---	---	---
B	West 34th	---	---	---	25%	4%
C	Excelsior	12%	35%	55%	76%	45%
D	Browndale	---	---	---	---	---
E	Browndale to Chain of Lakes	19%	32%	16%	46%	47%
F	Chain of Lakes to Lake Hiawatha	40%	54%	58%	73%	68%
H	Lake Hiawatha to Mouth	30%	12%	---	15%	6%

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 Minnehaha Creek bacteria TMDLs. The methods used for determining the TMDL are consistent with U.S. EPA technical memos.[1]

Lake Hiawatha nutrient TMDL:

Minnehaha Creek flows through Lake Hiawatha (Figure 5-10 of the final TMDL document) and flow and pollutant loading from Minnehaha Creek significantly influence water quality conditions in Lake Hiawatha. Water levels in Lake Hiawatha fluctuate because of its direct connection to Minnehaha Creek. In addition to these day-to-day fluctuations, there is a high level of variability in year-to-year seasonal inflow volumes to Lake Hiawatha. The residence time for Lake Hiawatha is very short, 4.4 days. The MPCA explained that this residence time is uniquely short and is much smaller than other lakes in the Minneapolis region. The loading capacity is the maximum phosphorus load which Lake Hiawatha can

[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.

receive over an annual period and still meet the NCHF WQS for chl-a and SD and the approved site-specific water quality standard for TP (50 µg/L).

For the Lake Hiawatha TP TMDL, MPCA employed FLUX32, a mass transport estimation model to calculate the TP cumulative watershed load from Minnehaha Creek to Lake Hiawatha. FLUX32 inputs are sample concentration data and daily flow data. The MCWD collected sample concentration data via water quality monitoring efforts at locations on Minnehaha Creek from 2001-2011. Daily flow information was provided by flow measurements from Minneapolis Metropolitan Council, the MPRB and the USGS flow gages within the MCLH watershed. MPCA's estimate of cumulative annual watershed load to Lake Hiawatha was 6,463 pounds of phosphorus.

The MPCA used annual load calculations to determine loading capacity values for Lake Hiawatha. Loading capacities on the annual scale (lbs/year) were calculated to meet the site-specific water quality target of 50 µg/L during the growing season (June 1 through September 30). The time period of June to September was chosen by MPCA as the growing season because it corresponds to the eutrophication criteria, contains the months that the general public typically uses Lake Hiawatha for aquatic recreation, and is the time of the year when water quality is likely to be impaired by excessive nutrient loading. Loading capacities were divided by 122 to calculate the daily loading capacities.

MPCA estimated the current phosphorus load to Lake Hiawatha to be 6,463 lbs TP/year (52.97 lbs TP/day). The loading capacity was calculated to be 4,556 lbs TP/year (37.34 lbs TP/day). The loading capacity for Lake Hiawatha was determined by a comparison of the in-lake site-specific target to actual water quality monitoring data collected by MCWD from 2001-2011. This analysis identified the percent reduction from current levels needed to achieve the site-specific water quality target (50 µg/L). MPCA calculates that water quality standards for the response variables (chl-a at 14 µg/L and SD at 1.4 m) will be attained at the designated loading capacity of 4,556 lbs TP/year. For Lake Hiawatha to meet the 50 µg/L growing season average TP TMDL target, total phosphorus loads must be reduced by 1,907 lbs TP per year (Table 10 of this Decision Document).

MPCA subdivided the loading capacity among the WLA, LA and MOS components of the TMDL (Table 9 of this Decision Document). The load assigned to the WLA accounted for a majority of the loading capacity (60%). 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 inputs are the greatest. TMDL allocations assigned during the summer growing season will protect Lake Hiawatha 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).

Table 9: Lake Hiawatha Nutrient TMDL

Site Name / MS4 Community	NPDES Permit Number	Existing *(lbs / season)*	TMDL *(lbs / season)*	TMDL *(lbs / day)*
POINT SOURCES (regulated MS4 permittees)				
Plymouth (MS4) [1, 2]	MS400112	24.50	19.60	0.16
Wayzata (MS4) [1, 2]	MS400058	13.00	10.40	0.09
Minnetonka (MS4) [1, 2]	MS400035	872.70	696.70	5.71
St Louis Park (MS4) [1, 2]	MS400053	725.80	332.80	2.73
Hopkins (MS4) [1, 2]	MS400024	383.80	170.50	1.40
Edina (MS4) [1, 2]	MS400016	841.40	424.40	3.48
City of Minneapolis (MS4) [1, 3]	MN0061018	1285.10	884.80	7.25
Hennepin Co. (MS4)	MS400138	52.90	34.20	0.28
MNDOT - Metro District (MS4)	MS400170	156.10	95.40	0.78
Total:		4355.30	2668.80	21.88
POINT SOURCES (NPDES permittees within the MCLH watershed)				
St Louis Park GWP (Reilly Tar Site): #001	MN0045489	6.30	6.30	0.05
St Louis Park GWP (Reilly Tar Site): #002	MN0045489	26.40	26.40	0.22
St Louis Park WTP	MNG640084	1.10	1.10	0.01
Kwong Tung Foods Inc	MN0062723	4.60	4.60	0.04
Total:		38.40	38.40	0.31
Total WLA:		4393.70	2707.20	22.19
NONPOINT SOURCES				
Upstream Load (Lake Minnetonka)		1279.00	1279.00	10.48
Non-MS4 Stormwater Runoff		786.20	565.70	4.64
Internal Loading		0.00	0.00	0.00
Atmospheric Deposition		4.10	4.10	0.03
Total LA:		2069.30	1848.80	15.15
MOS (implicit):		0.00	0.00	0.00
Loading Capacity:		6463.00	4556.00	37.34

1 = A construction stormwater load was included in the annual (lbs/season) and daily (lbs/day) loading values assigned to municipal MS4 permittees. The MS4 permittees are required to adopt and implement a construction stormwater ordinance with requirements at least as stringent as the State's NPDES/SDS General Stormwater for Construction Activity (MNR100001).

2 = An industrial stormwater load was included in the annual (lbs/season) and daily (lbs/day) loading values assigned to municipal MS4 permittees. The portion of the permittees allocated industrial stormwater load was estimated based on industrial stormwater discharges that would be expected to occur if the facility was complying with 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).

3 = An industrial stormwater load was included in the annual (lbs/season) and daily (lbs/day) loading value assigned to the City of Minneapolis. The City of Minneapolis is a Phase 1 MS4 community and is therefore responsible for overseeing industrial stormwater sources within the City.

Table 10 of this Decision Document discusses MPCA's estimates of the reductions required for Lake Hiawatha to meet its site-specific water quality targets. These loading reductions (i.e., the Percentage

column) were estimated from existing and TMDL load calculations. MPCA expects that these reductions will result in the attainment of the water quality target for Lake Hiawatha and the lake's water quality will return to a level where its designated use is no longer considered impaired.

Table 10: Lake Hiawatha Nutrient TMDL

Site Name / MS4 Community	NPDES Permit Number	Existing	TMDL	TMDL	Reduction	Percentage
		(lbs / season)	*(lbs / season)*	*(lbs / day)*	*(lbs / season)*	*(%)*
POINT SOURCES (regulated MS4 permittees)						
Plymouth (MS4)	MS400112	24.50	19.60	0.16	4.90	20.00%
Wayzata (MS4)	MS400058	13.00	10.40	0.09	2.60	20.00%
Minnetonka (MS4)	MS400035	872.70	696.70	5.71	176.00	20.17%
St Louis Park (MS4)	MS400053	725.80	332.80	2.73	393.00	54.15%
Hopkins (MS4)	MS400024	383.80	170.50	1.40	213.30	55.58%
Edina (MS4)	MS400016	841.40	424.40	3.48	417.00	49.56%
City of Minneapolis (MS4)	MN0061018	1285.10	884.80	7.25	400.30	31.15%
Hennepin Co. (MS4)	MS400138	52.90	34.20	0.28	18.70	35.35%
MNDOT - Metro District (MS4)	MS400170	156.10	95.40	0.78	60.70	38.89%
Total (regulated MS4 permittees):		4355.30	2668.80	21.88		
POINT SOURCES (NPDES permittees within the MCLH watershed)						
St Louis Park GWP (Reilly Tar Site): #001	MN0045489	6.30	6.30	0.05	0.00	0.00%
St Louis Park GWP (Reilly Tar Site): #002	MN0045489	26.40	26.40	0.22	0.00	0.00%
St Louis Park WTP	MNG640084	1.10	1.10	0.01	0.00	0.00%
Kwong Tung Foods Inc	MN0062723	4.60	4.60	0.04	0.00	0.00%
Total (NPDES permittees):		38.40	38.40	0.31		
Total WLA:		4393.70	2707.20	22.19		
NONPOINT SOURCES						
Upstream Load (Lake Minnetonka)		1279.00	1279.00	10.48	0.00	0.00%
Non-MS4 Stormwater Runoff		786.20	565.70	4.64	220.50	28.05%
Internal Loading		0.00	0.00	0.00	0.00	0.00%
Atmospheric Deposition		4.10	4.10	0.03	0.00	0.00%
Total LA:		2069.30	1848.80	15.15		
MOS (implicit):		0.00	0.00	0.00		
Loading Capacity:		6463.00	4556.00	37.34		

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 Lake Hiawatha TMDL. Additionally, EPA concurs with the loading capacities calculated by the MPCA in the Lake Hiawatha TMDL. EPA finds MPCA's approach for calculating the loading capacity for Lake Hiawatha 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 6 of the final TMDL document.

Minnehaha Creek bacteria TMDL:
MPCA recognized the load for the Minnehaha Creek bacteria TMDL as originating from a variety of nonpoint sources including upstream nonpoint source loads from areas above Grays Bay Dam, non-regulated stormwater runoff from areas in the watershed below Grays Bay Dam, wildlife bacteria additions and bacteria liberated from wetland and streambed deposits. MPCA classified the non-regulated stormwater runoff, wildlife and wetland and streambed bacteria deposited loads as 'non-MS4 stormwater load' within Table 7 of this Decision Document.

The LA assigned to the upstream boundary bacteria load from areas above Grays Bay Dam represents the input of nonpoint source phosphorus sources above Grays Bay Dam. Grays Bay is the downstream conduit of water draining from Lake Minnetonka into Minnehaha Creek. This load represents nonpoint sources which are draining into Grays Bay and upstream areas contributing to Lake Minnetonka. Waters from Lake Minnetonka are discharged into Minnehaha Creek at various times of the year (ex. during the spring snowmelt season). MPCA explained that the current load from areas upstream of Grays Bay Dam (i.e., Lake Minnetonka) are not subject to reductions since Grays Bay is meeting bacteria WQS.

EPA finds the MPCA's approach for calculating the LA for the Minnehaha Creek bacteria TMDL to be reasonable.

Lake Hiawatha nutrient TMDL:
MPCA recognized the LA for the Lake Hiawatha nutrient TMDL as originating from a variety of nonpoint sources including; upstream nonpoint source loads from areas above Grays Bay Dam, atmospheric deposition, wetland and forest sources, groundwater discharge, non-regulated stormwater runoff and wildlife inputs. LA was subdivided into loads assigned to an upstream LA for areas above Grays Bay Dam, a non-MS4 stormwater LA, and atmospheric deposition (Table 9 of this Decision Document).

MPCA determined that internal loading from lake sediments in Lake Hiawatha was not a factor which necessitated a LA (i.e., LA= 0). MPCA made this determination after studying the flow conditions and hydrologic interactions between Minnehaha Creek and Lake Hiawatha, examining the residence time of Lake Hiawatha (estimated to be 4.4 days) and completing load modeling within the Lake Hiawatha lake system. The load modeling (FLUX32) and water quality data collected at upstream and downstream locations demonstrated that phosphorus loads decreased in Lake Hiawatha. Lake Hiawatha was behaving more as a nutrient 'sink' on a typical year than a source of phosphorus. MPCA explained that, relative to other sources in the MCLH watershed, internal loading in Lake Hiawatha is not a major contributor.

The LA assigned to the upstream boundary TP load from areas above Grays Bay Dam represents the input of nonpoint source phosphorus sources above Grays Bay Dam. Grays Bay is the downstream conduit of water draining from Lake Minnetonka into Minnehaha Creek. This load represents nonpoint sources which are draining into Grays Bay and upstream areas contributing to Lake Minnetonka. Waters from Lake Minnetonka are discharged into Minnehaha Creek at various times of the year (ex. during the spring snowmelt season). MPCA explained that the current load from areas upstream of Grays Bay Dam (i.e., Lake Minnetonka) are not subject to reductions since Grays Bay is meeting NCHF TP WQS.

EPA finds the MPCA's approach for calculating the LA for the Lake Hiawatha nutrient TMDL to be reasonable and consistent with EPA guidance.

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:

Minnehaha Creek bacteria TMDL:

MPCA explained that quantifying regulated bacteria stormwater loads in Minnehaha Creek and assigning those loads to individual regulate MS4 permittees was too complex, and MPCA choose to use a categorical WLA. MPCA appointed a categorical WLA to eight of the nine regulated MS4 permittees within the MCLH watershed (Table 3 of this Decision Document). MN-DOT (NPDES Permit ID # MS400170) requested that the MPCA assign MN-DOT a separate WLA for the Minnehaha Creek bacteria TMDL. MPCA granted the request of MN-DOT and calculated an individual WLA for

MN-DOT based on land coverage of MN-DOT within the MCLH watershed (Table 7 in this Decision Document).

The use of a categorical bacteria WLA for Minnehaha Creek is consistent with aspects of MPCA guidance for incorporating MS4 stormwater programs into TMDLs. MPCA explained that a categorical WLA is appropriate when each permittee can perform the same stormwater management activities to accomplish the requirements of the TMDL. This situation also occurs when the TMDL prescribes a set of BMPs for more than one stormwater entity and those BMPs alone will achieve the WLA.[2] Also, MPCA explained that a categorical WLA may be appropriate when a single MS4 or other entity, such as the MCWD, will track BMPs implementation and associated load reductions. In the case of the Minnehaha Creek and Lake Hiawatha TMDLs, MCWD has an established water quality monitoring program that has measured, and will continue to measure, water quality conditions in the MCLH watershed. MCWD will also work with regulated MS4 permittees within the MCLH watershed to track progress towards achieving water quality targets.

There are no CSOs within the MCLH watershed, therefore, CSOs were assigned a WLA of zero (WLA = 0) for the Minnehaha Creek bacteria TMDL. MPCA determined that there were no CAFO facilities within the MCLH watershed. CAFOs and other feedlots are generally not allowed to discharge to waters of the State (Minnesota Rule 7020.2003). CAFOs were assigned a WLA of zero (WLA = 0) for the Minnehaha Creek bacteria TMDL.

EPA finds the MPCA's approach for calculating the WLA for the Minnehaha Creek bacteria TMDL to be reasonable.

Lake Hiawatha nutrient TMDL:

MPCA assigned portions of the WLA to NPDES permitted facilities and to regulated MS4 permittees (Tables 9 and 10 in the Decision Document). WLAs were assigned based on the necessary TP load reductions for achieving the TP site-specific water quality target (50 µg/L). Table 11 of this Decision Document displays the NPDES permitted facilities which received a portion of the TP WLA. MPCA explained that nutrient loads from these facilities represent a very small fraction of the overall load for the Lake Hiawatha nutrient TMDL. The WLAs from these facilities were calculated based on the growing season average TP loads (Table 11 of this Decision Document).

[2] Minnesota Pollution Control Agency, October 2011. *Supporting Material for Guidance and Policy for Incorporating Stormwater Language into Total Maximum Daily Loads*. Document Number: wq-strm7-03. St. Paul, MN.

Table 11: NPDES wastewater facility permits in the Minnehaha Creek TMDL study area

NPDES ID	Facility	Effluent Limit or Target Concentration (µg/L)	Average Flow (mgd)	Growing Season Average TP Load (pounds)
MN0045489	St. Louis Park GWP : Reilly Tar Site 001	30	0.164	6.3 [1]
	St. Louis Park GWP : Reilly Tar Site 002	30	0.864	26.4
MNG640084	St. Louis Park WTP	74	0.0117	1.1 [1]
MN0062723	Kwong Tung Foods	273	0.0131	4.6 [1]

[1] Includes a 25% increase to account for uncertainty in seasonal load estimates.

For the loads apportioned to MS4 Phase I and Phase II MS4 permittees, MPCA employed a targeted geographic framework based on land use classifications (i.e., areal coverage and impervious cover) to estimate the WLAs for individual MS4 municipalities. MS4 allocations were estimated based on each MS4 permittee's jurisdictional area within the MCLH watershed. While the MCWD is considered as a regulated MS4, the MPCA chose to not assign a portion of the MS4 WLA to the MCWD. The MPCA choose to assign the WLAs to other MS4 permittees within the MCLH watershed (Table 9 of the Decision Document). The MCWD owns and operates a limited number of conveyance structures within the MCLH watershed. MPCA considered MCWD's stormwater infrastructure (i.e., conveyance structures) to be a very small piece of a larger municipal MS4 dominated MCLH watershed (ex. the City of Plymouth, etc.) and thus did not assign any portion of the MS4 WLA to the MCWD (WLA =0).

MPCA calculated the portion of the WLA (17.5 lbs/year) assigned to construction stormwater and industrial stormwater based on construction and industrial permitted acreage in Hennepin County from 2008-2012. MPCA estimated this acreage and applied that percentage to the overall loading capacity (4556.00 lbs/season) to determine a seasonal average TP load to assign to construction stormwater (17.5 lbs/year) and industrial stormwater (17.5 lbs/year). MPCA distributed the 17.5 lbs/year of TP for construction stormwater WLA and the 17.5 lbs/year of TP for industrial stormwater across the municipal MS4 permits (Table 12 of this Decision Document). This distribution aligned with the targeted geographic framework employed to assign nutrient loads and the estimated nutrient reductions across subwatersheds A – H (Figure 3-1 of the final TMDL document).

Attaining the construction stormwater and industrial stormwater loads described in the Lake Hiawatha nutrient TMDL is the responsibility of construction and industrial site managers. Local municipal MS4 permittees are responsible for overseeing construction stormwater loads which impact water quality in Lake Hiawatha. MS4 communities within the watershed are required to have a construction stormwater ordnance at least as stringent as the State's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001). In the final TMDL document MPCA explained that if a construction site owner/operator obtains coverage under the NPDES/SDS General Stormwater Permit (MNR100001) and properly selects, installs and maintains all BMPs required under MNR1000001 and applicable local construction stormwater ordinances, 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. BMPs and

other stormwater control measures which act to limit the discharge of the pollutant of concern (phosphorus) are defined in MNR100001.

The MPCA is responsible for overseeing industrial stormwater loads which impact water quality in Lake Hiawatha. The exception to this are Phase 1designated MS4 communities. Phase 1 MS4 communities are responsible for overseeing any industrial stormwater loads which are within their jurisdictional boundaries. The City of Minneapolis is a recognized Phase 1 MS4 community. Industrial sites within the MCLH watershed are expected to comply with the requirements of 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). In the final TMDL document MPCA explained that 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. BMPs and other stormwater control measures which act to limit the discharge of the pollutant of concern (phosphorus) are defined in MNR050000 and MNG490000.

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. As noted above, MPCA has explained that meeting the terms of the applicable permits will be consistent with the WLAs set in the Minnehaha Creek and Lake Hiawatha TMDLs. In the event that the SWPPP does not meet the WLA, the SWPPP will need to be modified within 18-months of the approval of the TMDL by the U.S. EPA. This applies to sites under permits for MNR100001, MNR050000 and MNG490000.

There are no CSOs within the MCLH watershed, therefore, CSOs were assigned a WLA of zero (WLA = 0) for the Lake Hiawatha nutrient TMDL. MPCA determined that there were no CAFO facilities within the MCLH watershed. CAFOs and other feedlots are generally not allowed to discharge to waters of the State (Minnesota Rule 7020.2003). CAFOs were assigned a WLA of zero (WLA = 0) for the Lake Hiawatha nutrient TMDL.

EPA finds the MPCA's approach for calculating the WLA for the Lake Hiawatha nutrient TMDL to be reasonable and consistent with EPA guidance.

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:
Section 6 of the final TMDL submittal outlines the Margin of Safety used in the Minnehaha Creek bacteria TMDL and Lake Hiawatha nutrient TMDL. The margin of safety (MOS) accounts for uncertainties in both characterizing current conditions and the relationship between the load, wasteload, monitored flows and in-stream water quality. The purpose of the MOS is to account for uncertainty so the TMDL allocations result in attainment of water quality standards.

Minnehaha Creek bacteria TMDL:
The Minnehaha Creek bacteria TMDL incorporated an explicit MOS of approximately 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 (Table 7 of this Decision Document). The use of the LDC approach minimized variability associated with the development of the Minnehaha 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 Minnehaha 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 Hiawatha nutrient TMDL:
The Lake Hiawatha nutrient TMDL incorporated a margin of safety via assumptions made during the TMDL development process. These assumptions accounted for the imperfect understanding of the watershed and lake system. One of these imperfections involved phosphorus losses in the Meadowbrook Lake /Browndale pool reach of Minnehaha Creek (Subwatershed 'D', Figure 3-1 of the final TMDL document). In this reach the flow from the upstream portion of Minnehaha Creek slows as the creek waters enter into Meadowbrook Lake. This decrease in flow and the mixing of the Meadowbrook Lake

environment cause some of the phosphorus load of the upstream portion of Minnehaha Creek to be deposited into Meadowbrook Lake and the Browndale pool area. MPCA determined that decreased phosphorus concentrations, observed within the 2001-2011water quality monitoring data, were the result of phosphorus storage within Meadowbrook Lake and Browndale Pool. In calculating the loading capacity for the Lake Hiawatha nutrient TMDL, MPCA accounted for this loss of potential phosphorus loading from the upstream reaches of Minnehaha Creek.

Another assumption used to develop MOS for the Lake Hiawatha nutrient TMDL was the use of the site-specific water quality target of 50 µg/L for TP. MPCA justified its use of a site-specific standard at 50 µg/L in January 2013 document[3] to EPA. Within this document, MPCA explained that based on water quality data collected within the MCLH watershed from 2001-2011, setting the site-specific water quality target for Lake Hiawatha at 50 µg/L TP was a more conservative in-lake water quality endpoint than setting the site-specific water quality target at a greater concentration (ex. 60 µg/L or 70 µg/L). MPCA considered setting the site-specific water quality endpoint at a concentration greater than 50 µg/L, but ultimately chose the 50 µg/L in order to provide a measure of MOS for the lake to attain the site-specific water quality attainment goals for Lake Hiawatha.[4]

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 Minnehaha Creek and Lake Hiawatha TMDLs via the following methods:

Minnehaha 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 LDCs utilized flow measurements from local flow gages. These flow measurements were collected over a variety of flow conditions observed during the recreation season. LDCs developed from these flow records represented a range of flow conditions within the MCLH watershed and thereby accounted for seasonal variability over the recreation season. TMDL loads were based on sampling that occurred during the recreational season in 2001-2011.

[3] Minnesota Pollution Control Agency. January 2013. Lake Hiawatha Site-Specific Eutrophication Criteria Justification. Watershed Division. St. Paul, MN
[4] MPCA, *Lake Hiawatha Site-Specific Eutrophication Criteria Justification*, Public Notice Draft (January 2013), pg. 5

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 Hiawatha nutrient TMDL:

Nutrient influxes to Minnehaha Creek and Lake Hiawatha typically occur during wet weather events. Critical conditions that impact the response of surface waters in the MCLH watershed 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. Critical conditions that impact loading, or the rate that nutrients are delivered to the water body, were identified as those periods where large precipitation events coincide with periods of minimally covered land surfaces. The conditions generally occur in the spring and early summer seasons.

The nutrient targets employed in the Lake Hiawatha TMDL were based on the average nutrient values collected during the growing season (June 1 to September 30). The water quality targets were designed to meet the site-specific water quality target (50 µg/L) during the period of the year where the frequency and severity of algal growth is the greatest. Nutrient loading capacities were set in the TMDL development process to meet the WQS during the most critical period. The mid-late summer time period is typically when eutrophication standards are exceeded and water quality in Lake Hiawatha 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 Minnehaha Creek and Lake Hiawatha TMDLs discuss reasonable assurance activities in Section 7 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 MCLH TMDL study area. The responsibilities of the second framework is described in MCWD's Water Resources Management Plan and the LGUs' local water management plans.

MPCA and MS4 communities in the MCLH watershed:
MPCA is responsible for applying federal and state regulations to protect and enhance water quality within the MCLH TMDL study area. MPCA oversees all regulated MS4 entities (ex. cities of Plymouth, Wayzata etc., MN-DOT, Hennepin County, and the MCWD) in stormwater management accounting activities. Within the MCLH TMDL study area there is one Phase I MS4 permittee (the City of Minneapolis) and the rest of the MS4 permittees are Phase II MS4 permittees. Phase I MS4 NPDES/SDS 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; Minneapolis is issued an individual permit, which is similar but contains additional requirements. 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.

The Minnehaha Creek bacteria TMDL and Lake Hiawatha nutrient TMDL assign pollutant load allocations to the regulated MS4s (Tables 7 and 9 of this Decision Document). The MS4 Phase II General permit requires permittees to develop compliance schedules for any EPA approved TMDL WLAs not being achieved at the time of permit application. This includes BMPs that will be implemented over five-year permit term, timelines for their implementation, and a long term strategy for continued progress toward ultimately achieving those WLAs. For any WLA that is being met at the time of application, at least the same level of treatment must be maintained into the future. Per federal rule, all MS4 permittees, regardless of TMDL status, are required to reduce loading from their storm sewer system to MEP.

Reasonable assurance that the WLAs calculated for the Minnehaha Creek and Lake Hiawatha TMDLs will be implemented is provided by regulatory actions. According to 40 CFR 122.44(d)(1)(vii)(B), NPDES permits must be consistent with assumptions and requirements of all WLAs in an approved TMDL. MPCA's stormwater program and its NPDES permit program are the state programs responsible for ensuring that implementation activities are initiated and maintained and are consistent with the WLAs calculated from the TMDLs.

The NPDES program requires construction and industrial sites to create SWPPPs which summarize how stormwater will be minimized from construction and industrial sites. Under the MPCA's Stormwater General Permit, managers of sites under construction or industrial stormwater permits must review the adequacy of local SWPPPs to ensure that each plan meets WLA set in the Minnehaha Creek and Lake Hiawatha TMDLs. In the event that the SWPPP does not meet the WLA, the SWPPP will need to be modified within 18-months of the approval of the TMDL by the U.S. EPA. This applies to sites under the MPCA's General Stormwater Permit for Construction Activity (MNR100001) and its 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).

MPCA and LGUs (MS4 communities) in the MCLH watershed:

The MCWD was created in 1967 via 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 MCLH watershed.

The MCWD is considered as a regulated MS4. The MCWD owns and operates a limited number of conveyance structures within the MCLH watershed. The MCWD's stormwater infrastructure (i.e., conveyance structures) was considered very small, based on jurisdictional area, when compared to the stormwater infrastructure of the larger MS4 communities in the MCLH (ex. the City of Plymouth, etc.,).

MPCA did not assign a portion of the MS4 WLA to the MCWD and instead distributed the WLA to the Phase I and Phase II MS4 permittees within the MCLH watershed (Table 9 of the Decision Document).

The overall goals of restoring impaired water resources and protecting water resources in the MCLH watershed require active and collaborative partnerships between the MCWD and LGUs. The MCWD consists of all the cities and townships whose jurisdiction areas are within the boundaries of the MCLH watershed. Throughout the development of the MCLH TMDLs the MCWD has actively engaged in partnering efforts with their LGUs partners. In addition to meeting with members of each LGU 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 MCLH 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. As a result each LGU in the MCLH watershed 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 MCLH 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 Minnehaha Creek bacteria TMDL and the Lake Hiawatha phosphorus TMDL. The MCWD will also include other appropriate revisions to the 2007 MCWD Plan to make it more current.

The MCWD provides the LGUs with the flexibility to determine the most efficient and cost-effective means of achieving the reductions described in the Minnehaha Creek bacteria TMDL and the Lake Hiawatha phosphorus TMDL. 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 Minnehaha Creek and Lake Hiawatha 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 MCLH 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 MCLH watershed. Certain partnerships between the MCWD and individual LGUs were strengthened through the discussions at TMDL meetings held during the development of the MCLH TMDL.

During the development of the Minnehaha Creek and Lake Hiawatha TMDLs, MPCA, MCWD and LGUs held initial discussions regarding the establishment of a stormwater credit trading program in the MCLH watershed. The efforts toward the development of a stormwater credit trading program demonstrates the commitment of the MCWD and its partner LGUs to reduce pollutant loadings in the MCLH watershed. MCWD and its partner LGUs will continue to work on the details of this program with the help of MPCA stormwater staff.

Funding opportunities:
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).

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 MCLH watershed. Water quality monitoring is a critical component of the adaptive management strategy employed as part of the implementation planning efforts for Minnehaha Creek and Lake Hiawatha. 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 Minnehaha Creek will continue to be a part of the MCWD annual Hydrologic Data program. The MCWD will also continue to partner with the MPRB as it monitors water quality in Lake Hiawatha.

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 MCLH watershed.

Minnehaha Creek bacteria TMDL implementation strategies:
Urban/residential stormwater reduction strategies: The land use in the MCLH watershed is largely composed of developed urban/suburban areas with varying levels of impervious cover (ex. roads, parking lots, sidewalks, roofs etc.) MPCA believes that reducing stormwater flows into Minnehaha Creek from impervious surfaces will greatly benefit the water quality within the MCLH watershed. During the development of the TMDL, it became apparent that the MCLH watershed, due to the high percentage of impervious cover within the watershed, was a hydrologic system which was significantly influenced by stormwater events.

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

Stormwater volume control and infiltration BMPs: To mitigate the impact of stormwater in Minnehaha Creek and Lake Hiawatha, the MPCA recommends the installation of stormwater BMPs, including some combination of rain gardens, vegetated swales/bioswales/bioretention areas, detention ponds, rain barrels, pervious pavement and infiltration trenches. Reducing peak flow stormwater inputs within the MCLH 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.

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 stormwater runoff before the runoff enters into Minnehaha Creek or other surface water conveyance areas which feed into the main stem of Minnehaha 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 Minnehaha Creek and Lake Hiawatha.

Lake Hiawatha 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 MCLH 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 Minnehaha Creek should also be encouraged to restore the immediate creek side areas with native plants and create buffer areas to capture runoff and prevent erosion. Property owners with yards extending down to the creek 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 Minnehaha Creek. 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 MCLH 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.

Protection and restoration of wetlands (especially wetlands in the floodplain of Minnehaha Creek): MPCA recommends protecting and restoring wetlands in the floodplain areas of Minnehaha Creek and within the Lake Hiawatha direct watershed. Wetland areas should be protected against unnecessary stormwater introductions, which could potentially turn wetland areas from nutrient sinks to nutrient sources. MPCA advises that local partners complete a wetlands assessment to determine which wetland areas in the watershed should be prioritized for restoration.

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 Lake Hiawatha.

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 final TMDL document. Throughout the development of the Minnehaha Creek and Lake Hiawatha TMDLs 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 MCLH 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 Minnehaha Creek and Lake Hiawatha 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 MCLH watershed. This information was particularly important in developing the Reasonable Assurance analysis of the Minnehaha Creek and Lake Hiawatha TMDLs. Regulated MS4 communities and the MCWD will ultimately be responsible for the implementation efforts within the MCLH 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 August 12, 2013 and ended on September 11, 2013. The MPCA received four public comments and adequately addressed these comments. Comments were submitted by the Minnesota Center for Environmental Advocacy (MCEA), the City of Minnetonka, the Minneapolis Park and Recreation Board and the City of Minneapolis. The comments from the Minneapolis Park and Recreation Board and the City of Minneapolis were minor comments (i.e., suggestions to change wording used within the draft TMDL document, insertion of permit numbers in certain cases, insertion of dates which had been updated between the writing of the draft TMDL and the public notice period etc,). MCEA's comments focused on a request to disaggregate the WLA for the bacteria TMDL.

The City of Minnetonka's comments requested additional information be included within the TMDL document to better explain impervious coverages and land use assumptions (which make up the basis for assigning loads in the total phosphorus TMDL) and additional discussion related to the choice of the 'Combination Approach' in Section 6 of the final TMDL document. EPA believes that MPCA adequately addressed each of these comments and updated the final TMDL with appropriate language to address these comments. The MPCA submitted all of the public comments and responses in the final TMDL submittal packet received by the EPA on November 14, 2013.

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 Minnehaha Creek and Lake Hiawatha TMDL document, submittal letter and accompanying documentation from the MPCA on November 14, 2013. The transmittal letter explicitly stated that the final Minnehaha Creek (07010206-539) TMDL for bacteria and the final Lake Hiawatha (DNR ID 27-0018-00) TMDL for excessive nutrients 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 finds that the TMDL transmittal letter submitted for Minnehaha Creek and Lake Hiawatha 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 Minnehaha Creek (bacteria) and Lake Hiawatha (nutrient) satisfy all of the elements of approvable TMDLs. This approval is for two TMDLs, addressing one water body for aquatic recreational use impairments due to bacteria, Minnehaha Creek (07010206-539), and one water body for aquatic recreational use impairments due to nutrients, Lake Hiawatha (DNR ID 27-0018-00).

The EPA's approval of these TMDLs extends to the water bodies which are identified as Minnehaha Creek (07010206-539) and Lake Hiawatha (DNR ID 27-0018-00), 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.

Attachments:

Attachment #1: EPA Approval Letter of the Site-Specific Eutrophication Water Quality Standard for Lake Hiawatha *(dated July 24, 2013)*

Attachment #2: EPA's Review of the MPCA Request for Approval of a Site-Specific Eutrophication Water Quality Standard for Lake Hiawatha under Section 303(c) of the Clean Water Act (WQSTS# MN2013-481) *(dated July 24, 2013)*

Attachment #1

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

JUL 24 2013

REPLY TO THE ATTENTION OF: WQ-16J

Shannon Lotthammer, Division Director
Environmental Analysis and Outcomes Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Dear Ms. Lotthammer:

The U.S. Environmental Protection Agency has completed its review of water quality standards submitted by the Minnesota Pollution Control Agency (MPCA). On May 29, 2013, EPA received a submittal by MPCA for a site-specific water quality criterion for total phosphorus (TP) for Lake Hiawatha. Included in the submittal was a letter dated May 21, 2013 from MPCA's General Counsel certifying that the site-specific TP criterion for Lake Hiawatha was adopted pursuant to Minnesota State law. The site-specific water quality standard submitted by MPCA for Lake Hiawatha is reviewed by EPA under section 303(c) of the Clean Water Act (CWA) and EPA's regulations at 40 CFR Parts 131 and 132 (if applicable).

Consistent with section 303(c) of the CWA and federal regulations at 40 CFR 131.21, EPA is required to review and approve, or disapprove, new or revised state water quality standards. EPA has reviewed the site-specific water quality standard identified above and the information submitted by MPCA in support of this standard and hereby approves the standard identified above pursuant to section 303(c) of the CWA and federal regulations at 40 CFR 131.21.

As required under section 7 of the Endangered Species Act, EPA evaluated whether approval of this standard would affect federally-listed endangered or threatened species or designated critical habitat. There are no aquatic or aquatic-dependent endangered, threatened, and candidate species in the action area of Lake Hiawatha. EPA has determined that this approval action will have no effect on federally-listed species, nor will it adversely modify critical habitat in Minnesota. Thus, consultation with the U.S. Fish and Wildlife Service is not required.

If your staff has any questions regarding this approval, please have them contact Brian Thompson of my staff at (312) 353-6066 or thompson.brian@epa.gov.

Sincerely,

for Tinka G. Hyde
Director, Water Division

cc: Steven Heiskary, MPCA

Attachment #2

EPA's Review of the Minnesota Pollution Control Agency Request for Approval of a Site-Specific Eutrophication Water Quality Standard for Lake Hiawatha under Section 303(c) of the Clean Water Act WQSTS# 2013-481

Date: July 24, 2013

I. Summary

A. Date all required materials received by EPA: May 29, 2013

B. Submittal History:

The Minnesota Pollution Control Agency (MPCA) submitted a request, dated May 21, 2013, to the U.S. Environmental Protection Agency for approval of a site-specific water quality standard for Lake Hiawatha, located in Hennepin County, Minnesota.

C. Documents included in the submittal:

- Transmittal letter from MPCA to EPA, dated May 21, 2013
- Findings of Fact, Conclusions of Law, and Order, signed May 17, 2013
- MPCA responses to comments received during the public notice period (February 4, 2013 to March 6, 2013) – one letter dated March 15, 2013 including original comments
- Notice of availability of draft Lake Hiawatha site-specific standard (February 2013)
- Lake Hiawatha Site Specific Eutrophication Criteria Justification (January 2013)
- Certification letter from MPCA General Counsel, dated May 21, 2013
- Email from Elise Doucette of MPCA to Brian Thompson of U.S. EPA, Region 5 on the status of fisheries in Lake Hiawatha, July 2, 2013

D. Other supporting documents:

- Statement of Needs and Reasonableness (SONAR), Book II of III, In the Matter of Proposed Revisions Of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State, MPCA, July 2007
- Minnesota Lake Water Quality Assessment Report: Developing Nutrient Criteria, September 2005
- EPA's Record of Decision on the Minnesota 2008 Triennial Review Water Quality Standards Revisions
- 2007 Lake Information Report for Lake Hiawatha by the Minnesota Department of Natural Resources
- Memo to the Lake Byllseby file, dated April 19, 2011, from Robert Roche, Assistant Attorney General, on MPCA authority to adopt site-specific water quality standards

E. Description of Action:

Lake Hiawatha is located in Hennepin County at the lower end of the Minnehaha Creek Watershed in the Twin Cities Metropolitan area. Minnehaha Creek flows from Lake Minnetonka at the outlet of Grays Bay eastward to the Mississippi River. Lake Hiawatha is in-line to Minnehaha Creek. Lake Hiawatha and the Minnehaha Creek watershed which drains into Lake Hiawatha lie within the North Central Hardwood Forest (NCHF) ecoregion. Prior to development in the 1920s, Lake Hiawatha was a shallow wetland having strands of wild rice. Lake Hiawatha was acquired by the Minneapolis Park & Recreation Board (MPRB) in 1923 and was converted into Lake Hiawatha in 1929-1931 for the construction of the Hiawatha Golf Course. The construction of the golf course used approximately 1.25 million cubic yards of dredged material from Lake Hiawatha and incurred changes to the shape and depth of Lake Hiawatha (MRPM 2013).

The surface area of Lake Hiawatha is 55 acres and the lake receives streamflow from Minnehaha Creek and the upstream Minnehaha Creek watershed below Grays Bay Dam (approximately 47.3 square miles of area). This large upstream watershed area results in a watershed to lake area ratio of 550:1. The watershed to lake area ratio is larger when factoring in the drainage area of Lake Minnetonka above the Grays Bay Dam (123 square miles). Water from the Lake Minnetonka watershed is periodically released into Minnehaha Creek via Grays Bay dam. The lake hydraulic residence time is 4.4 days, based on an 11-year average. Lake Hiawatha is 62 percent littoral (80 percent being the cut-off for shallow vs. deep lakes) and has a maximum depth of 33 feet. Water level in Lake Hiawathaμ is maintained by a weir in its outlet (MPCA 2013). MPCA developed site-specific eutrophication standards for Lake Hiawatha to account for its unique characteristics.

The proposed site-specific water quality standard for Lake Hiawatha is 50 ug/l for total phosphorus (TP). The statewide criteria for the response variables, chlorophyll-a and Secchi disk depth, are not proposed to be changed for Lake Hiawatha (see Table 1, below).

Table 1. NCHF ecoregion criteria vs. proposed criteria for Lake Hiawatha

	TP (μg/L)	Chl-a (μg/L)	Secchi Depth (meters, not less than)
Eutrophication criteria for the NCHF ecoregion	40	14	1.4
Proposed criteria for Lake Hiawatha	***50***	14	1.4

F. Basis of Action:

MPCA has authority to modify water quality standards on a site-specific basis under Minn. R. 7050.0220 Subpart 7, "Site-specific modifications of standards."

> A. The standards in this part and in parts 7050.0221 to 7050.0227 are subject to review and modification as applied to a specific surface water body, reach, or segment. If site-specific information is available that shows that a site-specific modification is more appropriate than the statewide or ecoregion standards for a particular water body, reach, or segment, the site-specific information shall be applied.

The Lake Hiawatha site-specific eutrophication standards were developed in accordance with Minn. R. 7050.0222 Subpart 7. As described above, Subpart 7 provides authority to modify water quality standards on a site-specific basis where the data and specific environmental facts regarding a lake or other surface water show that a general standard is not appropriate.

Lake Hiawatha fits the condition described in Minn. R. 7050.0220 Subpart 7 for modifying water quality standards where the data and facts show that a site-specific standard is more appropriate than the statewide or ecoregion standards. Lake Hiawatha's watershed to lake surface area ratio of 550:1 is among the highest in Minnesota. Total phosphorus loadings and nutrients concentrations tend to be higher in lakes and reservoirs that have large watershed to surface area ratios. Also, Lake Hiawatha has a short residence time of 4.4 days, as compared to more typical residence time conditions of deep lakes. A short residence time reduces the amount of algae that can grow, taking a greater concentration of phosphorus to produce the same amount of algae (MPCA 2013a).

Minnesota added Lake Hiawatha to the statewide impaired waters (303(d)) list in 2002 for impairment to the aquatic recreation designated use due to excessive nutrients. In developing the TMDL for Lake Hiawatha, MPCA determined that a site-specific TP criterion should be developed. Justification for this decision was based on Lake Hiawatha water quality data and MPCA modeling efforts which examined the response of chlorophyll-a and Secchi depth to TP. MPCA considered summer data over a period of twelve years (from 2000 to 2011). The data were provided by the Minneapolis Parks & Recreation Board (MPRB). TP concentrations ranged from 59-99 µg/L, chlorophyll-a concentrations ranged from 8-46 µg/L, and average Secchi depth ranged from 0.8-1.9 meters. Lake Hiawatha met both the chlorophyll-a and Secchi depth criteria in three years of the twelve-year period. In those three years, TP concentrations ranged from 59-66 ug/l. The average TP concentration was 73 ug/l. The lake will require approximately a 30 percent reduction in phosphorus loading to meet 50 ug/l TP (MPCA 2013a). MPCA made the following observations and conclusions based on the MPRB data:

- In the three years in which Lake Hiawatha met the criteria for both chlorophyll-a and Secchi depth, the TP concentrations ranged from 59-66 ug/l.
- A linear regression between chlorophyll-a and total phosphorus shows a strong correlation (R-squared = 0.87). The regression equation shows that a chlorophyll-a value of 14 ug/l corresponds to a TP value of 64 ug/l.

- Similarly, a linear regression between Secchi depth and TP showed a reasonably strong correlation (R-squared = 0.57). The regression equation shows that a Secchi depth value of 1.4 meters corresponds to a TP value of 72 ug/l.

MPCA concluded that a TP criterion of 50 ug/ in Lake Hiawatha will result in meeting the ecoregional criteria for chlorophyll-a nd Secchi depth. In 2008, Minnesota adopted and EPA approved chlorophyll-a and Secchi depth values as part of Minnesota's lakes eutrophication standards. The Statement of Needs and Reasonableness for Minnesota's 2008 lakes eutrophication standards and the Minnesota Lake Water Quality Assessment Report provide the technical explanation for why meeting the chlorophyll-a and Secchi depth values will avoid algal blooms that exceed minimal nuisance conditions for recreation or substantially alter aquatic life communities, thereby protecting designated uses (MPCA 2005, 2007).

II. Areas Affected

The area affected by the site-specific TP criterion is limited to Lake Hiawatha in Hennepin County. Minnesota classifies Lake Hiawatha as a Class 2B water, which means it is intended to support a warm water fishery, its associated aquatic life and their habitats, and all forms of aquatic recreation. According to the Minnesota 2012 impaired waters list (303(d)) Lake Hiawatha's recreational use status is impaired by nutrients (U.S. EPA 2008). MPCA has determined that Lake Hiawatha's aquatic life designated use is not impaired. According to the Minnesota Department of Natural Resources (MDNR) lake information report, the Lake Hiawatha has a diverse fish community (MDNR 2007).

III. Clean Water Act (CWA) Sections 101(a)(2)/303(c)(2)/118(c)(2)/40 CFR 131 and 132 Review

A. EPA's authority under section 303(c)(2) of the CWA:

Water quality standards requirements of CWA sections 101(a)(2) and 303(c)(2) are implemented through federal regulations contained in 40 CFR 131; water quality standards requirements of CWA section 118, specific to waters of the Great Lakes System, are implemented through federal regulations contained in 40 CFR 132. Federal regulations at 40 CFR 131.21 require EPA to review and approve or disapprove state-adopted water quality standards. In making this determination, EPA must consider the following requirements of 40 CFR 131.5:

- whether state-adopted uses are consistent with CWA requirements;
- whether the state has adopted criteria protective of the designated uses;
- whether the state has followed legal procedures for revising its standards;
- whether state standards are based on appropriate technical and scientific data and analyses; and
- whether the state's submission includes certain basic elements as specified in 40 CFR 131.6.

Section 101(a)(2) of the CWA specifies that designated uses "provide for the protection and propagation of fish, shellfish, and wildlife and provide for recreation in and on the water." Section 303(c)(2) of the CWA requires that standards shall protect the public health and shall take into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational, agricultural, industrial, and navigational purposes.

EPA is required to review and approve or disapprove new and revised water quality standards submitted by States and Tribes. Possible EPA actions include:

- **Approval** (where EPA concluded that approval of certain revisions will have no effect on listed species, or is otherwise not subject to Endangered Species Act (ESA) consultation),
- **Approval subject to ESA consultation** (where EPA has concluded that certain revisions may affect listed species (including beneficial effects)),
- **Disapproval** (where EPA has concluded that certain revisions do not meet the requirements of the CWA or federal regulations and guidance), and
- **No EPA action** (where EPA has concluded that certain revisions are not revisions to the State's or Tribe's water quality standards and, therefore, do not need to be reviewed under section 303(c) of the CWA.

Consistent with federal regulations at 40 CFR 131.21, new or revised water quality standards do not become effective for CWA purposes until they are approved by EPA.

B. EPA's review of the site-specific criteria under 40 C.F.R. 131.5.:

The chlorophyll-a and Secchi depth levels used as the basis for the Lake Hiawatha site-specific TP criterion are the same values for deep lakes in the NCHF ecoregion in the 2008 Minnesota lakes eutrophication standards. These values reflect minimal ecological impact and acceptable swimming conditions (MPCA 2007, 2005).

As a Class 2B water, Lake Hiawatha is intended to support a warm water fishery and all forms of aquatic recreation. Determination of whether aquatic recreation uses are protected is based on an analysis of whether the site specific criterion of 50 ug/l will attain the existing criteria for chlorophyll-a and Secchi depth (the response variables) that MPCA adopted and EPA approved in 2008. MPCA evaluated the response of chlorophyll-a and Secchi depth in Lake Hiawatha and determined that modification of the TP criterion from 40 ug/l to 50 ug/l would not result in exceeding the chlorophyll-a and Secchi depth values of the 2008 lakes eutrophication standards. MPCA's evaluation was based on MPRB data from 2000-2011. MPCA determined that a site-specific value of 50 ug/l TP would meet the chlorophyll-a and Secchi depth values of the 2008 lakes eutrophication standards for the following reasons (MPCA 2013a):

1. In the years where the lake met both response variables (2002, 2004, 2005) the TP ranged from 59 to 66 ug/l and
2. Linear regressions developed by MPCA show that a chlorophyll-a value of 14 ug/l corresponds to a TP value of 64 ug/l (R-squared = 0.87) and that a Secchi depth value of 1.4 meters corresponds to a TP value of 72 ug/l (R-squared = 0.57).

EPA agrees with MPCA that this information supports that a TP concentration of 59-64 ug/l will likely meet the existing chloropohyll a and Secchi depth criteria. EPA concludes that a site-specific TP criterion of 50 ug/l will result in attaining the existing criteria for chlorophyll-a and Secchi depth and thereby protect the aquatic recreation uses for Lake Hiawatha.

Regarding aquatic life use protection, MPCA evaluated information from the lake information report for Lake Hiawatha developed by MDNR (2007). The report identifies that Lake Hiawatha has a diverse fish community dominated by black bullhead, followed by black crappie, bluegill, and yellow perch and that other common species include common carp, golden shiner, green sunfish, hybrid sunfish, northern pike, pumpkinseed sunfish, walleye, white sucker, and yellow bullhead. The report also identifies that Northern pike is the top predator in Lake Hiawatha and increased in numbers since 2001. MPCA observed that because Northern pike are sight-feeders, their increased numbers may be due to improved water clarity (MPCA 2013b). EPA believes this information supports that aquatic life uses are currently protected. EPA concludes that aquatic life uses will be protected in Lake Hiawatha by a site-specific TP criterion of 50 ug/l, because the current status of aquatic life uses in Lake Hiawatha is not impaired and because the site-specific TP criterion is below ambient concentrations.

In reviewing state water quality standards under section 131.5(a)(3), EPA determines whether the state followed its own procedures in adopting modifications of its water quality standards. In a letter to EPA dated May 21, 2013, MPCA's General Counsel certified that the site-specific TP criterion for Lake Hiawatha was adopted pursuant to State law. Further, a memo dated April 18, 2011 from Minnesota State Assistant Attorney General, Robert Roche, describes the legal procedural requirements in adopting site-specific water quality standards (MPCA 2011). The procedures followed by MPCA for the site-specific TP criterion for Lake Hiawatha are consistent with the Roche memo. For these reasons, EPA is satisfied that Minnesota followed State law in adopting the site-specific TP criterion for Lake Hiawatha.

C. Public Participation and Comments on the Draft Site-Specific Standard for Lake Hiawatha:

MPCA issued a notice of availability of the draft Lake Hiawatha site-specific eutrophication standards and request for comment in February 2013. MPCA received comments from one party, the Minnesota Department of Transportation (MDOT). The comments from MDOT are provided below. EPA does not see that the information provided in the comments indicates the site-specific TP criterion is not protective of designated uses or would require an EPA response. EPA did not provide any written comments to MPCA as part of the comment period.

Comments from MDOT:

1. Comment: Why is Lake Hiawatha being restored to lake standards when it was not a lake presettlement? Prior to the 1920's the lake did not exist and was a wetland. The standard being proposed is somewhere between a shallow and deep lake.

   MPCA's response: Water quality standards provided in Minnesota Rules 7050 apply to waterbodies in their current morphometry, not what existed presettlement. Based on 7050

Lake Hiawatha would need to meet a phosphorus standard for a deep lake (40 ug/L) if we did not propose a less stringent site-specific standard.

EPA's evaluation: EPA agrees with MPCA's assessment.

2. Comment: The watershed is a highly altered system from the dam at Lake Minnetonka to outlet structure at Lake Hiawatha. According to page 3 of the Linage Analysis, "Clearly the dominant inputs of phosphorus to Lake Hiawatha are transported through Minnehaha Creek." However, the golf course directly adjacent to the lake does not appear to have been studied or factored into analysis. In addition, the roads and bike paths that surround the lake have reduced the natural buffer areas and evidence of erosion from sheet flow can be seen from Ariel photos on Google maps. It appears that without a more comprehensive plan on managing the water flow within the watershed, water quality improvements will be difficult to achieve. This may lead to expensive investments on the part of MS4 permittees that will not improve the water quality in either the creek or lake (which was originally a wetland.

   MPCA's response: The draft TMDL includes an analysis of the overall watershed loading and response for the Minnehaha Creek/Lake Hiawatha watershed based on ambient water quality monitoring data collected by MCWD. Information presented in the Linkage Analysis document served as the starting point. In developing allocations for the draft TMDL, it was recognized that source load estimates should also included direct drainage to Lake Hiawatha (not only the golf course, roads, and bike paths that surround the lake, but also atmospheric deposition, potential internal load and a point source that discharges to the lake through the storm sewer system). The analysis in the draft TMDL indicates that the growing season average total phosphorus load from all sources contributing directly to Lake Hiawatha (excluding the inflow load from Minnehaha Creek) is 347 pounds (or just over 5% of the cumulative growing season average total phosphorus load to the lake).

   EPA's evaluation: This comment is outside the purview of EPA's review under CWA 303(c).

3. Comment: The Criteria Justification document mentions that the margin of safety (MOS) will be set at 10 ug/l, which is presented as the justification for why the standard is set at 50 ug/l and at 60 ug/l. The MOS is usually a part of the other side of the equation and a part of the sum of the WLA, LA and MOS to make up the TMDL. The TMDL standard is usually set first and then the other side of the equation is decided. Why is that no the case here?

   MPCA's response: There are multiple ways to set a margin of safety. Selecting a more conservative endpoint is one method and has been used before (e.g., Lake Independence). Lake Hiawatha is an important resource and gets a lot of use. While the dataset used to evaluate the site-specific standard is good we acknowledge it has its limits and so believe it is best to be conservative in setting the target up front in order to meet beneficial uses.

   EPA's evaluation: This comment is outside the purview of EPA's review under CWA 303(c).

C. EPA's Review of Minnesota's Final Site-Specific Standard:

1. Review of Submittal for Completeness

Regulatory Requirement:	Minnesota's Submittal:
Use designations consistent with the provisions of section 101(a)(2) and 303(c)(2) of the Act **(40 CFR 131.6(a))**	The current designated use for Lake Hiawatha is not being changed. As a Class 2B water, the Lake Hiawatha use will remain "supporting full aquatic life and primary contact recreation."
Methods used and analyses conducted to support WQS revisions **(40 CFR 131.6(b))**	The documentation provided by Minnesota in support of this site-specific standard and considered by EPA in reviewing this submittal is identified above under "Submittal History".
Water quality criteria sufficient to protect the designated uses of Minnesota surface waters **(40 CFR 131.6(c))**	The site-specific eutrophication criterion for Lake Hiawatha is Total Phosphorus < 50 µg/L as a summer mean.
An antidegradation policy consistent with §131.12 **(40 CFR 131.6(d))**	Not applicable. This site-specific criterion does not affect Minnesota's existing antidegradation policy.
Certification by the State Attorney General or other appropriate legal authority within the State that the WQS were duly adopted pursuant to State law. **(40 CFR 131.6(e))**	In a letter to Tinka Hyde, dated May 21, 2013, MPCA's General Counsel certified that the site-specific standard was duly adopted in accordance with all applicable procedures. Supplemental information is identified from a memo from Mr. Roche dated April 18, 2011 to clarify how legal procedural requirements were satisfied in adopting site-specific standards.
General information which will aid the Agency in determining the adequacy of the scientific basis of the standards which do not include uses specified in section 101(a)(2) of the Act as well as information on general policies applicable to State standards which their application and implementation. **(40 CFR 131.6(f))**	The documentation provided by MPCA in support of the site-specific eutrophication standard for Lake Hiawatha and considered by EPA in reviewing this submittal is identified above under "Submittal History". Additional information was considered by EPA and used in supporting EPA's positions given regarding various points in *Section III(B)* above. The additional information is cited and referenced below in *Section V. Documents Considered by EPA,*

2. EPA action on the final site-specific standard submitted by MPCA

EPA conclusion: EPA reviewed the submittal from MPCA along with other related information. Based on this review, EPA concludes the site-specific criterion for TP will support the existing uses in Lake Hiawatha.

EPA Action: EPA approves Minnesota's final TP site-specific criterion for Lake Hiawatha. The information provided by MPCA meets the requirements for the water quality standard submittal of 40 CFR 131.6, and the criteria are consistent with the applicable factors set out in 40 CFR 131.5.

IV. Endangered Species Act (ESA) Requirements

Consistent with Section 7 of the ESA and federal regulations at 50 CFR Part 402, EPA is required to consult with the U.S. Fish and Wildlife Service (USFWS) on any action taken by EPA that may affect federally-listed threatened and endangered species or their designated critical habitat. Actions are considered to have the potential to affect a listed species if the species or its critical habitat is present in the action area.

According to the USFWS website (USFWS 2013), there is one species listed as federally threatened or endangered for Hennepin County in Minnesota. That species is the Higgins eye pearlymussel *(Lampsilis higginsii)*. The USFWS website indicates that the Higgins eye pearlymussel is found in larger rivers, usually in areas with deep water and moderate currents. Hence, the Higgins eye pearlymussel does not live in the action area of Lake Hiawatha. Therefore, EPA's approval of the site-specific eutrophication standard for Hiawatha will not affect any Federally-listed species.

V. Documents Considered by EPA

In addition to the CWA federal regulation at 40 CFR Parts 131 and 132, other federal guidance (the primary documents are listed below), and EPA's Water Quality Standards Handbook (EPA 823-B-94-005a, August 1994), the following list includes the primary references considered in this review.

MDNR. 2007. Lake Information Report for Lake Hiawatha. Minnesota Department of Natural Resources, 2007. http://www.dnr.state.mn.us/lakefind/showreport.html?downum=27001800.

MPCA. 2005. *Minnesota Lake Water Quality Assessment Report: Developing Nutrient Criteria*, September 2005.

MPCA. 2007. *Statement of Need and Reasonableness, In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State (SONAR)*, Book II. July 2007. www.pca.state.mn.us/index.php/view-document.html?gid=7269

MPCA. 2011. Letter from Mr. Howard D. Markus with enclosed memo (April 18, 2011) from Robert B. Roche, Assistant Attorney General on the subject of MPCA authority to adopt site specific water quality standards, dated April 19, 2011.

MPCA. 2013a. Lake Hiawatha Site-Specific Eutrophication Criteria Justification. Public Notice Draft. Michigan Pollution Control Agency. January 2013.

MCPA 2013b. Email from Elise Doucette from MPCA to Brian Thompson at U.S. EPA, Region 5 on the status of aquatic life in Lake Hiawatha, July 2, 2013.

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