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

DEC 2 1 2015

REPLY TO THE ATTENTION OF:

WW-16J

Rebecca J. Flood, Assistant Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Dear Ms. Flood:

The U.S. Environmental Protection Agency has conducted a complete review of the final Total Maximum Daily Loads (TMDLs) for segments within the Vermillion River watershed (VRW), including support documentation and follow up information. The VRW is located in central Minnesota in parts of Dakota, Goodhue and Scott Counties. The VRW TMDLS addressed impaired aquatic recreation use due to excessive bacteria (*E. coli*) and excessive nutrients as well as impaired aquatic life use due to sediment.

EPA has determined that the Vermillion 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 twelve bacteria TMDLs, two nutrient TMDLs and one sediment TMDL. 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

wq-iw9-16g

TMDL: Vermillion River Watershed bacteria, nutrient & sediment TMDLs, Dakota, Goodhue and Scott Counties, Minnesota
Date: December 21, 2015

DECISION DOCUMENT
FOR THE VERMILLION RIVER WATERSHED TMDLS, DAKOTA, GOODHUE & SCOTT COUNTIES, MINNESOTA

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements for approvable 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 Vermillion River Watershed (VRW) (HUC-8 #07040001) is located in the southern portion of the Twin Cities Metropolitan Area in the Lower Mississippi River basin in central Minnesota. The VRW is approximately 335 square miles (214,400 acres) and spans portions of Dakota, Goodhue and Scott counties. Waters in the VRW generally flow from west to east where the surface waters of the VRW empty into the main stem of the Mississippi River northwest of Red Wing, Minnesota. The VRW spans two ecoregions, the North Central Hardwood Forest (NCHF) ecoregion and the Western Corn Belt Plain (WCBP) ecoregion. The VRW TMDLs address twelve (12) impaired segments due to excessive bacteria, two (2) impaired lakes due to excessive nutrients, and one (1) impaired segment for excessive sediment inputs (Table 1 of this Decision Document).

Table 1: The Vermillion River Watershed impaired waters addressed by this TMDL

Water body name	Assessment Unit ID	Affected Use	Pollutant or stressor	TMDL
Vermillion River	07040001-516	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
Vermillion River	07040001-517	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
		Aquatic Life Use	Sediment	TSS TMDL
South Creek	07040001-527	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
North Creek	07040001-542	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
North Creek	07040001-545	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
North Creek	07040001-670	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
North Creek	07040001-671	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
Middle Creek	07040001-546	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
Middle Creek	07040001-548	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
Middle Creek	07040001-668	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
South Branch Vermillion River	07040001-706	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
South Branch Vermillion River	07040001-707	Aquatic Recreation Use	Bacteria (*E. coli*)	*E. coli* TMDL
Alimagnet Lake	19-0021-00	Aquatic Recreation Use	Excess Nutrients (total phosphorus)	TP TMDL
East Lake	19-0349-00	Aquatic Recreation Use	Excess Nutrients (total phosphorus)	TP TMDL

The Minnesota Pollution Control Agency (MPCA) classified Alimagnet Lake and East Lake as shallow lakes (Table 2 of this Decision Document). MPCA characterizes shallow lakes as lakes with a maximum depth of 15 feet or less.

Table 2: Morphometric and watershed characteristics of Alimagnet Lake and East Lake

Parameter	Alimagnet Lake	East Lake
Surface Area (acres)	109	42
Average Depth (ft)	5	4
Maximum Depth (ft)	9	10
Volume (acre-ft)	545	162
Littoral Area (%)	100	100
Drainage Area (acres)	985	11,579

Land Use:

Land use in the VRW is predominantly agricultural lands (approximately 36% of the VRW area) and developed lands (approximately 34%) (Table 3 of this Decision Document). MPCA explained that it anticipates the remaining undeveloped and agricultural lands in the VRW to be developed in the future. MPCA explained that current agricultural and grassland lands are expected to be developed into low or medium density suburban areas. These soon to be transformed low and medium density suburban areas will ultimately be covered under Municipal Separate Storm Sewer System (MS4) permits. MPCA expects the changing landscape to impact pollutant loading to water bodies within the VRW.

Table 3: Land Use* in the Vermillion River Watershed

Land Use*	Area (acres)	Percent of Study Area
Agricultural Land	32,211	36.2%
Medium Density Development	20,852	23.4%
Low Density Development	9,128	10.3%
Emergent Wetland	5,248	5.9%
Forest	5,136	5.8%
Maintained Tall Grasses	3,225	3.6%
Dry Tall Grasses	2,293	2.6%
High Density Development	2,118	2.4%
Short Grasses	1,819	2.0%
Tall Grasses	1,806	2.0%
Wetland Open Water	1,340	1.5%
Tree Plantation	1,044	1.2%
Wetland Forest	899	1.0%
Open Water	848	1.0%
Wetland Shrubs	787	0.9%
Shrubland	194	0.2%
Mud Flat	<1	<1%
TOTAL	88,948	100%

* Land use data compiled from the Minnesota Land Cover Classification System (MLCCS) land coverages

Problem Identification:
Bacteria TMDLs: Bacteria impaired segments identified in Table 1 of this Decision Document were included on the draft 2014 Minnesota 303(d) list due to excessive bacteria. Water quality monitoring within the VRW indicated that these segments were not attaining their designated aquatic recreation uses due to exceedances of bacteria criteria. Bacteria exceedances can negatively impact recreational uses (swimming, wading, boating, fishing etc.) and public health. Elevated levels of bacteria may cause ear, nose, and throat infections, or stomach illness, within humans who have been in contact with or ingest bacteria laden water.

Nutrient TMDLs: Lakes identified in Table 1 of this Decision Document were included on the draft 2014 Minnesota 303(d) list due to excessive nutrients (phosphorus). Total phosphorus (TP), chlorophyll-*a* (chl-a) and Secchi depth (SD) measurements in the VRW indicated that Alimagnet Lake and East Lake were not attaining their designated aquatic recreation uses due to exceedances of nutrient criteria. While TP is an essential nutrient for aquatic life, elevated concentrations of TP can lead to nuisance algal blooms that negatively impact aquatic life and recreation (swimming, boating, fishing, etc.).

Algal decomposition depletes dissolved oxygen levels within the water column. The decreases in dissolved oxygen can stress benthic macroinvertebrates and fish. Depletion of oxygen in the water column can also lead to conditions where phosphorus is released from bottom sediments (i.e. internal loading). Also, 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.

Sediment (Total Suspended Solids) TMDL: A portion of the Vermillion River (07040001-517) was identified in the draft 2014 Minnesota 303(d) list as exceeding its sediment criteria. Water quality monitoring within the VRW indicated that this segment was not attaining its designated aquatic life uses due to high turbidity measurements. High sediment concentrations within the water column may lead to deleterious conditions and stress fish and macroinvertebrate communities.

MPCA measures sediment concentrations via total suspended solids (TSS) observations. TSS water quality data measure sediment and organic material within the water column. Suspended sediment and organic material inhibits natural light from penetrating the surface water column, may create turbid conditions within the water column and may increase the costs of treating surface waters used for drinking water or other industrial purposes (ex. food processing). Excessive amounts of sediment can reduce spawning and rearing areas for certain fish species, can clog the gills of fish, stress certain sensitive species by abrading their tissue, and overall lead to reduction in species health. When in suspension, sediment can limit visibility and light penetration which may impair foraging and predation activities by certain species.

Excessive fine sediment also may degrade aquatic habitats, alter natural flow conditions in stream environments and add organic materials to the water column. The potential addition of fine organic materials may lead to nuisance algal blooms which can 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 and limit the distribution of aquatic vegetation. Established aquatic vegetation stabilizes bottom sediments and provides important habitat areas for healthy macroinvertebrates and fish communities.

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 VRW 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, 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 VRW are popular locations for aquatic recreation. Water quality degradation has led to efforts to improve the overall water quality within the VRW, and to the development of TMDLs for these water bodies.

Pollutants of Concern:
The pollutants of concern are bacteria, nutrients (TP) and sediment (TSS).

Source Identification (point and nonpoint sources):

Point Source Identification: The potential point sources to the VRW are:

VRW bacteria 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 the Hampton Wastewater Treatment Facility (WWTF) (MN0021946) is the only WWTF which contributes bacteria to waters in the VRW. The Hampton WWTF was assigned a portion of the bacteria wasteload allocation (WLA).

Municipal Separate Storm Sewer System (MS4) communities: Stormwater from MS4s can transport bacteria to surface water bodies during or shortly after storm events. MPCA identified seven MS4 permittees which were assigned a portion of the WLA for bacteria TMDLs (Table 4 of this Decision Document).

Table 4: Regulated MS4 permittees in the Vermillion River Watershed assigned a portion of the WLA

Regulated MS4 Permittees	NPDES Permit ID	Assigned a portion of the WLA		
Credit River Township MS4	MS400131	Bacteria TMDL	TSS TMDL	--
Dakota County Right of Way (ROW) MS4	MS400132	Bacteria TMDL	TSS TMDL	Nutrient TMDL
Elko New Market City MS4	MS400237	Bacteria TMDL	TSS TMDL	--

Empire Township MS4	MS400135	Bacteria TMDL	TSS TMDL	Nutrient TMDL
Farmington City MS4	MS400090	Bacteria TMDL	TSS TMDL	--
Lakeville City MS4	MS400099	Bacteria TMDL	TSS TMDL	Nutrient TMDL
MNDOT - Metro District (MS4)	MS400170	Bacteria TMDL	--	Nutrient TMDL
Apple Valley City MS4	MS400074	--	--	Nutrient TMDL
Burnsville City MS4	MS400076	--	--	Nutrient TMDL
Eagan City MS4	MS400132	--	--	Nutrient TMDL
Rosemont City MS4	MS400117	--	--	Nutrient TMDL

Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs): MPCA determined that there are no CSOs nor SSOs which contribute bacteria to the bacteria impaired segments of the VRW.

Concentrated Animal Feedlot Operations (CAFOs): MPCA determined that there are no CAFO facilities within the boundaries of the VRW.

VRW nutrient TMDLs:
MS4 communities: Stormwater from MS4s can transport nutrients to surface water bodies during or shortly after storm events. Certain MS4 permittees in the VRW received a portion of the WLA for nutrient TMDLs in the VRW (Table 4 of this Decision Document).

Stormwater runoff from permitted construction and industrial areas: Construction and industrial sites may contribute phosphorus via sediment runoff during stormwater events. Any construction or industrial locations in the VRW must comply with the requirements of the MPCA's NPDES Stormwater Program and create a Stormwater Pollution Prevention Plan (SWPPP) which summarizes how stormwater will be minimized from the site.

VRW sediment (TSS) TMDL:
MS4 communities: Stormwater from MS4s can transport sediment to surface water bodies during or shortly after storm events. Certain MS4 permittees in the VRW received a portion of the WLA for sediment TMDLs (Table 4 of this Decision Document).

Stormwater runoff from permitted construction and industrial areas: Construction and industrial sites may contribute sediment via stormwater runoff during precipitation events. Any construction or industrial locations in the VRW must comply with the requirements of the MPCA's NPDES Stormwater Program and create a SWPPP which summarizes how stormwater will be minimized from the site.

Nonpoint Source Identification: The potential nonpoint sources to the VRW are:

VRW bacteria TMDLs:
Non-regulated urban runoff: Runoff from urban areas (urban, residential, commercial or industrial land uses) can contribute bacteria to local water bodies. Stormwater from urban areas, which drain impervious surfaces, may introduce bacteria (derived from wildlife or pet droppings) to surface waters.

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 VRW. These areas may contribute bacteria 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 VRW. 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.

Unrestricted livestock access to streams: Livestock with access to stream environments may add bacteria directly to the surface waters or resuspend particles that had settled on the stream bottom. Direct deposition of animal wastes can result in very high localized bacteria counts and may contribute to downstream impairments. Smaller animal facilities may add bacteria to surface waters via wastewater from these facilities or stormwater runoff from near-stream pastures.

Illicit discharges from Subsurface Sewage Treatment Systems (SSTS) or unsewered communities: Failing septic systems are a potential source of bacteria within the VRW. 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.

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

VRW 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 the lakes of the VRW. 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.

Urban/residential sources: Nutrients, organic material and organic-rich sediment may be added via runoff from urban/developed areas near the lakes of the VRW. Runoff from urban/developed areas can include phosphorus derived from fertilizers, leaf and grass litter, pet wastes, and other sources of anthropogenic derived nutrients.

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of nutrients, organic material and organic-rich sediment which may lead to impairments in the VRW. 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, organic material and organic-rich sediment 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 and organic-rich sediment to surface waters from livestock manure, fertilizers, vegetation and erodible soils.

Atmospheric deposition: Phosphorus and organic material may be added via particulate deposition. Particles from the atmosphere may fall onto lakes or other surface waters within the VRW. Phosphorus can be bound to these particles which may add phosphorus to surface water environments.

Contributions from upstream lake subwatersheds: Upstream lakes may contribute nutrient, organic material and organic-rich sediment loads via water flow between hydrologically connected upstream and downstream lake systems. Upstream lakes may contribute nutrient loads to downstream lakes via non-regulated stormwater runoff into the upstream lakes, nutrient contributions from wetland areas and forested areas into the upstream lakes, internal loading in upstream lakes, etc. These nutrient sources can all add nutrients to hydrologically connected downstream lake waters.

Illicit discharges from SSTS or unsewered communities: Failing septic systems are a potential source of nutrients within the VRW. 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 nutrient contribution from these systems.

Wetland and Forest Sources: Phosphorus, organic material and organic-rich sediment may be added to surface waters by stormwater flows through wetland and forested areas in the VRW. Storm events may mobilize phosphorus through the transport of suspended solids and other organic debris.

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.

VRW sediment (TSS) TMDL:

Stream channelization and streambank erosion: Eroding streambanks and channelization efforts may add sediment to local surface waters. 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. Unrestricted livestock access to streams and streambank areas may lead to streambank degradation and sediment additions to stream environments.

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of sediment which may lead to impairments in the VRW. Sediment inputs to surface waters can be exacerbated by tile drainage lines, which channelize the stormwater flows. Tile lined fields and channelized ditches enable particles to move more efficiently into surface waters.

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

Forest Sources: Sediment 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.

Atmospheric deposition: Sediment may be added via particulate deposition. Particles from the atmosphere may fall onto lake surfaces or other surfaces within the VRW.

Future Growth:
MPCA outlined its expectations for potential growth in the VRW in Section 4.2.2.2 of the final TMDL document. Significant development is expected in the VRW in the next 10-15 years (page 32 of the final TMDL document). MPCA explained that it expects land use patterns of the VRW to change from agricultural or undeveloped to developed (low, medium or high intensity). The WLA and load allocations (LA) for the VRW 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 VRW 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.

Comment:

Designated Uses:

Water quality standards (WQS) are the fundamental benchmarks by which the quality of surface waters are measured. Within the State of Minnesota, 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 VRW TMDLs are designated as Class 2 waters for aquatic recreation use (fishing, swimming, boating, etc.) and aquatic life use. The Class 2 designated use is described in Minnesota Rule 7050.0140 (3):

> *"Aquatic life and recreation includes all waters of the state that support or may support fish, other aquatic life, bathing, boating, or other recreational purposes and for which quality control is or may be necessary to protect aquatic or terrestrial life or their habitats or the public health, safety, or welfare."*

Standards:

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

> *"For all Class 2 waters, the aquatic habitat, which includes the waters of the state and stream bed, shall not be degraded in any material manner, there shall be no material increase in undesirable slime growths or aquatic plants, including algae, nor shall there be any significant increase in harmful pesticide or other residues in the waters, sediments, and aquatic flora and fauna; the normal fishery and lower aquatic biota upon which it is dependent and the use thereof shall not be seriously impaired or endangered, the species composition shall not be altered materially, and the propagation or migration of the fish and other biota normally present shall not be prevented or hindered by the discharge of any sewage, industrial waste, or other wastes to the waters."*

Numeric criteria:

Bacteria TMDLs: The bacteria water quality standards which apply to VRW TMDLs are:

Table 5: Bacteria Water Quality Standards Applicable to the VRW TMDLs

Parameter	Units	Water Quality Standard
E. coli [1]	# of organisms / 100 mL	The geometric mean of a minimum of 5 samples taken within any calendar month may not exceed 126 organisms
		No more than 10% of all samples collected during any calendar month may individually exceed 1,260 organisms

[1] = Standards apply only between April 1 and October 31

TMDL Target:

The bacteria TMDL targets employed for the VRW bacteria TMDLs are the *E. coli* standards as stated in Table 5 of this Decision Document. The focus of this TMDL is on the 126 organisms (orgs) per 100 mL (126 orgs/100 mL) portion of the standard. MPCA believes that using the 126 orgs/100 mL portion of the standard for TMDL calculations will result in the greatest bacteria reductions within the VRW and will result in the attainment of the 1,260 orgs/100 mL portion of the standard. While the bacteria TMDLs will focus on the geometric mean portion of the water quality standard, attainment of both parts of the water quality standard is required.

Nutrient TMDLs: Numeric criteria for TP, chlorophyll-*a*, and Secchi Disk depth are set forth in Minnesota Rules 7050.0222. These three parameters form the MPCA eutrophication standard that must be achieved to attain the aquatic recreation designated use. The numeric eutrophication standards which are applicable to the VRW lake TMDLs are found in Table 6 of this Decision Document.

Table 6: Minnesota Eutrophication Standards for Western Corn Belt Plain (WCBP) shallow lakes & North Central Hardwood Forest (NCHF) shallow lake ecoregions

Parameter	WCBP Eutrophication Standard (shallow lakes)[1]	NCHF Eutrophication Standard (shallow lakes)
	(East Lake)	*(Alimagnet Lake)*
Total Phosphorus (µg/L)	TP < 90	TP < 60
Chlorophyll-*a* (µg/L)	chl-a < 30	chl-*a* < 20
Secchi Depth (m)	SD > 0.7	SD > 1.0

[1] = 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).

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 60 µg/L and 90 µg/L, the response variables chl-*a* and SD will be attained, and the lakes addressed by the VRW lake TMDLs 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.

Nutrient TMDL Targets: MPCA selected TP targets of 90 µg/L for the East Lake TP TMDL and 60 µg/L for the Alimagnet Lake TP TMDL. MPCA selected TP as the appropriate target parameter to address eutrophication problems because of the interrelationships between TP and chl-*a*, and TP and 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. EPA finds the nutrient targets employed in the VRW lake TMDLs to be reasonable.

Sediment (TSS) TMDL: On January 23, 2015, EPA approved MPCA's regionally-based TSS criteria for rivers and streams. The TSS criteria replaced Minnesota's statewide turbidity criterion (measured in Nephelometric Turbidity Units (NTU)). The TSS criteria provide water clarity targets for measuring suspended particles in rivers and streams.

Sediment (TSS) TMDL Targets: The Class 2A TSS criterion which applies to the sediment (TSS) TMDLs of the VRW is **10 mg/L**.

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 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:
VRW bacteria TMDLs:
For all *E. coli* TMDLs addressed by the VRW TMDLs the geometric mean portion (**126 orgs/100 mL**) of the *E. coli* water quality standard was used to set the loading capacity of the bacteria TMDLs. MPCA believes the geometric mean portion of the WQS provides the best overall characterization of the status of the watershed. 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/100 mL) and that it expects that by attaining the 126 orgs/100 mL portion of the *E. coli* WQS the 1,260 orgs/100 mL portion of the *E. coli* WQS will also be attained. 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 VRW 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 each of the bacteria TMDLs in the VRW. The VRW FDCs were developed using flow data from monitoring stations within the VRW (Section 4.2.1 of the final TMDL document). Flow data focused on dates within the recreation season (April 1 to October 31). Daily stream flows were necessary to implement the load duration curve approach. 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 VRW 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 VRW 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 within the VRW. Water quality monitoring station information and bacteria data summaries were presented in Appendix B of the final TMDL document. 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. Individual LDCs are found in Appendix B of the final TMDL document.

The LDC plots were subdivided into five flow regimes; very high flow conditions (exceeded 0–10% of the time), high flow conditions (exceeded 10–40% of the time), mid-range flow conditions (exceeded 40–60% of the time), low flow conditions (exceeded 60–90% of the time), and very low flow conditions (exceeded 90–100% of the time). LDC plots can be organized to display individual sampling loads with the calculated LDC. Watershed managers can interpret LDC graphs with individual sampling points plotted alongside 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 VRW were calculated and those results are found in Table 7 (Attached) of this Decision Document. The load allocations were calculated after the determination of the WLA, and the Margin of Safety (MOS) (5% of the loading capacity). Load allocations (ex. stormwater runoff from agricultural land use practices etc.) were not split among individual nonpoint contributors. Instead, load allocations were combined together into a categorical LA value to cover all nonpoint source contributions.

Certain bacteria TMDLs incorporate LAs assigned to upstream lake boundary conditions for Lake Marion and East Lake. Outflow from these locations were included as separate LAs for North Creek, South Creek, and the main stem Vermillion River TMDLs (Table 7 of this Decision Document). Upstream boundary condition maps are included in Appendix B for the North Creek TMDLs (Appendix B: pages B-2 and B-4), the South Creek TMDLs (Appendix B: B-21 and B-23) and the Vermillion River TMDLs (Appendix B: B-29 and B-31). These LA boundary conditions were based on the ratio of the total watershed area to total impaired reach watershed (determined by GIS areal coverages) multiplied by the total impaired reach watershed loading capacity (determined by load duration curves) after the MOS was subtracted. Since watershed loading capacities for each impaired reach were established using the 126 cfu/100ml *E. coli* standard, the TMDL allocations assume outflow from each lake will be attaining the *E. coli* standard at its outlet point.

Table 7 (Attached) 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. Table 7 (Attached) of this Decision Document identifies the loading capacity for the water body at each flow regime. Although there are numeric loads for each flow regime, the LDC is what is being approved for this TMDL.

Table 7 of this Decision Document is located at the end of this Decision Document

Table 7 of the Decision Document also presents MPCA's loading reduction estimates for each TMDL. These loading reductions (i.e., the percent reduction row at the bottom of each TMDL table) were calculated from field sampling data collected in the VRW. MPCA explained that its load reduction estimates are likely more conservative since they are based on a limited water quality data set.

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

VRW nutrient TMDLs: MPCA used the U.S. Army Corps of Engineers (USACE) BATHTUB model to calculate the loading capacities for each of the nutrient impaired lakes in Table 1 of this Decision Document. The BATHTUB model was utilized to link observed phosphorus water quality conditions and estimated phosphorus loads to in-lake water quality estimates. MPCA has previously employed BATHTUB 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 the user the choice of several different mass-balance TP models for estimating loading capacity.

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 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 shallow lake nutrient WQS (Table 6 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 lakes in the VRW 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.

Loading capacities were determined using Canfield-Bachmann equations from BATHTUB. The model equations were originally developed from data taken from over 704 lakes. The model estimates in-lake phosphorus concentration by calculating net phosphorus loss (phosphorus sedimentation) from annual

---

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

phosphorus loads as functions of inflows to the lake, lake depth, and hydraulic flushing rate. To estimate loading capacity, the model is rerun, each time reducing current loads to the lake until the model result shows that in-lake total phosphorus would meet the applicable water quality standards.

MPCA subdivided the loading capacity among the WLA, LA, and MOS components of the TMDL (Tables 8 and 9 of this Decision Document). These calculations were based on the critical condition, the summer growing season, which is typically when the water quality in each lake is typically degraded and phosphorus loading inputs are the greatest. TMDL allocations assigned during the summer growing season will protect the VRW lakes 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).

Table 8: Nutrient TMDL for Alimagnet Lake (19-0021-00)

Allocation	Source	Existing TP Load		TMDL		Load Reduction	
		(lbs/yr)	*(lbs/day)*[1]	*(lbs/yr)*	*(lbs/day)*[1]	*(lbs/yr)*	*(%)*
Wasteload Allocation	Construction & Industrial Stormwater	3.50	0.01	3.50	0.01	0.00	0%
	Apple Valley MS4 (MS400074)	69.90	0.19	39.10	0.11	30.80	44%
	Burnsville City MS4 (MS400076)	88.00	0.24	62.40	0.17	25.60	29%
	MN-DOT (MS400170)	8.60	0.02	6.00	0.02	2.60	30%
	Dakota County MS4 (MS400132)	6.00	0.02	4.20	0.01	1.80	30%
	WLA Totals	***176.00***	***0.48***	***115.20***	***0.32***	***60.80***	***35%***
Load Allocation	Atmospheric Deposition	26.10	0.07	26.10	0.07	0.00	0%
	Internal Load	183.90	0.50	77.20	0.21	106.70	58%
	LA Totals	***210.00***	***0.57***	***103.30***	***0.28***	***106.70***	***51%***
Margin Of Safety (5 %)		--	--	11.50	0.03	--	--
	Total	**386.00**	**1.06**	**230.00**	**0.63**	**167.50**	**43%**

[1] = Annual loads converted to daily loads by dividing by 365 days per year

Table 9: Nutrient TMDL for East Lake (19-0349-00)

Allocation	Source	Existing TP Load		TMDL		Load Reduction	
		(lbs/yr)	*(lbs/day)*[1]	*(lbs/yr)*	*(lbs/day)*[1]	*(lbs/yr)*	*(%)*
Wasteload Allocation	Construction & Industrial Stormwater	14.1	0.04	14.1	0.04	0.00	0%
	Apple Valley MS4 (MS400074)	591.7	1.62	381.0	1.04	210.70	36%
	Dakota County MS4 (MS400132)	11.9	0.03	7.4	0.02	4.50	38%
	Eagan City MS4 (MS400014)	0.05	0.00	0.05	0.00	0.00	0%
	Empire Township MS4 (MS400135)	0.003	0.00	0.003	0.00	0.00	0%
	Lakeville City MS4 (MS400099)	94.1	0.26	50.3	0.14	43.80	47%
	MN-DOT (MS400170)	11.9	0.03	7.7	0.02	4.20	35%
	Rosemont City MS4 (MS400117)	0.00002	0.00	0.00002	0.00	0.00	0%
	WLA Totals	***723.75***	***1.98***	***460.55***	***1.26***	***263.20***	***36%***
Load Allocation	Alimagnet Lake contribution	82.1	0.22	54.8	0.15	27.30	33%
	Cobblestone Lake contribution	3.5	0.01	3.5	0.01	0.00	0%
	Atmospheric Deposition	10.2	0.03	10.2	0.03	0.00	0%
	Internal Load	165.0	0.45	45.3	0.12	119.70	73%
	LA Totals	***260.80***	***0.71***	***113.80***	***0.31***	***147.00***	***56%***
Margin Of Safety (5 %)		--	--	30.20	0.08	--	--
	Total	**984.55**	**2.70**	**604.55**	**1.66**	**410.20**	**42%**

[1] = Annual loads converted to daily loads by dividing by 365 days per year

Tables 8 and 9 of this Decision Document communicate MPCA's estimates of the reductions required for the VRW nutrient impaired lakes to meet their water quality targets. These loading reductions (i.e., the percentage column) were estimated from existing and TMDL load calculations. MPCA expects that these reductions will result in the attainment of the water quality targets and the lake water quality will return to a level where the designated uses for the lakes are no longer considered impaired.

EPA supports the data analysis and modeling approach utilized by MPCA in its calculation of WLA, LA and MOS for the VRW nutrient TMDLs. Additionally, EPA concurs with the loading capacities calculated by the MPCA in these two nutrient TMDLs. EPA finds MPCA's approach for calculating the loading capacity to be reasonable and consistent with EPA guidance.

VRW sediment (TSS) TMDL: MPCA developed a LDC to calculate a sediment TMDL for the Vermillion River (07040001-517) segment of the VRW. The same LDC development strategies were employed for the sediment and bacteria TMDLs (ex. the incorporation of monitored flows within the VRW to develop FDCs, water quality monitoring information collected within the VRW informing the LDC, etc.). The FDC were transformed into LDC by multiplying individual flow values by the TSS target (10 mg/L) and then multiplying that value by a conversion factor.

Sediment (TSS) TMDLs were calculated (Table 10 of this Decision Document). The load allocation was calculated after the determination of the WLA, and the MOS. Load allocations (ex. stormwater runoff from agricultural land use practices) was not split among individual nonpoint contributors. The TSS TMDL incorporated a LA assigned to the Lake Marion Boundary Condition which represents nonpoint source contributions to the Vermillion River. MPCA's process for calculating the LA for the Lake Marion Boundary Condition was explained earlier in this section but instead of incorporating the bacteria WQS, the TSS standard of 10 mg/L was employed. Since the watershed loading capacity for the impaired reach was established using the 10 mg/L TSS standard, this method assumes outflow from Lake Marion is allocated to the TSS standard (Section 4.1.3 of the final TMDL document). Maps showing land use, the MS4 boundaries, and the Lake Marion Boundary Condition for the TSS impaired reach watershed are provided in Appendix A of the final TMDL document.

The LDC method can be used to display collected sediment monitoring data and allows for the estimation of load reductions necessary for attainment of the TSS criterion of 10 mg/L. Using this method, daily loads were developed based upon the flow in the water body. Loading capacities were determined for the Vermillion River segment across all flow regimes. Table 10 of this Decision Document identifies the loading capacity for the Vermillion River segment at each flow regime. Although there are numeric loads for each flow regime, the LDC is what is being approved for this TMDL.

Table 10 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.

Table 10: Total Suspended Solids (TSS) TMDL for Vermillion River Watershed

Flow Regime TMDL analysis TSS (lbs/day)	Very High Flow	High Flow	Mid Flow	Low Flow	Very Low Flow
Vermillion River (07040001-517)					
Wasteload Allocation (WLA): Total	1314.32	577.13	304.11	173.77	106.27
Credit River Township MS4 (MS400131)	29.12	12.79	6.74	3.85	2.35
Dakota County Right of Way (ROW) (MS400132)	11.32	4.97	2.62	1.50	0.92
Elko New Market City MS4 (MS400237)	167.93	73.74	38.86	22.20	13.58
Empire Township MS4 (MS400135)	0.38	0.17	0.09	0.05	0.03
Farmington City MS4 (MS400090)	208.96	91.76	48.35	27.63	16.90
Lakeville City MS4 (MS400099)	754.64	331.36	174.60	99.77	61.01
Construction & Industrial Stormwater	141.97	62.34	32.85	18.77	11.48
Load Allocation (LA)	3336.52	1465.08	771.99	441.14	269.77
Lake Marion Boundary Condition	592.07	259.98	136.99	78.28	47.87
Watershed LA	2744.45	1205.10	635.00	362.86	221.90
Margin Of Safety (MOS) (5%)	244.78	107.48	56.64	32.36	19.79
TMDL	**4895.62**	**2149.69**	**1132.74**	**647.27**	**395.83**
Estimated Percent Reduction	50%	9%	0%	0%	0%

Table 10 of this Decision Document communicates MPCA's estimates of the reductions required for the Vermillion River (07040001-517) segment of the VRW to meet its TSS water quality targets. These loading reductions (i.e., the percentage row) were estimated from existing and TMDL load calculations. MPCA expects that these reductions will result in the attainment of the water quality targets and the river segment water quality will return to a level where its designated uses are no longer considered impaired.

EPA supports the data analysis and modeling approach utilized by MPCA in its calculation of WLA, LA and MOS for the sediment (TSS) TMDL. Additionally, EPA concurs with the loading capacity calculated by the MPCA in the sediment (TSS) TMDL. EPA finds MPCA's approach for calculating the loading capacity for the sediment (TSS) TMDL 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. MPCA recognized that LAs for each of the individual TMDLs addressed by the VRW TMDLs can be attributed to different nonpoint sources.

VRW bacteria TMDLs: The calculated LA values for the bacteria TMDLs are applicable across all flow conditions in the VRW (Table 7 of this Decision Document). MPCA identified several nonpoint sources which contribute bacteria loads to the surface waters of the VRW, including; upstream boundary lake contributions from Lake Marion and East Lake, non-regulated urban stormwater runoff, stormwater from agricultural and feedlot areas, failing septic systems, and wildlife (deer, geese, ducks, raccoons, turkeys and other animals). MPCA calculated individual LAs for upstream boundary contributions from Lake Marion and East Lake but did not determine individual load allocation values for each of these potential nonpoint source considerations. MPCA aggregated the nonpoint sources into a categorical LA value.

Bacteria TMDLs for the Middle Creek segments (07040001-546, -548, and -668) in the VRW do not assign any bacteria LA to the bacteria TMDL equations (i.e., LA = 0). MPCA explained that current undeveloped MS4 jurisdictional lands in the Middle Creek subwatershed are expected to be fully developed in the next 10-15 years (Section 4.2.2.2 of the final TMDL document). To account for this future MS4 loading, MPCA calculated the MS4 WLAs for those communities to the full extent of their jurisdictional boundaries, effectively reducing the LA contributions for these Middle Creek segments to 0 (LA = 0). MPCA assumed that any terrestrial loading in the Middle Creek subwatershed would be covered under MS4 permits (Table 7 of this Decision Document).

VRW nutrient TMDLs: MPCA identified several nonpoint sources which contribute nutrient loading to Alimagnet Lake and East Lake (Tables 8 and 9 of this Decision Document). These nonpoint sources included: watershed contributions from upstream lakes (i.e., Cobblestone Lake and Alimagnet Lake), internal loading, and atmospheric deposition. MPCA calculated individual load allocation values for each of these potential nonpoint source considerations where appropriate. Additionally, MPCA estimated nonpoint source loading reductions necessary for the water body to meet the nutrient TMDL targets. The reductions from nonpoint sources ranged from 29% to 73%.

MPCA recommended that stakeholders prioritize their efforts for decreasing nonpoint phosphorus inputs to the VRW 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 its 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 that stakeholders may be presented with the ongoing challenge of managing internal load.

Alimagnet Lake and East Lake have considerable internal loading. 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 VRW 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 VRW 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.

VRW sediment (TSS) TMDL: The calculated LA values for the sediment (TSS) TMDL are applicable across all flow conditions (Table 10 of this Decision Document). MPCA identified several nonpoint sources which contribute sediment loads to the surface waters in the VRW. MPCA calculated a LA for the Lake Marion subwatershed and a LA for the direct watershed contributing to the Vermillion River (07040001-517).

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:

VRW bacteria TMDLs: MPCA identified the Hampton WWTF (MN0021946) within the VRW and assigned that facility a portion of the WLA (0.76 billion orgs/day). The WLA for the Hampton WWTF was calculated based on the facility's wet weather design flow and the *E. coli* WQS (126 orgs /100 mL). MPCA explained that the WLA for the Hampton WWTF was calculated based on the *E. coli* WQS but WWTF permits are regulated for the fecal coliform WQS (200 orgs /100 mL). MPCA explained that if a facility is meeting its fecal coliform limits, which are set in the facility's discharge permit, MPCA assumes the facility is also meeting the calculated *E. coli* WLA from the VRW TMDLs. The WLA was therefore calculated using the assumption that the *E. coli* standard of 126 orgs/100 mL provides equivalent protection from illness due to primary contact recreation as the fecal coliform WQS of 200 orgs/100 mL.

There are seven MS4 permittees (Table 7 of this Decision Document) which are completely or partially within the watershed areas of the bacteria impaired segments addressed by the VRW bacteria TMDLs. Appendix B of the final TMDL document displays maps with updated MS4 coverage areas for each impaired reach's watershed. Individual MS4 allocations were calculated by multiplying each MS4's percent watershed coverage (determined from GIS areal coverages) by the total watershed loading capacity (determined by load duration curves) after the MOS and individual NPDES point source dischargers were subtracted.

VRW nutrient TMDLs: There are eight MS4 permittees (Tables 4, 8 and 9 of this Decision Document) which are completely or partially within the watershed areas of Alimagnet Lake and East Lake. Appendix C of the final TMDL document displays maps with updated MS4 coverage areas for Alimagnet Lake and East Lake. Individual MS4 allocations were calculated by multiplying each MS4's percent watershed coverage (determined from GIS areal coverages) by the total watershed loading capacity (from BATHTUB) after the MOS and other NPDES point source dischargers were subtracted.

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 permits from the previous 10-years. MPCA allocated 1.45% of the loading capacity to construction stormwater loads for Alimagnet Lake and East Lake to account for any future construction activities within the VRW. MPCA allocated 1.45% of the loading capacity to industrial stormwater loads for Alimagnet Lake and East Lake.

Attaining the construction stormwater and industrial stormwater loads described in the Alimagnet Lake and East Lake nutrient TMDLs is the responsibility of construction and industrial site managers. Local municipal MS4 permittees are responsible for overseeing construction stormwater loads which impact water quality in Alimagnet Lake and East Lake. MS4 communities within the watershed are required to have a construction stormwater ordinance at least as stringent as the State's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001). In the final TMDL document MPCA explained that if a construction site owner/operator obtains coverage under the NPDES/SDS General Stormwater Permit (MNR100001) and properly selects, installs and maintains all BMPs required under MNR1000001 and applicable local construction stormwater ordinances, including those related to impaired waters discharges and any applicable additional requirements found in Appendix A of the Construction General Permit, the stormwater discharges would be expected to be consistent with the WLA in this TMDL. BMPs and other stormwater control measures which act to limit the discharge of the pollutant of concern (phosphorus) are defined in MNR100001.

The MPCA is responsible for overseeing industrial stormwater loads which impact water quality in Alimagnet Lake and East Lake. Industrial sites within these lake subwatersheds 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). 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 Alimagnet Lake and East Lake 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.

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

VRW sediment (TSS) TMDL: There are seven MS4 permittees (Tables 4 and 10 of this Decision Document) which are completely or partially within the watershed area of the Vermillion River (07040001-517). Appendix A of the final TMDL document displays maps with updated MS4 coverage areas for the Vermillion River segment. Individual MS4 allocations were calculated by multiplying each

MS4's percent watershed coverage (determined from GIS areal coverages) by the total watershed loading capacity (determined by load duration curves) after the MOS and NPDES point source dischargers were subtracted.

MPCA calculated a portion of the WLA and assigned it to construction and industrial stormwater. MPCA's calculation for the construction stormwater WLA was based on areal coverage of construction permits from the previous 10-years. MPCA allocated 1.45% of the loading capacity to construction stormwater loads for the Vermillion River segment (07040001-517) to account for any future construction activities within the VRW. MPCA allocated 1.45% of the loading capacity to industrial stormwater loads for the Vermillion River segment (07040001-517).

Attaining the construction stormwater and industrial stormwater loads described in the Vermillion River segment (07040001-517) sediment (TSS) TMDL is the responsibility of construction and industrial site managers. Local municipal MS4 permittees are responsible for overseeing construction stormwater loads which impact water quality in Vermillion River segment (07040001-517). MS4 communities within the watershed are required to have a construction stormwater ordinance at least as stringent as the State's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001). In the final TMDL document MPCA explained that if a construction site owner/operator obtains coverage under the NPDES/SDS General Stormwater Permit (MNR100001) and properly selects, installs and maintains all BMPs required under MNR1000001 and applicable local construction stormwater ordinances, including those related to impaired waters discharges and any applicable additional requirements found in Appendix A of the Construction General Permit, the stormwater discharges would be expected to be consistent with the WLA in this TMDL. BMPs and other stormwater control measures which act to limit the discharge of the pollutant of concern (sediment) are defined in MNR100001.

The MPCA is responsible for overseeing industrial stormwater loads which impact water quality in the Vermillion River segment (07040001-517). Industrial sites within these lake subwatersheds 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). 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 (sediment) 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 Vermillion River segment (07040001-517) TMDL. 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.

EPA finds the MPCA's approach for calculating the WLA for the VRW sediment (TSS) 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, nutrient and sediment (TSS) TMDLs. The bacteria, nutrient and sediment (TSS) TMDLs employed an explicit MOS set at 5% of the loading capacity.

VRW bacteria and sediment (TSS) TMDLs: The bacteria and sediment (TSS) TMDLs incorporated a 5% explicit MOS applied to the total loading capacity calculation for each flow regime of the LDC. Five percent of the total loading capacity was reserved for MOS with the remaining load allocated to point and nonpoint sources (Tables 7 and 10 of this Decision Document). MPCA explained that the explicit MOS was set at 5% due to the following factors discovered during the development of the VRW bacteria and sediment (TSS) TMDLs:

- Environmental variability in pollutant loading;
- Variability in water quality data (i.e., collected water quality monitoring data, field sampling error, etc.); and
- Calibration and validation processes of LDC modeling efforts, uncertainty in modeling outputs, and conservative assumptions made during the modeling efforts.

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 VRW 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 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.

VRW nutrient TMDLs: The nutrient TMDLs employed an explicit MOS set at 5% of the loading capacity. The explicit MOS was applied by reserving 5% of the total loading capacity, and then allocating the remaining loads to point and nonpoint sources (Tables 8 and 9 of this Decision Document). MPCA explained that the explicit MOS was set at 5% due to the following factors discovered during the development of the VRW nutrient TMDLs:

- Environmental variability in pollutant loading;
- Variability in water quality data (i.e., collected water quality monitoring data);
- The agreement between water quality models' predicted and observed values;
- Conservative assumptions made during the modeling efforts; 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:

VRW bacteria 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 a local gages within the VRW. Flow measurements were collected over a variety of conditions observed during the recreation season. LDCs developed from these flow records represented a range of flow conditions within the VRW 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).

VRW nutrient TMDLs: Seasonal variation was considered for the VRW nutrient TMDLs as described in Section 4.3.5 of the final TMDL document. The nutrient targets employed in the Alimagnet Lake and East Lake nutrient 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 and WCBP 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 VRW nutrient 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 Alimagnet Lake and East Lake are 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).

VRW sediment (TSS) TMDL: Sediment inputs to surface waters typically occur primarily through wet weather events. Critical conditions that impact the response of VRW water bodies to sediment inputs may typically occur during periods of low flow. During low flow periods, sediment can accumulate within the impacted water bodies, there is less assimilative capacity within the water body, and generally sediment is not transported through the water body at the same rate it is under normal flow conditions.

Critical conditions that impact loading, or the rate that sediment is delivered to the water body, were identified as those periods where large precipitation events coincide with periods of minimal vegetative cover on fields. Large precipitation events and minimally covered land surfaces can lead to large runoff volumes, especially to those areas which drain agricultural fields. The conditions generally occur in the spring and early summer seasons.

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 VRW bacteria, nutrient, and sediment (TSS) TMDLs provide reasonable assurance that actions identified in the implementation section of the final TMDL (i.e., Section 6 of the final TMDL document), will be applied to attain the loading capacities and allocations calculated for the impaired reaches within the VRW. The recommendations made by MPCA will be successful at improving water quality if the appropriate local groups, such as the Vermillion River Watershed Joint Powers Organization (VRWJPO) 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.

The VRWJPO was created under the Minnesota Metropolitan Surface Water Management Act of 1982, which established requirements for preparing watershed management plans within the Twin Cities Metropolitan Area. The Act requires plans to focus on preserving and using natural water storage and retention systems through: improving water quality; preventing flooding and erosion from surface runoff; promoting groundwater recharge; protecting and enhancing fish and wildlife habitat and water recreation facilities; reducing, to the greatest practical extent, the public capital expenditures necessary to control excessive volumes and rate of runoff; and securing other benefits associated with proper management of surface water. The overall goals of restoring impaired water resources and protecting water resources from further degradation require an active partnership between the VRWJPO and the local governmental units (LGUs) which include all the cities and townships within the VRWJPO. The VRWJPO has been actively engaged in partnering efforts with LGUs whose jurisdiction areas are within the boundaries of the VRWJPO. The VRWJPO's main role in partnering with LGUs has been establishing a consistent regulatory framework throughout the VRWJPO and through implementation efforts from the VRWJPO's Watershed Management Plan or local water resource management plans (Section 6.2 of the final TMDL document).

MPCA has identified several local partners which have expressed interest in working to improve water quality within the VRW. 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 VRW: the VRWJPO, the Dakota and Scott County Soil and Water Conservation Districts (SWCDs), Minnesota Department of Natural Resources (DNR), Natural Resource Conservation Service (NRCS), National Park Service (NPS) and U.S. Fish and Wildlife Service.

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 WLA are consistent with the TMDL. 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 VRW TMDLs. In the event that the SWPPP does not meet the WLA, the SWPPP will need to be modified. 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 is responsible for applying federal and state regulations to protect and enhance water quality within the TMDL study area. MPCA oversees all regulated MS4 entities (ex. Elko New Market City) in stormwater management accounting activities. MS4 permits require permittees to implement BMPs to reduce pollutants in stormwater runoff to the Maximum Extent Practicable (MEP).

All regulated MS4 communities are required to satisfy the requirements of the MS4 general permit which 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.

The MS4 General Permit, which became effective August 1, 2013, requires permittees to develop compliance schedules for any TMDL that received U.S. EPA-approval prior to the effective date of the General Permit. This schedule must identify BMPs that will be implemented over the five-year permit term, timelines for their implementation, an assessment of progress, and a long term strategy for continued progress toward ultimately achieving those WLAs. Because this TMDL will be approved after the effective date of the General Permit, MS4s will not be required to report on WLAs contained in this TMDL until the effective date of the next General Permit, expected in 2018.

MPCA requires MS4 applicants to submit their application materials and SWPPP documentation to MPCA for review. Prior to extension of coverage under the general permit, all application materials are placed on 30-day public notice by the MPCA, to ensure adequate opportunity for the public to comment on each permittee's stormwater management program. Upon extension of coverage by the MPCA, the permittees are to implement the activities described within their SWPPP, and submit annual reports to MPCA by June 30 of each year. These reports document the implementation activities which have been completed within the previous year, analyze implementation activities already undertaken, and outline any changes within the SWPPP from the previous year.

The MPCA regulates the collection, transportation, storage, processing and disposal of animal manure and other livestock operation wastes at State registered animal feeding operation (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.

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, nutrient and TSS 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. The Clean Water Legacy Act (CWLA) was passed in Minnesota in 2006 for the purposes of protecting, restoring, and preserving Minnesota water. The CWLA provides the protocols and practices to be followed in order to protect, enhance, and restore water quality in Minnesota. The CWLA outlines how MPCA, public agencies and private entities should coordinate in their efforts toward improving land use management practices and water management. The CWLA anticipates that all agencies (i.e., MPCA, public agencies, local authorities and private entities, etc.) will cooperate regarding planning and restoration efforts. Cooperative efforts would likely include informal and formal agreements to jointly use technical, educational, and financial resources.

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

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

The EPA finds that 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 Vermillion River watershed. 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., the VRWJPO 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 the lakes discussed within this TMDL. At a minimum, the VRW will be monitored once every 10 years as part of the MPCA's 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 VRW. Water quality information will aid watershed managers in understanding how BMP pollutant removal efforts are impacting water quality. 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 VRW. 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 VRW, has been completed by a variety of organizations (i.e., Dakota or Scott SWCDs) and funded by Clean Water Partnership Grants, and other available local funds. MPCA anticipates that stream monitoring in the VRW will 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 are expected to be conducted by the MPCA, Minnesota Department of Natural Resources (MN-DNR), or other agencies every five to ten years during the summer season.

Lake Monitoring:

The lakes of the VRW have all been periodically monitored by volunteers and staff over the years. Monitoring for some of these locations is planned for the future 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:
The findings from the VRW TMDLs will be used to inform the selection of implementation activities as part of the Vermillion River WRAPS process. The purpose of the WRAPS report is to support local working groups and jointly develop scientifically-supported restoration and protection strategies to be used for subsequent implementation planning. The TMDL outlined implementation strategies in Section 8 of the final TMDL document. MPCA outlined the importance of prioritizing areas within the VRW, education and outreach efforts with local partners, and partnering with local stakeholders to improve water quality within the watershed. Reduction goals for the bacteria, nutrient and sediment (TSS) TMDLs may be met via components of the following strategies:

VRW bacteria TMDLs:
Stormwater wetland treatment systems: Constructed wetlands with the purpose of treating wastewater or stormwater inputs could be explored in selected areas of the VRW. Constructed wetland systems may be vegetated, open water, or a combination of vegetated and open water. MPCA explained that recent studies have found that the more effective constructed wetland designs employ large treatment volumes in proportion to the contributing drainage area, have open water areas between vegetated areas, have long flow paths and a resulting longer detention time, and are designed to allow few overflow events.

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 VRW.

Bioinfiltration of stormwater: Biofiltration practices rely on the transport of stormwater and watershed runoff through a medium such as sand, compost or soil. This process allows the medium to filter out sediment and therefore sediment-associated bacteria. Biofiltration/bioretention systems, are vegetated and are expected to be most effective when sized to limit overflows and designed to provide the longest flow path from inlet to outlet.

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.

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 VRW.

Education and Outreach Efforts: Increased education and outreach efforts to the general public bring greater awareness to the issues surrounding bacteria contamination and strategies to reducing loading and transport of bacteria. Education efforts targeted to the general public are commonly used to provide information on the status of impacted waterways as well as to address pet waste and wildlife issues. Education efforts may emphasize aspects such as cleaning up pet waste or managing the landscape to discourage nuisance congregations of wildlife and waterfowl. Education can also be targeted to municipalities, wastewater system operators, land managers and other groups who play a key role in the management of bacteria sources.

VRW nutrient TMDLs:

Urban/Residential Nutrient Reduction Strategies: These strategies involve reducing stormwater runoff from lakeshore homes and other residences within the VRW. 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.

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

Internal Loading Reduction Strategies: Internal nutrient loads may be addressed to meet the TMDL allocations outlined in the VRW nutrient TMDLs. MPCA recommends that before any strategy is put into action, an intensive technical review, to evaluate the costs and feasibility of internal load reduction options be completed. Several options should be considered to manage internal load inputs to each of the water bodies addressed in this TMDL.

- *Management of fish populations:* Monitor and manage fish populations to maintain healthy game fish populations and reduce rough fish (i.e. carp, bullheads, fathead minnows) populations.
- *Vegetation management:* Improved management of in-lake vegetation in order to limit phosphorus loading and to increase water clarity. Controlling the vitality of curly-leaf pondweeds via chemical treatments (herbicide applications) will reduce one of the significant sources of internal loading, the senescence of curly-leaf plants in the summer months.
- *Chemical treatment:* The addition of chemical reactants (ex. aluminum sulfate) to lakes of the VRW in order for those reactants to permanently bind phosphorus into the lake bottom sediments. This effort could decrease phosphorus releases from sediment into the lake water column during anoxic conditions.

Septic Field Maintenance: Septic systems are believed to be a source of nutrients to waters in the VRW. 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 VRW.

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 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.

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 lakes in the VRW.

VRW sediment (TSS) TMDL:
Improved Agricultural Drainage Practices: MPCA recommends that a review of local agricultural drainage networks be completed to examine how improving drainage ditches and drainage channels could reduce the influx of sediments to the surface waters in the VRW. The reorganization of the drainage network could include the installation of drainage ditches or sediment traps to encourage particle settling during high flow events. Additionally, MPCA recommends that cover crops be planted in agricultural areas of the VRW to reduce runoff to surface waters.

Reducing Livestock Access to Stream Environments: MPCA recommends that livestock managers in the VRW be encouraged to implement measures to protect riparian areas. Managers should install exclusion fencing near stream environments to prevent direct access to these areas by livestock. Additionally, installing alternative watering locations and stream crossings between pastures may aid in reducing sediments to surface waters.

Identification of Stream, River, and Lakeshore Erosional Areas: MPCA recommends that local groups, such as the VRWJPO, assess areas within the stream and river channel, and lakeshore erosional areas to evaluate critical areas for erosion control best management practices. Implementation actions (ex. planting deep-rooted vegetation near water bodies to stabilize streambanks) should be prioritized to target areas which are actively eroding. This strategy could prevent additional sediment inputs into surface waters of the VRW and minimize or eliminate degradation of habitat.

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 9 of the final TMDL document. Throughout the development of the VRW TMDLs the public was given various opportunities to participate. As part of the strategy to communicate the goals of the TMDL project and to engage with members of the public, MPCA teamed with members of the VRWJPO to create a 'technical advisory group' (TAG). The TAG consisted of stakeholders from local cities, counties, state and regional agencies, consultants, soil and water conservation districts, University of Minnesota staff, and others. The TAG held meetings in 2014 whose topics included TMDL process, the results of water quality sampling conducted in the VRW, draft results of VRW TMDLs and the WRAPS process. A full description of civic engagement activities associated with the TMDL process will be available within in the VRW WRAPS report.

MPCA posted the draft TMDL online at (http://www.pca.state.mn.us/water/tmdl) for a public comment period. The 30-day public comment period was started on June 29, 2015 and ended on July 29, 2015. MPCA received two public comments on the VRW TMDLs during the public comment period.

The City of Rosemont requested further clarification from MPCA on certain subwatershed boundaries, land locked drainage areas, land locked drainage area classifications and requested that MPCA include specific City ponds (ex. Birger Pond) in the WLA for the East Lake nutrient TMDL. Some of the City's concerns were related to how land areas were represented in the areal calculations for loading contributions to the VRW TMDLs and the WRAPs document. MPCA responded that it has corrected some of the inaccuracies where appropriate and that it held further discussions with the City regarding identifying priority areas for implementing BMPs to best protect resources in and near the City.

The Minnesota Center for Environmental Advocacy (MCEA) raised several questions related to load reductions, TSS and bacteria source identification and quantification of those sources, calculation of WLAs, implementation and achievability of phosphorus targets for the lake nutrient TMDLs, appropriateness of MOS, reasonable assurance and river eutrophication WQS. MCEA requested further clarification on these questions which MPCA provided in its response to comments letter and where appropriate, updated the final TMDL document with additional discussion. One example of this was MPCA's adjustment of construction and industrial stormwater percentage values during its calculation of the WLA assigned to construction and industrial stormwater to better represent planned development in the VRW.

EPA believes that MPCA adequately addressed the comments from the City of Rosemont and MCEA and updated the final TMDL appropriately. MPCA submitted all public comments and its response to those comments in the final TMDL submittal packet received by the EPA on October 14, 2015.

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 Vermillion River watershed TMDL document, submittal letter and accompanying documentation from MPCA on October 14, 2015. The transmittal letter explicitly stated that the final TMDLs referenced in Table 1 of this Decision Document were being submitted to EPA pursuant to Section 303(d) of the Clean Water Act for EPA review and approval.

The letter clearly stated that this was a final TMDL submittal under Section 303(d) of CWA. The letter also contained the name of the watershed as it appears on Minnesota's 303(d) list, and the causes/pollutants of concern. This TMDL was submitted per the requirements under Section 303(d) of the Clean Water Act and 40 CFR 130.

The EPA finds that the TMDL transmittal letter submitted for the Vermillion 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 12 bacteria TMDLs, 2 nutrient (TP) TMDLs, and 1 sediment (TSS) TMDL satisfy all elements for approvable TMDLs. This TMDL approval is for **fifteen TMDLs**, addressing fourteen different segments for aquatic recreational and aquatic life use impairments (Table 1 of this Decision Document).

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.

Table 7: Bacteria (*E. coli*) TMDLs for Vermillion River watershed

Flow Regime TMDL analysis *E. coli* (billions of bacteria/day)	Very High Flow	High Flow	Mid Flow	Low Flow	Very Low Flow
North Creek (07040001-545)					
Wasteload Allocation (WLA): Total	159.349	51.452	26.876	14.382	6.283
Dakota County ROW (MS400132)	1.592	0.514	0.269	0.144	0.063
Empire Township MS4 (MS400135)	9.536	3.079	1.608	0.861	0.376
Farmington City MS4 (MS400090)	65.438	21.129	11.037	5.906	2.580
MN-DOT ROW (MS400170)	0.079	0.026	0.013	0.007	0.003
Lakeville City MS4 (MS400099)	82.704	26.704	13.949	7.464	3.261
Load Allocation (LA)	85.370	34.653	18.443	10.717	5.954
East Lake Boundary Condition	85.370	34.653	18.443	10.717	5.954
Margin Of Safety (MOS) (5%)	12.880	4.532	2.385	1.321	0.644
TMDL	**257.599**	**90.637**	**47.704**	**26.420**	**12.881**
Estimated Percent Reduction	62%	26%	39%	2%	49%
North Creek (07040001-671)					
Wasteload Allocation (WLA): Total	55.11727	22.37293	11.90714	6.91913	3.84387
Dakota County ROW (MS400132)	0.65206	0.26468	0.14087	0.08186	0.04547
Empire Township MS4 (MS400135)	4.33621	1.76013	0.93676	0.54434	0.30241
Farmington City MS4 (MS400090)	15.71915	6.38065	3.39584	1.97330	1.09625
MN-DOT ROW (MS400170)	0.00030	0.00010	0.00010	0.00004	0.00002
Lakeville City MS4 (MS400099)	34.40955	13.96737	7.43357	4.31959	2.39972
Load Allocation (LA)	85.36985	34.65295	18.44264	10.71687	5.95370
East Lake Boundary Condition	85.36985	34.65295	18.44264	10.71687	5.95370
Margin Of Safety (MOS) (5%)	7.39406	3.00136	1.59735	0.92821	0.51566
TMDL	**147.88118**	**60.02724**	**31.94713**	**18.56421**	**10.31323**
Estimated Percent Reduction	56%	0%	4%	12%	56%
North Creek (07040001-670)					
Wasteload Allocation (WLA): Total	54.61	22.17	11.80	6.85	3.82
Dakota County ROW (MS400132)	0.65	0.26	0.14	0.08	0.05
Empire Township MS4 (MS400135)	3.83	1.56	0.83	0.48	0.27
Farmington City MS4 (MS400090)	15.72	6.38	3.40	1.97	1.10
Lakeville City MS4 (MS400099)	34.41	13.97	7.43	4.32	2.40
Load Allocation (LA)	85.37	34.65	18.44	10.72	5.95
East Lake Boundary Condition	85.37	34.65	18.44	10.72	5.95
Margin Of Safety (MOS) (5%)	7.37	2.99	1.59	0.92	0.51
TMDL	**147.35**	**59.81**	**31.83**	**18.49**	**10.28**
Estimated Percent Reduction	41%	0%	28%	10%	51%
North Creek (07040001-542)					
Wasteload Allocation (WLA): Total	34.748	14.105	7.508	4.362	2.424
Dakota County ROW (MS400132)	0.475	0.193	0.103	0.060	0.033
Empire Township MS4 (MS400135)	0.008	0.003	0.002	0.001	0.001
Farmington City MS4 (MS400090)	0.026	0.011	0.006	0.003	0.002
Lakeville City MS4 (MS400099)	34.239	13.898	7.397	4.298	2.388
Load Allocation (LA)	85.370	34.653	18.443	10.717	5.954
East Lake Boundary Condition	85.370	34.653	18.443	10.717	5.954
Margin Of Safety (MOS) (5%)	6.322	2.566	1.366	0.794	0.441

TMDL	**126.440**	**51.324**	**27.317**	**15.873**	**8.819**
Estimated Percent Reduction	46%	79%	88%	92%	91%
Middle Creek (07040001-668)					
Wasteload Allocation (WLA): Total	92.07	29.65	15.06	6.41	1.97
Dakota County ROW (MS400132)	0.57	0.18	0.09	0.04	0.01
Farmington City MS4 (MS400090)	85.92	27.67	14.06	5.98	1.84
Lakeville City MS4 (MS400099)	5.58	1.80	0.91	0.39	0.12
Load Allocation (LA)	0.00	0.00	0.00	0.00	0.00
Margin Of Safety (MOS) (5%)	4.85	1.56	0.79	0.34	0.10
TMDL	**96.92**	**31.21**	**15.85**	**6.75**	**2.07**
Estimated Percent Reduction	--	33%	86%	--	--
Middle Creek (07040001-546)					
Wasteload Allocation (WLA): Total	37.12	10.11	4.17	2.04	0.73
Dakota County ROW (MS400132)	0.58	0.16	0.06	0.03	0.01
Farmington City MS4 (MS400090)	11.13	3.03	1.25	0.61	0.22
Lakeville City MS4 (MS400099)	25.41	6.92	2.86	1.40	0.50
Load Allocation (LA)	0.00	0.00	0.00	0.00	0.00
Margin Of Safety (MOS) (5%)	1.95	0.53	0.22	0.11	0.04
TMDL	**39.07**	**10.64**	**4.39**	**2.15**	**0.77**
Estimated Percent Reduction	--	77%	82%	92%	94%
Middle Creek (07040001-548)					
Wasteload Allocation (WLA): Total	23.06	6.28	2.59	1.27	0.46
Farmington City MS4 (MS400090)	4.37	1.19	0.49	0.24	0.09
Lakeville City MS4 (MS400099)	18.69	5.09	2.10	1.03	0.37
Load Allocation (LA)	0.00	0.00	0.00	0.00	0.00
Margin Of Safety (MOS) (5%)	1.21	0.33	0.14	0.07	0.02
TMDL	**24.27**	**6.61**	**2.73**	**1.34**	**0.48**
Estimated Percent Reduction	--	38%	65%	80%	84%
South Creek (07040001-527)					
Wasteload Allocation (WLA): Total	63.06	29.57	20.46	15.76	9.83
Dakota County ROW (MS400132)	0.61	0.29	0.20	0.15	0.09
Farmington City MS4 (MS400090)	9.44	4.43	3.06	2.36	1.47
Lakeville City MS4 (MS400099)	53.01	24.85	17.20	13.25	8.27
Load Allocation (LA)	59.83	28.05	19.41	14.96	9.33
Watershed LA	17.75	8.32	5.76	4.44	2.77
Lake Marion Boundary Condition	42.08	19.73	13.65	10.52	6.56
Margin Of Safety (MOS) (5%)	6.47	3.03	2.10	1.62	1.01
TMDL	**129.36**	**60.65**	**41.97**	**32.34**	**20.17**
Estimated Percent Reduction	77%	0%	0%	0%	0%
Vermillion River (07040001-516)					
Wasteload Allocation (WLA): Total	18.60	6.21	7.73	3.75	1.76
Credit River Township MS4 (MS400237)	2.63	0.88	1.09	0.53	0.25
Elko New Market City MS4 (MS400131)	15.17	5.06	6.31	3.06	1.43
Lakeville City MS4 (MS400099)	0.80	0.27	0.33	0.16	0.08
Load Allocation (LA)	115.89	38.63	48.16	23.37	10.93
Watershed LA	115.89	38.63	48.16	23.37	10.93
Margin Of Safety (MOS) (5%)	7.08	2.36	2.94	1.43	0.67