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

REPLY TO THE ATTENTION OF:
W-15J

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

Dear Mr. Skuta:

The U.S. Environmental Protection Agency completed its review of the final Total Maximum Daily Loads (TMDL) for segments within the North Fork Crow River Watershed (NFCRW), including supporting documentation. The NFCRW encompasses parts of Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Stearns, and Wright counties in south-central Minnesota. The NFCRW TMDLs address impaired aquatic recreation use due to excessive nutrients and bacteria and impaired aquatic life use due to excessive sediment, chloride, and nutrients.

The NFCRW 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 eight bacteria TMDLs, one chloride TMDL, one sediment TMDL, four nutrient (stream) TMDLs, and four nutrient (lake) TMDLs for a total of eighteen TMDLs. EPA describes Minnesota's compliance with the statutory and regulatory requirements in the enclosed decision document.

EPA acknowledges 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. Stephen Feely, at 312-886-5867 or feely.stephen@epa.gov.

Sincerely,

4/21/2023

X

Tera L. Fong
Director, Water Division
Signed by: Environmental Protection Agency

wq-iw8-62g

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

REPLY TO THE ATTENTION OF
WW-16

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

Re: Corrections to North Fork Crow River TMDL Decision Document

Dear Mr. Skuta:

The U.S. Environmental Protection Agency has reviewed the approval (original approval April 21, 2023) of the final Total Maximum Daily Loads (TMDL) for segments within the North Fork Crow River Watershed (NFCRW) and has determined that corrections are needed in the Decision Document. These corrections involve changes to the total number of impairments addressed by this TMDL; changes to the designated uses for two stream segments listed for stream nutrient impairments in Table 1 of the corrected Final TMDL and Decision Document; and a correction to the load allocation in Table 9 of the Decision Document. EPA has made these corrections in a revised NFCRW Decision Document. I am enclosing a copy of the revised Decision Document for your records.

If you have any questions, please contact Mr. Stephen Feely, TMDL Review at 312-866-5867 or feely.stephen@epa.gov.

Sincerely,

5/15/2023

X David Pfeifer

David Pfeifer
Manager, Watersheds and Wetlands Branch
Signed by: DAVID PFEIFER

Enclosure

cc: Danielle Kvasager, MPCA

TMDL: North Fork Crow River Watershed *E. coli*, chloride, sediment, and phosphorus TMDLs in portions of Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Stearns, and Wright counties in south-central Minnesota
Date: 04/21/2023 (corrected 5/10/2023)

DECISION DOCUMENT FOR THE NORTH FORK CROW RIVER WATERSHED TMDLS IN SOUTH-CENTRAL 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 North Fork Crow River Watershed (NFCRW) in south-central Minnesota covers parts of Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Stearns, and Wright counties. The NFCRW is approximately 1,476 square miles (approximately 944,640 acres) in size and occupies parts of the North Central Hardwood Forest (NCHF) and Western Cornbelt Plains (WCP) ecoregion. The North Fork Crow River (NFCR) flows from the northwest to the southeast of the watershed (Section 1.1 of the final TMDL document).

The NFCRW TMDLs address twenty impairments in eleven (11) stream reaches and four (4) lakes in the NFCRW. The NFCRW TMDLs address eight (8) stream segments impaired due to excessive bacteria; one (1) stream segment impaired due to chloride; one (1) stream segment impaired due to turbidity, macroinvertebrate IBI, and fish IBI; four (4) stream segments impaired due to excessive nutrients; and four (4) lakes impaired due to nutrients (Table 1 of this Decision Document).

Table 1: North Fork Crow River Watershed impaired waters addressed by this TMDL

Water body name	Assessment Unit ID	Affected Use	Pollutant or stressor	TMDL
Crow River, North Fork, Headwaters (Grove Lk 61-0023-00) to CD32	07010204-763	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Crow River, North Fork, CD32 to Rice Lk	07010204-764	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Crow River, Middle Fork, Green Lk to N Fk Crow R	07010204-511	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Crow River, North Fork, M Fk Crow R to Jewitts Cr	07010204-507	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Crow River, North Fork, Meeker/Wright County line to Mill Cr	07010204-556	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Twelvemile Creek (Dutch Lk to Little Waverly Lk)	07010204-679	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Mill Creek, Buffalo Lk to N Fk Crow R	07010204-515	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Crow River, North Fork, Mill Cr to S Fk Crow R	07010204-503	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
			TOTAL Bacteria TMDLs	**8**
Jewitts Creek (County Ditch 19, 18, 17), Headwaters (Lk Ripley 47-0134-00) to N Fork Crow River	07010204-585	Aquatic Life	Chloride	Chloride TMDL
			TOTAL Chloride TMDLs	**1**

Crow River, North Fork, Meeker/Wright County line to Mill Cr	07010204-556	Aquatic Life	TSS/Sediment (Turbidity, M-IBI[1], and F-IBI[2])	TSS TMDL
			TOTAL TSS TMDLs	**1**
Mill Creek, Buffalo Lk to N Fk Crow R	07010204-515	Aquatic Life	Nutrients (Phosphorus)	Phosphorus TMDL
Crow River, North Fork, Mill Cr to S Fk Crow R	07010204-503	Aquatic Life	Nutrients (Phosphorus)	Phosphorus TMDL
Unnamed creek (Regal Creek), Unnamed Creek to Crow River	07010204-542	Aquatic Life	Nutrients (Phosphorus)	Phosphorus TMDL
Crow River, S Fk Crow to Mississippi River	07010204-502	Aquatic Life	Nutrients (Phosphorus)	Phosphorus TMDL
			TOTAL (Stream) Nutrients TMDLs	**4**
Wolf Lake	47-0016-00	Aquatic Recreation	Nutrients (Phosphorus)	Phosphorus TMDL
Dog Lake	86-0178-00	Aquatic Recreation	Nutrients (Phosphorus)	Phosphorus TMDL
Green Mountain Lake	86-0063-00	Aquatic Recreation	Nutrients (Phosphorus)	Phosphorus TMDL
Wilhelm Lake	86-0020-00	Aquatic Recreation	Nutrients (Phosphorus)	Phosphorus TMDL
			TOTAL (Lake) Nutrients TMDLs	**4**

1 Aquatic macroinvertebrate bioassessments, TSS identified as a conventional stressor (see Section 2.4.1.5 of final TMDL Report).
2 Fishes bioassessments, TSS identified as a conventional stressor (see Section 2.4.1.5 of final TMDL Report).

There are no federally recognized tribal lands within the boundary of the NFCRW, and the TMDL does not allocate pollutant load to any federally recognized Indian tribe in this watershed (Section 3.0 of the final TMDL document).

Land Use:
Land use in the NFCRW is mainly cropland with some pasture and wetlands (Section 3.4 of the final TMDL document and Table 2 of this Decision Document).

Table 2: Land Use in the North Fork Crow River Watershed

Drainage Area (Sq. Miles)	Cropland (%)	Pasture/Hay (%)	Developed (%)	Wetlands/Open Water (%)	Forests/ Shrub lands (%)	Barren/ Mining (%)
1476	58	12	6	17	7	<1

Problem Identification:
Bacteria TMDLs: Bacteria impaired segments identified in Table 1 of this Decision Document were included on the final 2022 Minnesota 303(d) list due to excessive bacteria. Water quality monitoring within the NFCRW indicated that these segments were not attaining their designated aquatic recreation uses due to exceedances of the bacteria criteria. Excessive bacteria can negatively impact recreational uses (e.g., swimming, wading, boating, fishing etc.) and public health. At elevated levels, bacteria may cause illness within humans who have contact with or ingest bacteria laden water. Recreation-based contact can lead to ear, nose, and throat infections, and stomach illness.

Chloride TMDL: The chloride impaired segment identified in Table 1 of this Decision Document was included on the final 2022 Minnesota 303(d) list due to excessive chloride. Water quality monitoring within the NFCRW indicated that this segment was not attaining its designated aquatic life uses due to high chloride measurements and the negative impact of those conditions on aquatic life (i.e., fish and macroinvertebrate communities).

Low levels of chloride can be found naturally in the NFCRW lakes and streams. Chloride is essential for aquatic life to carry out a range of biological functions. However, high concentrations of chloride in the surrounding water can harm cellular osmotic processes in aquatic life. Excessive dissolved chlorides in water may stress aquatic species and disrupt cellular processes within aquatic species. If elevated concentrations of chloride persist in the water column, aquatic life such as fish, invertebrates and even some plant species may become stressed and/or die.

Excessive dissolved chloride can also alter the density of water in lake environments. Density changes can impact seasonal mixing patterns of lake waters, especially in deeper lakes. Seasonal mixing in lake environments distributes oxygen and nutrients throughout the water column and is necessary for healthy aquatic communities. Mixing pattern disruptions may also impact nutrient cycling, phytoplankton and zooplankton community composition and productivity and fish and macroinvertebrate health.

High levels of salt can also negatively affect infrastructure, vehicles, plants, soils, pets, wildlife and groundwater and drinking water supplies. MPCA acknowledged that groundwater derived drinking water is a vital resource for many Minnesotans and the potential for chlorides to contaminate shallow drinking water wells is a concern in the NFCRW.

Phosphorus TMDLs: The lakes identified in Table 1 of this Decision Document were included on the final 2022 Minnesota 303(d) list due to excessive nutrients (phosphorus). Total phosphorus (TP), chlorophyll-*a* (chl-*a*) and Secchi depth (SD) measurements in the NFCRW indicated that these waters were not attaining their designated aquatic recreation uses due to exceedances of nutrient criteria. Water quality monitoring was completed throughout the NFCRW, and that data formed the foundation for phosphorus TMDL modeling efforts.

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 (e.g., swimming, boating, fishing, etc.). Algal decomposition can also deplete 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 is an important habitat for macroinvertebrates and fish.

Total Suspended Solids (sediment) TMDL: Sediment impaired segments identified in Table 1 of this Decision Document were included on the final 2022 Minnesota 303(d) list due to excessive sediment within the water column. Water quality monitoring within the NFCRW indicated that these segments were not attaining their designated aquatic life uses due to high sediment measurements and the negative impact of those conditions on aquatic life (i.e., fish and macroinvertebrate communities).

Total suspended solids (TSS) is a measurement of the sediment and organic material that inhibits natural light from penetrating the surface water column. Excessive sediment and organic material within the water column can negatively impact fish and macroinvertebrates communities within the ecosystem. Excess sediment and organic material 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 (e.g., food processing).

Excessive amounts of fine sediment in stream environments can degrade aquatic communities. Sediment can reduce spawning and rearing areas for certain fish species. Excess suspended sediment can clog the gills of fish, stress certain sensitive species by abrading their tissue, and thus reduce fish 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 (e.g., 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.

Priority Ranking:
MPCA's schedule for TMDL completions, as indicated on the 303(d) impaired waters list, reflects Minnesota's priority ranking of this TMDL. MPCA has aligned TMDL priorities with the watershed approach and Watershed Restoration and Protection Strategy (WRAPS) cycle. The schedule for TMDL completion corresponds to the WRAPS report completion on the 10-year cycle. Mainstem river TMDLs, which are not contained in major watersheds and thus not addressed in WRAPS, must also be completed. The MPCA is developing a state plan, to meet the needs of EPA's national measure (WQ-27) as a follow-up to the EPA's Long-Term Vision for Assessment, Restoration and Protection under the CWA section 303(d) program. The waters of the NFCRW addressed by this TMDL are part of the MPCA draft prioritization plan to meet EPA's national measure.

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

Source Identification (point and nonpoint sources):

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

NFCRW 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 wastewater according to their NPDES permit. MPCA determined that there are several wastewater treatment plants (WWTPs) in the NFCRW which contribute bacteria from treated wastewater releases (Section 3.6.2 of the final TMDL document). MPCA assigned each of these facilities a portion of the bacteria wasteload allocation (WLA) (Table 3 of this Decision Document).

Table 3: NPDES facilities which contribute bacteria to impaired segments in the North Fork Crow River Watershed

Facility Name	Permit #	Downstream WIDs (07010204-)	WLA (billions org/day)
Facilities assigned bacteria (*E. coli*) WLA (billions org/day)			
Annandale/Maple/Lake/Howard Lake WWTP	MN0066966	503, 556	5.65
Atwater WWTP	MN0022659	503, 511, 507, 556	5.83
Belgrade WWTP	MN0051381	503, 511, 507, 556	7.07
Brooten WWTP	MNG585271	503, 511, 507, 556, 685	5.06
Buffalo WWTP	MN0040649	503, 556	20.60
Cokato WWTP	MN0049204	503, 556	3.46
Darwin WWTP	MNG585150	503, 556	1.55
Dassel WWTP	MN0054127	503, 556	5.83
Glacial Lake SSWD	MN0052752	503, 511, 507, 556	4.24
Grove City WWTP	MN0023574	503, 507, 556	4.64
Litchfield WWTP	MN0023973	503, 556	14.78
Montrose WWTP	MN0024228	503	3.72

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 three MS4 permittees, which were assigned a portion of the WLA for the bacteria TMDLs (Tables 9-16 of this Decision Document). Litchfield City (MS400253) and Buffalo City MS4 (MS400238) are both wholly within an impaired drainage area, while St. Michael City MS4 (MS400246) is partially within a portion of the impaired watershed area (Section 3.6.2.1 of the final TMDL document).

Concentrated Animal Feedlot Operations (CAFOs): MPCA has identified CAFOs in the NFCRW (Section 3.6.1.2, Table 18, and Figure 19 of the final TMDL document). As explained by MPCA, CAFO production areas must be designed to contain all manure, and direct precipitation and manure-contaminated runoff from precipitation events up to the 25-year, 24-hour storm event. In the event of a discharge, the discharge cannot cause or contribute to a violation of a water quality standard (WQS). MPCA noted that any precipitation-caused runoff from the land application of manure at agronomic rates is not considered a point source discharge and is accounted for in the load allocation (LA) of the TMDL. MPCA explained that these facilities are not designed to discharge effluent and therefore were not assigned a portion of the WLA (WLA = 0).

Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs): MPCA determined that the NFCRW does not have CSOs nor SSOs which contribute bacteria to waters of the NFCRW (WLA = 0).

NFCRW Chloride TMDL:
NPDES permitted facilities: NPDES permitted facilities may contribute chloride loads to surface waters through discharges of treated wastewater. MPCA identified one NPDES facility, Litchfield WWTP (MN0023973), as contributing chloride loads to Jewitts Creek (07010204-585). Permitted facilities must discharge wastewater according to their NPDES permit. MPCA assigned a chloride WLA to this facility (Table 17 of this Decision Document).

Municipal Separate Storm Sewer System (MS4) communities: Stormwater from MS4s can transport chloride to surface water bodies during or shortly after storm events. MPCA identified one MS4 permittee, which was assigned a portion of the WLA for the bacteria TMDLs (Table 17 of this Decision Document).

NFCRW Phosphorus TMDLs:
NPDES permitted facilities: NPDES permitted facilities may contribute nutrient loads to surface waters through discharges of wastewater. Permitted facilities must discharge treated wastewater according to their NPDES permit. MPCA determined that there are several WWTFs/WWTPs in the CRW which contribute nutrients (TP) from treated wastewater releases (Tables 18-21 and Tables 23-26 of this Decision Document). MPCA assigned each of these facilities a portion of the TP WLA.

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

MS4 communities: Stormwater from MS4s can transport nutrients to surface water bodies during or shortly after storm events. MPCA identified several MS4 permittee, which were assigned a portion of the WLA for the phosphorus TMDLs (Table 18-21 and Tables 23-26 of this Decision Document).

NFCRW TSS TMDL:
NPDES permitted facilities: NPDES permitted facilities may contribute sediment loads to surface waters through discharges of wastewater. Permitted facilities must discharge wastewater according to their NPDES permit. MPCA determined that there are several facilities which contribute sediment from treated wastewater releases (Table 22 of this Decision Document). MPCA assigned each of these facilities a portion of the sediment WLA.

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

MS4 communities: Stormwater from MS4s can transport sediment to surface water bodies during or shortly after storm events. MPCA identified one MS4 permittee, Litchfield City (MS400253), which was assigned a portion of the WLA for the TSS TMDL (Table 22 of this Decision Document).

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

NFCRW Bacteria TMDLs:

Non-regulated urban runoff: Runoff from urban areas (i.e., 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 (e.g., 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 NFCRW. 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 NFCRW. 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 surfaces 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.

Discharges from Subsurface Sewage Treatment Systems (SSTS) or unsewered communities: Failing septic systems are a potential source of bacteria within the NFCRW. 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 via contaminated runoff from animal habitats, such as urban park areas, forest, and rural areas.

NFCRW Chloride TMDL:

Natural background chloride load: Chloride is present in soils and minerals and is added to groundwater due to natural weathering processes of minerals and rock.

Snow/ice removal: Chloride may be added to waters of the NFCRW via the application of deicing compounds from state, county, and local entities. Deicing compounds may be mobilized and transported to surface waters during stormwater runoff events (e.g., winter rain events, spring melt, etc.).

Stormwater from areas not covered under a MS4 NPDES permit: Stormwater runoff from areas outside the boundaries of MS4 areas, such as non-permitted urban, residential, commercial, or industrial areas, can contribute chloride to surface waters of the NFCRW. Non-regulated stormwater may drain impervious surfaces and add any residual chlorides from those surfaces to surface waters.

Discharges from SSTS or unsewered communities: Septic systems are a potential source of chloride within the NFCRW. 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 chloride contribution from these systems. Water softening systems which are in areas not connected to municipal sewer lines likely discharge to septic fields and chloride contributions from those septic systems may ultimately mix with groundwater or surface water near the septic field.

Chloride contributions from agricultural lands: Chloride may be added via use of fertilizers containing chloride anions (ex. potassium chloride (KCl)) and biosolids which are spread onto agricultural areas. Chloride may be liberated from farm fields within stormwater runoff which can be exacerbated by tile drainage lines, which channelize the stormwater flows.

Other nonpoint sources: MPCA cited chloride as a component of dust suppressants on gravel roads and parking areas, as a portion of landfill leachate and as a chemical byproduct of alum chloride treatments for lake sediments or ferric chloride treatments for stormwater.

NFCRW Phosphorus TMDLs:

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

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of nutrients, organic material and organic-rich sediment which may lead to impairments in the NFCRW. 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.

Unrestricted livestock access to streams: Livestock with access to stream environments may add nutrients 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 nutrient concentrations and may contribute to downstream impairments. Smaller animal facilities may add nutrients to surface waters via wastewater from these facilities or stormwater runoff from near-stream pastures.

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

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

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

Discharges from SSTS or unsewered communities: Failing septic systems are a potential source of nutrients within the NFCRW. 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 NFCRW. 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 via contaminated runoff from animal habitats, such as urban park areas, forest, and rural areas.

NFCRW 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 NFCRW. 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 and Forest Sources: Sediment may be added to surface waters by stormwater flows through wetland or forested areas in the NFCRW. Storm events may mobilize decomposing vegetation, organic soil particles through the transport of suspended solids and other organic debris.

Atmospheric deposition: Sediment may be added via particulate deposition. Particles from the atmosphere may fall onto surface waters within the NFCRW.

Future Growth:
MPCA referenced population trend projects from the Minnesota State Demographic Center for 2020-2040 and shared that the populations in the NFCRW are projected to increase in some counties (Carver 25.7%, Hennepin 15.8%, Wright 11.2%, Stearns 2.9%, Kandiyohi 0.3%) and decrease in other counties (McLeod -1.9%, Pope-2.9%, and Meeker -3.0%), with an overall growth of 13.8% in the eight counties that have area in the watershed (Section 5 of the final TMDL document). MPCA acknowledged that potential increases in population and potential development of lakeside properties will likely impact waterbodies in the NFCRW.

The WLA and LA for the NFCRW 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 NFCRW 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 is 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 NFCRW TMDLs are designated as Class 2 waters for aquatic recreation use (fishing, swimming, boating, etc.) and aquatic life use (phosphorus and TSS). 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."*

Water use classifications for individual water bodies are provided in Minnesota Rules 7050.0470, 7050.0425, and 7050.0430. This TMDL report addresses the water bodies that do not meet the standards for Class 2 and 3 waters. The impaired streams in this report are classified as class 2B, 2Bg and/or 3C waters (Table 1 and Table 2 of the final TMDL document).

Class 2B waters are protected for aquatic life and recreation, and the streams in this project are Class 2Bg waters, which are characterized as general warm water habitat waters. Class 3C waters are protected for industrial consumption use. The lakes addressed in this report are classified as Class 2B waters, which are protected for aquatic life and recreation. The most stringent class for the impaired waters is Class 2B.

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 NFCRW TMDLs are:

Table 5: Bacteria Water Quality Standards Applicable to the NFCRW 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

Bacteria TMDL Targets: The bacteria TMDL targets employed for the NFCRW bacteria TMDLs are the E. *coli* standards as stated in Table 5 of this Decision Document and Table 3 of the final TMDL document. MPCA determined that 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 NFCRW 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.

Chloride TMDL: The chronic standard for chloride to protect for Class 2B uses is 230 mg/L (Table 6 of this Decision Document; Table 3 of the final TMDL document). The chronic standard is defined in Minn. R. 7050.0218, subp. 3.l., as '*the highest water concentration of a toxicant to which organisms can be exposed indefinitely without causing chronic toxicity*.'

The 230 mg/L value is based on a 4-day exposure of aquatic organisms to chloride. The maximum (acute) standard to protect for 2B uses is 860 mg/L. The maximum standard is defined in Minn. R. 7050.0218, subp. 3.T., as '*the highest concentration of a toxicant in water to which organisms can be exposed for a brief time with zero to slight mortality*.' The 860 mg/L value is based on a 24-hour exposure of aquatic organisms to chloride. These criteria are adopted from the EPA's recommended water quality criteria for chloride. EPA believes it is reasonable to believe that by MPCA meeting its chronic chloride water quality standard (230 mg/L) the acute chloride water quality standard (860 mg/L) will also be attained.

Table 6: Chloride Water Quality Standards Applicable to the NFCRW TMDLs

Parameter	Units	Water Quality Standard
Chloride	mg/L	Not to exceed 230

Chloride TMDL Targets: The chloride TMDL target for the NFCRW chloride TMDL is 230 mg/L as stated in Table 6 of this Decision Document.

***TSS TMDL*:** In January 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.

TSS TMDL Target: MPCA employed the regional TSS criterion for the Central River Nutrient Region (CRNR), **30 mg/L** from April 1 to September 30, for the NFCRW TSS TMDL.

***Phosphorus TMDLs (streams)*:** 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 (Table 3 of the final TMDL document). Segments located in the CRNR have a phosphorus standard of 100 µg/L or 0.10 mg/L. The Crow River (-502), from the confluence of the North Fork Crow River and South Fork Crow River to the Mississippi River, has a phosphorus standard of 125 µg/L or 0.125 mg/L (Table 7 of this Decision Document).

Table 7: Phosphorus Water Quality Standards Applicable to the NFCRW TMDLs

Pollutant	Water Quality Standard	Units
Nutrients (River Eutrophication; Phosphorus) - Central River Nutrient Region	Not to exceed 0.1	mg/L
Nutrients (River Eutrophication; Phosphorus) - Crow River, confluence of North Fork Crow River and South Fork Crow River to the Mississippi River.	Not to exceed 0.125	mg/L

Phosphorus TMDL Targets (stream segments impaired due to excessive nutrients): The phosphorus TMDL targets employed for the NFCRW phosphorus TMDLs differ depending on if the segment is located within the CRNR or if the segment is the Crow River. MPCA determined that the target for the river TMDLs is total phosphorus (Sections 2.4.1.3 and 4.4.1 of the final TMDL document). The TMDL target is 100ug/L for all waters except the mainstem Crow river (-502) which has a TMDL target of 125 ug/L. For all impaired streams segments, a phosphorus exceedance and at least one response variable outlined in Table 4 of the Final TMDL is necessary for the stream reach to be considered impaired.

Phosphorus TMDLs (lakes): Numeric criteria for TP, chl-*a*, and SD 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 NFCRW lake TMDLs are found in Table 8 of this Decision Document (Table 5 of the final TMDL document).

In developing the lake nutrient standards for Minnesota lakes, MPCA evaluated data from a large cross-section of lakes within each of the State's ecoregions. Clear relationships were established between the causal factor, TP, and the response variables, chl-*a* and SD depth. MPCA anticipates that by meeting the TP concentrations of NCHF WQS the response variables chl-*a* and SD will be attained and the lakes of the NFCRW TMDL will achieve their designated beneficial uses. For lakes to achieve their designated beneficial use, the lake must not exhibit signs of eutrophication and must allow water-related recreation, fishing, and aesthetic enjoyment. MPCA views the control of eutrophication as the lake enduring minimal nuisance algal blooms and exhibiting desirable water clarity (Section 2.4.2 of the final TMDL document.

Table 8: Minnesota Eutrophication Standards for lakes within the North Central Hardwood Forest (NCHF) ecoregion applicable in the North Fork Crow River Watershed TMDLs

Parameter	NCHF Eutrophication Standard (standard lakes)	NCHF Eutrophication Standard (shallow lakes)[1]
Total Phosphorus (µg/L)	TP < 40	TP < 60
Chlorophyll-a (µg/L)	chl-*a* < 14	chl-*a* < 20
Secchi Depth (m)	SD > 1.4	SD > 1.0

[1] = 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).

Nutrient TMDL Targets (lakes): MPCA selected TP targets of **60 µg/L** (for NCHF shallow lakes (Green Mountain, Wolf, and Wilhelm lakes)) and **40 µg/L** (for NCHF standard lakes (Dog Lake)) for lakes identified in Table 1 of this Decision Document. 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 for the NFCRW phosphorus TMDLs to be reasonable.

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

3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a water body for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

The pollutant loadings may be expressed as either mass-per-time, toxicity, or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement chosen. The TMDL submittal should describe the method used to establish the cause-and-effect 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:

NFCRW Bacteria TMDLs: MPCA used the geometric mean (**126 orgs/100 mL**) of the *E. coli* water quality standard to calculate loading capacity values for the bacteria TMDLs Section 4.3.1 of the final TMDL document). MPCA believes the geometric mean 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 assumptions to be reasonable.

Typically loading capacities are expressed as a mass per time (e.g., pounds per day). However, for *E. coli* loading capacity calculations, mass is not always an appropriate measure because *E. coli* is expressed in terms of organism counts. This approach is consistent with the EPA's regulations which define "load" as "an amount of matter that is introduced into a receiving water" (40 CFR §130.2). To establish the loading capacities for the NFCRW 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 NFCRW. The NFCRW FDCs were developed using flow data generated from Hydrologic Simulation Program-Fortran (HSPF) modeling efforts at the outlet/pour point of each impaired reach (Section 4.1.2 of the final TMDL document). MPCA focused on daily HSPF modeled flows from approximately 2005 to 2014 and bacteria (*E. coli*) water quality data from the same time period. HSPF hydrologic models were developed to simulate flow characteristics within the NFCRW and 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.

HSPF is a comprehensive modeling package used to simulate watershed hydrology and water quality on a basin scale. The package includes both an Agricultural Runoff Model and a more general nonpoint source model. HSPF parametrizes numerous hydrologic and hydrodynamic processes to determine flow rate, sediment, and nutrient loads. HSPF uses continuous meteorological records to create hydrographs and to estimate time series pollution concentrations.[1,2] The output of the HSPF process is a model of multiple hydrologic response units (HRUs), or subwatersheds of the overall NFCRW. The flow from these HRUs were transferred from a nearby USGS gage (USGS #05460000) (Table 28 of the final TMDL document).

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[1] HSPF User's Manual - https://water.usgs.gov/software/HSPF/code/doc/hspfhelp.zip
[2] EPA TMDL Models Webpage - https://www.epa.gov/exposure-assessment-models/tmdl-models-and-tools

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 NFCRW bacteria TMDLs, have flow duration interval (percentage of time flow exceeded) on the X-axis and *E. coli* loads (number of bacteria per unit time) on the Y-axis. The NFCRW LDC used *E. coli* measurements in billions of bacteria per day. The curved line on a LDC graph represents the TMDL of the respective flow conditions observed at that location.

Water quality monitoring was completed in the NFCRW and measured *E. coli* concentrations were converted to individual sampling loads by multiplying the sample concentration by the instantaneous flow measurement observed/estimated at the time of sample collection and then by a conversion factor which allows the individual samples to be plotted on the same figure as the LDCs (e.g., Figure 22 of the final TMDL document). Individual LDCs are found in Section 4.3.6 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 NFCRW were calculated by MPCA and those results are found in Tables 9-16 of this Decision Document. The load allocations were calculated after the determination of the WLA, and the Margin of Safety (MOS) (10% of the loading capacity). Load allocations (e.g., stormwater runoff from agricultural land use practices and feedlots, SSTS, wildlife inputs etc.) were not split among individual nonpoint contributors. Instead, load allocations were combined into a categorical LA ('Watershed Load') to cover all nonpoint source contributions.

Tables 9-16 of this Decision Document reports five points (the midpoints of the designated flow regime) on the loading capacity curve. However, it should be understood that the components of the TMDL equation could be illustrated for any point on the entire loading capacity curve. The LDC method can be used to display collected bacteria monitoring data and allows for the estimation of load reductions necessary for attainment of the bacteria water quality standard. Using this method, daily loads were developed based upon the flow in the water body. Loading capacities were determined for the segment for multiple flow regimes. This allows the TMDL to be represented by an allowable daily load across all flow conditions. Tables 9-16 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.

Tables 9-16: Bacteria (*E. coli*) TMDLs for the North Fork Crow River Watershed are located at the end of this Decision Document

Tables 9-16 of this Decision Document communicates MPCA's estimates of reductions required for streams impaired due to excessive bacteria. Attaining these reduction percentage estimates under the flow conditions which the reductions are prescribed to will allow the impaired segment 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 stream segment's water quality will return to a level where the designated uses are no longer considered impaired.

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

NFCRW Chloride TMDL: MPCA calculated a chloride TMDL for the Jewitts Creek (07010204-585) segment. This chloride TMDL was calculated to meet the chloride water quality target of 230 mg/L (i.e., the chronic water quality criterion). The MPCA used LDCs develop the chloride TMDL (e.g., the incorporation of HSPF model simulated flows to develop FDCs, water quality monitoring information collected within the DMRB informing the LDC, etc.). The FDC were transformed into LDC by multiplying individual flow values by the chloride target of 230 mg/L and then multiplying that value by a conversion factor.

A chloride TMDL for Jewitts Creek was calculated (Table 17 of this Decision Document). The load allocation was calculated after the determination of the WLA, and the MOS (10%). Load allocations was not split among individual nonpoint contributors. Instead, load allocations were combined into one value to cover all nonpoint source contributions. MPCA also calculated a load allocation contribution attributed to natural background (Section 4.2.2 of the final TMDL document). Table 17 of this Decision Document reports five points (the midpoints of the designated flow regime) on the loading capacity

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

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 chloride monitoring data and allows for the estimation of load reductions necessary for attainment of the chloride water quality standard. Using this method, daily loads were developed based upon the flow in the water body. Loading capacities were determined for the Jewitts Creek segment for multiple flow regimes. This allows the TMDL to be represented by an allowable daily load across all flow conditions. Table 17 of this Decision Document identifies the loading capacity for each 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 17: Allocations for Jewitts Creek (County Ditch 19, 18, 17), Headwaters (Lk Ripley 47-0134-00) to NFCR (07010204-585) Chloride TMDL.

Chloride Listing year: 2010 Baseline year: 2013 Numeric WQ standard used: 230 mg/L		**Flow Conditions**				
		Very High	**High**	**Mid-Range**	**Low**	**Very Low**
		[lbs/day]				
Loading Capacity		**96,620**	**27,138**	**10,387**	**5,470**	**3,496**
Wasteload Allocation	Litchfield WWTP	5,950	5,950	5,950	###[1]	###[1]
	Litchfield City (MS400253)[2]	12,271	3,447	1,319	###[1]	###[1]
	Total WLA	**18,221**	**9,397**	**7,269**	**###[1]**	**###[1]**
Load Allocation	**Total LA**	**68,737**	**15,027**	**2,078**	**###[3]**	**###[3]**
	Natural Background	7,856	2,206	844	445	284
	Nonpoint Sources	60,881	12,821	1,234	###[3]	###[3]
Margin of Safety (MOS)		**9,662**	**2,714**	**1,039**	**547**	**350**
Average Concentration during very low flows		**256.7 mg/L[4]**				
Overall estimated percent reduction		**10.40%**				

[1]### = WLA are flow dependent, see Section 4.2.3.6
[2]MS4 WLA set to 12.7% of loading capacity, see Section 4.2.3.4.
[3]The permitted wastewater design flows exceed the stream flow in the indicated flow zone(s). The allocations are expressed as an equation rather than an absolute number: allocation = (flow contribution from a given source) x (230 mg/L).
[4]Average concentration and overall percent reduction taken as the average concentration during the very low flow conditions (critical condition).

MPCA estimated load reductions needed for the Jewitts Creek (-585) segment to attain 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 that water quality will return to a level where the designated uses are no longer considered impaired.

EPA supports the data analysis and modeling approach utilized by MPCA in its calculation of wasteload allocations, load allocations and the margin of safety for the chloride TMDL. Additionally, EPA concurs with the loading capacities calculated by the MPCA in the chloride TMDL. EPA finds MPCA's approach for calculating the loading capacity for the chloride 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.

NFCRW Phosphorus TMDLs (streams): The language of the MPCA river eutrophication standard (RES) explains that the RES must be maintained for the long-term summer concentration of TP, when averaged over all flows (Section 2.4.1.3 of the final TMDL document). MPCA explained that to align with the language of the RES the loading capacity value was based on the seasonal (June 1 to September 30) average of midpoint flows of five equally spaced flow regimes (0% to 20%, 20% to 40%, 40% to 60%, 60% to 80% and 80% to 100%). Selecting the midpoint flow values from these equally spaced flow regimes avoids weighting certain flow regimes more than other flow regimes when calculating the average flow across all flow regimes. The loading capacity was calculated as the average seasonal flow multiplied by the river eutrophication target of 100 µg/L (CRNR Ecoregion) or 125 µg/L (Crow River downstream of the confluence of the South Fork and North Fork) (Section 4.4.1 of the final TMDL document). The Crow River, from the confluence of the NFCR and SFCR to the mouth at the Mississippi River, drains both the NFCRW and the SFCR Watershed. MPCA notes that the entire SFCR upstream of the confluence with the NFCR is considered a boundary condition for the Crow River, South Fork to Mississippi River (WID 502) TMDL (Section 4.4.1.1 of the Final TMDL Document). The lower portion of the SFCR, Buffalo Creek to NFCR (WID 07010205-508) is impaired for excessive nutrients and MPCA states that this segment is scheduled to be addressed by a TMDL study in 2026.

MPCA estimated the allocations for each of the permitted facilities, the MOS set at 10% of the loading capacity, the upstream contributions (if appropriate) and the remainder of the load was attributed to the LA. Load allocations (e.g., stormwater runoff from agricultural land use practices and feedlots, SSTS, wildlife inputs etc.) were not split among individual nonpoint contributors. Instead, load allocations were combined into a categorical LA to cover all nonpoint source contributions.

Tables 18-21: Total Phosphorus (TP) TMDLs for streams of the North Fork Crow River Watershed are located at the end of this Decision Document

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

NFCRW TSS TMDL: MPCA used the same LDC development strategies as it did for the NFCRW bacteria TMDLs to calculate the loading capacities for the TSS TMDLs in the NFCRW. These strategies included incorporating HSPF model simulated flows to develop FDCs and water quality monitoring information collected within the NFCRW informing the LDC. The FDC were transformed into LDC by multiplying individual flow values by the TSS target (30 mg/L) and then multiplying that value by a conversion factor.

A TSS TMDL was calculated (Table 22 of this Decision Document). The load allocation was calculated after the determination of the WLA, and the MOS. Load allocations (e.g., stormwater runoff from agricultural land use practices) was not split among individual nonpoint contributors. Instead, load allocations were combined into one value to cover all nonpoint source contributions. Table 22 of this Decision Document reports five points (i.e., 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 TSS monitoring data and allows for the estimation of load reductions necessary for attainment of the TSS water quality standard. Using this method, daily loads were developed based upon the flow in the water body. Loading capacities were determined for each segment for multiple flow regimes. This allows the TMDL to be represented by an allowable daily load across all flow conditions. Table 22 of this Decision Document identifies the loading capacity for each 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 22. TSS Allocations for Crow River, North Fork, Meeker/Wright County line to Mill Cr (WID 07010204-556).

Total Suspended Solids Listing year: 2012 Baseline year: 2013 Numeric WQ standard used: 30 mg/L		**Flow Conditions**				
		Very High	**High**	**Mid-Range**	**Low**	**Very Low**
		[tons/day]				
Loading Capacity		**178.659**	**79.184**	**35.702**	**13.525**	**3.619**
Wasteload Allocation	Annandale/Maple Lake/Howard Lake WWTP	0.148	0.148	0.148	0.148	0.148
	Atwater WWTP	0.229	0.229	0.229	0.229	0.229
	Belgrade WWTP	0.278	0.278	0.278	0.278	0.278
	Brooten WWTP	0.199	0.199	0.199	0.199	0.199
	Buffalo WWTP	0.451	0.451	0.451	0.451	0.451
	Cokato WWTP	0.136	0.136	0.136	0.136	0.136
	Darwin WWTP	0.061	0.061	0.061	0.061	0.061
	Dassel WWTP	0.229	0.229	0.229	0.229	0.229
	Glacial Lakes SSWD	0.111	0.111	0.111	0.111	0.111
	Grove City WWTP	0.183	0.183	0.183	0.183	0.183
	Litchfield WWTP	0.237	0.237	0.237	0.237	0.237
	Litchfield City (MS400253)	0.733	0.325	0.146	0.055	0.015
	Construction/Industrial Stormwater	0.357	0.158	0.071	0.027	0.007
	Total WLA	**3.352**	**2.745**	**2.479**	**2.344**	**2.284**
Load Allocation (LA)		**157.441**	**68.521**	**29.653**	**9.828**	**0.973**
Margin of Safety (MOS)		**17.866**	**7.918**	**3.570**	**1.353**	**0.362**
Average existing monthly geometric mean		**73.0 org/100mL**				
Overall estimated percent reduction		**59%**				

MPCA estimated load reductions needed for the TSS TMDL to attain the TSS water quality target of 30 mg/L. 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 that water quality will return to a level where the designated uses are no longer considered impaired.

EPA supports the data analysis and modeling approach utilized by MPCA in its calculation of wasteload allocations, load allocations and the margin of safety for the TSS TMDLs. Additionally, EPA concurs with the loading capacities calculated by the MPCA in the TSS TMDLs. EPA finds MPCA's approach for calculating the loading capacity for the 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 third criterion.

NFCRW Phosphorus TMDLs (lakes): MPCA used the U.S. Army Corps of Engineers (USACE) BATHTUB model to calculate the loading capacities for the NFCRW lake phosphorus TMDLs (Section 4.6.1 of the final TMDL 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 timescales 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 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 and general lake nutrient WQS (Tables 23-26 of this Decision Document). Loading capacities on the annual scale (pounds per year (lbs/year)) were calculated by MPCA 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 NFCRW for aquatic recreation, and is the time of the year when water quality is likely to be impaired by excessive nutrient loading. Loading capacities were divided by 365 to calculate the daily loading capacities.

MPCA subdivided the loading capacity among the WLA, LA, and MOS components of the TMDL (Tables 23-26 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 NFCRW 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 23-26: Total phosphorus TMDLs for lakes in the North Fork Crow River Watershed are located at the end of this Decision Document

Tables 23-26 of this Decision Document communicate MPCA's estimates of the reductions required for the lakes of the NFCRW 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 are no longer considered impaired.

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

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 NFCRW TMDLs can be attributed to different nonpoint sources.

NFCRW Bacteria TMDLs: The calculated LA values for the bacteria TMDLs are applicable across all flow conditions in the NFCRW (Tables 9-16 of this Decision Document). MPCA identified several nonpoint sources which contribute bacteria loads to the surface waters of the NFCRW, including non-regulated urban stormwater runoff, stormwater from agricultural and feedlot areas, failing septic systems, wildlife (e.g., deer, geese, ducks, raccoons, turkeys, and other animals) and bacteria contributions from upstream subwatersheds. MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations but aggregated the nonpoint sources into one 'watershed load' LA calculation (Tables 9-16 of this Decision Document).

NFCRW Chloride TMDL: The calculated LA values for the chloride TMDL are applicable across all flow conditions. MPCA identified several nonpoint sources which contribute chloride nonpoint source loads to the surface waters in the NFCRW (Table 17 of this Decision Document). Load allocations were recognized as originating from many diverse nonpoint sources including stormwater contributions from agricultural lands, discharges from SSTS, and stormwater runoff liberating salt from roads, parking lots, commercial/industrial areas and or sidewalks. MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations but aggregated the nonpoint sources into one LA value ('Unregulated Runoff').

MPCA calculated LA for natural background and, where appropriate, for rural/non-permitted urban areas. Individual nonpoint source load allocations were aggregated to the LA natural background or the LA non-permitted portions of the TMDL. These allocations addressed nonpoint source loading attributed to winter maintenance activities in these rural/non-permitted urban areas, potential runoff from agricultural lands where fertilizer containing chloride may be applied, and the impact of septic systems on shallow groundwater and recharge.

NFCRW Phosphorus TMDLs (streams and lakes): MPCA identified several nonpoint sources which contribute nutrient loading to the stream segments of the NFCRW (Table 18-21 of this Decision Document) and lakes (Tables 23-26 of this Decision Document). These nonpoint sources included:

watershed contributions from each stream or lakes' direct watershed, watershed contributions from upstream watersheds, non-regulated urban (i.e., non-MS4) stormwater runoff, internal loading, and atmospheric deposition. For both stream phosphorus TMDLs and lake phosphorus TMDLs, MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations but aggregated the nonpoint sources into one LA calculation.

NFCRW TSS TMDL: The calculated LA values for the TSS TMDL are applicable across all flow conditions. MPCA identified several nonpoint sources which contribute TSS loads to the surface waters in the NFCRW (Table 22 of the Decision Document). Load allocations were recognized as originating from many diverse nonpoint sources including stormwater contributions from agricultural lands, stream channelization and streambank erosion, wetland and forest sources, and atmospheric deposition. MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations but aggregated the nonpoint sources into one "watershed load" LA calculation (Table 22 of this Decision Document).

EPA finds MPCA's approach for calculating the LA for bacteria, phosphorus and TSS 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:

NFCRW Bacteria TMDLs: MPCA identified NPDES permitted facilities (Table 3 of this Decision Document) within the NFCRW and assigned those facilities a portion of the WLA (Tables 9-16 of this

Decision Document). WLAs for continuous flow facilities (Table 29 of the final TMDL document) were calculated based on the facility's maximum allowable discharge and permitted concentration limits. MPCA explained that the WLA for each individual WWTP was calculated based on the *E. coli* WQS, but WWTP permits are regulated for the fecal coliform WQS (200 orgs /100 mL) and 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 DMRB 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.

MS4 allocations were calculated for the NFCRW bacteria based on the estimated regulated area of each permitted MS4 within an impaired watershed was divided by the total area of the watershed to represent the percent coverage of each permitted MS4 within the impaired watershed. The WLAs for permitted MS4s were calculated as the percent coverage of each permitted MS4 multiplied by the loading capacity minus the MOS minus wastewater WLAs (Section 4.3.3.4 of the final TMDL document).

MPCA has identified CAFOs in the NFCRW (Section 3.6.1.2, Table 18, and Figure 19 of the final TMDL document). As explained by MPCA, CAFO production areas must be designed to contain all manure, and direct precipitation and manure-contaminated runoff from precipitation events up to the 25-year, 24-hour storm event. In the event of a discharge, the discharge cannot cause or contribute to a violation of a water quality standard (WQS) (Minnesota Rule 7020.2003). MPCA noted that any precipitation-caused runoff from the land application of manure at agronomic rates is not considered a point source discharge and is accounted for in the LA of the TMDL. MPCA explained that these facilities are not designed to discharge effluent and therefore were not assigned a portion of the WLA (WLA = 0).

EPA finds the MPCA's approach for calculating the WLAs for the NFCRW bacteria TMDLs to be reasonable and consistent with EPA guidance.

NFCRW Chloride TMDL: Similar to the bacteria WLA calculations, MPCA identified one NPDES facility and a chloride WLA was calculated based on the facility's maximum allowable discharge (Table 17 of this Decision document; Table 25 of the final TMDL document), the chloride WQS (230 mg/L) and a conversion factor.

MPCA explained that loading capacity values in the low or very low flow regimes for segment 07100001-602 were less than permitted WWTP's maximum allowable discharge flows. To account for these circumstances, WLAs and LAs in these low flow regimes were expressed as an equation rather than a number. The equation was,

Allocation = flow contribution from a given source * 230 mg/L

MS4 allocation for the City of Litchfield (MS400253) was calculated based on the percentage of the drainage area for the impaired reach which is covered by the City of Litchfield's MS4 area and the WQS for chloride of 230 mg/L. A footnote at the bottom of Table 26 of the final TMDL document includes the estimate for MS4 coverage area (12.7% of the loading capacity) in the subwatershed for segment 07010204-585. The percentage value (12.7%) was then multiplied by the loading capacity for that impaired segment to calculate the WLA attributed to the City of Litchfield.

EPA finds the MPCA's approach for calculating the WLA for the NFCRW chloride TMDL to be reasonable and consistent with EPA guidance.

NFCRW Phosphorus TMDLs (streams): MPCA identified 20 NPDES permitted facilities in the contributing watersheds for the NFCRW stream phosphorus TMDLs and assigned those facilities a portion of the WLA (Tables 18-21 of the Decision Document). The MPCA developed a Phosphorus Effluent Limit Review for the Greater Crow River Watershed to determine the necessary TP WLAs and water quality based effluent limits (WQBELs) for wastewater treatment facilities discharging in the watersheds of NFCR, the SFCR, and the Crow River downstream of their confluence (Section 4.4.3.1 of the NFCRW final TMDL document).

The WLA for construction stormwater was calculated based on the average percent area (0.12%) of the NFCRW which was covered under a NPDES/SDS Construction Stormwater General Permit during the previous five years (Section 4.4.3.3 of the final TMDL document). The construction and industrial stormwater WLAs were calculated as the percent area (0.12%) multiplied by the loading capacity.

Attaining the construction stormwater and industrial stormwater loads described in the NFCRW phosphorus TMDLs is the responsibility of construction and industrial site managers. For example, for the Wolf Lake (47-0016-00) phosphorus TMDL, local permittees are responsible for overseeing that construction and/or industrial stormwater loads which impact water quality in Wolf Lake do not exceed the WLA assigned to those areas. Local MS4 permittees 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 MNR100001 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 to lakes and stream segments in the NFCRW. Industrial sites within 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 NFCRW phosphorus 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 EPA. This applies to sites under permits for MNR100001, MNR050000 and MNG490000.

MS4 allocations for the NFCRW stream phosphorus TMDLs were calculated in the same manner as the MS4 allocations for the NFCRW bacteria TMDLs (i.e., see calculative method in ***Section 5 - NFCWRW bacteria TMDLs***, within this Decision Document). These MS4 allocations are found in Tables 18-21 of this Decision Document.

NFCRW TSS TMDL: MPCA identified 11 NPDES facilities in the contributing watersheds for NFCRW. The TSS WLAs for the NFCRW were calculated based on existing permit calendar month average loading limits in kg/day (Table 51 of the final TMDL document). MPCA states that the existing permit limits are consistent with TSS WLA assumptions. Individual WLAs were calculated by MPCA for each of these individual facilities based on the information in the facilities NPDES permit:

- **Load Limit:** When a permit defined a calendar monthly average TSS load limit, that limit was used as the basis of the WLA.
- **Design flow and concentration limits:** When a permit did not define a TSS load limit but did define one or more design flows and TSS concentration limits, the WLA was calculated by MPCA using a design flow and the concentration limit. If an average wet weather design flow was defined, it was used to calculate the WLA; if the average wet weather design flow was not defined, then the maximum design flow was used to calculate the WLA. If a monthly average TSS concentration limit was defined, then that limit was used to calculate the WLA; if only a daily maximum concentration limit was defined, then that limit was used to calculate the WLA.
- **No design flow and concentration limits:** If a permit did not define a design flow, the WLA was calculated using an estimated design flow and the TSS concentration limit of 30 mg/L. The design flow was estimated as the average reported flows for similar sites in the vicinity of the project area.

Similar to the phosphorus TMDLs, MPCA calculated a portion of the WLA for construction and industrial stormwater for the TSS TMDL. This WLA was represented as a categorical WLA for construction and industrial stormwater. The construction and industrial stormwater allocations for the NFCRW TSS TMDLs were calculated in the same manner as the construction and industrial stormwater allocations for the NFCRW phosphorus TMDLs (i.e., see calculative method in ***Section 5 – NFCRW phosphorus TMDLs (streams)***, within this Decision Document).

MPCA's expectations and responsibilities for overseeing construction and industrial stormwater loads for the phosphorus TMDLs are the same for the TSS TMDL. Construction and industrial sites are expected 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 TSS TMDLs for NFCRW. 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. EPA. This applies to sites under permits for MNR100001, MNR050000 and MNG490000.

EPA finds the MPCA's approach for calculating the WLA for the NFCRW TSS TMDL to be reasonable and consistent with EPA guidance.

NFCRW Phosphorus TMDLs (lakes): MPCA identified construction and industrial stormwater contributions as necessitating a WLA (Tables 23-26 of this Decision Document). Similar to the phosphorus stream TMDLs, MPCA calculated a portion of the WLA for construction and industrial stormwater for the phosphorus (lakes) TMDL. This WLA was represented as a categorical WLA for construction and industrial stormwater. The construction and industrial stormwater allocations for the NFCRW phosphorus (lakes) TMDLs were calculated in the same manner as the construction and industrial stormwater allocations for the NFCRW phosphorus TMDLs (streams) (i.e., see calculative method in ***Section 5 – NFCRW phosphorus TMDLs (streams)***, within this Decision Document).

MS4 allocations for the NFCRW phosphorus lake TMDLs were calculated in the same manner as the MS4 allocations for the NFCRW bacteria (i.e., see calculative method in ***Section 5 - NFCRW bacteria TMDLs***, within this Decision Document).

EPA finds the MPCA's approach for calculating the WLA for the NFCRW phosphorus 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, chloride, phosphorus, and TSS TMDLs.

NFCRW Bacteria, Chloride, Phosphorus, and TSS TMDLs: The NFCRW bacteria, chloride, phosphorus, and TSS TMDLs incorporated a 10% explicit MOS applied to the total loading capacity calculation for each flow regime of the LDC. Ten percent of the total loading capacity was reserved for MOS with the remaining load allocated to point and nonpoint sources (Tables 9-26 of this Decision

Document). MPCA explained in Section 4 of the final TMDL document that the explicit MOS was set at 10% due to the following factors discovered during TMDL development for these pollutants:

- Uncertainty in simulated flow data from the HSPF model;
- Environmental variability in pollutant loading and water quality data (i.e., collected water quality monitoring data, field sampling error, etc.); and
- Uncertainty with regrowth, die-off, and natural background levels of *E. coli*
- Uncertainty in observed daily flow records
- Calibration and validation processes of the LDC/BATHTUB modeling efforts, uncertainty in modeling outputs, and conservative assumptions made during the modeling efforts.
- MPCA's confidence in the BATHTUB model's performance during the development of TP TMDLs.

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 NFCRW 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.

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:

NFCRW Bacteria TMDLs: In Section 4.3.5 of the final TMDL document, MPCA explained that 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 1^{st} to October 31^{st}, regardless of the flow condition. The development of the LDCs utilized simulated flow data which were validated and calibrated with local flow gage data. Modeled flow measurements represented a variety of flow conditions from the recreation season. LDCs developed from these modeled flow conditions represented a range of flow conditions within the NFCRW 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).

NFCRW Chloride TMDL: In Section 4.2.5 of the final TMDL document, MPCA explained that the NFCRW chloride TMDL considered chloride sources across all seasons since chloride is added to the system on a seasonal basis as well as an annual basis (Section 4.2.5 of the final TMDL document). Spring snowmelt and subsequent runoff contribute chloride to local waterbodies during the springtime period, summer storms may contribute chlorides via stormwater runoff and continuous year-round sources of chloride are present in the NFCRW due to contributions from WWTPs and water softening systems in areas which are not tied into municipal sanitary sewer systems. Chloride loadings to streams vary seasonally. Stream water quality responds to loadings on a seasonal basis and the highest chloride concentrations tend to occur during the spring snowmelt.

NFCRW Phosphorus TMDLs: Seasonal variation was considered for the NFCRW phosphorus TMDLs (both streams and lakes) as described in Section 4.4.6 and 4.6.5 of the final TMDL document. The nutrient targets employed in the NFCRW phosphorus 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 CRNR 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 NFCRW phosphorus TMDL efforts, the LA and WLA estimates were calculated from modeling efforts which incorporated mean growing season total phosphorus values. Nutrient loading capacities were set in the TMDL development process to meet the WQS during the most critical period. The mid to late summer period is typically when eutrophication standards are exceeded and water quality within the NFCRW is deficient. By calibrating the modeling efforts to protect these water bodies during the worst water quality conditions of the year, it is assumed that the loading capacities established by the TMDLs will be protective of water quality during the remainder of the calendar year (October through May).

NFCRW TSS TMDL: In Section 4.5.5 of the final TMDL document, MPCA explained that the TSS WQS applies from April 1 to September 30 which is also the time period when high concentrations of sediment are expected in the surface waters of the NFCRW. Sediment loading in the NFCRW varies depending on surface water flow, land cover and climate/season. Spring is typically associated with large flows from snowmelt, the summer is associated with the growing season as well as periodic storm events and receding streamflows, and the fall brings increasing precipitation and rapidly changing agricultural landscapes. In all seasons, sediment inputs to surface waters typically occur primarily through wet weather events. Critical conditions that impact the response of NFCRW 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 NFCRW bacteria, chloride, phosphorus, and TSS TMDLs provide reasonable assurance that actions identified in the implementation section of the final TMDL (i.e., Sections 6 and 8 of the final TMDL document), will be applied to attain the loading capacities and allocations calculated for the impaired reaches within the NFCRW. The recommendations made by MPCA will be successful at improving water quality if the appropriate local groups work to implement these recommendations. Those mitigation suggestions will require commitment from state agencies and local stakeholders to carry out the suggested actions.

MPCA has identified several local partners which have expressed interest in working to improve water quality within the NFCRW. Implementation practices will be implemented over the next several years. It is anticipated that staff from Soil and Water Conservation District (SWCDs) (e.g., the Pope SWCD, Stearns SWCD) staff, local Minnesota Board of Soil and Water Resources (BWSR) offices, lake associations and watershed districts (e.g., North Fork Crow River Watershed District (NFCRWD) and Middle Fork Crow River Watershed District (MFCRWD)) and other local watershed groups, will work together to reduce pollutant inputs to the NFCRW. MPCA has authored an update to the North Fork Crow River WRAPS document (November 2022) which provides information on the development of scientifically supported restoration and protection strategies for implementation planning and action. MPCA sees the WRAPS document as a starting point for which MPCA and local partners can develop tools that will help local governments, landowners, and special interest groups determine (1) the best strategies for making improvements and protecting resources that are already in good condition, and (2) focus those strategies within the best places to do work.

County SWCDs, such as the Pope SWCD and or the Stearns SWCD, have a history of implementation efforts in the NFCRW. The Pope SWCD has been applying conservation practices in areas in the NFCRW and providing educational opportunities to local landowners in order to achieve sound management of natural resources since the 1949 (https://popeswcd.org/). The SWCD employs various programming, such as shoreline restoration projects, native planting, terrain analysis, water quality assessments, cost-share programming, and other technical services to ensure that efforts are made to improve water quality and conserve water resources in the NFCRW. Most notably, Pope SWCD recently completed the Benson Shoreline Restoration Project, which initiated a cost-share program resulting in the utilization of 1,345 plants as part of the project. Other County SWCDs in the NFCRW has similar programming efforts which locals can utilize. Figure 35 of the final TMDL document displays the amount of BMPs implemented in the NFCRW.

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 sediment 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.

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.

Reasonable assurance that the WLA set forth will be implemented is provided by regulatory actions. According to 40 C.F.R. § 122.44(d)(1)(vii)(B), NPDES permit effluent limits must be consistent with assumptions and requirements of all WLAs in an approved TMDL. MPCA's stormwater program and the NPDES permit program are the implementing programs for ensuring 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 NFCRW 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 (e.g., Litchfield 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 requires permittees to develop compliance schedules for any TMDL that received 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.

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.

Various funding mechanisms will be utilized to execute the recommendations made in the implementation section of this TMDL. Some examples of funding sources include BWSR's Watershed-based Implementation Funding, Clean Water Fund Competitive Grants (e.g., Projects and Practices), and conservation funds from Natural Resources Conservation Service (NRCS) (e.g., Environmental Quality Incentives Program and Conservation Stewardship Program). According to MPCA, over $116,000,000 has been spent on watershed implementation projects in the NFCRW since 2004 (Figure 38 in the Final TMDL Document).

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 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 (*http://bwsr.state.mn.us/cwf_programs*).

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 NFCRW (Section 7 of the final TMDL document). Progress of TMDL implementation will be measured through regular monitoring efforts of water quality and total BMPs completed. MPCA anticipates that monitoring will be completed by local groups including, but not limited to, the NFCRWD, the MFCRWD, DNR, MPCA, and local SWCDs, and local volunteers (through the Volunteer Lake and Stream Monitoring Program), as long as there is sufficient funding to support the efforts of these local entities. Monitoring is an ongoing effort, and work is anticipated to continue further, in the NFCRW.

Water quality monitoring is a critical component of the adaptive management strategy employed as part of the implementation efforts utilized in the NFCRW. 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 NFCRW. 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 NFCRW has been completed by a variety of organizations (i.e., SWCDs) and funded through a combination of federal, state, and local funds. MPCA anticipates that stream monitoring in the NFCRW should continue in order to build on the current water quality dataset and track changes based on implementation progress. Continuing to monitor water quality and biota scores in the listed segments will determine whether or not stream habitat restoration measures are required to bring the watershed into attainment with water quality standards. Through the Intensive Watershed Monitoring program, MPCA will collect water quality and biological data at stream and lake monitoring stations for one to two years, every ten years. At a minimum, fish and macroinvertebrate sampling should 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 in the NFCRW 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 NFCRW TMDLs will be used to inform the selection of implementation activities as part of the North Fork Crow 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 some implementation strategies in Section 8 of the final TMDL document. MPCA outlined the importance of prioritizing areas within the NFCRW, education and outreach efforts with local partners, and partnering with local stakeholders to improve water quality within the watershed. The NFCRW WRAPS document (November 2022) includes additional detail regarding specific recommendations from MPCA to aid in the reduction of bacteria, , chloride nutrients and TSS to surface waters of the NFCRW. Additionally, MPCA referenced the Statewide Nutrient Reduction Strategy (https://www.pca.state.mn.us/water/nutrient-reduction-strategy) for focused implementation efforts targeting phosphorus nonpoint sources in NFCRW. The reduction goals for the bacteria, nutrient and TSS TMDLs may be met via components of the following strategies:

NFCRW Bacteria TMDLs:

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

Manure Collection and Storage Practices: Manure has been identified as a source of bacteria. Bacteria can be transported to surface water bodies via stormwater runoff. Bacteria laden water can also leach into groundwater resources. Improved strategies for the collection, storage and management of manure can minimize impacts of bacteria entering the surface and groundwater system. Repairing manure storage facilities or building roofs over manure storage areas may decrease the amount of bacteria in stormwater runoff.

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

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

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

Stormwater wetland treatment systems: Constructed wetlands with the purpose of treating wastewater or stormwater inputs could be explored in selected areas of the NFCRW. 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 NFCRW.

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.

NFCRW Chloride TMDL:

The potential BMPs which, if installed and maintained, would likely result in decreases in chloride to surface waters of the NFCRW involve more efficient uses of salt resources. Improving winter maintenance practices (i.e., reducing the amount of salt used) of municipal and private applicators for smarter and more efficient use of salt resources. The key challenge in reducing salt usage is balancing the need for public safety with the growing expectation for clear, dry roads, parking lots, and sidewalks throughout the mix, severity, and duration of winter conditions in the NFCRW.

NFCRW Phosphorus TMDLs:

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

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

Pasture management and agricultural reduction strategies: These strategies involve reducing nutrient transport from fields and minimizing soil loss. Specific practices would include erosion control through conservation tillage, reduction of winter spreading of fertilizers, elimination of fertilizer spreading near open inlets and sensitive areas, installation of stream and lake shore buffer strips, streambank stabilization practices (gully stabilization and installation of fencing near streams), and nutrient management planning.

Urban/Residential Nutrient Reduction Strategies: These strategies involve reducing stormwater runoff from lakeshore homes and other residences within the NFCRW. 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 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 NFCRW. 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 (e.g., vegetated swales) or retrofitting existing stormwater BMPs.

Internal Loading Reduction Strategies: Internal nutrient loads may be addressed to meet the TMDL allocations outlined in the NFCRW phosphorus 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 (e.g., aluminum sulfate) to lakes of the NFCRW 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.

NFCRW TSS TMDL:

Improved Agricultural Drainage Practices: A review of local agricultural drainage networks should be completed to examine how improving drainage ditches and drainage channels could be reorganized to reduce the influx of TSS to the surface waters in the NFCRW. 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, cover cropping, and residue management is recommended to reduce erosion and thus siltation and runoff into streams.

Reducing Livestock Access to Stream Environments: Livestock managers should 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: An assessment of stream channel, river channel, and lakeshore erosional areas should be completed to evaluate areas where erosion control strategies could be implemented in the NFCRW. Implementation actions (e.g., planting deep-rooted vegetation near water bodies to stabilize streambanks) could be prioritized to target areas which are actively eroding. This strategy could prevent additional sediment inputs into surface waters of the NFCRW 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 NFCRW 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 worked with county and SWCD staff from the eight counties in the NFCRW to promote water quality, to gain input from landowners via surveys and interviews and to better understand the social dynamics of stakeholders in the NFCRW. MPCA's goal was to create civic engagement and discussion which would enhance the content of the TMDL and WRAPS documents. A full description of civic engagement activities associated with the TMDL process is available within Section 3 of the NFCRW WRAPS report (November 2022).

MPCA posted the draft TMDL online at (http://www.pca.state.mn.us/water/tmdl) for a public comment period. The public comment period was started on November 28, 2022 and ended on December 28, 2022. MPCA states that they received, and responded to, two comment letters resulting from the public notice period. Both comments and MPCA responses were made available to EPA staff.

EPA reviewed the comments and responses. One comment letter suggested additional details and language be added to the TMDL to clarify certain sections. MPCA incorporated most of the suggestions. The other letter requested additional clarification language be added to the TMDL regarding implementation efforts and MS4 implementation. MPCA revised the language as needed. EPA determined that MPCA responded to all comments as appropriate.

The North Fork Crow River Watershed does not include any tribal lands within the watershed boundary (Section 3 of the final TMDL document).

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 North Fork Crow River Watershed TMDL document, submittal letter and accompanying documentation from MPCA on March 29th, 2023. 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 C.F.R. §130.

The EPA finds that the TMDL transmittal letter submitted for the North Fork Crow 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 8 bacteria TMDLs, the 1 chloride TMDL, the 4 phosphorus river TMDLs, the 1 TSS TMDL, and the 4 phosphorus lake TMDLs satisfy all elements for approvable TMDLs. This TMDL approval is for **eighteen TMDLs**, addressing 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 9. ***E. coli*** **Allocations for the Crow River, North Fork, Headwaters (Grove Lk 61-0023-00) to CD32 (WID 07010204-763).**

Escherichia coli Listing year: 2020 Baseline year: 2013 Numeric WQ standard used: 126 org/100 mL	**Flow Conditions**				
	Very High	**High**	**Mid-Range**	**Low**	**Very Low**
	[Billions organisms/day]				
Loading Capacity	**376.49**	**131.82**	**52.02**	**18.31**	**5.20**
Load Allocation (LA)	**338.84**	**118.64**	**46.82**	**16.48**	**4.68**
Margin of Safety (MOS)	**37.65**	**13.18**	**5.20**	**1.83**	**0.52**
Average existing monthly geometric mean	**569.3 org/100mL**				
Overall estimated percent reduction	**78%**				

Table 10. ***E. coli*** **Allocations for the Crow River, North Fork, CD32 to Rice Lk (WID 07010204-764).**

Escherichia coli Listing year: 2020 Baseline year: 2013 Numeric WQ standard used: 126 org/100 mL		**Flow Conditions**				
		Very High	**High**	**Mid-Range**	**Low**	**Very Low**
		[Billions organisms/day]				
Loading Capacity		**1,453.42**	**490.89**	**201.02**	**78.83**	**26.21**
Wasteload Allocation	Brooten WWTP	5.06	5.06	5.06	5.06	5.06
	Total WLA	**5.06**	**5.06**	**5.06**	**5.06**	**5.06**
Load Allocation (LA)		**1,303.02**	**436.74**	**175.86**	**65.89**	**18.53**
Margin of Safety (MOS)		**145.34**	**49.09**	**20.10**	**7.88**	**2.62**
Average existing monthly geometric mean		**318.4 org/100mL**				
Overall estimated percent reduction		**60%**				

Table 11. *E. coli* Allocations for the Crow River, Middle Fork, Green Lk to N Fk Crow R (WID 07010204-511).

Escherichia coli Listing year: 2012 Baseline year: 2013 Numeric WQ standard used: 126 org/100 mL		**Flow Conditions**				
		Very High	**High**	**Mid-Range**	**Low**	**Very Low**
		[Billions organisms/day]				
Loading Capacity		**1,243.33**	**538.92**	**214.36**	**53.77**	**9.30**
Wasteload Allocation	Atwater WWTP	5.83	5.83	5.83	5.83	###[1]
	Belgrade WWTP	7.07	7.07	7.07	7.07	###[1]
	Brooten WWTP	5.06	5.06	5.06	5.06	###[1]
	Glacial Lakes SSWD	4.24	4.24	4.24	4.24	###[1]
	Total WLA	**22.20**	**22.20**	**22.20**	**22.20**	**###[1]**
Load Allocation (LA)		**1,096.80**	**462.83**	**170.72**	**26.19**	**###[1]**
Margin of Safety (MOS)		**124.33**	**53.89**	**21.44**	**5.38**	**0.93**
Average existing monthly geometric mean		**313.7 org/100mL**				
Overall estimated percent reduction		**60%**				

[1]The permitted wastewater design flows exceeded the stream flow in the indicated flow zone. The allocations are expressed as an equation rather than an absolute number: allocation = (flow contribution from a given source) X (126 org/100mL)

Table 12. *E. coli* Allocations for the Crow River, North Fork, M Fk Crow R to Jewitts Cr (WID 07010204-507).

Escherichia coli Listing year: 2012 Baseline year: 2013 Numeric WQ standard used: 126 org/100 mL		**Flow Conditions**				
		Very High	**High**	**Mid-Range**	**Low**	**Very Low**
		[Billions organisms/day]				
Loading Capacity		**3,246.74**	**1,447.59**	**625.16**	**195.37**	**38.76**
Wasteload Allocation	Atwater WWTP	5.83	5.83	5.83	5.83	5.83
	Belgrade WWTP	7.07	7.07	7.07	7.07	7.07
	Brooten WWTP	5.06	5.06	5.06	5.06	5.06
	Glacial Lakes SSWD	4.24	4.24	4.24	4.24	4.24
	Grove City WWTP	4.64	4.64	4.64	4.64	4.64
	Total WLA	**26.84**	**26.84**	**26.84**	**26.84**	**26.84**
Load Allocation (LA)		**2,895.23**	**1,275.99**	**535.80**	**148.99**	**8.04**
Margin of Safety (MOS)		**324.67**	**144.76**	**62.52**	**19.54**	**3.88**
Average existing monthly geometric mean		**256.3 org/100mL**				
Overall estimated percent reduction		**51%**				

Table 13. ***E. coli*** **Allocations for the Crow River, North Fork, Meeker/Wright County line to Mill Cr (WID 07010204-556).**

Escherichia coli Listing year: 2012 Baseline year: 2013 Numeric WQ standard used: 126 org/100 mL		Flow Conditions [Billions organisms/day]				
		Very High	**High**	**Mid-Range**	**Low**	**Very Low**
Loading Capacity		**6,429.02**	**2,713.79**	**1,142.17**	**382.00**	**106.31**
Wasteload Allocation	Annandale/Maple Lake/Howard Lake WWTP	5.65	5.65	5.65	5.65	5.65
	Atwater WWTP	5.83	5.83	5.83	5.83	5.83
	Belgrade WWTP	7.07	7.07	7.07	7.07	7.07
	Brooten WWTP	5.06	5.06	5.06	5.06	5.06
	Buffalo WWTP	20.60	20.60	20.60	20.60	20.60
	Cokato WWTP	3.46	3.46	3.46	3.46	3.46
	Darwin WWTP	1.55	1.55	1.55	1.55	1.55
	Dassel WWTP	5.83	5.83	5.83	5.83	5.83
	Glacial Lakes SSWD	4.24	4.24	4.24	4.24	4.24
	Grove City WWTP	4.64	4.64	4.64	4.64	4.64
	Litchfield WWTP	14.78	14.78	14.78	14.78	14.78
	Litchfield City (MS400253)	26.36	11.13	4.68	1.57	0.44
	Total WLA	**105.07**	**89.84**	**83.39**	**80.28**	**79.15**
Load Allocation (LA)		**5,681.05**	**2,352.57**	**944.56**	**263.52**	**16.53**
Margin of Safety (MOS)		**642.90**	**271.38**	**114.22**	**38.20**	**10.63**
Average existing monthly geometric mean		**197.1 org/100mL**				
Overall estimated percent reduction		**36%**				

Table 14. ***E. coli*** **Allocations for Twelvemile Creek, Dutch Lk to Little Waverly (WID 07010204-679).**

Escherichia coli Listing year: 2020 Baseline year: 2013 Numeric WQ standard used: 126 org/100 mL	Flow Conditions [Billions organisms/day]				
	Very High	**High**	**Mid-Range**	**Low**	**Very Low**
Loading Capacity	**357.57**	**114.69**	**51.82**	**13.93**	**3.28**
Load Allocation (LA)	**321.81**	**103.22**	**46.64**	**12.54**	**2.95**
Margin of Safety (MOS)	**35.76**	**11.47**	**5.18**	**1.39**	**0.33**
Average existing monthly geometric mean	**775.9 org/100mL**				
Overall estimated percent reduction	**84%**				

Table 15. *E. coli* Allocations for the Mill Creek, Buffalo Lk to N Fk Crow R (WID 07010204-515).

Escherichia coli Listing year: 2012 Baseline year: 2013 Numeric WQ standard used: 126 org/100 mL		**Flow Conditions**				
		Very High	**High**	**Mid-Range**	**Low**	**Very Low**
		[Billions organisms/day]				
Loading Capacity		**305.87**	**106.33**	**52.48**	**16.91**	**1.58**
Wasteload Allocation	Buffalo City (MS400238)	43.81	15.24	7.52	2.43	0.23
	Total WLA	**43.81**	**15.24**	**7.52**	**2.43**	**0.23**
Load Allocation (LA)		**231.47**	**80.46**	**39.71**	**12.79**	**1.19**
Margin of Safety (MOS)		**30.59**	**10.63**	**5.25**	**1.69**	**0.16**
Average existing monthly geometric mean		**129.8 org/100mL**				
Overall estimated percent reduction		**3%**				

Table 16. *E. coli* Allocations for the Crow River, North Fork, Mill Cr to S Fk Crow R (WID 07010204-503).

Escherichia coli Listing year: 2012 Baseline year: 2013 Numeric WQ standard used: 126 org/100 mL		Flow Conditions				
		Very High	High	Mid-Range	Low	Very Low
		[Billions organisms/day]				
Loading Capacity		**7,283.12**	**3,082.00**	**1,301.49**	**453.01**	**124.85**
Wasteload Allocation	Annandale/Maple Lake/Howard Lake WWTP	5.65	5.65	5.65	5.65	5.65
	Atwater WWTP	5.83	5.83	5.83	5.83	5.83
	Belgrade WWTP	7.07	7.07	7.07	7.07	7.07
	Brooten WWTP	5.06	5.06	5.06	5.06	5.06
	Buffalo WWTP	20.60	20.60	20.60	20.60	20.60
	Cokato WWTP	3.46	3.46	3.46	3.46	3.46
	Darwin WWTP	1.55	1.55	1.55	1.55	1.55
	Dassel WWTP	5.83	5.83	5.83	5.83	5.83
	Glacial Lakes SSWD	4.24	4.24	4.24	4.24	4.24
	Grove City WWTP	4.64	4.64	4.64	4.64	4.64
	Litchfield WWTP	14.78	14.78	14.78	14.78	14.78
	Montrose WWTP	3.72	3.72	3.72	3.72	3.72
	Buffalo City (MS400238)	48.27	20.42	8.63	3.00	0.83
	Litchfield City (MS400253)	29.13	12.33	5.21	1.81	0.50
	St. Michael City (MS400246)	1.03	0.44	0.18	0.06	0.02
	Total WLA	**160.86**	**115.62**	**96.45**	**87.30**	**83.78**
Load Allocation (LA)		**6,393.95**	**2,658.18**	**1,074.89**	**320.41**	**28.58**
Margin of Safety (MOS)		**728.31**	**308.20**	**130.15**	**45.30**	**12.49**
Average existing monthly geometric mean		**150.3 org/100mL**				
Overall estimated percent reduction		**16%**				

Table 18. TP Allocations for the Mill Creek, Buffalo Lk to NFCR (WID 07010204-515).

Phosphorus as P Listing year: 2016 Baseline year: 2013 Numeric WQ standard used: 100 µg/L		**Flow Condition - Summer Average [lbs/day]**
Wasteload Allocation	**Total WLA**	**1.99**
	Buffalo City (MS400238)	1.96
	Construction/Industrial Stormwater	0.03
Load Allocation (LA)		**9.98**
Margin of Safety (MOS)		**1.37**
Reserve Capacity (RC)		**0.35**
Loading Capacity (LC/TMDL)		**13.69**
Existing Load		**16.05**
Estimated Load Reduction		**14.7%**

Table 19. TP Allocations for the Crow River, North Fork, Mill Cr to S Fk Crow R (WID 07010204-503).

Phosphorus as P Listing year: 2016 Baseline year: 2013 Numeric WQ standard used: 100 µg/L		**Flow Condition - Summer Average [lbs/day]**
Wasteload Allocation	**Total WLA**	**23.19**
	Annandale/Maple Lake/Howard Lake WWTP	1.39
	Atwater WWTP	0.55
	Belgrade WWTP	2.43
	Buffalo WWTP	5.05
	Cokato WWTP	1.28
	Dassel WWTP	1.34
	Glacial Lakes SSWD	1.57
	Great River Energy Dickinson	0.37
	Litchfield WWTP	3.62
	Montrose WWTP	1.37
	Buffalo City (MS400238)	2.19
	Litchfield City (MS400253)	1.32
	St. Michael City (MS400246)	0.05
	Construction/Industrial Stormwater	0.66
Load Allocation (LA)		**270.83**
Margin of Safety (MOS)		**33.04**
Reserve Capacity (RC)		**3.37**
Loading Capacity (LC/TMDL)		**330.43**
Existing Load		**520.33**
Estimated Load Reduction		**36.5%**

Table 20. TP Allocations for Unnamed creek (Regal Creek), Unnamed Creek to Crow River (WID 07010204-542).

Phosphorus as P Listing year: 2020 Baseline year: 2013 Numeric WQ standard used: 100 µg/L		**Flow Condition - Summer Average [lbs/day]**
Wasteload Allocation	**Total WLA**	**3.491**
	Buffalo City (MS400238)	0.008
	Monticello City (MS400242)	0.021
	Otsego City (MS400243)	0.040
	St. Michael City (MS400246)	3.104
	Albertville City (MS400281)	0.297
	MnDOT Outstate District (MS400180)	0.004
	Construction/Industrial Stormwater	0.017
Load Allocation (LA)		**3.926**
Margin of Safety (MOS)		**0.840**
Reserve Capacity (RC)		**0.140**
Loading Capacity (LC/TMDL)		**8.397**
Existing Load		**11.986**
Estimated Load Reduction		**30.0%**

Table 21. TP Allocation for Crow River, S Fk Crow to Mississippi River (WID 07010204-502).

Phosphorus as P Listing year: 2016 Baseline year: 2013 Numeric WQ standard used: 125 µg/L		Flow Condition - Summer Average [lbs/day]
Wasteload Allocation	**Total WLA**	**46.58**
	Annandale/Maple Lake/Howard Lake WWTP	1.39
	Atwater WWTP	0.55
	Belgrade WWTP	2.43
	Buffalo WWTP	5.05
	Cokato WWTP	1.28
	Dassel WWTP	1.34
	Glacial Lakes SSWD	1.57
	Great River Energy Dickinson	0.37
	Greenfield WWTP	0.29
	Litchfield WWTP	3.62
	Meadows of Whisper Creek WWTP	0.20
	Met Council - Rogers WWTP	3.57
	Montrose WWTP	1.37
	Otsego East WWTP	3.66
	Rockford WWTP	1.81
	Saint Michael WWTP	5.45
	Loretto City (MS400030)	0.02
	Corcoran City (MS400081)	0.29
	Dayton City (MS400083)	0.19
	Independence City (MS400095)	0.23
	Medina City (MS400105)	0.10
	Buffalo City (MS400238)	1.26
	Monticello City (MS400242)	0.02
	Otsego City (MS400243)	0.58
	St. Michael City (MS400246)	5.04
	Litchfield City (MS400253)	0.76
	Albertville City (MS400281)	0.32
	Hanover City (MS400286)	0.79
	Rogers City (MS400282)	2.19
	MnDOT Metro District (MS400170)	0.03
	MnDOT Outstate District (MS400180)	0.02
	Hennepin County (MS400138)	0.01
	Construction/Industrial Stormwater	0.78
Load Allocation (LA)		**299.07**
Margin of Safety (MOS)		**38.81**
Reserve Capacity (RC)		**3.63**
Boundary Condition (South Fork Crow River outlet)		**486.35**

Loading Capacity (LC/TMDL)	**874.44**
Existing Load	**1564.16**
Estimated Load Reduction	**44.1%**

Table 23. Wolf Lake (47-0016-00) phosphorus TMDL summary.

TMDL Parameter Listing year: 2020 Baseline year 2013 Water quality standard: 60 µg/L TP	**TMDL TP Load**	
	lb/yr	**lb/day**
Load Allocation	1,848	5.1
WLA for construction stormwater (MNR100001)	2.2	0.0060
WLA for industrial stormwater (MNR050000 and MNG490000)	2.2	0.0060
Margin of Safety	206	0.56
Loading capacity	2,058	5.7
Other		
Existing Load	5,410	15
Percent load reduction	62%	62%

Table 24. Dog Lake (86-0178-00) phosphorus TMDL summary

TMDL Parameter Listing year: 2020 Baseline year 2013 Water quality standard: 40 µg/L TP	**TMDL TP Load**	
	lb/yr	**lb/day**
Load Allocation	83	0.23
WLA for construction stormwater (MNR100001)	0.10	0.00027
WLA for industrial stormwater (MNR050000 and MNG490000)	0.10	0.00027
Margin of Safety	9.2	0.025
Loading capacity	92	0.26
Other		
Existing Load	119	0.33
Percent load reduction	23%	23%

Table 25. Green Mountain Lake (86-0063-00) phosphorus TMDL summary.

TMDL Parameter Listing year: 2020 Baseline year 2013 Water quality standard: 60 µg/L TP	TMDL TP Load	
	lb/yr	lb/day
Load Allocation	233	0.64
WLA for construction stormwater (MNR100001)	0.28	0.00077
WLA for industrial stormwater (MNR050000 and MNG490000)	0.28	0.00077
Margin of Safety	26	0.071
Loading capacity	260	0.71
Other		
Existing Load	1,422	3.9
Percent load reduction	82%	82%

Table 26. Lake Wilhelm (86-0020-00) phosphorus TMDL summary.

TMDL Parameter Listing year: 2022 Baseline year 2013 Water quality standard: 60 µg/L TP	TMDL TP Load	
	lb/yr	lb/day
Load Allocation	94	0.26
WLA for construction stormwater (MNR100001)	0.22	0.00060
WLA for industrial stormwater (MNR050000 and MNG490000)	0.22	0.00060
WLA for MS4 St. Michael	89	0.24
WLA for MS4 Hanover	0.82	0.0022
Margin of Safety	21	0.058
Loading capacity	205	0.56
Other		
Existing Load	645	1.8
Percent load reduction	68%	68%