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

REPLY TO THE ATTENTION OF:
WW-16J

APR 28 2014

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 Loads (TMDL) for segments within the Sunrise River watershed, including support documentation and follow up information. The Sunrise River watershed is in central Minnesota in Anoka, Chisago, Isanti and Washington Counties. The Sunrise River watershed TMDLs address impaired aquatic recreation due to excessive nutrients (phosphorus), impaired aquatic recreation due to excessive bacteria (*E. coli*) and impaired aquatic life use due to excessive nutrients (phosphorus).

EPA has determined that the Sunrise River watershed 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 five nutrient TMDLs and two bacteria TMDLs. 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 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
Christopher Klucas, MPCA

wq-iw6-06g

TMDL: Sunrise River watershed nutrient & bacteria TMDLs, Anoka, Chisago, Isanti and Washington Counties, MN
Date: April 28, 2014

DECISION DOCUMENT
FOR THE SUNRISE RIVER WATERSHED NUTRIENT& BACTERIA TMDLS, ANOKA, CHISAGO, ISANTI & WASHINGTON COUNTIES, MN

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements for approvable TMDLs. Additional information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable. These TMDL review guidelines are not themselves regulations. They are an attempt to summarize and provide guidance regarding currently effective statutory and regulatory requirements relating to TMDLs. Any differences between these guidelines and EPA's TMDL regulations should be resolved in favor of the regulations themselves.

1. Identification of Water body, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the water body as it appears on the State's/Tribe's 303(d) list. The water body 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 water body 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 water body. 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 water body is located;
(2) the assumed distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and

(5) an explanation and analytical basis for expressing the TMDL through *surrogate measures*, if applicable. *Surrogate measures* are parameters such as percent fines and turbidity for sediment impairments; chlorophyll *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comment:

Location Description/Spatial Extent:

The Sunrise River watershed (SRW) (HUC-10 #07030005-04) is located in the St. Croix River Basin (SCRB) in central Minnesota. The SRW is one of the subwatersheds of the SCRB and one of the four subwatersheds which make up the SCRB (in the referenced Figure the SRW is part of the St. Croix River (Stillwater) subwatershed).[1] The SRW is approximately 388 square miles (248,320 acres) and spans parts of Anoka, Chisago, Isanti and Washington counties in central Minnesota.

The SRW includes eight incorporated cities North Branch, Stacy, Wyoming, Forest Lake, East Bethel, Chisago City, Lindstrom, and Center City and covers portions of nineteen townships. The North branch of the Sunrise River begins in Isanti County and flows east to its confluence with the main stem of the Sunrise River. The West Branch of the Sunrise River begins in Anoka County and flows east to the confluence with the main stem of the Sunrise River in Stacy, Minnesota. The headwater of the main branch of the Sunrise River is located in northern Washington County. The main branch flows north and east to its confluence with the St. Croix River at Sunrise Township.

The SRW was designated by the Minnesota Pollution Control Agency (MPCA) as a high priority subwatershed of the St. Croix River. The Sunrise River was identified as one of the greatest contributors of phosphorus and sediment to the St. Croix River (Final TMDL document, page 18) and was allocated a 33% reduction in phosphorus loading by the Lake St. Croix Total Maximum Daily Load (TMDL) Study. The SRW TMDL addresses four nutrient impaired lakes, one nutrient impaired stream and two stream segments which are impaired due to bacteria. The lakes and stream segments of the SRW TMDL are:

- Linwood Lake (02-0026-00) for nutrients;
- Second Lake (13-0025-00) for nutrients;
- Vibo Lake (13-0030-00) for nutrients;
- White Stone Lake (13-0048-00) for nutrients;
- Sunrise River (07030005-543 for bacteria (*E. coli*);
- Hay Creek (07030005-545) for bacteria (*E. coli*); and
- Sunrise River, West Branch (07030005-529) for fish bioassessment and macroinvertebrate bioassessment (addressed via a nutrient TMDL).

All segments of the SRW TMDL are within the boundaries of the North Central Hardwood Forest (NCHF) ecoregion (Table 1 of this Decision Document).

[1] Map of St. Croix River Basin (Minnesota side): http://www.pca.state.mn.us/index.php/view-document.html?gid=9986

Table 1: Sunrise River Watershed impaired waters addressed by this TMDL

Water body name	Assessment Unit ID	Affected Use	Pollutant or stressor	TMDL
Linwood Lake	02-0026-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient
Second Lake	13-0025-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient
Vibo Lake	13-0030-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient
White Stone Lake	13-0048-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient
Sunrise River	07030005-543	Aquatic Recreation	Bacteria (*E. coli*)	Bacteria
Hay Creek	07030005-545	Aquatic Recreation	Bacteria (*E. coli*)	Bacteria
Sunrise River, West Branch	07030005-529	Aquatic Life	Macroinvertebrate bioassessment, Fish Bioassessment & Turbidity	Nutrient

A previous bacteria (fecal coliform) TMDL was completed for the Sunrise River-North Branch and approved by EPA in 2007. Areas covered by the Sunrise River-North Branch TMDL (2007) effort are upstream of the Sunrise River segment (07030005-543). MPCA incorporated relevant load allocations from Sunrise River-North Branch TMDL (2007) into the TMDL calculation for the Sunrise River segment (07030005-543) (See Table 6 of this Decision Document). A previous phosphorus TMDL was completed for Martin Lake (approved by EPA in 2012). MPCA included appropriate levels of the load allocation for the Sunrise River-West Branch (07030005-529) nutrient TMDL (Table 8 of this Decision Document).

The MPCA classified Linwood Lake as a deep lake and Second, Vibo and White Stone Lake as shallow lakes. MPCA defines deep lakes as enclosed basins with maximum depths greater than 15 feet (Table 2 of this Decision Document) and shallow lakes as lakes with a maximum depth less than 15 feet.

Table 2: Morphometric and watershed characteristics of lakes addressed in the Sunrise River Watershed TMDL

Parameter	Linwood Lake	Second Lake	Vibo Lake	White Stone Lake
Surface Area (acres)	569	85	57	49
Littoral Area (%)	85	100	100	100
Volume (acre-ft)	5,252	446	265	244
Average Depth (ft)	9.2	5.3	4.6	5.0
Maximum Depth (ft)	42	11	12	8
Watershed (acres)	7,366	605	7,733	268
Watershed area : surface area	13:1	7:1	136:1	5.5:1

Land Use:

Land use in the SRW is comprised of forested lands, developed lands, grasslands, croplands, wetlands and open water (Table 3 of this Decision Document). MPCA estimated that land use within the SRW is primarily composed of hay/pasture lands and forested areas. The land use within the watershed is primarily agricultural and is expected to remain agricultural for the foreseeable future. There may be a shift in crop usage within the watershed (i.e. grasslands converted to row crop land uses) but MPCA does not believe that this will have a significant impact on nutrient loading to waterbodies within the SRW.

Table 3: Land Use* in the Sunrise River watershed

Land Use*	Sunrise River, West Branch (07030005-529)		Sunrise River [1] (07030005-543)		Hay Creek (07030005-545)	
	Acres	Percent	Acres	Percent	Acres	Percent
Forested	4,179	47%	4,019	26%	1,727	19%
Developed	817	9%	736	5%	397	4%
Grassland	964	11%	5,983	38%	3,275	37%
Cropland	551	6%	4,389	28%	3,229	36%
Wetland	1,901	21%	474	3%	300	3%
Open Water	439	5%	51	0%	0	0%
TOTAL	8,851	100%	15,652	100%	8,928	100%

Land Use*	Linwood Lake (02-0025-00)		Second Creek (13-0025-00)		Vibo Lake (13-0030-00)	
	Acres	Percent	Acres	Percent	Acres	Percent
Forested	2,390	32%	282	47%	867	11%
Developed	323	4%	8	1%	383	5%
Grassland	812	11%	169	28%	3,420	44%
Cropland	1,115	15%	22	4%	2,845	37%
Wetland	1,969	27%	41	7%	181	2%
Open Water	757	10%	84	14%	37	0%
TOTAL	7,366	100%	606	100%	7,733	100%

Land Use*	White Stone Lake (13-0048-00)	
	Acres	Percent
Forested	72	27%
Developed	24	9%
Grassland	68	25%
Cropland	38	14%
Wetland	21	8%
Open Water	45	17%
TOTAL	268	100%

* Land use data compiled from the 2006 National Land Cover Dataset from the USGS

1 = Only includes the most downstream portion of the Sunrise River Watershed

Problem Identification:

Linwood Lake was originally listed on the 2002 Minnesota 303(d) list due to excessive nutrients (phosphorus). Second Lake, Vibo Lake, and White Stone Lake were originally listed on the 2012 Minnesota 303(d) list due to excessive nutrients (phosphorus). All four lakes are on the draft 2014 Minnesota 303(d) list for impaired aquatic recreation due to nutrient exceedances. Historic water quality conditions are presented by MPCA in Table 7 of the final TMDL document (page 25). Water quality measurements in all four lakes demonstrate exceedances of growing season averaged total phosphorus (TP) concentrations, chlorophyll-a (chl-*a*) concentrations and Secchi Disk (SD) depth. The water quality summary displayed in Table 7 of the final TMDL document indicates that Linwood Lake, Second Lake, Vibo Lake and White Stone Lake are not attaining their designated aquatic recreation uses due to exceedances of nutrient criteria. Data collected during these efforts was the foundation for modeling efforts completed in this TMDL study.

Sunrise River (07030005-543) and Hay Creek (07030005-545) were listed on the 2012 Minnesota 303(d) list for a bacteria impairment (*E. coli*). Both of these segments are found on the draft 2014 Minnesota 303(d) list for impaired aquatic recreation due to bacteria. MPCA describes the historic water quality conditions which indicate a bacteria impairment for the Sunrise River and Hay Creek segments in Section 3.5.2 of the final TMDL document (pages 25-26). Bacteria water quality data was compiled from sampling efforts in the Sunrise River from 2006-2010 (Figure 5 of the final TMDL document, page 26) and Hay Creek from 2009-2010 (Figure 6 of the final TMDL document, page 26). Bacteria data collected indicated that Sunrise River (07030005-543) and Hay Creek (07030005-545) were not attaining their designated aquatic recreation uses due to exceedances of bacteria.

The Sunrise River, West Branch (07030005-529) segment was listed on the 2004 Minnesota 303(d) list for impaired fish communities, on the 2008 Minnesota 303(d) list for turbidity and the 2012 Minnesota 303(d) list for impaired macroinvertebrate communities. These three impairments are found on the draft 2014 Minnesota 303(d) list. Biological monitoring (i.e., fish and macroinvertebrate sampling) was completed by the Minnesota Department of Natural Resources (MN-DNR) and confirmed that the Sunrise River, West Branch (07030005-529) was not attaining its designated aquatic life uses. MPCA determined that this non-attainment was due to excessive phosphorus within the Sunrise River, West Branch.

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

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

Priority Ranking:
The water bodies addressed by the SRW TMDLs were given a priority ranking 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. Areas within the SRW are popular locations for aquatic recreation. Water quality degradation has led to efforts to improve the overall water quality within the SRW, and to the development of TMDLs for these water bodies.

Pollutants of Concern:
The pollutants of concern are phosphorus for nutrient impaired water bodies (Linwood Lake, Second Lake, Vibo Lake and White Stone Lake), bacteria (*E. coli*) for bacteria impaired water bodies (Sunrise River (07030005-543) and Hay Creek (07030005-545)), and phosphorus for the Sunrise River, West Branch (07030005-529) segment with evidence of fish, macroinvertebrate and turbidity impairments.

Source Identification (point and nonpoint sources):

Point Source Identification: The potential point sources to the Sunrise River watershed are:

Sunrise River and Hay Creek bacteria (*E. coli*) TMDLs:
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. MPCA determined that there is one NPDES discharger within the Sunrise River subwatershed which impacts the bacteria wasteload allocation (WLA) for the Sunrise River (07030005-543) bacteria TMDL. This facility is the Chisago Lakes Joint Sewage Treatment Commission's (STC) Chisago Lakes Joint Sewage Treatment Facility (MN0055808). This facility was assigned a portion of the wasteload allocation (WLA) for the Sunrise River bacteria TMDL (Table 6 of this Decision Document).

Municipal Separate Storm Sewer System (MS4) communities: There is one MS4 community (the City of North Branch (MS400260)) within the Hay Creek subwatershed which received a portion of the WLA for the Hay Creek (07030005-545) bacteria TMDL (Table 7 of this Decision Document). Stormwater from MS4s can transport bacteria to surface water bodies during or shortly after storm events.

Combined Sewer Overflows (CSOs): There are no CSO communities in either the Sunrise River or the Hay Creek subwatersheds. CSOs may deliver bacteria to waterways during or shortly after storm events.

Concentrated Animal Feedlot Operations (CAFOs): There are no CAFOs within the Sunrise River and Hay Creek subwatersheds.

Linwood Lake, Second Lake, Vibo Lake, White Stone Lake & Sunrise River, West Branch nutrient TMDLs:
MS4 communities: There is one MS4 community (City of East Bethel (MS400087)) in the Linwood Lake subwatershed which was assigned a portion of the WLA for the Linwood Lake nutrient TMDL

(Table 9 of this Decision Document). Stormwater from MS4s can transport phosphorus to surface water bodies during or shortly after storm events.

Permitted construction and industrial areas: Construction and industrial sites may contribute phosphorus via sediment runoff during stormwater events. These areas within the SRW 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.

CSOs: There are no CSO communities in the Linwood Lake, Second Lake, Vibo Lake, White Stone Lake or Sunrise River, West Branch subwatersheds. CSOs may deliver phosphorus to waterways during or shortly after storm events.

CAFOs: There are no CAFOs in the Linwood Lake, Second Lake, Vibo Lake, White Stone Lake or Sunrise River, West Branch subwatersheds.

Nonpoint Source Identification: The potential nonpoint sources to the Sunrise River watershed are:

Sunrise River and Hay Creek bacteria (*E. coli*) TMDLs:
Stormwater from agricultural land use practices and feedlots near surface waters: Animal Feeding Operations (AFOs) in close proximity to surface waters can be a source of bacteria to water bodies in the SRW via the mobilization and transportation of pollutant laden waters from feeding, holding and manure storage sites. Runoff from agricultural lands may contain significant amounts of bacteria which may lead to impairments in the SRW. Feedlots generate manure which may be spread onto fields. Runoff from fields with spread manure can be exacerbated by tile drainage lines, which channelize the stormwater flows and reduce the time available for bacteria to die-off.

Illicit discharges from Subsurface Sewage Treatment Systems (SSTS) or unsewered communities: Failing septic systems are a potential source of bacteria within the SRW. Septic systems generally do not discharge directly into a water body, but effluents from SSTS may leach into groundwater or pond at the surface where they can be washed into surface waters via stormwater runoff events. Age, construction and use of SSTS can vary throughout a watershed and influence the bacteria contribution from these systems.

Failing SSTS are specifically defined as systems that are failing to protect groundwater from contamination, while those systems which discharge partially treated sewage to the ground surface, road ditches, tile lines, and directly into streams, rivers and lakes are considered an imminent threat to public health and safety (ITPHS). ITPHS systems also include illicit discharges from unsewered communities.

Straight pipe septic systems: 'Straight pipe' septic systems are a potential source of bacteria within the SRW. Straight pipe systems may contribute bacteria via direct discharge to the surface waters of the watershed. Straight pipe discharges from septics into the streams are illegal but are suspected to be a large contributor of bacteria, especially when high counts at low flow are observed. Septic systems with illegal straight pipe connection to tiling or stormwater drainage systems within the SRW are likely, but their contribution of bacteria is unknown.

Urban stormwater runoff: Runoff from urban areas (urban, residential, commercial or industrial land uses) can contribute various pollutants, including bacteria to local water bodies. Stormwater from urban areas, which drain impervious surfaces, may introduce pollutants to surface waters. Potential urban sources of bacteria can also include wildlife or pet wastes.

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 nutrients. Wildlife contributes to the potential impact of contaminated runoff from animal habitats, such as urban park areas, forest, and rural areas.

Linwood Lake, Second Lake, Vibo Lake, White Stone Lake & Sunrise River, West Branch nutrient TMDLs:

Internal loading: The release of phosphorus from lake sediments, the release of phosphorus from lake sediments 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 Linwood Lake, Second Lake, Vibo Lake and White Stone Lake. 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.

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of nutrients which may lead to impairments in the SRW. Manure spread onto fields is often a source of phosphorus, and can be exacerbated by tile drainage lines, which channelize the stormwater. Tile lined fields and channelized ditches enable particles to move more efficiently into surface waters. Phosphorus may be added via surface runoff from upland areas which are being used for Conservation Reserve Program (CRP) lands, grasslands, and agricultural lands used for growing hay or other crops. Stormwater runoff may contribute nutrients to surface waters from livestock manure, fertilizers, vegetation and erodible soils.

SSTS: Failing septic systems are a potential source of nutrients within the SRW. Septic systems generally do not discharge directly into a water body, but effluents from SSTS may leach into groundwater or pond at the surface where they can be washed into surface waters via stormwater runoff events. Age, construction and use of SSTS can vary throughout a watershed and influence the bacteria contribution from these systems.

Stream channelization and stream erosion: Eroding streambanks and channelization efforts may add nutrients to local surface waters. Nutrients may be added if there is particulate phosphorus bound with eroding soils. Eroding riparian areas may be linked to soil inputs within the water column and potentially to changes in flow patterns. Changes in flow patterns may also encourage down-cutting of the streambed and streambanks. Stream channelization efforts can increase the velocity of flow (via the removal of the sinuosity of a natural channel) and disturb the natural sedimentation processes of the streambed.

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

Urban/residential sources: Nutrients may be added via runoff from urban/developed areas near Linwood Lake, Second Lake, Vibo Lake and White Stone Lake. Runoff from urban/developed areas can include phosphorus derived from fertilizers, leaf and grass litter, pet wastes, and other sources of anthropogenic derived nutrients.

Wetland Sources: Phosphorus may be added to surface waters by stormwater flows through wetland areas in the SRW. 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.

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.

Future Growth:
Significant development is not expected in the SRW. The land use within the watershed is primarily agricultural and according to MPCA is expected to remain agricultural for the foreseeable future. The WLA and load allocations for the SRW TMDLs were calculated for all current and future sources. Any expansion of point or nonpoint sources will need to comply with the respective WLA and LA values calculated in the SRW TMDLs.

The EPA finds that the TMDL document submitted by 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 water body, 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.

<u>Comment:</u>

Designated Uses:

Water quality standards are the fundamental benchmarks by which the quality of surface waters are measured. Within the State of Minnesota, water quality standards (WQS) are developed pursuant to the Minnesota Statutes 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.

Minnesota Rule Chapter 7050 designates uses for waters of the state. The segments addressed by the Sunrise River watershed TMDLs are 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:

<u>*Narrative Criteria:*</u> 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."*

<u>Numeric criteria:</u>

<u>For bacteria impaired waters:</u>

The bacteria water quality standards which apply to Sunrise River watershed are:

Table 4: Bacteria Water Quality Standards Applicable to the Sunrise River watershed TMDLs

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

<u>*TMDL Bacteria Target:*</u> 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' standard of 126 orgs/100ml. MPCA believes that utilizing the 126 orgs/100 mL portion of the water quality standard will result in the greatest bacteria reductions within the SRW as well as attainment of the daily maximum of 1,260 orgs.100 mL. 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, attainment of both parts of the water quality standard is required.

<u>For nutrient impaired waters:</u>
Numeric criteria for TP, chl-*a*, and 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 Linwood Lake are those set forth for Class 2B deep lakes in the NCHF Ecoregion (Table 5 of this Decision Document). The numeric eutrophication standards which are applicable to Second Lake, Vibo Lake and White Stone Lake are those set forth for Class 2B shallow lakes in the NCHF Ecoregion (Table 5 of this Decision Document). In developing the lake nutrient standards for Minnesota lakes, 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 depth.

MPCA anticipates that by meeting the TP concentrations of 40 μg/L and 60 μg/L, the response variables chl-a and SD will be attained and the lakes addressed by the Sunrise River watershed TMDL will achieve their designated beneficial uses. For lakes to achieve their designated beneficial use, the lake must not exhibit signs of eutrophication and must allow water-related recreation, fishing and aesthetic enjoyment. MPCA views the control of eutrophication as the lake enduring minimal nuisance algal blooms and exhibiting desirable water clarity.

Table 5: Minnesota Eutrophication Standards for Deep and Shallow lakes within the North Central Hardwood Forest (NCHF) ecoregion

Parameter	NCHF Eutrophication Standard (deep lakes)[1]	NCHF Eutrophication Standard (shallow lakes)[2]
	(Linwood Lake)	*(Second, Vibo & White Stone Lake)*
Total Phosphorus (µg/L)	TP < 40	TP < 60
Chlorophyll-a (µg/L)	chl-a < 14	chl-a < 20
Secchi Depth (m)	SD > 1.4	SD > 1.0

[1] = Deep lakes are defined as enclosed basins with a maximum depth greater than 15-feet

[2] = Shallow lakes are defined as lakes with a maximum depth less than 15-feet, or with more than 80% of the lake area shallow enough to support emergent and submerged rooted aquatic plants (littoral zone).

<u>*TMDL Nutrient Target:*</u> MPCA selected a target of 40 µg/L of TP to develop the TMDL for Linwood Lake and a target of 60 µg/L of TP to develop the TMDLs for Second Lake, Vibo Lake and White Stone Lake. MPCA selected TP as the appropriate target parameter to address eutrophication problems at Linwood Lake, Second Lake, Vibo Lake and White Stone Lake because of the interrelationships between TP and chl-*a*, as well as SD depth. 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 depth.

MPCA developed the Sunrise River, West Branch nutrient load duration curve (LDC) using the NCHF shallow lake TP WQS (60 µg/L) as the endpoint for the LDC (Section 4.1.1.3 of the final TMDL document, page 53). MPCA felt this nutrient target was appropriate for the Sunrise River, West Branch nutrient TMDL since MPCA does not currently have nutrient WQS for rivers and streams. MPCA is in the process of developing river eutrophication standards[2] and has set its initial river eutrophication targets at concentrations greater than the NCHF shallow lake TP endpoint (60 µg/L). EPA feels the nutrient target employed in the Sunrise River, West Branch nutrient TMDL is reasonable.

The EPA finds that the TMDL document submitted by 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 water body 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

[2] MPCA webpage: http://www.pca.state.mn.us/index.php/water/water-permits-and-rules/water-rulemaking/new-water-quality-standards-for-river-eutrophication-and-total-suspended-solids.html#technical-support-documents

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:

Sunrise River and Hay Creek bacteria (*E. coli*) TMDLs:

For all *E. coli* TMDLs addressed by the SRW TMDL, a geometric mean of **126 orgs/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 stated that the bacteria TMDLs will focus on the geometric mean portion of the water quality standard (126 orgs/100mL). MPCA expects that attainment of the chronic WQS (126 orgs/100 mL) will result in the acute WQS (1,260 orgs/100 mL) being met. EPA finds these assumption 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 SRW bacteria TMDLs, MPCA used Minnesota's WQS for *E. coli* (126 orgs/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.

Separate flow duration curves (FDCs) were created for the Sunrise River (07030005-543) and Hay Creek (07030005-545) bacteria TMDLs in the SRW. The Sunrise River and Hay Creek FDCs were developed based on Soil and Water Assessment Tool (SWAT) modeling results and flow data from a MN-DNR stream gage on the Sunrise River at Sunrise, MN (CR-88, 37030001). Flow data from this location was collected from 2006-2012. Flow data from this location 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 approach. MPCA employed SWAT modeling results to fill in some of the flow data gaps in some of the impaired reaches in the upper portions of the SRW. SWAT was used to used to fill data gaps and predict non-monitored flows.

The loading capacity for the Sunrise River (07030005-543) segment was determined by subtracting contributions from the upstream segments of Hay Creek (07030005-545), Sunrise River, North Branch (07030005-501), the drainage area contributing to the North Pool of the Carlos Avery Wildlife Management Area (area draining to subwatershed 57) and the drainage area contributing to the Chisago Chain-of-Lakes (area draining to subwatershed 84) (Figure 14 of the final TMDL document, page 67). The *E. coli* WQS (126 orgs/100 mL) was applied to monitored flows on the North Branch to determine the loading capacity of this portion of the watershed. For the bacteria contributions from the North Pool of the Carlos Avery Wildlife Management Area and Chisago Chain-of-Lakes MPCA assumed that discharge from these subwatersheds was at the *E. coli* WQS (126 orgs/100 mL) since there was no *E. coli* monitoring data available for these subwatersheds. The loading capacity for the Hay Creek (07030005-545) segment was determined from the direct subwatershed drainage to that segment (Figure 15 of the final TMDL document, page 68).

FDCs 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 orgs/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 SRW bacteria TMDLs, 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 SRW LDC used *E. coli* measurements in billions of bacteria per day. The curved line on a LDC graph represents the TMDL of the respective flow conditions observed at that location.

Water quality monitoring was completed in the SRW between 2006-2010 and measured *E. coli* concentrations 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 created LDC.

The LDC plots were subdivided into five flow regimes; high flows (exceeded 0–10% of the time), wet 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 flow conditions (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.

Bacteria TMDLs for the Sunrise River (07030005-543) and Hay Creek (07030005-545) were calculated (Tables 6 & 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). Load allocations (ex. stormwater runoff from agricultural land use practices and feedlots, SSTS, wildlife inputs etc.) were not split among individual nonpoint contributors. Instead, load allocations were combined together into a one value to cover all nonpoint source contributions.

Tables 6 & 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 LDC 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. Tables 6 & 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 6: Bacteria (*E. coli*) TMDL for the Sunrise River (07030005-543) in the Sunrise River Watershed

Allocation	Source	High	Wet	Mid	Dry	Low
		E. coli (billions of bacteria/day)				
Existing Load		333.70	2058.70	669.70	733.20	120.00
Modified Existing Load[1]		0.00	796.70	24.10	339.20	0.00
TMDL for Sunrise River (07030005-543)						
Wasteload Allocation	Chisago Lakes Joint STC (MN0055808)	11.70	11.70	11.70	11.70	11.70
Load Allocation	Watershed runoff	624.50	209.40	75.70	6.40	0.00
	Upstream load (North Branch Fecal Coliform TMDL)[2]	759.80	389.30	250.10	178.90	128.50
	LA Totals	***1384.30***	***598.70***	***325.80***	***185.30***	***128.50***
Margin Of Safety (10%)		155.10	67.80	37.50	21.90	13.90
Loading Capacity (TMDL)		**1551.10**	**678.20**	**375.00**	**218.90**	**154.10**
Estimated Load Reduction (%)		**0%**	**19%**	**0%**	**38%**	**0%**

1 = The modified existing load accounts for future load reductions as part of the North Branch Fecal Coliform TMDL as well as the assumption that the discharge from the Carlos Avery Wildlife Management Area and the Chisago Chain of Lakes meets the standard of 126 org/100 ml [billion org/day]. Refer to Section 3.3 of the final TMDL document for the drainage area covered by this TMDL.
2 = A previous TMDL for excess fecal coliform has been completed for the Sunrise River (North Branch) and includes a WLA, LA and MOS for its drainage area. The WLA and LA presented here apply only to the -543 drainage area downstream of the Sunrise River (North Branch). Note that load allocations for fecal coliform have been converted to *E. coli* measurements at a ratio of 200 to 126 (equivalent to 0.63) per the MPCA Bacteria TMDL Protocols and Submittal Requirements, Revised March 2009.

Table 7: Bacteria (*E. coli*) TMDL for the Hay Creek (07030005-545) in the Sunrise River Watershed

Allocation	Source	High	Wet	Mid	Dry	Low
		E. coli (billions of bacteria/day)				
Existing Load[1]		No data	48.40	45.90	69.80	16.80
TMDL for Hay Creek (07030005-545)						
Wasteload Allocation	MS4: City of North Branch (MS400260)	1.40	0.61	0.34	0.20	0.13
Load Allocation	Watershed runoff	54.40	23.80	13.20	7.67	4.87
Margin Of Safety (10%)		6.20	2.71	1.50	0.88	0.56
Loading Capacity (TMDL)		**62.00**	**27.12**	**15.04**	**8.75**	**5.56**
Estimated Load Reduction (%)		--	**44%**	**67%**	**87%**	**67%**

1 = The loading capacities and allocations for 07030005-545 are based on a limited amount of water quality data from July and August only

The reduction from current conditions needed to meet the bacteria water quality standards was estimated for each reach, where data were sufficient. The reductions were calculated from the geometric mean of fecal coliform observed in each reach. The calculation used was:

(observed geometric mean – 126 orgs/100 mL) / observed geometric mean)

MPCA states that these estimated reductions needed are intended to be approximate, and does not account for variability in flow and bacteria itself can be a highly variable parameter. The estimates are intended to give a relative magnitude of reductions needed across the two segments (Figures 14 & 15 of the final TMDL).

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 SRW bacteria TMDLs. The methods used for determining the TMDL are consistent with U.S. EPA technical memos.[3]

Sunrise River, West Branch nutrient TMDL:

MPCA developed a LDC based nutrient TMDL for the Sunrise River, West Branch (07030005-529). This LDC TMDL was developed in a similar manner to the bacteria TMDLs except that the Sunrise River, West Branch TMDL's endpoint was a nutrient concentration of 60 μg/L.

Table 8: Nutrient TMDL for Sunrise River, West Branch (07030005-529) in the Sunrise River Watershed

Allocation	Source	High	Wet	Mid	Dry	Low
		Total Phosphorus (lbs/day)				
Existing Load		60.00	55.00	25.30	17.10	5.70
Modified Existing Load[1]		58.60	12.60	21.00	13.10	2.90
TMDL for Sunrise River, West Branch (07030005-529)						
Wasteload Allocation	Construction Stormwater	4.10	1.79	0.99	0.58	0.37
	Industrial Stormwater	4.10	1.79	0.99	0.58	0.37
	WLA Totals	***8.20***	***3.58***	***1.98***	***1.16***	***0.74***
Load Allocation	Watershed runoff	26.00	11.30	6.33	3.64	2.33
	Upstream of Martin Lake[2]	34.20	15.00	8.27	4.83	3.07
	LA Totals	***60.20***	***26.30***	***14.60***	***8.47***	***5.40***
Margin Of Safety (10%)		7.60	3.32	1.84	1.07	0.68
Loading Capacity (TMDL)		**76.00**	**33.20**	**18.42**	**10.70**	**6.82**
Estimated Load Reduction (%)		**0%**	**0%**	**12%**	**18%**	**0%**

1 = The modified existing load accounts for future load reductions as part of the Martin Lake TMDL

2 = A previous TMDL for phosphorus was completed for Martin Lake, the LA represented here is for the drainage area of 07030005-529 downstream of Martin Lake

Table 8 of this Decision Document outlines MPCA's estimates of the reductions required for the Sunrise River, West Branch to meet its water quality targets (i.e., the Estimated Load Reduction (%)). These loading reductions were estimated from existing and TMDL calculations. MPCA expects that these reductions will result in the attainment of the water quality targets and the segment's water quality will return to a level where its designated uses are no longer considered impaired.

Linwood Lake, Second Lake, Vibo Lake & White Stone Lake nutrient TMDLs:

The approach utilized by MPCA to calculate the loading capacity for the Linwood Lake, Second Lake, Vibo Lake and White Stone Lake nutrient TMDLs is described in Section 4.0 of the final TMDL document. MPCA used the BATHTUB model to calculate the loading capacity for each lake. MPCA determined the nutrient budget for each lake based on inputs from; direct watershed and upstream sources, MS4 source contributions, construction and industrial stormwater inputs, internal load, and

[3] 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.

atmospheric load. Additionally, MPCA included information for lake geometry, climate data, precipitation data, water quality data and flow data into the BATHTUB setup.

The BATHTUB model was utilized to link observed phosphorus water quality conditions and estimated phosphorus loads to in-lake water quality estimates. BATHTUB has previously been used successfully in many lake studies in Minnesota. BATHTUB is a steady-state annual or seasonal model that predicts a lake's growing season (June 1 to September 30) average surface water quality. BATHTUB utilizes annual or seasonal time-scales which are appropriate because watershed TP loads are normally impacted by seasonal conditions.

BATHTUB has built-in statistical calculations which account for data variability and provide a means for estimating confidence in model predictions. BATHTUB employs a mass-balance TP model that accounts for water and TP inputs from tributaries, direct watershed runoff, the atmosphere, and sources internal to the lake, and outputs through the lake outlet, water loss via evaporation, and TP sedimentation and retention in the lake sediments. BATHTUB provides flexibility to tailor model inputs to specific lake morphometry, watershed characteristics and watershed inputs. The BATHTUB model also allows MPCA to assess different impacts of changes in nutrient loading. BATHTUB allows choice among several different mass-balance TP models.

The loading capacity of the lake was determined through the use of BATHTUB and the Canfield-Bachmann subroutine and then allocated to the WLA, LA, and Margin of Safety (MOS). To simulate the load reductions needed to achieve the WQS, a series of model simulations were performed. Each simulation reduced the total amount of TP entering each of the water bodies during the growing season (or summer season, June 1 through September 30) and computed the anticipated water quality response within the lake. The goal of the modeling simulations was to identify the loading capacity appropriate (i.e., the maximum allowable load to the system, while allowing it to meet WQS) from June 1 to September 30. The modeling simulations focused on reducing the TP to the system.

The BATHTUB modeling efforts were used to calculate the loading capacity for each lake. The loading capacity is the maximum phosphorus load which each of these water bodies can receive over an annual period and still meet the deep and shallow lake NCHF WQS (Table 5 of this Decision Document). Loading capacities on the annual scale (lbs/year) were calculated to meet the WQS 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 Linwood Lake, Second Lake, Vibo Lake and White Stone Lake 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 365 to calculate the daily loading capacities.

MPCA subdivided the loading capacity among the WLA, LA, and MOS components of the TMDL (Tables 9 to 12 of this Decision Document). The LA accounted for a majority of the loading capacity. 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 Linwood Lake, Second Lake, Vibo Lake and White Stone Lake during the worst water quality conditions of the year. 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).

In developing the lake nutrient standards for Minnesota lakes (Minn. Rule 7050), 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 depth. Based on these relationships it is expected that the allocations set forth in this TMDL to meet the phosphorus targets of 60 µg/L and 40 µg/L for shallow and deep lakes will result in the chl-*a* and Secchi standards being met.

Table 9: Nutrient TMDL for Linwood Lake in the Sunrise River watershed

Allocation	Source	Existing TP Load		TMDL		Load Reduction	
		(lbs/yr)	*(lbs/day)*	*(lbs/yr)*	*(lbs/day)*	*(lbs/yr)*	*(%)*
Wasteload Allocation	MS4: City of East Bethel (MS400087)	21.30	0.058	21.30	0.058	0.0	0%
	Construction Stormwater	3.70	0.010	3.70	0.010	0.0	0%
	Industrial Stormwater	3.70	0.010	3.70	0.010	0.0	0%
	WLA Totals	***28.70***	***0.079***	***28.70***	***0.079***	*--*	*--*
Load Allocation	Watershed contributions	1050.30	2.878	762.00	2.088	288.3	27%
	Internal Load	307.00	0.841	277.90	0.761	29.1	9%
	SSTS	110.30	0.302	86.40	0.237	23.9	22%
	Atmospheric Deposition	152.30	0.417	152.30	0.417	0.0	0%
	LA Totals	***1619.90***	***4.438***	***1,278.60***	***3.503***	***341.3***	***21%***
Margin Of Safety (10%)		--	--	145.30	0.398	--	--
Loading Capacity (TMDL)		**1648.60**	**4.517**	**1,452.60**	**3.980**	**341.3**	**21%**

Table 10: Nutrient TMDL for Second Lake in the Sunrise River watershed

Allocation	Source	Existing TP Load		TMDL		Load Reduction	
		(lbs/yr)	*(lbs/day)*	*(lbs/yr)*	*(lbs/day)*	*(lbs/yr)*	*(%)*
Wasteload Allocation	Construction Stormwater	0.07	0.0002	0.07	0.0002	0.00	0%
	Industrial Stormwater	0.07	0.0002	0.07	0.0002	0.00	0%
	WLA Totals	***0.14***	***0.0004***	***0.14***	***0.0004***	*--*	*--*
Load Allocation	Watershed contributions	148.50	0.407	80.90	0.222	67.60	46%
	Internal Load	--	--	--	--	--	--
	SSTS	10.60	0.029	6.20	0.017	4.40	42%
	Atmospheric Deposition	22.70	0.062	22.70	0.062	0.00	0%
	LA Totals	***181.80***	***0.498***	***109.80***	***0.301***	***72.00***	***40%***
Margin Of Safety (10%)		--	--	12.20	0.033	--	--
Loading Capacity (TMDL)		**181.94**	**0.498**	**122.14**	**0.335**	**72.00**	**40%**

Table 11: Nutrient TMDL for Vibo Lake in the Sunrise River watershed

Allocation	Source	Existing TP Load		TMDL		Load Reduction	
		(lbs/yr)	*(lbs/day)*	*(lbs/yr)*	*(lbs/day)*	*(lbs/yr)*	*(%)*
Wasteload Allocation	Construction Stormwater	0.40	0.001	0.40	0.001	0.00	0%
	Industrial Stormwater	0.40	0.001	0.40	0.001	0.00	0%
	WLA Totals	***0.80***	***0.002***	***0.80***	***0.002***	--	--
Load Allocation	Watershed contributions	9238.20	25.310	698.00	1.912	8540.20	92%
	Internal Load	1202.70	3.295	28.00	0.077	1174.70	98%
	SSTS	6.60	0.018	3.80	0.010	2.80	42%
	Atmospheric Deposition	15.40	0.042	15.40	0.042	0.00	0%
	LA Totals	***10462.90***	***28.665***	***745.20***	***2.042***	***9717.70***	***93%***
Margin Of Safety (10%)		--	--	82.90	0.227	--	--
Loading Capacity (TMDL)		**10463.70**	**28.668**	**828.90**	**2.271**	**9717.70**	**93%**

Table 12: Nutrient TMDL for White Stone Lake in the Sunrise River watershed

Allocation	Source	Existing TP Load		TMDL		Load Reduction	
		(lbs/yr)	*(lbs/day)*	*(lbs/yr)*	*(lbs/day)*	*(lbs/yr)*	*(%)*
Wasteload Allocation	Construction Stormwater	0.03	0.0001	0.03	0.0001	0.00	0%
	Industrial Stormwater	0.03	0.0001	0.03	0.0001	0.00	0%
	WLA Totals	***0.06***	***0.0002***	***0.06***	***0.0002***	--	--
Load Allocation	Watershed contributions	40.90	0.112	7.70	0.021	33.20	81%
	Internal Load	63.50	0.174	23.90	0.065	39.60	62%
	SSTS	17.20	0.047	10.00	0.027	7.20	42%
	Atmospheric Deposition	13.00	0.036	13.00	0.036	0.00	0%
	LA Totals	***134.60***	***0.369***	***54.60***	***0.150***	***80.00***	***59%***
Margin Of Safety (10%)		--	--	6.10	0.017	--	--
Loading Capacity (TMDL)		**134.66**	**0.369**	**60.76**	**0.166**	**80.00**	**59%**

Tables 9 to 12 of this Decision Document discusses MPCA's estimates of the reductions required for Linwood Lake, Second Lake, Vibo Lake and White Stone Lake to meet their water quality targets. These loading reductions (i.e., the percentage column) were estimated from existing and TMDL calculations. MPCA expects that these reductions will result in the attainment of the water quality targets and the lake water quality will return to a level where their designated uses are no longer considered impaired.

EPA supports the data analysis and modeling approach utilized by MPCA in its calculation of wasteload allocations, load allocations and the margin of safety for the Linwood Lake, Second Lake, Vibo Lake and White Stone Lake nutrient TMDLs. Additionally, EPA concurs with the loading capacities calculated by the MPCA in these four nutrient TMDLs. EPA finds MPCA's approach for calculating the loading capacity for Linwood Lake, Second Lake, Vibo Lake and White Stone Lake to be reasonable and consistent with EPA guidance.

The EPA finds that the TMDL document submitted by 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:
MPCA determined the LA calculations for each of the TMDLs based on the applicable WQS or water quality targets. MPCA recognized that LAs for each of the individual TMDLs addressed by the SRW TMDLs can be attributed to different nonpoint sources.

Sunrise River and Hay Creek bacteria (*E. coli*) TMDLs:
The calculated LA values for the bacteria TMDLs are applicable across all flow conditions in the Sunrise River and Hay Creek subwatersheds (Tables 6 & 7 of this Decision Document). MPCA identified several nonpoint sources which contribute bacteria loads to the surface waters in the SRW. Load allocations were recognized as originating from many diverse nonpoint sources including; stormwater from agricultural and feedlot areas, failing septic systems, urban stormwater runoff, and wildlife (deer, geese, ducks, raccoons, turkeys and other animals). MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations, but aggregated the nonpoint sources into one LA value.

The Sunrise River bacteria TMDL (07030005-543) incorporated a portion of the LA which was attributed to an earlier TMDL, the Sunrise River-North Branch fecal coliform TMDL (approved in 2007). The LA was classified as the '*Upstream Load (North Branch Fecal Coliform TMDL)*' (see Table 6 of this Decision Document). The LA assigned to the Sunrise River TMDL (07030005-543) from the 2007 TMDL was based on areas upstream of the Sunrise River segment (07030005-543) which MPCA felt were contributing bacteria loading to segment (07030005-543). MPCA converted fecal coliform loads, from the 2007 TMDL, to *E. coli* concentrations via the WQS ratio per the MPCA Bacteria TMDL Protocols and Submittal Requirements.

Linwood Lake, Second Lake, Vibo Lake, White Stone Lake & Sunrise River, West Branch nutrient TMDLs:
MPCA divided the LA for the Linwood Lake, Second Lake, Vibo Lake and White Stone Lake nutrient TMDLs between a variety of nonpoint sources. These nonpoint sources included; watershed contributions from each lake's direct watershed, SSTS, atmospheric deposition, and internal loading sources. The direct watershed nonpoint sources for all four water bodies include TP inputs from agricultural nonpoint source runoff, urban nonpoint source runoff and wetland nonpoint source contributions. MPCA calculated estimated percent reductions for different LA sources. These reductions represent the estimated decreases necessary to meet the NCHF WQS (Tables 9 to 12 of this Decision Document). The reductions necessary from nonpoint sources ranged from 9% to 98%.

MPCA recommended that stakeholders prioritize their efforts for decreasing nonpoint phosphorus inputs to the four lakes addressed in the SRW nutrient TMDLs. MPCA explained that its strategy for assigning nonpoint source reductions to each individual lake was based on targeting external (or direct) watershed nonpoint sources first. After fully investigating the nonpoint source load which could reasonably be expected to be reduced from external watershed sources, MPCA then focused their reduction efforts on internal load to each of the individual lakes. MPCA believes that external watershed loads should be addressed prior to internal loads because loading from external watershed sources oftentimes contributes to phosphorus available in the lake bottom sediments. Without mitigating one of the main sources to internal load MPCA explained stakeholders may be presented with the ongoing challenge of managing internal load.

Vibo Lake and White Stone Lake have considerable internal loading and substantial internal load reductions are necessary in order for these lakes to eventually attain WQS. MPCA recognizes that its load reductions goals for internal load are aggressive but these goals are based on the on the best available information for the SRW nutrient TMDLs and the reduction targets are within the range of reductions required for other lakes in Minnesota. Once implementation actions are conducted to address both internal loads (e.g. alum treatment) and watershed loads (e.g. stormwater treatment) and additional water quality monitoring is completed to assess the progress, MPCA and local partners plan to revisit the reduction goals of the SRW nutrient TMDLs. Through this adaptive management approach, MPCA and local partners will be able to decide whether further implementation actions are needed or if MPCA should consider a site-specific water quality standard.

EPA finds MPCA's approach for calculating the LA to be reasonable.

The EPA finds that the TMDL document submitted by 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:

Sunrise River and Hay Creek bacteria (*E. coli*) TMDLs:

MCPA identified the Chisago Lakes Joint Sewage Treatment Facility (MN0055808) as an NPDES permitted facility within the Sunrise River subwatershed and assigned this facility a portion of the WLA assigned to mitigate bacteria inputs (Table 6 of this Decision Document). The WLA for this facility was calculated based on the facility's design flow and the permit limit. MPCA expects the Chisago Lakes Joint Sewage Treatment Facility to meet the concentration targets assigned in the WLA across all flow conditions. MPCA identified the City of North Branch (MS400260) as an MS4 community within the Hay Creek subwatershed which may contribute bacteria, via stormwater, to Hay Creek. The City of North Branch MS4 was assigned a portion of the WLA (Table 7 of this Decision Document) based on bacteria WQS and the MS4 area.

There are no CSOs within the SRW, therefore, CSOs were assigned a WLA of zero (WLA = 0) for the Sunrise River and Hay Creek bacteria TMDLs. MPCA determined that there were no CAFO facilities within the SRW. 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 Sunrise River and Hay Creek bacteria TMDLs.

EPA finds the MPCA's approach for calculating the WLA for the Sunrise River and Hay Creek bacteria TMDLs to be reasonable.

Linwood Lake, Second Lake, Vibo Lake, White Stone Lake & Sunrise River, West Branch nutrient TMDLs:

MPCA identified the City of Bethel (MS400087) as an MS4 community within the Linwood Lake subwatershed which may contribute nutrients, via stormwater, to Linwood Lake. The City of Bethel MS4 was assigned a portion of the WLA (Table 9 of this Decision Document) based on nutrient WQS and the MS4 area (1.6% of the total area within the Linwood Lake subwatershed).

MPCA calculated a portion of the WLA and assigned it to construction stormwater and industrial stormwater. MPCA's calculation for the construction stormwater WLA was based on areal coverage of construction permitted areas by county from 2007-2012. MPCA combined individual permitted sites into one 'categorical' WLA (Table 28 of the final TMDL document, page 58). The industrial stormwater WLA was set equal to the construction stormwater WLA to account for future industrial stormwater contributions within the SRW.

MPCA explained that BMPs and other stormwater control measures should be implemented at active construction sites to limit the discharge of pollutants of concern. BMPs and other stormwater control measures which should be implemented at construction sites are defined in the State's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001). 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.

Industrial sites within the Sunrise River 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 Linwood Lake, Second Lake, Vibo Lake, White Stone Lake and the Sunrise River, West Branch nutrient 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 SRW, therefore, CSOs were assigned a WLA of zero (WLA = 0) for the Linwood Lake, Second Lake, Vibo Lake, White Stone Lake and Sunrise River, West Branch nutrient TMDLs. MPCA determined that there were no CAFO facilities within the SRW. 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 Linwood Lake, Second Lake, Vibo Lake, White Stone Lake and the Sunrise River, West Branch nutrient TMDLs.

EPA finds the MPCA's approach for calculating the WLA for the Linwood Lake, Second Lake, Vibo Lake, White Stone Lake and the Sunrise River, West Branch nutrient TMDLs to be reasonable and consistent with EPA guidance.

The EPA finds that the TMDL document submitted by 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:

The final TMDL submittal outlines the determination of the Margin of Safety for the bacteria and nutrient TMDLs (an explicit MOS set at 10% of the loading capacity). The explicit MOS was applied by reserving approximately 10% of the total loading capacity, and then allocating the remaining loads to point and nonpoint sources (Tables 6 to 12 of this Decision Document). The use of an explicit MOS accounted for environmental variability in pollutant loading, variability in water quality data (i.e., collected water quality monitoring data), calibration and validation processes of modeling efforts, uncertainty in modeling outputs, and conservative assumptions made during the modeling efforts.

Sunrise River and Hay Creek bacteria (*E. coli*) TMDLs:

The bacteria TMDLs employed an explicit MOS of 10% of the total loading capacity. The use of the LDC approach minimized variability associated with the development of the SRW bacteria TMDLs 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 *E. coli* loads include the dynamics and complexity of bacteria in stream environments. Factors such as die-off and re-growth contribute to general uncertainty that makes quantifying stormwater bacteria loads particularly difficult. The MOS for the SRW bacteria TMDLs also incorporated certain conservative assumptions in the calculation of the TMDLs. No rate of decay, or die-off rate of pathogen species, was used in the TMDL calculations or in the creation of load duration curves for *E. coli*. Bacteria have a limited capability of surviving outside their hosts, and normally a rate of decay would be incorporated. MPCA determined that it was more conservative to use the WQS (126 orgs/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 orgs/100 mL. Thus, it is more conservative to apply the State's WQS as the bacteria target value, because this standard must be met at all times under all environmental conditions.

Linwood Lake, Second Lake, Vibo Lake, White Stone Lake & Sunrise River, West Branch nutrient TMDLs:

The Linwood Lake, Second Lake, Vibo Lake, White Stone Lake and Sunrise River, West Branch nutrient TMDLs employed an explicit MOS set at 10% of the loading capacity. MPCA explained that the explicit MOS was set at 10% due to the following factors discovered during the development of the SRW nutrient TMDLs:

- The robust dataset that includes lake water quality monitoring data collected over multiple years and basins;
- The strong correlation between the predicted water quality values from modeling efforts and the observed water quality values in the SRW (i.e., the models reflect the water quality conditions in the SRW reasonably well); and
- MPCA's confidence in the Canfield-Bachmann model's performance during the development of nutrient TMDLs.

The EPA finds that the TMDL document submitted by 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:

Sunrise River and Hay Creek bacteria (*E. coli*) TMDLs:

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 SRW and thereby accounted for seasonal variability over the recreation season.

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).

Linwood Lake, Second Lake, Vibo Lake, White Stone Lake & Sunrise River, West Branch nutrient TMDLs:

The nutrient targets employed in the Linwood Lake, Second Lake, Vibo Lake and White Stone Lake TMDLs 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 NCHF eutrophication WQS during the period of the year where the frequency and severity of algal growth is the greatest.

The Minnesota eutrophication standards state that total phosphorus WQS are defined as the mean concentration of phosphorus values measured during the growing season. In the Linwood Lake, Second Lake, Vibo Lake and White Stone Lake phosphorus TMDL efforts, the LA and WLA estimates were calculated from modeling efforts which incorporated mean growing season total phosphorus values. 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 within the SRW is deficient. By calibrating the modeling efforts to protect these water bodies during the worst water quality conditions of the year, it is assumed 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 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 Sunrise River watershed bacteria and nutrient TMDLs provide reasonable assurance that actions identified in the implementation strategy, as discussed in the TMDL in Section 7, will be applied to attain the loading capacities and allocations calculated for the impaired reaches within the SRW. The recommendations made by MPCA will be successful at improving water quality if the appropriate local groups work to implement these recommendations. Those mitigation suggestions, which fall outside of regulatory authority, will require commitment from state agencies and local stakeholders to carry out the suggested actions.

MPCA has identified several local partners which have expressed interest in working to improve water quality within the SRW. Implementation practices will be implemented over the next several years. The following groups are expected to work closely with one another to ensure that pollutant reduction efforts via BMPs are being implemented within the SRW: Anoka County Conservation District (CD), Chisago Soil & Water Conservation District (SWCD), Isanti SWCD, Washington County CD, Sunrise River Water Management Organization (SRWMO), and Comfort Lake Forest Lake Watershed District (CLFLWD).

Continued water quality monitoring within the basin is supported by MPCA. Additional water quality monitoring results could provide insight into the success or failure of BMP systems designed to reduce bacteria and nutrient effluent loading into the surface waters of the watershed. Local watershed managers would be able to reflect on the progress of the various pollutant removal strategies and would have the opportunity to change course if observed progress is unsatisfactory.

Various funding mechanisms will be utilized to execute the recommendations made in the implementation section of this TMDL. MCPA is in the process of developing a Watershed Restoration and Action Plan (WRAP) for the Sunrise River watershed and will incorporate the loadings described in this TMDL as well as the implementation recommendations from the SRW TMDLs. MPCA anticipates that the WRAP will be finalized after the approval of the SRW TMDLs. Funding for implementation efforts will be a mixture of local, state and federal funding vehicles. Local funding may be through SWCD cost-share funds, Natural Resources Conservation Service (NRCS) cost-share funds, and local government cost-share funds. Federal funding, via the Section 319 grants program, may provide money to implement voluntary nonpoint source programs within the Sunrise River watershed. State efforts may be via Clean Water Legacy Act (CWLA) grant money and the Minnesota Clean Water Partnership program.

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

The CWLA also provides details on public and stakeholder participation, and how the funding will be used. The implementation plans are required to contain ranges of cost estimates for point and nonpoint source load reductions, as well as monitoring efforts to determine effectiveness. MPCA has developed guidance on what is required in the implementation plans (Implementation Plan Review Combined Checklist and Comment, MPCA), which includes cost estimates, general timelines for implementation, and interim milestones and measures. The Minnesota Board of Soil and Water Resources administers the Clean Water Fund as well, and has developed a detailed grants policy explaining what is required to be eligible to receive Clean Water Fund money (FY '11 Clean Water Fund Competitive Grants Policy; Minnesota Board of Soil and Water Resources, 2011).

Reasonable assurance that the WLA set forth will be implemented is provided by regulatory actions. According to 40 CFR 122.44(d)(1)(vii)(B), NPDES permit effluent limits must be consistent with assumptions and requirements of all WLAs in an approved TMDL. MPCA's stormwater program and the NPDES permit program are some of the implementing programs for ensuring effluent limits are consistent with the TMDL. The MPCA issues permits for wastewater treatment facilities that discharge into waters of the state. The permits have site specific limits on bacteria and nutrients that are based on

The MPCA regulates the collection, transportation, storage, processing and disposal of animal manure and other livestock operation wastes at State registered AFO facilities. The MPCA Feedlot Program implements rules governing these activities, and provides assistance to counties and the livestock industry. The feedlot rules apply to most aspects of livestock waste management including the location, design, construction, operation and management of feedlots and manure handling facilities.

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 Sunrise River watershed (Section 6 of the final TMDL document). Progress of TMDL implementation will be measured through regular monitoring efforts of water quality and total BMPs completed. MPCA anticipates that monitoring will be completed by local groups (e.g., SRWMO) as long as there is sufficient funding to support the efforts of these local entities. Additionally, volunteers may be relied on to complete monitoring in some of the lakes (Linwood Lake and Second Lake) discussed within this TMDL. At a minimum, the Sunrise River watershed will be monitored by MPCA, as part of the MPCA lead 10-year Intensive Watershed Monitoring cycle.

Water quality monitoring is a critical component of the adaptive management strategy employed as part of the implementation efforts utilized in the Sunrise River watershed. Water quality information will aid watershed managers in understanding how BMP pollutant removal efforts are impacting water quality within the SRW. Water quality monitoring combined with an annual review of BMP efficiency will provide information on the success or failure of BMP systems designed to reduce pollutant loading into water bodies of the SRW. Watershed managers will have the opportunity to reflect on the progress or lack of progress, and will have the opportunity to change course if progress is unsatisfactory. Review of BMP efficiency is expected to be completed by the local and county partners.

Stream Monitoring:
River and stream monitoring in the SRW (Sunrise River, Hay Creek and the Sunrise River, West Branch), has been completed by a variety of organizations (i.e., SWCDs) and funded by Clean Water Partnership Grants, and other available local funds. MPCA anticipates that stream monitoring in the SRW should continue in order to build on the current water quality dataset and track changes based on implementation progress. Continuing to monitor water quality and biota scores in the listed segments will determine whether or not stream habitat restoration measures are required to bring the watershed into attainment with water quality standards. At a minimum, fish and macroinvertebrate sampling should

WQS. Permits regulate discharges with the goals of protecting public health and aquatic life, and assuring that every facility treats wastewater.

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 Sunrise River watershed 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 oversees regulated MS4 entities (ex. City of East Bethel) in stormwater management accounting activities. The City of East Bethel is a Phase II MS4 permittee and required to satisfy the requirements of the MS4 general permit. The MS4 general permit requires the permittee to develop a SWPPP which addresses all permit requirements, including the following six minimum control measures:

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

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

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

SSTS are regulated by Minnesota Statutes 115.55 and 115.56 which establish minimum technical standards for individual and mid-sized SSTS, a framework for local administration of SSTS programs and statewide licensing and certification of SSTS professionals, SSTS product review and registration, and establishment of the SSTS Advisory Committee.

into groundwater resources. Improved strategies for the collection, storage and management of manure can minimize impacts of bacteria entering the surface and groundwater system. Repairing manure storage facilities or building roofs over manure storage areas may decrease the amount of bacteria in stormwater runoff.

Manure management plans: Developing manure management plans can ensure that the storage and application rates of manure are appropriate for land conditions. Determining application rates that take into account the crop to be grown on that particular field and soil type will ensure that the correct amount of manure is spread on a field given the conditions. Spreading the correct amount of manure will reduce the availability of bacteria to migrate to surface waters.

Feedlot runoff controls: Treatment of feedlot runoff via diversion structures, holding/storage areas, and stream buffering areas can all reduce the transmission of bacteria to surface water environments. Additionally, cleaner stormwater runoff can be diverted away from feedlots so as to not liberate bacteria.

Subsurface septic treatment systems: Improvements to septic management programs and educational opportunities can reduce the occurrence of septic pollution. Educating the public on proper septic maintenance, finding and eliminating illicit discharges and repairing failing systems could lessen the impacts of septic derived bacteria inputs into the SRW.

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 the main stem or tributaries of the SRW.

Linwood Lake, Second Lake, Vibo Lake, White Stone Lake & Sunrise River, West Branch nutrient TMDLs:

Septic Field Maintenance: Septic systems are believed to be a source of nutrients to waters in the SRW. Failing systems are expected to be identified and addressed via upgrades to those SSTS not meeting septic ordinances. MPCA explained that SSTS improvement priority should be given to those failing SSTS on lakeshore properties or those SSTS adjacent to streams within the direct watersheds for each water body. MPCA aims to greatly reduce the number of failing SSTS in the future via local septic management programs and educational opportunities. Educating the public on proper septic maintenance, finding and eliminating illicit discharges, and repairing failing systems could lessen the impacts of septic derived nutrients inputs into the Sunrise River watershed.

Manure management (feedlot and manure stockpile runoff controls): Manure has been identified as a potential source of nutrients. Nutrients derived from manure can be transported to surface water bodies via stormwater runoff. Nutrient laden water can also leach into groundwater resources. Improved strategies in the collection, storage and management of manure can minimize impacts of nutrients entering the surface and groundwater system. Repairing manure storage facilities or building roofs over manure storage areas may decrease the amount of nutrients in stormwater runoff.

Pasture management and agricultural reduction strategies: These strategies involve reducing nutrient transport from fields and minimizing soil loss. Specific practices would include; erosion control through conservation tillage, reduction of winter spreading of fertilizers, elimination of fertilizer spreading near be conducted by the MPCA, MN DNR, or other agencies every five to ten years during the summer season at each established location until attainment is observed for at least two consecutive assessments.

Lake Monitoring:
Linwood Lake, Second Lake, Vibo Lake and White Stone Lake have all been periodically monitored by volunteers and staff over the years. Monitoring for some of these locations is planned for the future to continue in order to keep a record of the changing water quality as funding allows. Lakes are generally monitored for TP, chl-a, and Secchi disk transparency. MPCA expects that in-lake monitoring will continue as implementation activities are installed across the watersheds. These monitoring activities should continue until water quality goals are met. Some tributary monitoring has been completed on the inlets to the lakes and may be important to continue as implementation activities take place throughout the subwatersheds.

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. MPCA referenced county websites and reports by County conservation districts (Anoka and Washington) and the Chisago SWCD which provide information on implementation activities underway within the SRW. MPCA outlined the importance of prioritizing areas within the SRW, education and outreach with local partners, and partnering efforts with local stakeholders to improve water quality within the watershed. Reduction goals for the bacteria and nutrient TMDLs may be met via components of the following strategies:

Sunrise River and Hay Creek bacteria (*E. coli*) TMDLs:
Pasture management/livestock exclusion plans: Reducing livestock access to stream environments will lower the opportunity for direct transport of bacteria to surface waters. The installation of exclusion fencing near stream and river environments to prevent direct access for livestock, installing alternative water supplies, and installing stream crossings between pastures, would work to reduce the influxes of bacteria and improve water quality within the watershed. Additionally, introducing rotational grazing to increase grass coverage in pastures, and maintaining appropriate numbers of livestock per acre for grazing, can also aid in the reduction of bacteria inputs.

Manure Collection and Storage Practices: Manure has been identified as a source of bacteria. Bacteria can be transported to surface water bodies via stormwater runoff. Bacteria laden water can also leach open inlets and sensitive areas, installation of stream and lake shore buffer strips, streambank stabilization practices (gully stabilization and installation of fencing near streams), and nutrient management planning.

Urban/Residential Nutrient Reduction Strategies: These strategies involve reducing stormwater runoff from lakeshore homes and other residences within the SRW. These practices would include; rain gardens, lawn fertilizer reduction, lake shore buffer strips, vegetation management and replacement of failing septic systems. Water quality educational programs could also be utilized to inform the general public on nutrient reduction efforts and their impact on water quality.

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 Linwood Lake, Second Lake, Vibo Lake and White Stone Lake. The SRWMO could mail annual newsletters to local property owners encouraging them to visit the SRWMO website or to consult information within the newsletter which would outline nutrient reduction strategies.

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 SRW TMDLs the public was given various opportunities to participate. MPCA encouraged public participation through public meetings and small group discussions. MPCA worked with members of the Steering Committee, which is composed of local stakeholders, technical staff, city officials, members of the Minnesota Department of Transportation (MN-DOT), MN-DNR (Fisheries and Eco/Waters), City of Wyoming, City of North Branch, Anoka County CD, Isanti SWCD, Washington County CD, Chisago SWCD, USDA Natural Resources Conservation Service (NRCS), Friends of the Sunrise River, Linwood Lake Improvement Association, to share information about the TMDL development results and to solicit their input for potential

implementation strategies. Members of the Steering Committee are the main groups which will ultimately be responsible for the implementation efforts within the Sunrise River watershed. The meetings between MPCA and the Steering Committee were held in 2012 and 2013.

In addition to the Steering Committee meetings, MPCA met with farmer focus groups in the watershed on March 28, 2011 and April 3, 2012 (page 83 of the final TMDL document). The farmer focus group consisted of influential agricultural producers within Chisago County, local agronomists, Chisago SWCD and USDA NRCS staff. The focus of these meetings was to discuss ongoing TMDL studies in Chisago County and pollutant inputs from agricultural areas. The MPCA shared statistics with the farmer focus group which highlighted pollutant runoff potentials from different land use types. MPCA hosted public meetings in 2012. Members of the general public and lake associations were invited to a series of stakeholder meetings to discuss the progress of the Sunrise River watershed TMDLs. The draft TMDL was posted online by MPCA at (http://www.pca.state.mn.us/water/tmdl). The 30-day public comment period was started on November 4, 2013 and ended on December 4, 2013. MPCA received 4 public comments during the public comment period.

A comment was submitted by the Comfort Lake Forest Lake Watershed District which requested that MPCA provide additional description within the final TMDL document which discussed flow conditions between Second Lake and First Lake (Figures 31 and 32), specifically that under high flow conditions Second Lake may supply First Lake with flow, and to clarifying language related to historic land use and current land uses in the Second Lake subwatershed. MPCA answered all of CLFLWD's requests and updated the final draft of the SRW TMDL.

A comment was submitted by the Minnesota Department of Agriculture (MDA) which requested that MPCA update language within the final SRW TMDL to describe local ordinances which regulate feedlots, to update maps within the TMDL to reflect feedlot locations, to include clarification for certain source discussions, and to reference the MDA Agricultural BMP Handbook. MPCA agreed to update language, where appropriate, in the final SRW TMDL and provided MDA with responses to all of their comments which were received during the public notice period.

A comment was submitted by the Anoka Conservation District (ACD) which requested that MPCA fix language within the draft SRW TMDL referencing an Anoka County stormwater ordinance and a website reference to the Sunrise River Management Organization. MPCA made both of these corrections requested by ACD within the final draft of the SRW TMDL.

A comment was submitted by the Minnesota Center for Environmental Advocacy (MCEA) which requested that MPCA provide further clarification on: the nonpoint source discussion for nutrients within the SRW, the MPCA's rationale for its estimate of internal load for Linwood Lake, Second Lake, Vibo Lake and White Stone Lake TMDLs, post-TMDL lake water quality sampling efforts to monitor water quality improvements in Vibo and White Stone Lakes, and the SRW's reasonable assurance discussion. MPCA answered all of MCEA's questions and requests, in detail, within a response to MCEA's comments submitted with the final TMDL package received by EPA on March 17, 2014.

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 March 17, 2014.

The EPA finds that the TMDL document submitted by 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 water body, and the pollutant(s) of concern.

Comment:
The EPA received the final Sunrise River watershed TMDL document, submittal letter and accompanying documentation from MPCA on March 17, 2014. The transmittal letter explicitly stated that the following final TMDLs were being submitted to EPA pursuant to Section 303(d) of the Clean Water Act for EPA review and approval.

- Linwood Lake (02-0026-00) for nutrients;
- Second Lake (13-0025-00) for nutrients;
- Vibo Lake (13-0030-00) for nutrients;
- White Stone Lake (13-0048-00) for nutrients;
- Sunrise River (07030005-543 for bacteria (*E. coli*);
- Hay Creek (07030005-545) for bacteria (*E. coli*); and
- Sunrise River, West Branch (07030005-529) for fish bioassessment and macroinvertebrate bioassessment (addressed via a nutrient TMDL).

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 the Sunrise River watershed TMDLs by MPCA satisfies the requirements of this twelfth element.

13. Conclusion

After a full and complete review, the EPA finds that the TMDLs for the Sunrise River Watershed satisfy all of the elements of approvable TMDLs. Those TMDLs are:

- Linwood Lake (02-0026-00) for nutrients;
- Second Lake (13-0025-00) for nutrients;
- Vibo Lake (13-0030-00) for nutrients;
- White Stone Lake (13-0048-00) for nutrients;
- Sunrise River (07030005-543 for bacteria (*E. coli*);
- Hay Creek (07030005-545) for bacteria (*E. coli*); and
- Sunrise River, West Branch (07030005-529) for fish bioassessment and macroinvertebrate bioassessment (addressed via a nutrient TMDL).

This TMDL approval is for **seven** TMDLs, addressing seven different water bodies for aquatic recreational and aquatic life use impairments.

The EPA's approval of these TMDLs extends to the water bodies which are identified above 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.