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

JAN 09 2018

REPLY TO THE ATTENTION OF:

WW-16J

Glenn Skuta, Watershed Division Director
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194
Dear Mr. Skuta:

The U.S. Environmental Protection Agency has conducted a complete review of the Total Maximum Daily Load (TMDL) for Miller Creek, located in St. Louis County, Minnesota. The TMDL is calculated for heat, and addresses the temperature impairment to the Aquatic Life designated use.

EPA has determined that this TMDL meets the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, EPA hereby approves Minnesota's TMDL for Miller Creek. The statutory and regulatory requirements, and EPA's review of Minnesota's compliance with each requirement, are described in the enclosed decision document.

We wish to acknowledge Minnesota's effort in submitting this TMDL, and look forward to future 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,

Linda Holst

for Christopher Korleski
Director, Water Division

Enclosure

cc: Celine Lyman, MPCA
Tom Estabrooks, MPCA

wq-iw10-07g

TMDL: Miller Creek, St. Louis County, MN
Date: January 8, 2018

Decision Document for the

Approval of the Miller Creek Total Maximum Daily Load

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.

TMDL Document Refers to the:

Miller Creek Water Temperature Total Maximum Daily Load
Prepared by Minnesota Pollution Control Agency
October 2017
Received by EPA Region 5 October 18th, 2017.

Section 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.

Section 1 Review Comments:

The TMDL document executive summary provides an overview of the characteristics of Miller Creek, it's value to the community, and the problems it is experiencing related to excessive summer heat gain.

> *Miller Creek is a small, urban trout stream flowing through the cities of Duluth and Hermantown in northeastern Minnesota. The watershed includes parks, trails and residential neighborhoods, but also crisscrosses the regions retail, commercial and transportation corridors. The importance of the stream, along with other streams and natural resources of this area, is continually reinforced by the many efforts and activities undertaken by citizens, businesses, schools, and community and government organizations to protect and restore stream water quality and ecology. Water temperature data demonstrate that problems occur in summer months, mostly from high air temperatures during periods of lower stream flows, or less frequently from runoff from summer rains that occur after high air temperatures. Elevated stream temperatures are believed to also be negatively affecting the fish and aquatic insect communities.*
> *[Excerpted from the TMDL Document]*

A review of the draft 2016 MN 303(d) list shows a listing matching Table 1 of the TMDL document.

Table 1: Impaired designated uses for Miller Creek addressed in this TMDL study.

Name	River AUID	Year Listed	Affected Use	Pollutant or Stressor
Miller Creek	04010201-512, Headwaters to St. Louis River	2002	Aquatic Life	Water Temperature (Heat)

Excerpted from the TMDL document

Water body name	Water body description	Year added to List	Basin	AUID	Affected designated use	Pollutant or stressor	TMDL target start year	TMDL target completion year
Miller Creek	Headwaters to St Louis R	2012	Lake Superior	04010201-512	Aquatic Life	Aquatic macroinvertebrate bioassessments	2016	2022
Miller Creek	Headwaters to St Louis R	2010	Lake Superior	04010201-512	Aquatic Life	Chloride	2018	2022
Miller Creek	Headwaters to St Louis R	2012	Lake Superior	04010201-512	Aquatic Recreation	Escherichia coli	2017	2019
Miller Creek	Headwaters to St Louis R	2002	Lake Superior	04010201-512	Aquatic Life	Lack of cold water assemblage	2016	2022
Miller Creek	Headwaters to St Louis R	2002	Lake Superior	04010201-512	Aquatic Life	Temperature, water	2016	2022

Excerpted from the MN 2016 Proposed Impaired Waters List

The excerpt from the MN 2016 Proposed Impaired Waters List shows that Miller Creek (Assessment Unit 04010201-512) is listed for five impairments. This TMDL is intended only to address the temperature impairment. The pollutant of concern for which the TMDL is written is identified in Table 1 of the TMDL document as heat.

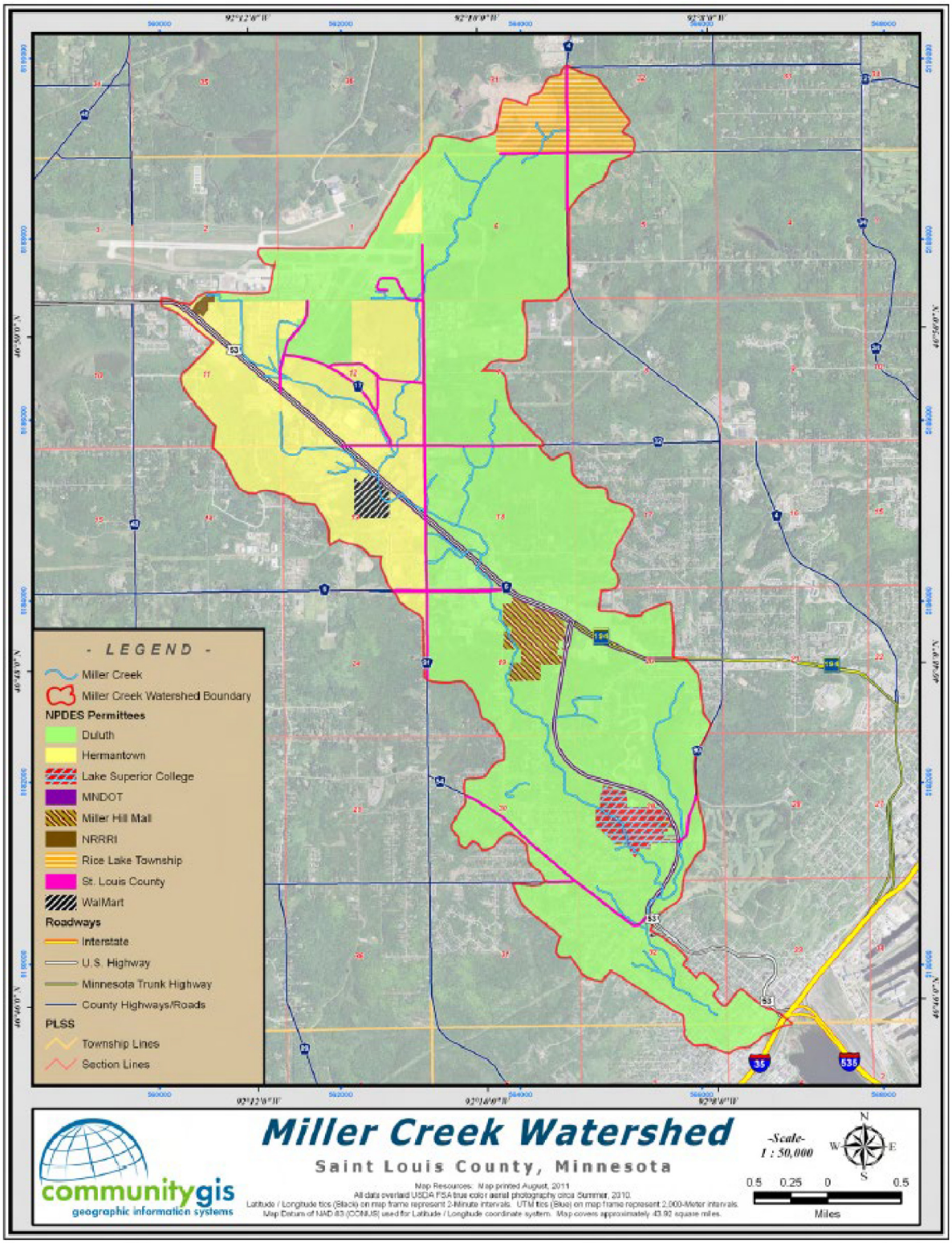
The MN system for priority ranking is discussed in Section 1.3 of the TMDL document.

> *The Minnesota Pollution Control Agency's (MPCA's) schedule for TMDL completions, as indicated on the 303(d) impaired waters list, reflects Minnesota's priority ranking of this TMDL. MPCA developed a state plan, Minnesota's TMDL Priority Framework Report, to meet the needs of EPA's national measure (WQ-27) under EPA's Long-Term Vision for Assessment, Restoration and Protection under the Clean Water Act Section 303(d) Program. As part of these efforts, the MPCA identified water quality impaired segments that will be addressed by TMDLs by 2022. Miller*

Creek, addressed by this TMDL, is part of that the MPCA prioritization plan to meet the EPA's national measure.
[Excerpted from the TMDL Document]

No industrial point sources or municipal WWTP are identified as sources of heat to the impaired waterbody. Permitted point sources in the form of construction stormwater, industrial stormwater, and MS4s are identified as sources of heat and allocated waste loads. Figure 13 of the TMDL document provides a map showing the watershed boundaries and the location of permitted MS4s in the watershed. Atmospheric heating is identified as a primary non-point source of heat as well as non-municipal stormwater sources including Walmart Store #1757 (MN0060372) in Hermantown and Miller Hill Mall (MN0056979). Additional unregulated stormwater runoff, consisting of runoff that reaches the waterbody without MS4 infrastructure, is considered to be a very small fraction of total runoff and was not specifically quantified.

Figure 13: MS4s within Miller Creek Watershed (South St. Louis SWCD).



Excerpted from the TMDL document

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

Section 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.

Section 2 Review Comments:

Section 2.1 of the document discusses the numerical water quality target for temperature and how it was derived from the narrative WQS of "No Material Increase".

The temperature standard for Class 2A waters is a narrative statement of "no material increase" (Minn. R. 7050.0222). In order to quantify and determine a TMDL for Miller Creek, numeric temperature target values for the TMDL were chosen, based on the values set forth in U.S. Environmental Protection Agency (EPA's) Quality Criteria for Water (EPA 1986), which provides the following numeric temperature criteria for brook trout:

- *19 °C (66 °F) = maximum weekly average temperature (MWAT) for growth (chronic), and*
- *24 °C (75 °F) = daily maximum (DM) temperature for survival of short term exposure (acute).*

The MWAT temperature (19 °C) was selected as the numeric temperature target for the TMDL because there were more exceedances of the MWAT than the DM temperature in the 2007 to 2009 data set (Herb 2011). The number of exceedances for each criteria at the Miller Creek sites are

shown in Table 4. Given that the exceedances generally paralleled each other over time, use of the MWAT as the target for the TMDL will also address the acute target (Figures 2, 3, and 4). [Excerpted from the TMDL Document]

EPA notes that although the temperature value of 19ºC is typically used to represent the maximum weekly average temperature to protect against chronic exposure effects, MPCA has chosen to utilize this value as a daily maximum temperature value in calculating the TMDL to provide an additional implicit margin of safety.

> *The implicit MOS includes applying the 19°C target as the daily maximum temperature value in calculating the TMDL,* [1]

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

Section3. 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 additionally 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.

[1] MPCA response to EPA comments, letter from Thomas E. Estabrooks – MPCA, to Jim Ruppel - EPA Region 5, August 29, 2017.

Section 3 Review Comments:

Figure 12 of the TMDL document presents loading capacity of the waterbody for "Heat Input" in the form of a flow duration curve in units of joules per day (J/day). Joules are a unit of energy (similar to calories or BTUs), whereas temperature is a measurement of energy density.

> *The amount of heat loading, in Joules of energy, to a stream is a function of the density and specific heat of water (ρ and C_p), volume (Q) and temperature (T) of water, and time (t). For any location in a stream, the heat (H) required for the stream temperature to be X degrees above freezing can be calculated as the product of ρ, C_p, Q, T, and t as shown in the equation,*
>
> $H = \rho \times C_p \times Q, \times T \times t,$
>
> *where ρ = 4.186 joule/gram °C and C_p = 62.4 lb/ft_3. Q is stream flow. T is either the observed or target temperature. And, t is 1 day for the TMDL. The observed load is computed with the observed temperature in °C and the loading capacity is computed with the target temperature (19 °C).*
> *[Excerpted from the TMDL Document]*

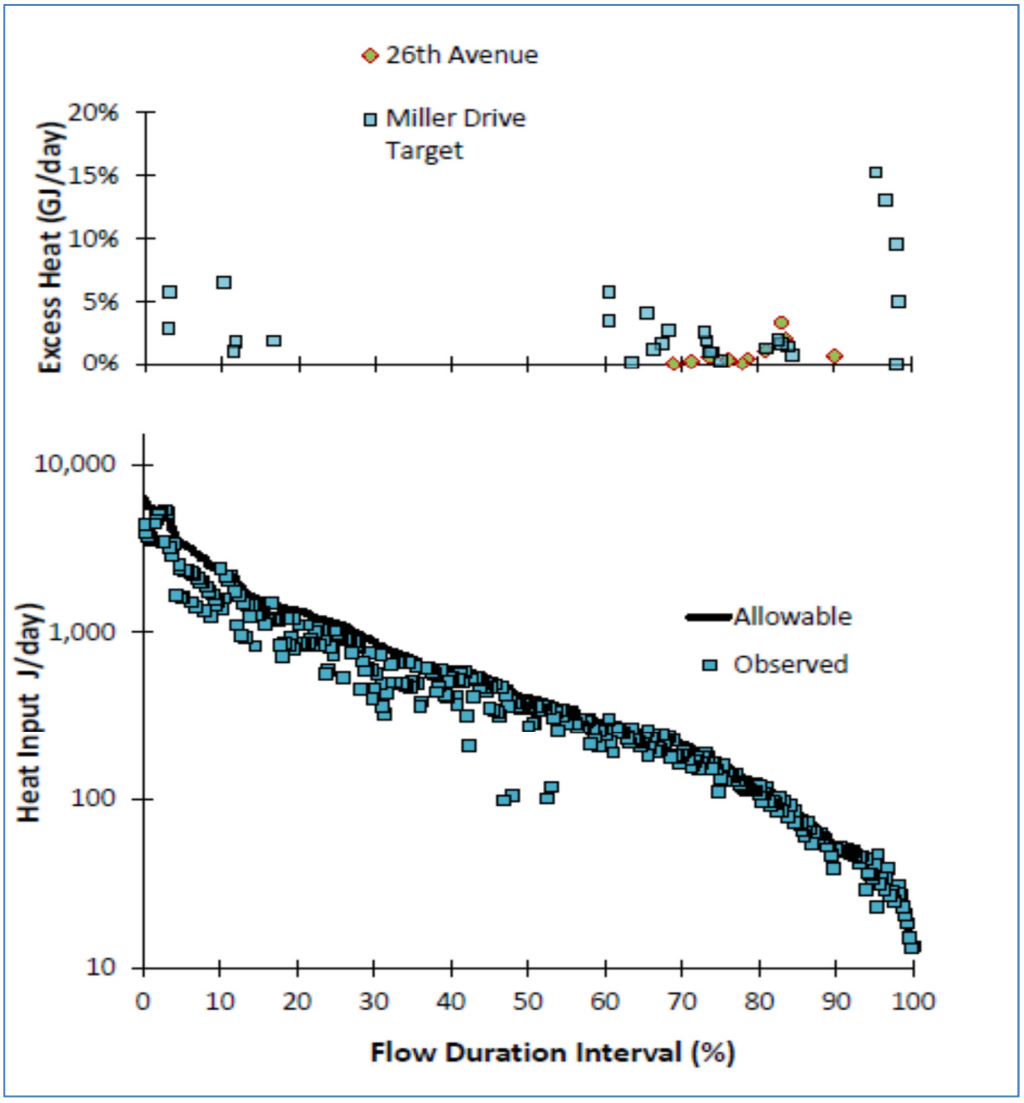
A variety of different models were utilized to predict instream temperatures and the heat loads from different sources.

> *The Stream Network Temperature (SNTEMP) model, United States Geologic Survey (USGS) 2008, a heat transport model, was used to predict daily average and DM stream temperatures from nonpoint source heat inputs to Miller Creek, based upon current riparian shading conditions (June 2008 through September 2008). In addition, several mitigation scenarios with increased shading were also completed utilizing SNTEMP (discussed further in Section 8). Water temperatures were modeled with a focus on low flow (base flow) conditions when trout habitat becomes critical (Herb et al. 2009). The Minnesota Urban Heat Export Tool (MINUHET), University of Minnesota, a surface runoff modeling tool, was used to predict stormwater runoff temperatures for Miller Creek. Runoff was simulated using 2008 data for typical residential and commercial subwatersheds and calibrated to observed stormwater discharge temperatures. This data was applied to the entire watershed, using runoff volumes from the SWMM model. The simulated runoff temperatures and volumes were used to estimate point source heat loadings to Miller Creek (Herb et al. 2009). A Storm Water Management Model (SWMM), EPA, was constructed for Miller Creek to simulate continuous time series of stream flow at 15-minute intervals using observed precipitation, stream bathymetry, watershed hydrogeology, and tributary and storm sewer characteristics as input. The model was calibrated and validated against 2008 data, and is able to predict mean flows, peak flows, base flows, and*

storm runoff volumes. Stream alteration scenarios were also simulated using the SWMM (Erickson et al. 2010). A load duration curve approach was used to determine the flow regimes during which thermal loads to Miller Creek exceed water quality targets. The load duration curve method is based on an analysis that encompasses the cumulative frequency of historic flow data over a specified period. Because this method uses a long-term record of daily flow volumes, virtually the full spectrum of allowable loading capacities is represented by the resulting curve. Only five points on the entire loading capacity curve are depicted (the midpoints of the designated flow zones). However, it should be understood that the entire curve represents the TMDL and is what is ultimately approved by the EPA.

Figure 12 depicts actual (observed) and allowable heat inputs to Miller Creek, plotted as a function of stream flow as load duration curves. Flow data is from the 26th Avenue West station (2007 to 2009), and excess heat data is derived from observed stream temperature values (2007 to 2009). The lower graph shows the values of observed and allowable heat inputs on a log scale. The upper graph shows the difference between the observed and allowable (excess) heat. [Excerpted from the TMDL Document]

Representative loadings for the five flow regimes are presented in Table 6 of the TMDL document.



Excerpted from the TMDL document

Table 6: Heat loading, wasteload allocations and load allocations for Miller Creek Watershed.

Miller Creek Temperature TMDL *					
Flow Duration Interval (%)	High 0-10	Moist 10-40	Mid-range 40-60	Dry 60-90	Low 90-100
Flow Range (cfs)	>11.8	3.1-11.8	1.5-3.1	0.28-1.5	< 0.28
Total Heat Capacity	**5521**	**1302**	**574**	**234**	**33**
Margin of Safety**	**552**	**130**	**57**	**23**	**3.3**
Total Waste Load Allocation	**4,014**	**865**	**299**	**92**	**10**
City of Duluth (MS40086)	2,347	506	175	54	6.1
City of Hermantown (MS400093)	821	177	61	19	2.1
City of Rice Lake (MS400151)	68	15	5.0	1.6	0.18
MN DOT (MS400180)	215	46	16	4.9	0.56
St. Louis County (MS400158)	277	60	21	6.4	0.72
UMD-NRRI (MS400214)	12	2.7	0.92	0.28	0.03
Walmart (MN0060372)	36	7.8	2.7	0.83	0.09
Miller Hill Mall (MN0056979)	200	43	14.9	4.6	0.52
Lake Superior College (MS400225)	38	8.2	2.8	0.87	0.10
Other Waste Load Allocation	**13.2**	**3.1**	**1.37**	**0.56**	**0.08**
Construction Stormwater	7.7	1.8	0.80	0.33	0.05
Industrial Stormwater	5.5	1.3	0.57	0.23	0.03
Load Allocation	**942**	**304**	**216**	**117**	**19**

* Heat units: gigajoules (GJ) per day (GJ/day)

** MOS = 10% of total heat capacity

Excerpted from the TMDL document

Several models were used to calculate pollutant loading and determine necessary load reductions. The year 2008 was chosen as a baseline year because it comprised the most complete set of data for stream flows and temperatures, and it was the most representative to near normal conditions for air temperature and precipitation of the 2007, 2008 and 2009 data sets. The Stream Network Temperature (SNTEMP) model, United States Geologic Survey (USGS) 2008, a heat transport model, was used to predict daily average and DM stream temperatures from nonpoint source heat inputs to Miller Creek, based upon current riparian shading conditions (June 2008 through September 2008). In addition, several mitigation scenarios with increased shading were also completed utilizing SNTEMP (discussed further in Section 8). Water temperatures were modeled with a focus on low flow (base flow) conditions when trout habitat becomes critical (Herb et al. 2009). The Minnesota Urban Heat Export Tool (MINUHET), University of Minnesota, a surface runoff modeling tool, was used to

predict stormwater runoff temperatures for Miller Creek. Runoff was simulated using 2008 data for typical residential and commercial subwatersheds and calibrated to observed stormwater discharge temperatures. This data was applied to the entire watershed, using runoff volumes from the SWMM model. The simulated runoff temperatures and volumes were used to estimate point source heat loadings to Miller Creek (Herb et al. 2009). A Storm Water Management Model (SWMM), EPA, was constructed for Miller Creek to simulate continuous time series of stream flow at 15-minute intervals using observed precipitation, stream bathymetry, watershed hydrogeology, and tributary and storm sewer characteristics as input. The model was calibrated and validated against 2008 data, and is able to predict mean flows, peak flows, base flows, and storm runoff volumes. Stream alteration scenarios were also simulated using the SWMM (Erickson et al. 2010).
[Excerpted from the TMDL Document]

Section 4.1.5 of the TMDL document describes critical conditions for heat input and stream temperature for Miller Creek.

The critical conditions occur in summer months (June through September) when air temperatures are highest and aquatic activity (growth and reproduction) is at its greatest. Critical conditions may be further exacerbated by extended hot periods, periods with little precipitation, and rainstorms that produce heated stormwater runoff. The TMDL utilizes data collected during the period from June through September over a three-year period, from 2007 to 2009. Elevated water temperatures due to atmospheric heat transfer to the stream were found to be the dominant mechanism for temperature exceedances above 19° C MWAT. The TMDL addresses these conditions through implementation strategies that will reduce stream temperatures. The TMDL includes the assumption that practices to reduce MWAT are expected to also lower daily peak temperatures (DM), given the strong correlation between daily peaks and weekly average temperatures, weekly average temperatures and air temperatures, and highest loading due to solar radiation.
[Excerpted from the TMDL Document]

Critical conditions are most likely to occur during times of low base flow when a given heat input will have a greater relative impact on temperature. Therefore, modeling efforts focused on low flow conditions which are more likely to represent critical conditions for cold water species such as brook trout.

The Stream Network Temperature (SNTEMP) model, United States Geologic Survey (USGS) 2008, a heat transport model, was used to predict daily average and DM stream temperatures from nonpoint source heat inputs to Miller Creek, based upon current riparian shading conditions (June 2008 through September

2008). In addition, several mitigation scenarios with increased shading were also completed utilizing SNTEMP (discussed further in Section 8). Water temperatures were modeled with a focus on low flow (base flow) conditions when trout habitat becomes critical (Herb et al. 2009).
[Excerpted from the TMDL Document]

Load duration curves are used in the TMDL approach when WQS are expressed in terms of numerical concentration criteria. In this case, the heat energy in the water is expressed in units of joules (similar to BTUs or calories), with loads being expressed as joules of heat energy per day. The concentration of a pollutant is a function of both the loading of the pollutant to the waterbody as well as the volume of water in the stream available to assimilate the load. The load duration curve approach accounts for seasonal variation and critical conditions by directly determining the assimilative capacity of a waterbody based on the flow in the waterbody for any given flow condition.

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

Section 4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Where possible, load allocations should be described separately for natural background and nonpoint sources.

Section 4 Review Comments

Load allocations for existing NPS sources are accounted for in Table 6 of the TMDL document. No future NPS sources are expected in the watershed.

The LAs represent the portion of the loading capacity that is designated for non-regulated sources of temperature (heat) to Miller Creek, as described in Section 3.6.1.2. The LA includes natural background, and all non-permitted sources, such as solar radiation & atmospheric heating and unregulated stormwater runoff. Natural background means characteristics of the waterbody resulting from the multiplicity of factors in nature, including climate and ecosystem dynamics, that affect the physical, chemical, or biological conditions in a waterbody, but does not include measurable and distinguishable pollution that is attributable to human activity or influence
[Excerpted from the TMDL Document]

The entire Miller Creek watershed is covered under MS4 Stormwater Discharge Permits. Stormwater discharge waste loads represents a greater portion of the overall load allocation during higher flows with atmospheric heat loads allocations becoming a more significant proportion of the overall load allocation during lower flows (see Table 6 of the TMDL document). Unregulated Stormwater Discharges represent a small fraction of the overall stormwater load.

> ***Unregulated stormwater runoff****: Direct runoff and any stormwater that reaches the waterbody without MS4 infrastructure is considered to be non-regulated stormwater, unless regulated by other NPDES Permits. Unregulated stormwater runoff makes up only a very small fraction of total stormwater entering Miller Creek and was not quantified for this TMDL.*
> *[Excerpted from the TMDL Document]*

Natural Background heat loads were not separated out from other non-point source loads.

> *The potential exists for exceedances of water quality standards under natural background conditions (due to extended periods of high air temperatures during low stream flow conditions). However, for this TMDL, natural background sources were not quantified, and there is no evidence at this time to suggest natural background sources are a major driver of any of the impairments and/or affect the creek's ability to meet water quality standards. Natural background sources are implicitly included in the LA portion of the TMDL allocation.*
> *[Excerpted from the TMDL Document]*

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

Section 5. Wasteload Allocations (WLAs)

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

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

Section 5 Review Comments

Table 6 of the TMDL document includes waste load allocations for permitted municipal stormwater systems and non-municipal storm water systems. Permit numbers are included in the table.

The entire Miller Creek watershed is covered under NPDES MS4 Stormwater Discharge Permits (Figure 13). Seven entities are permittees under the General NPDES/SDS Permit MNR040000 for MS4s:

- *city of Duluth (MS400086), the largest contributor by area;*
- *city of Hermantown (MS400093), the second largest contributor by area;*
- *Minnesota Department of Transportation ((MnDOT), MS400180), for U.S. Highway 53;*
- *St. Louis County (MS400158), for county roads;*
- *LSC (MS400225), covering its campus along Trinity Rd.;*
- *University of Minnesota Duluth (UMD) (MS400214), for the NRRI property; and*

- *city of Rice Lake (MS400151), for a small corner of the municipality.*

Non-municipal stormwater: *There are two individual, non-municipal stormwater permits within the watershed: Walmart Store #1757 (MN0060372) in Hermantown and Miller Hill Mall (MN0056979) in Duluth.*
[Excerpted from the TMDL Document]

Separate monitoring data for each MS4 was unavailable, consequently MS4 allocations were based on impervious area as describe in the TMDL document.

Separate stormwater monitoring data was not available for each MS4 in the Miller Creek Watershed. In order to determine the relative contribution to the total thermal loading to Miller Creek for each MS4, the total impervious surface was calculated using Geographic Information System (GIS) methods. It was assumed that each MS4 contributed heat to Miller Creek in proportion to the total impervious area contained in each MS4. WLAs were calculated, where the WLA for heat (H_{wla}) was equal to the total heat allocation for a particular flow regime ($H_{a,\ tot}$), multiplied by the fraction of stormwater (f_{sw}) and multiplied by the fraction of impervious surface (f_{imp}) (Herb 2011).
[Excerpted from the TMDL Document]

Table 6 of the TMDL document also includes waste load allocations for permitted construction and industrial stormwater. Permit numbers for construction and industrial activities are included in the text of the TMDL document in Section 4.1.3 and presented below.

(NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001).

The WLA for construction stormwater is based on an estimate of the average annual percentage of the watershed being under an MPCA Construction Stormwater Permit, using the MPCA Construction Stormwater Permit data provided from 2007 through 2013 for Miller Creek Watershed. For the period from 2007 through 2013, the estimated average annual area of the watershed under the MPCA Construction Stormwater Permit was 0.14%.
[Excerpted from the TMDL Document]

(NPDES/SDS Industrial Stormwater Multi-Sector General Permit (MNR050000), or facility specific Individual Non-municipal Stormwater Permits, or NPDES/SDS General Permit for Construction Sand & Gravel, Rock Quarrying and Hot Mix Asphalt Production facilities (MNG490000).

For industrial stormwater, a categorical WLA was set at 0.1% of the watershed. Acreage data is not readily available for industrial stormwater; however, the general Industrial Stormwater Permits (approximately 10) comprise only a small

fraction of Miller Creek Watershed.
[Excerpted from the TMDL Document]

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

Section 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.

Section 6 Review Comments:

Section 4.1.4 of the TMDL document discusses the margin of safety.

Both an implicit and explicit margin of safety are included in the TMDL analysis.

An explicit margin of safety of 10% is included and considered adequate based on the best professional judgement of MPCA staff and the minimization of uncertainty inherent in the use of load duration curves in determining loading capacities. A further implicit margin of safety is provided by treating the maximum weekly average temperature rather than the daily maximum target as the direct loading target for development of the load duration curve.

> *The 10% MOS was considered appropriate because the load duration curve approach minimizes a great deal of uncertainty with developing TMDLs. The 10% was determined to be reasonable to account for uncertainties in data, and to account for assumptions used in data analysis and modeling.*
> *…*
> *The use of the chronic target in calculating the TMDL does provide an inherent margin of safety (MOS) in that the target (MWAT) value was used as a daily value in calculating the TMDL. The allowable heat for any given day (streamflow in the load duration curve) was calculated as the daily flow value times the chronic value (19 °C) rather than the DM target value of 24 °C. This is described in Section 4 of the TMDL.*[2]

[2] MPCA response to EPA comments, letter from Thomas E. Estabrooks – MPCA, to Jim Ruppel - EPA Region 5, August 29, 2017.

Table 6 of the TMDL specifies the margin of safety for the 5 flow regimes specified in the analysis.

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

Section 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)).

Section 7 Review Comments:

Section 4.1.5 of the TMDL document discusses the impacts of seasonal variation and how seasonal variation is accounted for in the analysis. Critical periods include periods of hot weather with low flow conditions in which direct solar radiation from a lack of shade and elevated air water interface temperatures combine to push up water temperatures, and periods when stormwater inputs from summer rainstorms wash over impervious heated surfaces and transport that heat to the stream.

> *The critical conditions occur in summer months (June through September) when air temperatures are highest and aquatic activity (growth and reproduction) is at its greatest. Critical conditions may be further exacerbated by extended hot periods, periods with little precipitation, and rainstorms that produce heated stormwater runoff. The TMDL utilizes data collected during the period from June through September over a three-year period, from 2007 to 2009. Elevated water temperatures due to atmospheric heat transfer to the stream were found to be the dominant mechanism for temperature exceedances above 19° C MWAT. The TMDL addresses these conditions through implementation strategies that will reduce stream temperatures.*
> *[Excerpted from the TMDL Document]*

Section 4.1.1 of the TMDL document discusses how a combination of models were used to predict seasonal variations in water temperatures during the summer months.

> *The Stream Network Temperature (SNTEMP) model, United States Geologic Survey (USGS) 2008, a heat transport model, was used to predict daily average and DM stream temperatures from nonpoint source heat inputs to Miller Creek, based upon current riparian shading conditions (June 2008 through September 2008). In addition, several mitigation scenarios with increased shading were also completed utilizing SNTEMP (discussed further in Section 8). Water temperatures were modeled with a focus on low flow (base flow) conditions when trout habitat becomes critical (Herb et al. 2009). The Minnesota Urban Heat Export Tool (MINUHET), University of Minnesota, a surface runoff modeling tool, was used to predict stormwater runoff temperatures for Miller Creek. Runoff was simulated using 2008 data for typical residential and commercial subwatersheds and calibrated to observed stormwater discharge temperatures. This data was applied to the entire watershed, using runoff volumes from the SWMM model. The simulated runoff temperatures and volumes were used to estimate point source heat loadings to Miller Creek (Herb et al. 2009). A Storm Water Management Model (SWMM), EPA, was constructed for Miller Creek to simulate continuous time series of stream flow at 15-minute intervals using observed precipitation, stream bathymetry, watershed hydrogeology, and tributary and storm sewer characteristics as input. The model was calibrated and validated against 2008 data, and is able to predict mean flows, peak flows, base flows, and storm runoff volumes. Stream alteration scenarios were also simulated using the SWMM (Erickson et al. 2010).*
> *[Excerpted from the TMDL Document]*

Seasonal variation is also accounted for during the development of the load duration curves through the direct determination of loading capacity based on stream discharge.

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

Section 8. Reasonable Assurances

When a TMDL is developed for waters impaired by point sources only, the issuance of a National Pollutant Discharge Elimination System (NPDES) permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R.

122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL. When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by nonpoint sources. However, EPA cannot disapprove a TMDL for nonpoint source-only impaired waters, which do not have a demonstration of reasonable assurance that LAs will be achieved, because such a showing is not required by current regulations.

Section 8 Review Comments:

Table 5 of the TMDL document provides an indication of the overall reductions needed to reduce heat loadings to levels consistent with the TMDL targets. The period from August 6-10th shows an overall load reduction of 15GJ/day. This equates to a load reduction of only 9% and indicates the potential for meeting this load through increased shading and increased baseflows in the watershed is reasonable. The next highest percent reduction occurs during the August 18-21, 2009 time period and shows that a 4.7% reduction is needed. This equates to an absolute reduction needed of 605 GJ/day. This exceedance appears to coincide with a period of relatively high loads and flows indicating that the potential to address this reduction though the installation of stormwater management BMPs is reasonable. Four of the six time periods examined show exceedances below 3 percent. It is reasonable to expect that the combination of increased shading installed to reduce the incidence of solar heat gain during low flow periods, and BMPs designed to reduce heat loads from stormwater runoff

Table 5: Observed and allowable loads (GJ/day) for time periods where 7-day running average water temperatures exceeded 19 °C.

Time Period	Observed Load	Allowable Load	Amount Exceeded	Percent Exceeded
June 18 – 20, 2007	5,653	5,567	86	1.5
July 11 – 12, 2007	343	338	5	1.5
August 6 – 10, 2007*	171	156	15	9
August 2 – 9, 2008	1,249	1,234	15	1.2
June 27 – July 1, 2009	1,014	990	24	2.4
August 18 – 21, 2009	13,464	12,859	605	4.7

* Missing temperature data prior to August 6, 2007.

Excerpted from the TMDL document

during higher flow periods would also have combined carryover benefits during periods of intermediate flow (i.e. flow regimes 2-4). Given the relatively modest levels of reductions needed in the remaining four flow periods studied, it is reasonable to expect that such reductions are achievable.

A discussion of the types and locations of BMPs that could be utilized to achieve the heat load reductions needed can be found in Section 8 of the TMDL document. A combination of riparian shading, reducing and detaining stormwater runoff, and increasing overall stream baseflow are discussed as potential means to reduce heat loads during low flow, high flows (including stormwater), and intermediate flows.

> *Temperature mitigation and baseflow augmentation were modeled for the Miller Creek Watershed. Increased riparian shading in the upper watershed, the lower watershed, and the entire watershed were evaluated. The largest increases in shading for potential future scenarios were in the impacted wetland above Kohl's Department Store. Increasing the shading upstream of Kohl's provides substantial reductions in DM temperatures (up to 2° C), with reductions in maximum daily temperature persisting for approximately two kilometers downstream of Kohl's (Herb et al. 2009). Stormwater runoff rate and volume controls were also evaluated, including reducing peak flow rates through wet detention basins, bottom outlet discharges, underground stormwater storage, and infiltration. Each method can provide some thermal reductions, but may be muted depending on the pre-runoff conditions, intensity and duration of runoff, and other site limitations (Herb et al. 2009). Increasing stream baseflows may reduce stream temperatures, and provide better habitat for brook trout. While four scenarios were evaluated, increasing the channel length in the wetland above Kohl's was the most realistic and beneficial scenario. The restored channel would represent more natural stream function. Increasing the length would decrease channel slope, and increase the residence time of water, which could provide additional channel storage and result in increased baseflow (Erickson et al. 2010).*
> *[Excerpted from the TMDL Document]*

Section 6 of the TMDL document addresses providing reasonable assurance that the load reductions will occur and allocated loading levels will be met. Table 7 of the TMDL document provides a listing of regulatory controls that are in place to assure that permitted stormwater sources will install the best management practices needed to meet the waste load allocations called for by the TMDL.

Table 7: Regulatory controls in place that provide reasonable assurance allocations will be achieved.

Entity	Regulatory Authority or Control
MS4 Permittees in Miller Creek Watershed	Comprehensive Plans that guide the types and locations of development in a community Zoning Ordinances that regulate where and how development may occur, and measures to minimize environmental impacts Stormwater Utility, where applicable Adoption and/or compliance with state and federal requirements (Wetland Conservation Act (WCA), Shoreland, MS4-SWPPP, NPDES, 404 and 401 of CWA)
State Government Agencies	NPDES regulation of stormwater discharges Shoreland and Floodplain Management Wetlands management (WCA and 401)
Federal Government Agencies	404 Authority over aquatic resources
Non-Government Agencies (businesses, institutions)	Facility management plans Compliance with local, state and federal requirements

Excerpted from the TMDL document

Appendix A of the TMDL document provides additional details on the types, targeted locations, and targeted permitees for BMPs that may potentially be used to achieve the reductions needed to meet the allocated waste loads.

Appendix A
BMPs for MS4 Permittees

BMP Categories	Target Locations	Target Permitees	Considerations
Improved Stormwater Treatment			*Note: See SAFL report 536 on baseflow augmentation scenarios and report 535 on stormwater management scenarios.*
Increase stormwater treatment	Upper watershed: commercial, industiral, and transportation areas	Duluth, Hermantown, St. Louis County, MnDOT, NRRI	Add stormwater treatment to areas lacking treatment. Reduce the need for treatment by reducing impervious surfaces or diverting potential stormwater from impervious surfaces.
	Entire watershed: residential areas	Duluth, Hermantown	Technical assistance to watershed residences (e.g., rain gardens, rain barrels, disconnecting impervious surfaces, redirecting runoff, etc.).
Retrofit existing stormwater BMPs	Upper watershed: Examples include St. Louis County ponds near Sam's Club, MnDOT at US Hwy 53/Maple Grove Rd	Duluth, Hermantown, St. Louis County, MnDOT	Evaluate existing BMPs for thermal reduction potential and implement projects based on outcomes. Miller Hill Mall completed a comprehensive Stormwater Management Plan for temperature mitigation in 2016.
Reduced Impacts from Solar Radiation			*Note: See SAFL report 535 on shading scenarios, see other common methods used.*
Improve riparian vegetation density and composition	Upper watershed: US Hwy 53/Mall Drive, near Walmart to Chambersburg Ave	Duluth, Hermantown, St. Louis County, MnDOT	Identify and prioritize projects based on existing condtions (e.g., stream orientation, bank angle, and soils).
	Upper watershed: Chambersburg Ave to Lake Superior College	Duluth, St. Louis County, Lake Superior College	Technical assistance to riparian landowners (e.g., planting trees and native plants, and reducing turfgrass areas).
	Upper Watershed: above Rice Lake Landfill to US Hwy 53/Mall Drive, near Walmart	Rice Lake, Duluth, Hermantown, St. Louis County, St. Louis County, MnDOT	Analyze stream orientation, bank angle, soils, and vegetation potential and use this information to target projects.
	Lower watershed: Lincoln Park	Duluth	Coordinate with implementation of Lincoln Park Mini Master Plan (draft 2016).
Retrofit existing stormwater BMPs, where feasible	Upper watershed: commercial, industiral, and transportation areas	Duluth, Hermantown, St. Louis County, MnDOT, Lake Superior College	Evaluate existing BMPs for thermal reduction potential and implement projects based on outcomes
Improved water retention			*Note: See SAFL report 536 on baseflow augmentation scenarios.*
Mitigate the negative effects resulting from stream channelization	Upper watershed: Examples include: Haines Rd, below Duluth International Airport; US Hwy 53/Mall Drive, near Walmart; US Hwy 53/Haines Rd to Kohl's store; Mall Drive/Burning Tree Rd to Decker Rd. Lower watershed: Enger Park Golf Course, Lincoln Park, above 3rd St	Dependent on project	Feasibility and project scope is dependent on existing conditions and limitations (e.g., adjacent infrastructure) within the stream corridor and floodplain. Stream segment from US Hwy 53/Haines Rd to Kohl's store has completed design and is awaiting funding.
Restore and maintain wetland functions	Upper watershed: Ridgewood Rd to Lake Superior College. Lower watershed: Trinity Road to Lincoln Park	Upper watershed: Rice Lake, Duluth, Hermantown, St. Louis County, MnDOT; Lower watershed: Duluth, MnDOT	Update Miller Creek Wetland Functional Assessment and use this information to implement projects that will restore and maintain wetland condition and function.
Protect coldwater source waters	Upper watershed: US Hwy 53/Mall Drive near Walmart (and/or stream areas within brook trout potential) to Lake Superior College Lower watershed: Trinity Road to Lincoln Park. Entire watershed: wetlands and tributaries.	Rice Lake, Duluth, Hermantown, St. Louis County, MnDOT	Identify cold water inputs and sources. Implement projects that will maintain cold water inputs to Miller Creek.
Promote infiltration, where appropriate	Upper watershed: commercial, industrial, transporation, and residential areas	Duluth, Hermantown, St. Louis County, MnDOT	Identifiy areas with greatest infiltration potential and implement projects based on findings.
Other			*Note: See NRRI Macroinvertebrate, Habitat, and Temperature Report, St. Louis River Watershed Stressor Identification Report (draft), and applicalble DNR Fisheries management plans.*
Thermal refuge for brook trout	Upper watershed: US Hwy 53/Mall Drive near Walmart (and/or stream areas with potential for brook trout habitat) to Lake Superior College Lower watershed: Trinity Road to Lincoln Park	Upper watershed: Hermantown, Duluth, Lake Superior College; Lower watershed: Duluth, MnDOT	Determine cold water input locations and sources. Evaluate stream channel for thermal refuge for brook trout. In conjunction with DNR Fisheries staff, use this informatation to target creation, enhancement, and protection of thermal refuges in Miller Creek.
Temporary and permanent controls of land (conservation easements, management of public lands, purchase of private lands)	Upper watershed: riparian and wetland land owners in watershed	Duluth, Hermantown, St. Louis County, MnDOT, Lake Superior College	Undeveloped parcels containing wetlands, or stream channel and tributaries, especially those under pressure for development. Developed parcels containing wetlands, stream channel or tributaries (e.g., formal or informal conservation easements).

Notes:
Upper watershed equals headwaters to Lake Superior College.
Lower watershed equals Lake Superior College to St. Louis River.

Excerpted from the TMDL document

Section 6.1 of the TMDL document provides an overview of Minnesota MS4 General Permit requirements and discusses how those permits will provide reasonable assurance that BMPs to reduce heat loads will be implemented by MS4 permittees, and their effectiveness monitored to ensure adequate measures are taken to achieve assigned WLAs.

> *The MPCA's MS4 General Permit requires MS4 permittees to provide reasonable assurances that progress is being made toward achieving all WLAs in TMDLs approved by the EPA prior to the effective date of the permit. In doing so, they must determine if they are currently meeting their WLA(s). If the WLA is not being achieved at the time of application, a compliance schedule is required that includes interim milestones, expressed as BMPs, that will be implemented over the current five-year permit term to reduce loading of the pollutant of concern in the TMDL. Additionally, a long-term implementation strategy and target date for fully meeting the WLA must be included.*
> *[Excerpted from the TMDL Document]*

At high flows the load allocation, at just 17% of the TMDL allowable load, is small relative to the WLA, however during low flows when stormwater contributes a lower proportion of the heat load, non-point sources of heat, particularly atmospheric heat transfer becomes a major part of the heat load. Accordingly, the load allocation for non-point sources increases to become 58% of the total load allocation as flows decrease during low flow periods. Section 8.2.1 of the TMDL document discusses the implementation measures needed to address atmospheric heat inputs during periods of low flow.

> *8.2.1 Atmospheric Heating*
> *A majority of the allocations for this TMDL have been assigned to LA, due to atmospheric heat transfer to Miller Creek. While there are no regulatory mechanisms in place to track progress and implementation towards meeting the LA for Miller Creek, many of the implementation activities, such as tree plantings, riparian vegetation management restoration of channelized stream sections will be completed by, and/or in cooperation with the MS4 entities. Projects implemented to address WLAs may also benefit LAs and those implemented to address LAs may also benefit WLAs. Table 8 and Appendix A provide a summary of activities that will lead to heat energy reductions to Miller Creek.*
> *[Excerpted from the TMDL Document]*

Table 8 of the TMDL document provides several examples of BMPs that may be relied upon to reduce heat loads, including practices to reduce direct runoff of stormwater from heated impervious surfaces, and increasing riparian vegetation to shade the stream.

Table 8: Potential heat-reducing BMP implementation strategies.

Potential Implementation BMPs and Heat Reduction Strategies
Stormwater improvements: Develop a comprehensive stormwater management plan for Miller Hill Mall; install BMPs to newly developed, redeveloped and to existing impervious surfaces (e.g., tree trenches, wet rock cribs, underground storage, wet pond bottom outlets, rain gardens and bio-filtration); maintain existing stormwater infrastructure; reduce the amount of existing impervious surfaces (removal or replacement with pervious); disconnect direct runoff from rooftops.
Vegetation improvements: Conduct tree plantings in riparian areas; reestablish native plant communities in areas of turf grass.
Stream Restoration: Restore channel morphology and habitat on select channelized sections of Miller Creek.
Education: Outreach and education with homeowners along the stream; develop materials for Miller Hill Mall tenants and patrons. Hold public workshops, festivals, stream clean-ups.
Code: Enhanced enforcement of zoning codes; encourage low impact development practices.

Excerpted from the TMDL document

Additional reasonable assurance that load reductions will be successfully implemented is provided through the Minnesota Clean Water Legacy Act. 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 to protect, enhance, and restore water quality in Minnesota.

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

The CWLA also provides details on public and stakeholder participation, and how the funding will be used. In part to attain these goals, the CWLA requires MPCA to develop Watershed Restoration and Protection Strategies (WRAPS). The WRAPS are required to contain such elements as the identification of impaired waters, watershed modeling outputs, point and nonpoint sources, load reductions, etc. (Chapter 114D.26; CWLA). The WRAPS also contain an implementation table of strategies and actions that are capable of achieving the needed load reductions, for both point and nonpoint sources (Chapter 114D.26, Subd.

1(8); CWLA). Implementation plans developed for the TMDLs are included in the table, and are considered "priority areas" under the WRAPS process (Watershed Restoration and Protection Strategy Report Template, MPCA). This table includes not only needed actions but a timeline for achieving water quality targets, the reductions needed from both point and nonpoint sources, the governmental units responsible, and interim milestones for achieving the actions. MPCA has developed guidance on what is required in the WRAPS (Watershed Restoration and Protection Strategy Report Template, MPCA).

The Minnesota Board of Soil and Water Resources administers the Clean Water Fund as well, and has developed a detailed grants policy explaining what is required to be eligible to receive Clean Water Fund money (FY 2014 Clean Water Fund Competitive Grants Request for Proposal (RFP); Minnesota Board of Soil and Water Resources, 2014).

The WRAPS process for Miller Creek is currently under development as part of the larger Duluth Urban Area WRAPS report.

> *Table 8 provides a summary of BMPs that could potentially be implemented to provide thermal loading reductions to Miller Creek, and are creditable to both the WLA and LA. Appendix A (BMPs for MS4 Permittees) of this TMDL provides more specific details on appropriate types of BMPs, targeted locations, targeted permittees, and special considerations for implementation. The information in Appendix A is incorporated into the TMDL as a means to reinforce the responsibility and commitment of permittees to work to reduce thermal loading to Miller Creek. Additional information related to prioritized restoration and protection activities within the Miller Creek watershed can be found in the Duluth Urban Area WRAPS report (currently in development). Once completed, the Duluth Urban Area WRAPS report will be available on the St. Louis River watershed web page at: https://www.pca.state.mn.us/water/watersheds/st-louis-river*
> *[Excerpted from the TMDL Document]*

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

Section 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.

Section 9 Review Comments

Section 7 of the TMDL document discusses the importance of future monitoring efforts to ensure that measures to achieve the load reductions needed to meet TMDL allocations are being implemented and to evaluate their effectiveness.

> *Monitoring for TMDL implementation activities is important in order to measure the effectiveness of those activities implemented, and to inform future direction and choice of activities implemented (i.e., adaptive management). Monitoring should continue throughout implementation until water quality standards are attained. However, monitoring for temperature and heat energy reductions is a challenging and complex endeavor for permittees. An alternative means to measure progress toward TMDL reduction goals will be developed by the MPCA (in coordination with permittees) and applied throughout implementation.*
> *[Excerpted from the TMDL Document]*

Section 7 of the document goes on to discuss several ongoing monitoring activities and potential future monitoring activities that could be incorporated into monitoring efforts to track TMDL implementation and the effectiveness of those efforts at reducing loads.

> *For Miller Creek, there are a number of monitoring activities currently underway, or will be occurring in the future:*
> - *Those parties with activities subject to NPDES/SDS Permits (MS4, CSW, ISW, and Non-municipal Stormwater Permit holders) will continue to conduct monitoring and other methods of evaluation of BMPs as a requirement of the applicable permit(s).*
> - *DNR currently conducts, and will continue to conduct, stream population and temperature assessments on an annual basis at the brook trout index station, and at other select locations in Miller Creek.*
> - *The MPCA installed a new stream station near the mouth of Miller Creek for stream stage and flow monitoring during 2014 to 2017. In 2017, the station equipment will be changed to a mulita-parameter water chemistry probe, collecting continuous stream temperature, specific conductivity,*

estimated stream flows, and precipitation. The station will be maintained into the foreseeable future by UMD-NRRI.

- *Under the Watershed Approach and the WRAPS process, the MPCA and local partners will begin two years of intensive watershed monitoring in the St. Louis River Watershed, which includes Miller Creek, in 2019 as part of the second 10-year cycle of intensive watershed monitoring. Monitoring will include water chemistry parameters, biotic community health, and assessing habitat conditions. This effort will continue under the Duluth Urban WRAPS, with additional monitoring and evaluation.*
- *UMD-NRRI redeployed multi-parameter water chemistry probe at LSC in 2015, collecting continuous stream temperature, specific conductivity, estimated stream flows, and precipitation, with the intent to continue data collection for the foreseeable future.*
- *Miller Creek Watershed has been, and continues to be, a focus for research by local, state, and federal agencies, and by academic institutions. Voluntary activities implemented to reduce heat loading to Miller Creek will be tracked and reported by the MPCA, in coordination with local partners.*
- *As part of ongoing civic engagement activities, input from citizens and targeted groups will be collected to gauge interest, concerns, and participation in watershed-related activities by local partners, in coordination with the MPCA.*

[Excerpted from the TMDL Document]

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

Section 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.

Section 10 Review Comments

Section 8 of the TMDL document discusses the strategy for implementing the activities needed to achieve the load allocations. The section does a sufficient job of discussing how existing regulations and programs will be relied upon to implement the load and waste load allocations.

Appendix A of the document provides additional details as to which BMPs may be appropriate for specific locations and allocated load.

Following the approval of the TMDL, MPCA plans on developing a more detailed Watershed Restoration and Protection Strategy (WRAPS).

> *Additional information related to prioritized restoration and protection activities within the Miller Creek watershed can be found in the Duluth Urban Area WRAPS report (currently in development). Once completed, the Duluth Urban Area WRAPS report will be available on the St. Louis River watershed web page at: https://www.pca.state.mn.us/water/watersheds/st-louis-river*
> *[Excerpted from the TMDL Document]*

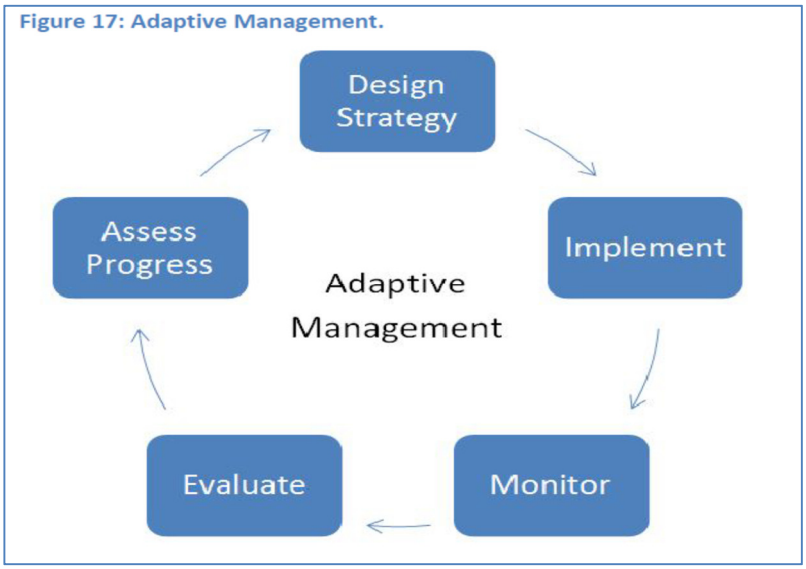
Section 8.3 of the TMDL document includes estimates of the cost of implementing the TMDL to achieve the needed load reductions.

> *The initial estimate for implementing this TMDL ranges from $750,000 to $3,500,000, based upon cost estimates for various BMPs and other activities that will be defined in the Duluth Urban Area WRAPS report. However, this is a broad estimate and a number of factors may affect the total costs for implementation, such as the number, scope and detail of individual projects implemented to achieve the TMDL reductions.*
> *[Excerpted from the TMDL Document]*

As discussed in Section 8 of this review, the load reductions called for by the TMDL appear to be feasible to achieve. However, uncertainty remains on whether sufficient opportunities will be available to increase riparian shading to reduce atmospheric heat gains. As ongoing implementation continues it will be important for responsible authorities to remain flexible to take advantage of opportunities to cooperate with MS4s and other stormwater permitees and landholders. An adaptive management approach will be needed as is discussed in Section 8.4 of the TMDL document and presented in Figure 17 of the TMDL document.

Continued monitoring and "course corrections" responding to monitoring results are the most appropriate strategy for attaining the water quality goals established in this TMDL. Management activities will be changed or refined accordingly to efficiently meet the TMDL and lay the groundwork for de-listing the impaired water body.
[Excerpted from the TMDL Document]

Figure 17: Adaptive Management.



Excerpted from the TMDL document

Additional detailed discussion of the implementation strategy is also contained in this review document in the section on reasonable assurance (Section 8 of this document).

Section 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.

Section 11 Review Comments

Section 9 and Table 9 of the TMDL document describe the public participation process. A variety of methods were used to reach out to and involve stakeholders during the TMDL development process.

> *Annual meetings were held to keep stakeholders and other interested parties informed, and annual newsletters were also developed. A Technical Advisory Group (TAG) was established at the beginning of the TMDL study and represented a broad spectrum of organizations, including MS4 permittees, government organizations, and natural resource organizations. The TAG reviewed data, provided feedback to the project manager and SWCD staff on the approaches taken for the study, and provided advice in helping to find solutions to any problems that emerged over the course of the study. Monthly meetings of the RSPT also served as a forum for updating local entities (especially MS4s) about the progress of the TMDL Study. An opportunity for public comment on the draft TMDL report was provided via a public notice in the State Register from June 5, 2017 through July 5, 2017. An overview of all public participation efforts is summarized in Table 9.*
> *[Excerpted from the TMDL Document]*

Table 9: Public outreach activities for the Miller Creek TMDL.

What	Audience	When	Response	Notes
Flyer/Invite to Lunch Meeting	All businesses in the watershed.	February, 2008	Poor - cancelled lunch but met privately with three interested businesses.	Two Best Management Practices came out of this effort.
Four Newsletters	All homeowners and businesses in the watershed.	Annually 2007 – 2010	unknown	Approx. 2,000 households and 250 businesses received the newsletters.
Meetings	Homeowners	June & October, 2007	Poor	Due to poor response, used newsletters to keep people informed instead.
Presentation	Service corps employees at Community Action Duluth	7/23/09	Good - 15 service corps staff	Followed by a watershed clean-up.
Rain garden and rain barrel workshop	Homeowners	9/18/09	Very good - 20 in attendance	Attendees received free rain garden plants and instructions for building their own rain garden.
Brochure	All	2008-2011	Unknown	Distributed at SWCD booth at various public events including the St. Louis County fair, Harvest Fest, and Earth Trax.
South St. Louis SWCD Website	All	2008-current	Unknown	Updated information on the Miller Creek TMDL was continually provided on the SWCD website.
TAG Meetings	TAG Members	10/10/07, 3/25/08, 12/15/09, 1/21/11, 6/30/11	Good, approx. 25 in attendance at each meeting.	Meetings held annually during data collection to review data and approach. 2011 meetings held to discuss approach for calculating loading capacity, WLAs and LAs.
RSPT Meetings	RSPT members	Monthly September 2007 – current	Good, approx. 20 in attendance at each meeting.	RSPT has an agenda for each meeting and Miller TMDL updates were included on many of these agendas.
Special Topics Meeting	City of Duluth Stormwater Staff	Periodic, 2010 to 2016	Good	City of Duluth and other MS4s wanted a meeting to discuss what possible implementation strategies they could use to meet their Wasteload Allocations.
Formal MPCA 30-Day Comment Period	All interested parties	6/5/2017 – 7/5/2017	52 individual comments from six entities	Formally responded to public comments.

Excerpted from the TMDL document

A formal 30-day public comment period was held from June 5th 2017 to July 5th 2017. The State received 49 public comments from 5 interested parties, 36 of which were related to the draft implementation plan which was subsequently removed from the final TMDL by MPCA. The majority of the comments about implementation expressed concerns and opinions regarding the most effective practices for reducing heat loads. MPCA acknowledged the concerns and committed to working with stakeholders during the BMP selection and implementation process to help ensure the most effective BMPs are utilized whenever possible. It should be noted that EPA does not approve implementation plans so the State's response to these comments and its decision to remove the draft implementation plan from the final TMDL submittal, are not a direct factor in the approval of this section of the TMDL.

A number of additional comments expressed concern regarding whether the TMDL would protect against acute maximum daily temperature effects given that the TMDL target was based on the chronic maximum weekly average temperature. MPCA clarified that the TMDL intends to utilize the weekly value as a daily average temperature and believes that this will ensure that the acute effects are not experienced. MPCA also pointed out that the water quality standard in question is based on a narrative standard of no material increase, and that the targets selected are based on an interpretation of the narrative standard and not a numerical water quality standard.

The remaining comments expressed opinions and concerns about technical aspects of the TMDL modeling and various assumptions. MPCA addressed each comment and question, and in most cases opted not to make changes to the TMDL analysis but instead explained why it had made the choices and assumptions it made.

EPA finds that the State satisfactorily addressed the comments and concerns expressed, and that adequate public participation was provided for as part of the TMDL development process.

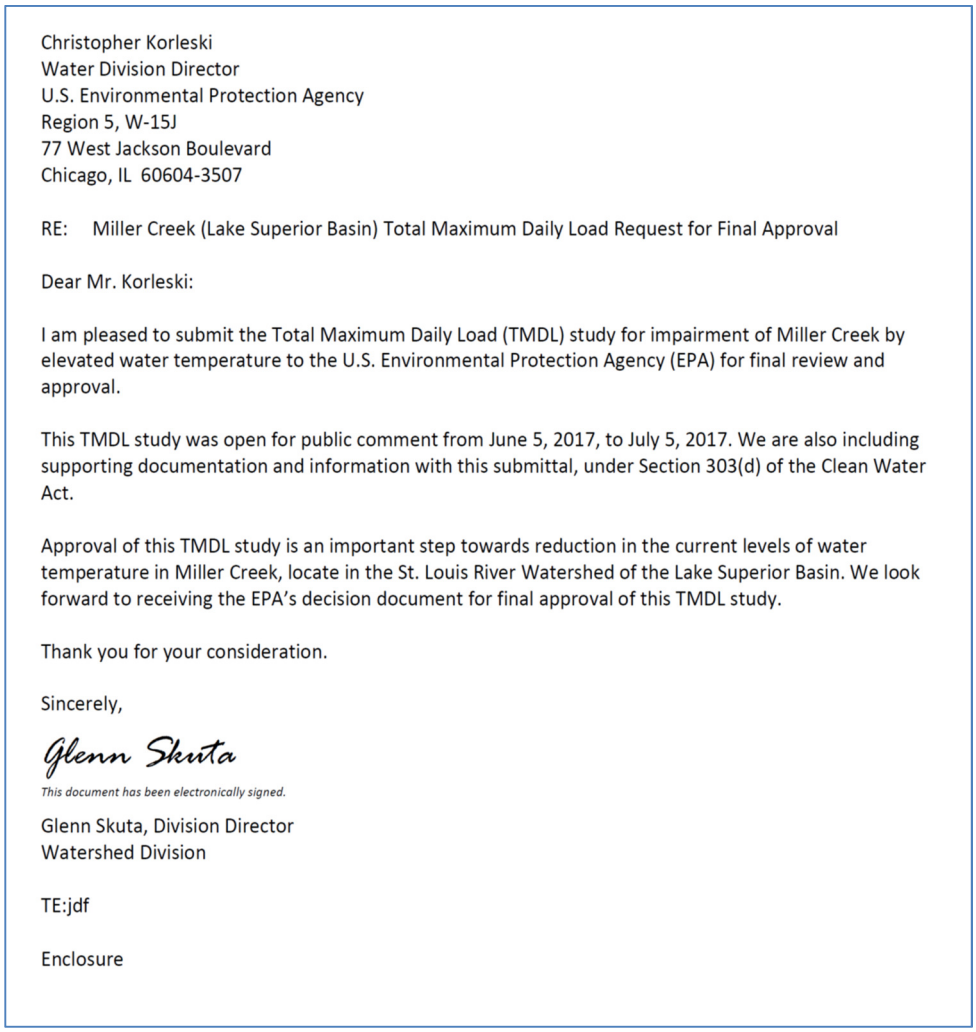
Section 12. Submittal Letter

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.

Section 12 Review Comments:

The TMDL was accompanied by a submittal letter requesting formal review and approval under section 303d of the Clean Water Act.



Christopher Korleski
Water Division Director
U.S. Environmental Protection Agency
Region 5, W-15J
77 West Jackson Boulevard
Chicago, IL 60604-3507

RE: Miller Creek (Lake Superior Basin) Total Maximum Daily Load Request for Final Approval

Dear Mr. Korleski:

I am pleased to submit the Total Maximum Daily Load (TMDL) study for impairment of Miller Creek by elevated water temperature to the U.S. Environmental Protection Agency (EPA) for final review and approval.

This TMDL study was open for public comment from June 5, 2017, to July 5, 2017. We are also including supporting documentation and information with this submittal, under Section 303(d) of the Clean Water Act.

Approval of this TMDL study is an important step towards reduction in the current levels of water temperature in Miller Creek, locate in the St. Louis River Watershed of the Lake Superior Basin. We look forward to receiving the EPA's decision document for final approval of this TMDL study.

Thank you for your consideration.

Sincerely,

Glenn Skuta

This document has been electronically signed.

Glenn Skuta, Division Director
Watershed Division

TE:jdf

Enclosure

Excerpted from the TMDL submittal letter

The EPA finds that the accompanying submittal letter satisfies the requirements of the twelfth criterion.

Section 13. Conclusion

After a full and complete review, EPA finds that the TMDL study satisfies all of the elements of an approvable TMDL.

This approval is for 1 TMDL received by EPA on October 18, 2017 addressing a water temperature impairment in Miller Creek as identified in Table 1 of the TMDL document.

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