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

REPLY TO THE ATTENTION OF

January 7, 2021

WW-16J

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

RE: Approval of the Roseau Watershed (Hay Creek) TMDL

Dear Mr. Skuta:

The U.S. Environmental Protection Agency has conducted a complete review of the two final Total Maximum Daily Loads (TMDLs) for Hay Creek in the Roseau River Watershed, located in Roseau County, Minnesota. The TMDLs are calculated for Total Suspended Solids (TSS) and *E. coli*, and address impairments to Aquatic Life and Aquatic Recreation designated uses respectively.

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

We wish to acknowledge Minnesota's effort in submitting these TMDLs and look forward to future submissions by the State of Minnesota. If you have any questions, please contact James Ruppel of the Watersheds and Wetlands Branch at ruppel.james@epa.gov or 312-886-1823.

Sincerely,

Digitally signed by Tera L. Fong
Date: 2021.01.07 11:26:45 -06'00'

Tera L. Fong
Division Director, Water Division

Enclosure

cc: Celine Lyman, MPCA

wq-iw5-18g

MN Roseau River Watershed TMDL Study

EPA Final Review and Decision

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.

Language referring to "the TMDL document" in this Decision Document is understood to mean the;

Roseau River Watershed TMDL Study
December 2020

Section 1. Identification of Waterbody, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the waterbody as it appears on the State's/Tribe's 303(d) list. The waterbody should be identified/georeferenced using the National Hydrography Dataset (NHD), and the TMDL should clearly identify the pollutant for which the TMDL is being established. In addition, the TMDL should identify the priority ranking of the waterbody and specify the link between the pollutant of concern and the water quality standard (WQS) (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 National Pollutant Discharge Elimination System (NPDES) permits within the waterbody. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of the natural background. This information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation.

The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as:

(1) The spatial extent of the watershed in which the impaired waterbody is located;
(2) The assumed distribution of land use in the watershed (e.g., urban, forested, agriculture)
(3) Population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) Present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and
(5) An explanation and analytical basis for expressing the TMDL through *surrogate measures*, if applicable. *Surrogate measures* are parameters such as percent fines and turbidity for sediment impairments; chlorophyll a and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Section 1 Review Comments:

The waterbody(s) are identified as they appear on the 303(d) list.

Table 1-1 of the TMDL document identifies the impaired assessment unit ID, the impaired designated uses, and the pollutants causing the impairments. This TMDL study is AUID 09020314-505, Hay Creek and addresses Aquatic Life Use impairment due to Total Suspended Solids (TSS) and Aquatic Recreation Use impairment due to *E. coli* in Hay Creek.

Table 1-1: RRW impairments addressed in this TMDL study

AUID 09020314 -	Waterbody	Impairment/Parameter	Beneficial Use	Year Listed	Addressed in this TMDL?
501	Roseau River	Mercury in Fish Tissue	Aquatic Consumption	1998	No
502	Roseau River	Mercury in Fish Tissue	Aquatic Consumption	1998	No
504	Roseau River[1]	Mercury in Fish Tissue	Aquatic Consumption	1998	No
505	Hay Creek	TSS	Aquatic Life	2018	Yes
		E. coli	Aquatic Recreation	2018	Yes
		Macroinvertebrate Bioassessments	Aquatic Life	2018	No
		Fish Bioassessments	Aquatic Life	2018	No
508	Sprague Creek	Turbidity[2]	Aquatic Life	2008	No
516	Severson Creek (Co. Ditch 23)	Macroinvertebrate Bioassessments	Aquatic Life	2018	No
541	Severson Creek (Co. Ditch 23)	Macroinvertebrate Bioassessments	Aquatic Life	2018	No
542	Pine Creek	Fish Bioassessments	Aquatic Life	2018	No

[1]Delisted for turbidity in 2018

[2]Approved for delisting of turbidity impairment – will be finalized during 2020 cycle.

Excerpted from the TMDL document

A review of Minnesota's 2018 impaired waters list as shown in TMDL Review Table 1-R confirms that the information shown in Table 1-1 of the TMDL document accurately represents the information on the list.

TMDL Review Table 1-R

Water body name	AUID	Water body description	Watershed name	Affected designated use	Pollutant or stressor
Hay Creek	09020314-505	Headwaters to Roseau R	Roseau River	Aquatic Life	Aquatic macroinvertebrate bioassessments
Hay Creek	09020314-505	Headwaters to Roseau R	Roseau River	Aquatic Life	Fishes bioassessments
Hay Creek	09020314-505	Headwaters to Roseau R	Roseau River	Aquatic Life	Total suspended solids
Hay Creek	09020314-505	Headwaters to Roseau R	Roseau River	Aquatic Recreation	Escherichia coli

[Excerpted from the 2018 MN List of Impaired Waters]

The TMDL identifies the priority ranking of the waterbody.

Section 1.3 of the TMDL document discusses the priority ranking of the waterbody.

The MPCA has aligned TMDL priorities with the watershed approach and the WRAPS cycle. The MPCA developed a state plan, Minnesota's TMDL Priority Framework Report, to meet the needs of the EPA national measure (WQ-27) under EPA's Long-Term Vision for Assessment, Restoration and Protection under the Clean Water Act Section 303(d) Program. As part of these efforts, the MPCA identified water quality impaired segments that will be addressed by TMDL studies by 2022. The RRW waters addressed by this TMDL study are part of the MPCA prioritization plan to meet EPA's national measure.
[Excerpted from the TMDL document]

The TMDL clearly identifies the pollutant(s) for which the TMDL is being established.

Table 1-1 of the TMDL document clearly identifies TSS and *E. coli* as the pollutants for which the TMDL is being established.

The link between the pollutant of concern (POC) and the water quality impairment is specified.

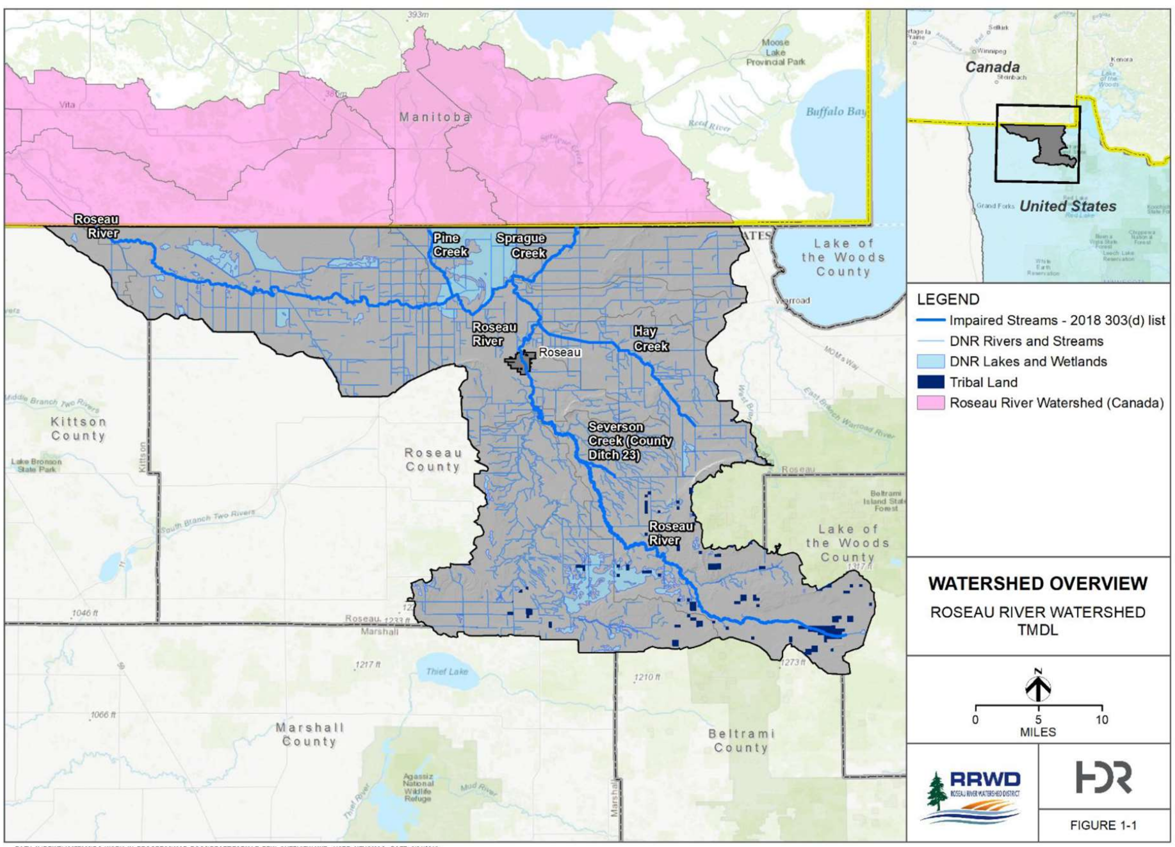
Both TSS and *E. coli* have numerically based water quality criterion, an exceedance of which is considered a basis for assessing the waterbody as impaired for those pollutants for the designated uses specified. Additional discussion of the water quality standards is provided in Section 2 of the TMDL document and reviewed in Section 2 of this Decision Document.

Waters within Indian Country, (as defined in 18 U.S.C. Section 1151) are identified and discussed.

Section 3 of the TMDL document discusses the location of tribal lands within the basin and acknowledges that the TMDL does not exercise jurisdiction over tribal lands.

Tribal lands associated with the Red Lake Band of Chippewa Ojibwe are located within the RRW. Figure 1-1 shows that the Red Lake Band of Chippewa Ojibwe land is located primarily in the southeast portion of the watershed and is not impacted by this TMDL study. The state does not have authority to assess or list impairments for waters within Tribally-owned lands. [Excerpted from the TMDL document.]

Figure 1-1 of the TMDL document shows that tribal lands are not present in the Hay Creek watershed and therefore not expected to be directly impacted by this TMDL study.



Excerpted from the TMDL document

The location and quantity of point and non-point sources are identified.

TSS

Permitted Sources (TSS)

Section 3.6.1.1 of the TMDL document discusses the permitted sources of TSS to Hay Creek.

> *The regulated sources of TSS within the RRW and the impaired streams addressed in this TMDL study include: WWTP effluent, National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) permitted feedlots (permitted to be zero-discharge), construction stormwater, and industrial stormwater.*
> *[Excerpted from the TMDL document]*

Construction and Industrial stormwater are identified as minor sources of TSS.

> *Construction activities exposing bare ground can be a large source of TSS to streams. The larger and longer an area of bare soil is exposed, the more likely soil is to erode from the landscape and enter nearby waterbodies. Industrial operations vary widely, and discharge criteria of TSS is regulated based on the specific industrial activity. Construction and industrial stormwater activities in the RRW are not of a high magnitude, and do not have enough data to support identification of site specific loading; as such, compliance with TMDLs occur under NPDES/SDS general permits for each activity. Section 4.2 discusses how these sources are included in the TMDL study's LAs.*
> *[Excerpted from the TMDL document]*

One municipal wastewater treatment plant (WWTP) discharges TSS to the impaired reach.

> *The RRW contains one WWTP, discharging to an impaired stream (Table 3-5). The Roseau WWTP is a stabilization pond system containing primary and secondary treatment ponds. The WWTP is permitted to discharge March 1 through June 30 and September 1 through December 31. Applicable permitted discharge limits for the Roseau WWTP are described in Section 4.2. This TMDL study will not result in a change to the Roseau WWTP's existing TSS limit.*
> *[Excerpted from the TMDL document]*

Table 3-5 of the TMDL document provides additional detailed information on the Roseau WWTP, including the NPDES Permit number.

Table 3-5: RRW WWTP permitted discharger

Facility	Permit Number	HUC-10 Subwatershed Name	System Type	Secondary Pond Size (ac)
Roseau WWTP	MNG580039	Hay Creek	Pond	31.0

Excerpted from the TMDL document

Section 4.2.3 of the TMDL document clarifies that there are no other regulated point sources of TSS in the watershed.

> *The only regulated sources of TSS in the Hay Creek Subwatershed are construction and industrial stormwater dischargers, and a WWTP. There are no NPDES/SDS permitted feedlots or MS4s in the drainage area.*
> *[Excerpted from the TMDL document]*

Non-Point Sources (TSS)

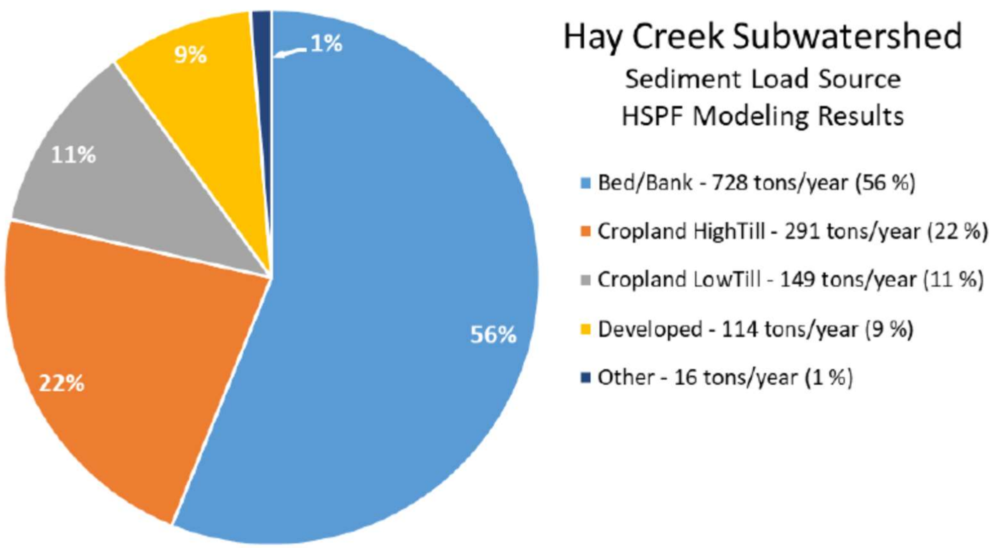
Section 3.6.1.2 of the TMDL document provides a discussion of non-permitted (non-point) sources of TSS in the watershed. Bed and bank erosion constitute the majority of the non-point source loading to Hay Creek watershed followed by erosion related to tilled cropland.

> *In the Hay Creek Subwatershed, TSS loading is comprised primarily of upland field erosion and in-channel stream bank erosion.*
> *[Excerpted from the TMDL document.]*
>
> *Cultivated land comprises 38.4% of the Hay Creek Subwatershed. These areas do not have a crop canopy for eight to nine months out of the year and, therefore, are without sufficient protection, so these areas can become primary sources of upland sediment.*
> *[Excerpted from the TMDL document.]*
>
> *In-stream channel and bank erosion can be accelerated by changes to the landscape such as channelization of waterways, drainage, modification to riparian vegetation, increases in impervious surfaces or precipitation causing more runoff, and livestock access to streams. According to the MPCA (2013), 68% of the watercourses in the Hay Creek Subwatershed have been physically altered, though channelization, or ditching. This includes the entire length of Hay Creek itself, as shown in Figure 3-10. Channels were often straightened and widened in an effort to alleviate flooding. Each modification results in increases in slope, stream velocity, and channel erosion.*
> *[Excerpted from the TMDL document.]*
>
> *The RRW SID Report (MPCA 2018a) highlighted a number of potential sources of increased sediment to Hay Creek. Past channelization and ditch maintenance have increased the velocity and strength of water flow, and acted to disconnect or remove the floodplain during high flow conditions. Channel modifications are likely a primary contributor to the altered hydrology of the reach, as stated in the repot: "the reach is prone to extreme peak flows, as well as periods of minimal flow." These items act to increase stream flow velocities and intensify erosion. The erosion results in deposition along flatter sloped reaches of the stream. In lesser channelized locations, the Stressor ID report indicated signs of cattle grazing in the channel, linking these activities with increased erosion.*
> *[Excerpted from the TMDL document]*

The Hydrological Simulation Program—Fortran (HSPF) model was used to analyze and quantify the various NPS sources of sediment. Figure 3-11 of the TMDL document provides a summary of sediment sources by source type based on modeling results.

The HSPF modeling was set up to account for the varying landscapes of the watershed, including upland and in-stream erosion. The TSS loading data for the 2005 to 2014 period were extracted from the model using SAM. Figure 3-11 shows that 56% of the TSS load at the outlet of Hay Creek originates from instream and bank erosion processes, while approximately 33% of the TSS results from upland agricultural sources. Figure 3-12 and Figure 3-13 describe spatially where the sediment originates. The HSPF modeling shows that 31% of the TSS comes from reach A247, and over 75% of the sediment originates in the downstream half of the subwatershed. Increased sediment sources in the downstream portion of Hay Creek are consistent with the Glacial Lake Agassiz Basin ecoregion, and the highly cultivated areas. The results shown in Figure 3-13 can also be used for prioritization of protection strategies based on the relative magnitude of sediment yield.
[Excerpted from the TMDL document]

Figure 3-11: Hay Creek Subwatershed sediment source loading summary by source type. HSPF modeling results over the analysis period (2005 to 2014).

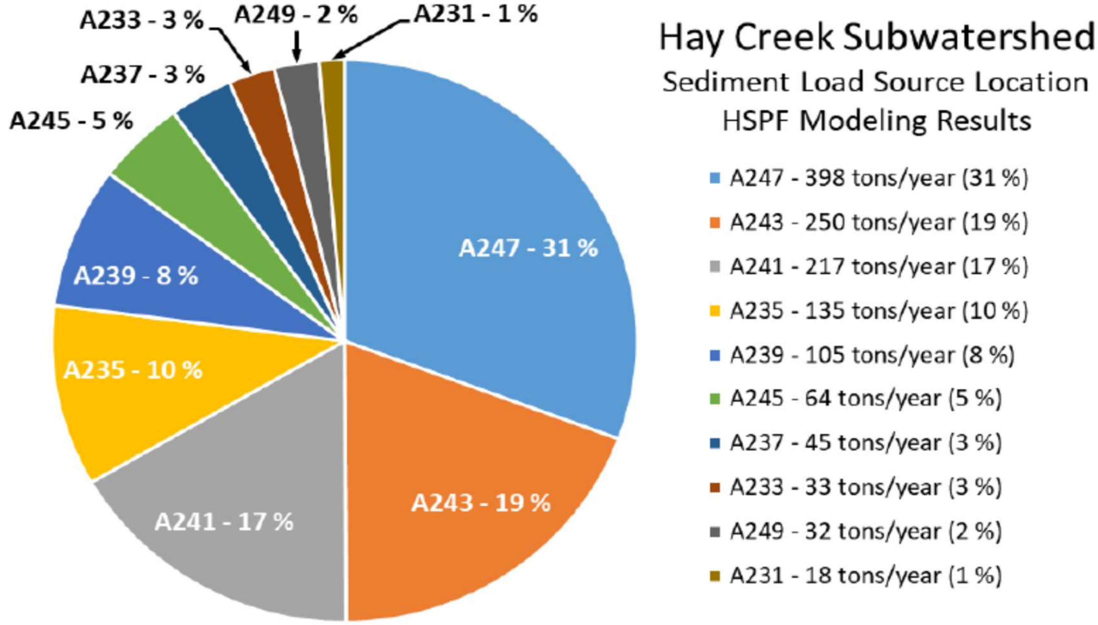


*Other Sediment Source Loads in descending order include: Developed Effective Impervious Area (EIA), Roseau WWTP, Woody Wetlands, Pasture, Deciduous Forest, Coniferous Forest, Grassland, and Herbaceous Wetlands.

Excerpted from the TMDL document

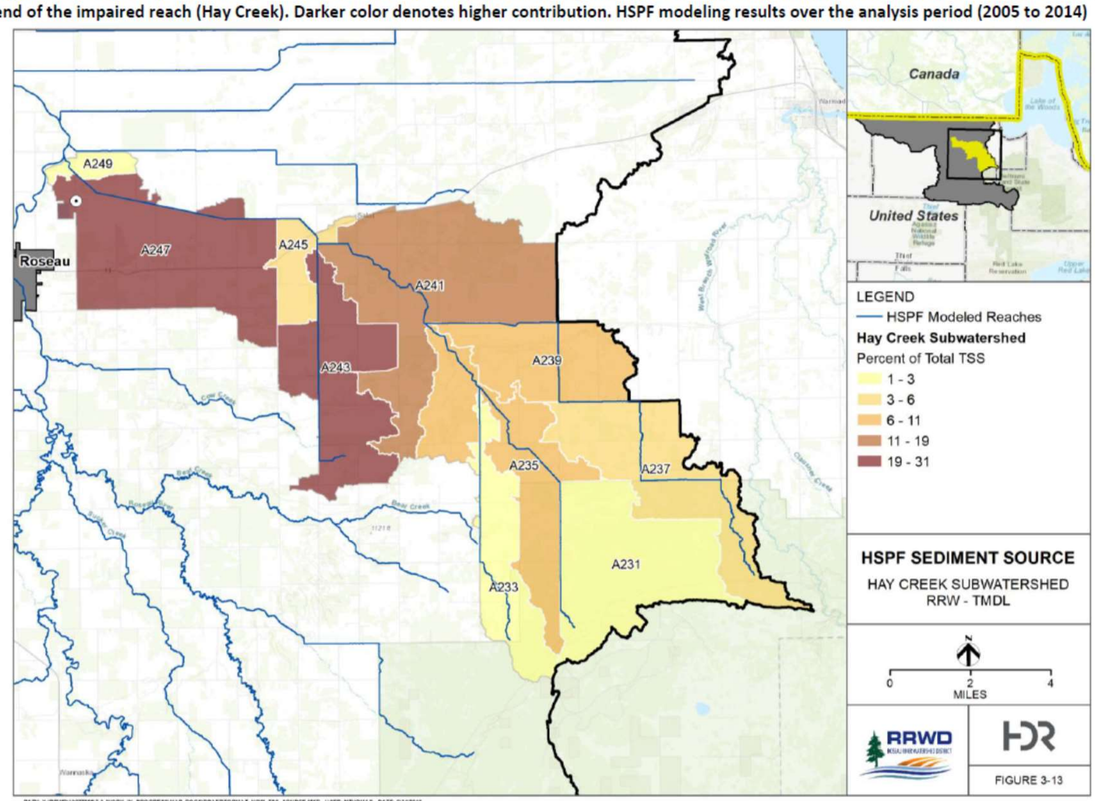
Figures 3-12 and 3-13 of the TMDL document provide a sediment source summary based on source locations with the Hay Creek Subwatershed.

Figure 3-12: Hay Creek Subwatershed sediment source loading summary, by source location. HSPF modeling results over the analysis period (2005 to 2014).



Excerpted from the TMDL document

Figure 3-13: Hay Creek Subwatershed sediment source loading summary map. The figure is colored by the percent of total load each sub-basin contributes to the end of the impaired reach (Hay Creek). Darker color denotes higher contribution. HSPF modeling results over the analysis period (2005 to 2014)



Excerpted from the TMDL document

E. coli

Section 3.6.2 of the TMDL document discusses the sources of *E. coli* to Hay Creek.

> *Bacteria is naturally occurring in the environment; however, bacteria concentrations can be increased through a number of sources including humans, companion animals, and livestock. Many factors contribute to the complex relationship between bacteria sources and in-stream bacteria concentrations including livestock management practices, wildlife activities, land use practices, stream flow, temperature, resuspension, and other environmental factors.*
> *[Excerpted from the TMDL document]*
>
> *Identification and quantification of the bacteria sources to the stream were completed through the following steps:*
>
> *1. Identify and quantify the magnitude of potential bacteria sources which could contribute E. coli to Hay Creek. Potential sources include: permitted sources (WWTPs, industrial facilities, municipal stormwater discharge, and confined animal feeding operations), and non-permitted sources (subsurface sewage treatment systems [SSTS], companion animals, livestock, and wildlife);*
> *2. Assign a bacteria production rate to each identified source based on literature values; and*
> *3. Summarize the relative loading from each identified source of bacteria. Bacteria production rates are applied to the potential sources and magnitudes estimated. This information was aggregated to describe the relative impact of each source.*
>
> *[Excerpted from the TMDL document.]*

Permitted Sources (E. coli)

MPCA noted that there is one WWTP discharging *E. coli* to Hay Creek.

> *In the Hay Creek Subwatershed, there is only one point source discharger, the Roseau WWTP. A WWTP operating under an NPDES/SDS permit is required to reduce fecal coliform concentrations to 200 org/100mL (E. coli - 126 org/100mL) or less. The function of this limit is to ensure the wastewater effluent has been adequately disinfected, and no longer poses a risk to human health through recreational activities. The Roseau WWTP is a stabilization pond system with primary and secondary cells. This WWTP discharges treated effluent to the surface water in the spring (March through June) and again in the fall (September through December). Table 3-6 provides the permitted discharge volume and bacteria load of Roseau WWTP. This TMDL study will not result in a change to the Roseau WWTP's existing E. coli limit.*
> *[Excerpted from the TMDL document]*

Table 3-6 of the TMDL document provides additional details about the Roseau WWTP, including the NPDES permit number and bacteria load.

Table 3-6: WWTP permitted flows and bacteria loads in Hay Creek

Facility	Permit Number	HUC-10 Subwatershed Name	System Type	Secondary Pond Size (acres)	Discharge Volume (MGD)	Bacteria Load as *E. coli* (billion organisms/day)[1]
Roseau WWTP	MNG580039	Hay Creek	Pond	31.0	5.05	24.1

[1] Bacteria loading is based on the *E. coli* limit of 126 org/100mL

Excerpted from the TMDL document

Section 4.3.3 of the TMDL document provides further discussion on the permitted sources of *E. coli* to Hay Creek. Construction and industrial stormwater are not regulated sources of *E. coli* in the watershed, nor are any MS4s or CAFOs in the drainage area

> *Construction stormwater is not regulated for bacteria, but is regulated for sediment. Stormwater controls for sediment also reduce bacteria loading, and are assumed to limit bacteria input from construction stormwater to the streams. Industrial stormwater is not regulated for bacteria and industrial stormwater is generally not considered to contribute to bacteria impairments and should not receive a WLA, except in special circumstances (MPCA 2009). Special circumstances include industrial dischargers operating under individual permits that monitor bacteria indicators. Such circumstances are not applicable to industrial dischargers in the RRW. As such, the only regulated sources of E. coli in the Hay Creek Subwatershed is the Roseau WWTP. There are no NPDES/SDS permitted Concentrated Animal Feeding Operation (CAFOs) or MS4s in the drainage area.*
> *[Excerpted from the TMDL document]*

Non-Point Sources (E. coli)

Non-point sources of *E. coli* discussed in Section 3.2.6.1 of the TMDL document include failing subsurface sewage treatment systems (SSTS), companion animals, livestock, wildlife, and natural background sources. The majority of *E coli* non-point source loading (92%) are shown to be related to livestock production, mostly (87%) related to cattle production.

<u>SSTS - septic systems *(E. coli)*</u>

> *Non-compliant SSTSs can become an important source of bacterial contamination to surface waters, especially during dry periods when stream flows are low and SSTSs continue to discharge. An SSTS discharging untreated wastewater to the ground surface, road ditches, tile lines, or directly into streams is considered an Imminent Threat to Public Health (ITPH). The MPCA (2011) reports failing SSTSs by county from 2000 to 2009. The Hay Creek Subwatershed lies completely within Roseau County, which has an estimated 4% ITPH septic systems. The rural population in Hay Creek Subwatershed was estimated based on the 2010 census data, and multiplied by the rate of failing SSTSs to obtain an estimated loading rate.*

> *Therefore, of the rural pollution in the Hay Creek Subwatershed, an estimated 4% or 30 residents have failing SSTSs. This is a small source category.*
> *[Excerpted from the TMDL document]*

<u>Companion Animals *(E. coli)*</u>

> *According to the American Veterinary Medical Association's data (AVMA 2007), 34.2% of households in Minnesota own dogs and each of these households has 1.4 dogs. Furthermore, 38% of dog waste is not collected by owners and is capable of contributing to surface waters (TBEP 2012). Bacteria loading from dogs was estimated based on total households in the Hay Creek Subwatershed (U.S. Census Bureau 2010a and 2010b).*
> *[Excerpted from the TMDL document.]*

<u>Livestock *(E. coli)*</u>

Populations of livestock animals in the watershed was estimated based on USDA statistics for the entire county and the portion of the county within the Hay Creek subwatershed. The results are presented in Table 3-7 of the TMDL document.

> *Livestock have the potential to contribute bacteria to surface water through grazing and runoff, direct stream input, and improper management and storage of manure. The United States Department of Agriculture (USDA) National Agricultural Statistic Service (NASS) provides livestock populations by county. The most recent USDA census of agriculture occurred in 2012; livestock numbers for Roseau County are tabulated in Table 3-7. Livestock populations are assumed to be distributed evenly across the county. Hay Creek Subwatershed makes up 5.7% of Roseau County, so it is assumed 5.7% of the livestock population is located in Hay Creek Subwatershed. Roseau County has a large turkey population. However, there are no permitted turkey feedlots in Hay Creek Subwatershed, so it was assumed turkeys do not contribute to the Hay Creek Subwatershed bacteria loading. This (livestock) is the dominant source category.*
> *[Excerpted from the TMDL document]*

Table 3-7: Livestock population estimates in Roseau County and Hay Creek Subwatershed (USDA 2013)

Animal		Livestock Estimates*	
		Roseau County	Hay Creek
Cattle	All	16,701	965
	Beef	6,884	398
	Dairy	1,469	85
	Cattle on Feed	8,348	482
Hogs	-	8,529	493
Sheep	-	1,027	60
Goats	-	237	14
Horses	-	837	49
Poultry	Layers	727	42
	Pullets	64	4
	Boilers	236	14

*Based on 2012 USDA agricultural census data

Excerpted from the TMDL document

Wildlife *(E. coli)*

Wildlife are considered a minor source of *E. coli* within the watershed. Table 3-8 provides a summary of the information used to estimate wildlife populations within the basin.

> *Hay Creek Subwatershed partially lies in the NMW Ecoregion, offering numerous places for wildlife to congregate, live, and provide a source of bacteria to the impaired reach of Hay Creek. In this assessment, the wildlife considered as potential sources of bacteria include deer, geese, and ducks. Other animals, which could live in the watershed including beaver, raccoons, coyotes, foxes, and squirrels, were not explicitly reported in Table 3-10. It is assumed that the bacteria loading of these animals is lower than the wildlife reported. However, the bacteria loading contributed by these animal groups is accounted for in the observed bacteria data, which is used to develop the LDCs and the estimated load reductions needed for bacteria. This is a minor source category.*
> *[Excerpted from the TMDL document]*

Table 3-8: Wildlife population estimate data sources

Bacteria Source	Population Estimate Source and Assumptions
Deer	The DNR report "Status of Wildlife Populations, Fall 2014" (DNR 2014) includes numerous studies which estimate wildlife populations of various species. Pre-fawn deer densities were reported by permit area. Permit area 105 covers all of Hay Creek Subwatershed, densities were attributed to all NLCD 2011 land uses except open water. An average of the 2009 to 2014 densities was used.
Geese	The DNR report "Status of Wildlife Populations, Fall 2014" (DNR 2014) includes numerous studies which estimate wildlife populations of various species. Geese counts were reported annually by ecoregion. Counts from 2005 to 2014, were averaged and used to calculate a population density. An area-weighted estimate was used to determine geese population density, and applied to the Hay Creek Subwatershed.
Ducks	Duck pair density population estimates from the USFW service commonly called the "Thunderstorm Maps" provided input duck populations (MPCA 2011).

Excerpted from the TMDL document

Natural Background *(E. coli)*

A brief discussion of potential natural background sources is provided in the TMDL document. Natural background sources are considered to be minor.

Additional discussion is provided in Section 4.1.1 of the TMDL document.

> *Natural background conditions were also evaluated, where possible, within the modeling and source assessment portion of this study. These source assessment exercises indicate natural background inputs are generally low compared to livestock, cropland, streambank, WWTPs, failing SSTSs, and other anthropogenic sources.*
> *[Excerpted from the TMDL document.]*

Section 3.6.2.2 of the TMDL document discusses the estimated bacterial production rates of the assessed sources of *E. coli* in the watershed. The results are presented in Table 3-9 of the TMDL document.

> *The EPA's document Protocol for Developing Pathogen TMDLs (EPA 2001) provides a summary of source-specific pathogen and fecal indicator concentrations. Productions rates described in the EPA document were provided in fecal coliform, and converted to E. coli equivalents (200 org/100mL fecal coliform to 126 org/100mL E. coli). Fecal coliform rates, E. coli rates, and references for production rates are included in Table 3-9.*
> *[Excerpted from the TMDL document.]*

Table 3-9: Bacteria production rates

Source Category	Producer	Production Rate (billion org/day-head)		Literature Source
		Fecal Coliform	*E. coli*	
Humans	Humans	2	1.3	Metcalf and Eddy (1991)
	Companion Animals	5	3.2	Horsley and Witten (1996)
Livestock	Cattle	100	63	ASAE (1998)
	Hogs	10	6.3	ASAE (1998)
	Sheep and Goats	12	7.6	ASAE (1998)
	Horses	0.42	0.26	ASAE (1998)
	Chickens	0.14	0.09	ASAE (1998)
Wildlife	Deer	0.36	0.23	Zeckoski et al (2005)
	Geese	49	31	LIRPB (1978)
	Ducks	2.5	1.6	ASAE (1998)

Excerpted from the TMDL document

An *E. coli* source summary was conducted by MPCA and the results are presented in Table 3-10 of the TMDL document. The analysis showed that an estimated 92% of the *E. coli* load was related to livestock sources, and 87% was due to cattle production.

The bacteria evaluation was completed through a GIS desktop analysis, using generalized bacteria production rates. Population estimates were based on county, state, and regional scale data. These were formulated to be the most relevant for Hay Creek Subwatershed. Uncertainty can be attributed to a lack of knowledge of the spatial distribution of the data. Only the source and magnitude of bacteria were estimated in this assessment, omitting the fate and transport of bacteria. Bacteria die off, travel time, and transport mechanisms impact how much of the bacteria source is transported to the stream.
[Excerpted from the TMDL document]

Table 3-10: Summary of *E. coli* production estimates

Source Category	Producer	*E. coli* Source – Hay Creek	
		E. coli (billion org/day)	% of total
Humans	**All**	**260**	**0%**
	WWTP	23	0%
	SSTS	38	0%
	Companion Animals	198	0%
Livestock	**All**	**64,479**	**92%**
	Cattle	60,795	87%
	Hogs	3,106	4%
	Sheep and Goats	559	1%
	Horses	13	0%
	Poultry	5	0%
Wildlife	**All**	**5,484**	**8%**
	Deer	205	0%
	Geese	4,507	6%
	Ducks	772	1%
Total		**70,222**	

Excerpted from the TMDL document

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 1.

Section 2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. (40 C.F.R. §130.7(c)(1)). EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

The TMDL submittal must identify a numeric water quality target(s) – a quantitative value used to measure whether or not the applicable water quality standard is attained. Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. Occasionally, the pollutant of concern is different from the pollutant that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as Dissolved Oxygen (DO) criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

Section 2 Review Comments:

Applicable WQS are identified, described, and a numerical water quality target is included.

Section 2 of the TMDL document provides a detailed presentation and discussion of the applicable WQS for Hay Creek.

> *Generally, waters within the RRW are classified as class 2 waters, indicating they are protected for aquatic life and aquatic recreation. Protection, in accordance with Minnesota State Statute 7050.0150, is defined by the Minnesota Narrative standard below:*
>
> > *"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 aquatic biota 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 aquatic biota normally present shall not be prevented or hindered by the discharge of any sewage, industrial waste, or other wastes to the waters."*
>
> *The impaired waters in Hay Creek have been assigned 2Bg (MPCA 2017), aquatic life and recreation – general warm water habitat, use classification. The narrative water quality standards associated with a 2Bg classification from Minnesota State Statute*

7050.0222:

"'General cool and warm water aquatic life and habitat' or 'class 2Bg' is a beneficial use that means waters capable of supporting and maintaining a balanced, integrated, adaptive community of warm or cool water aquatic organisms having a species composition, diversity, and functional organization comparable to the median of biological condition gradient level 4 as established in Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012)."

[Excerpted from the TMDL document]

Table 2-1 of the TMDL document presents the water quality standard, water quality criterion, applicable time period for each parameter, including both the chronic and acute values for *E. coli*. While the TMDL for *E. coli* was calculated using the 126 org/100 mL geometric mean portion of the WQS, both parts of the criteria are applicable.

Table 2-1: Applicable water quality standards in the Roseau River Watershed

Parameter	Water Quality Standard	Criteria	Applicable Time Period
Total Suspended Solids – Central Nutrient Region	Not to Exceed 30 mg/L; TSS standards for Class 2B may be exceeded no more than 10% of the time	≤ 30 mg/L	April 1 – September 30
E. coli	Not to exceed 126 organisms per 100 milliliters (org/100 mL) as a geometric mean within a calendar month	≤ 126 org/100 mL (*geometric mean*)	April 1 – October 31
	Not to exceed 1,260 organisms per 100 milliliters (org/100 mL) for more than 10 % of samples during a calendar month	≤ 1260 org/100 mL (*10% of Samples*)	April 1 – October 31

Excerpted from the TMDL document

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 2.

Section 3. Loading Capacity - Linking Water Quality and Pollutant Sources

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

The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is additionally expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement chosen. The TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

The TMDL submittal should contain documentation supporting the TMDL analysis, including the basis for any assumptions; a discussion of strengths and weaknesses in the analytical process; and results from any water quality modeling. EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

TMDLs must take into account *critical conditions* for steam flow, loading, and water quality parameters as part of the analysis of loading capacity. (40 C.F.R. §130.7(c)(1)). TMDLs should define applicable *critical conditions* and describe their approach to estimating both point and nonpoint source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

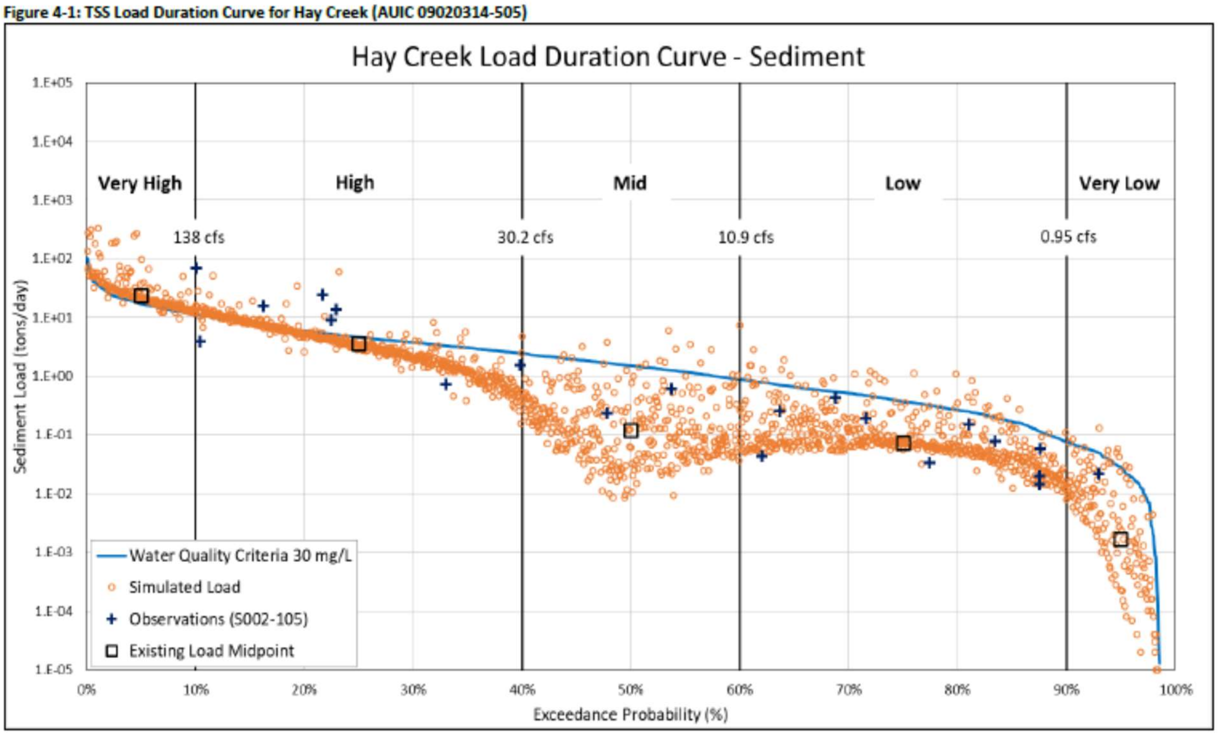
Section 3 Review Comments:

The loading capacity is presented for the pollutant of concern (including daily loads).

TSS Loading Capacity

Figure 4-1 of the TMDL document presents the TSS loading capacity for Hay Creek in the form of a load duration curve in units of tons of sediment per day.

Figure 4-1: TSS Load Duration Curve for Hay Creek (AUIC 09020314-505)



Excerpted from the TMDL document

Table 4-3 of the TMDL document presents the TSS loading capacity for Hay Creek in tabular format and units of Tons of TSS per day broken down by flow regimes.

Table 4-3: Hay Creek ~~(09040314-505)~~ TSS TMDL summary

- **303(d) listing year: 2018** (EPA notes that Hay Creek AUID should read 09020314-505)
- **Baseline year(s): 2005-2014**

Hay Creek - Total Suspended Solids		Flow Condition*				
		Very High	High	Mid	Low	Very Low
		Tons per day				
Loading Capacity		**17.0**	**4.62**	**1.51**	**0.37**	**0.028**
Wasteload Allocations	**Total WLA**	**0.99**	**0.96**	**0.95**	**	**
	Roseau WWTP (MNG580039)	0.95	0.95	0.95	**	**
	Construction Stormwater (MNR100001)	0.02	0.005	0.002	**	**
	Industrial Stormwater (MNR500000)	0.02	0.005	0.002	**	**
Load Allocations	**Total LA**	**14.29**	**3.20**	**0.41**	**	**
Margin of Safety - MOS (10%)		1.70	0.46	0.15	**	**
Existing Load		**23.10**	**3.48**	**0.12**	**0.07**	**0.002**
Estimated Load Reduction		**6.10**				
Percent Reduction		**27%**				

*HSPF simulated flow and TSS loading were used to develop the flow zones and loading capacities for this reach.

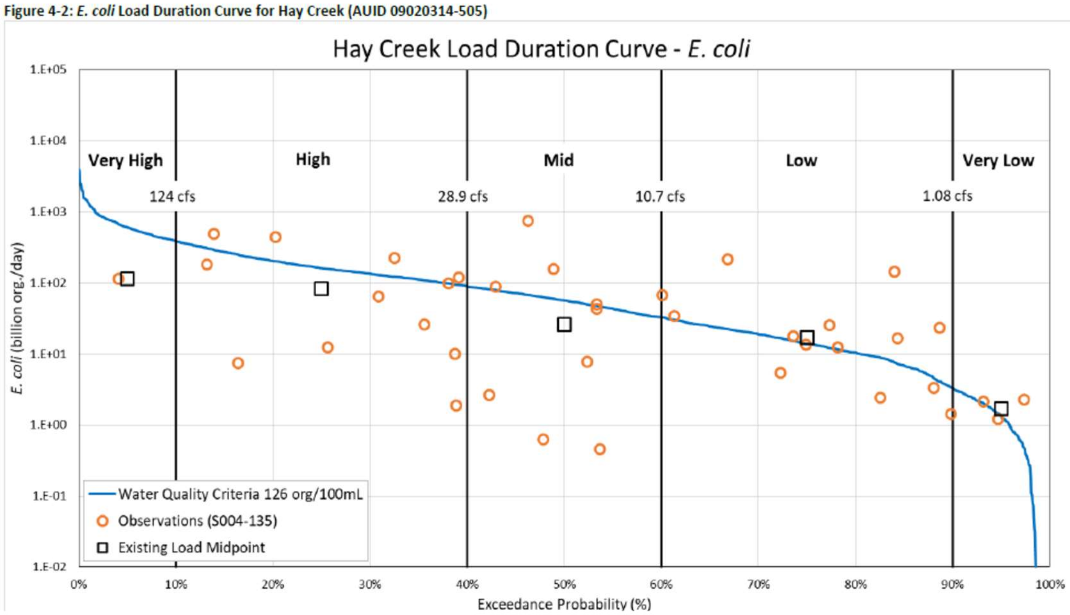
**The WLA for the permitted wastewater discharger is based on a facility design flow. The WLA exceeded the very low-flow and low-flow zone total daily LC (minus the MOS). For these flow zones, the WLA and LAs are determined by the following formula: Allocation = (flow contribution from a given source) X (TSS concentration limit or standard).

Excerpted from the TMDL document (AUID Corrected by EPA)

E coli Loading Capacity

Figure 4-2 of the TMDL document presents the *E. coli* loading capacity for Hay Creek in the form of a flow duration curve in units of billions of organisms per day.

Figure 4-2: ***E. coli*** **Load Duration Curve for Hay Creek (AUID 09020314-505)**



Excerpted from the TMDL document

Table 4-6 of the TMDL document presents the *E. coli* loading capacity for Hay Creek in tabular format and units of billions of organisms per day, broken down by flow regimes.

Table 4-6: Hay Creek (~~09040314-505~~) ***E. coli*** **TMDL summary**

- **303(d) listing year: 2018**
- **Baseline year(s): 2005-2014**

(EPA notes that Hay Creek AUID should read 09020314-505)

Hay Creek - *E. coli*		Flow Condition				
		Very High	**High**	**Mid**	**Low**	**Very Low**
		Billion Organisms per day				
Loading Capacity		**602**	**161**	**56.5**	**13.8**	**1.3**
Wasteload Allocations	**Total WLA**	**24.1**	**24.1**	**24.1**	**	**
	Roseau WWTP (MNG580039)	24.1	24.1	24.1	**	**
Load Allocations	**Total LA**	**518**	**120**	**26.8**	**	**
Margin of Safety - MOS (10%)		60.2	16.1	5.6	**	**
Existing Load		**114**	**81.9**	**25.6**	**16.8**	**1.68**
Estimated Load Reduction					**3.06**	**0.35**
Percent Reduction					**18%**	**21%**

*HSPF-simulated flow was used to develop the flow zones and loading capacities for this reach.
**The WLA for the permitted wastewater discharger is based on a facility design flow. The WLA exceeded the very low-flow and low-flow zones total daily LC (minus the MOS). For these flow zones, the WLA and LAs are determined by the following formula: Allocation = (flow contribution from a given source) X (*E. coli* concentration limit or standard).

Excerpted from the TMDL document (AUID Corrected by EPA)

The method to establish a cause and effect relationship between the POC and the numerical target is described, and the TMDL analysis is documented and supported

TSS Loading Capacity Methodology

Section 4.2.1 of the TMDL document provides a discussion of the methodology used to develop the load duration curves used to determine the TSS load capacity of Hay Creek consistent with meeting WQS. The HSPF model was used to simulate flow data.

The most recent 10 years of modeled results were used as the evaluation period (2005 to 2014). A Flow Duration Curve (FDC) was created for this period, by ranking the modeled daily average flows and assigning a percent exceedance value to each flow. Each flow exceedance pair represents the frequency for which the flow rate is exceeded (the maximum flow is exceeded 0% of the time, while the minimum flow is exceeded 100% of the time). Figure 4-1 shows the LDC in blue, which was created by multiplying the FDC by the TSS criteria of 30 mg/L. The LDC shown in blue represents the LC of the system, since the line is based on the water quality criteria. Water quality under the LDC (blue line) is below the criteria, while anything above the LDC is exceeding the numeric criteria. The TSS water quality criteria allows for exceedance of the 30 mg/L threshold up to 10% of the time, as described in section 2.2. The LDC shown in blue represents the 30 mg/L standard, which does not take into account the 10% exceedance. This does not modify the approach to compute the TMDL, but creates an implicit MOS in the TMDL calculations.
[Excerpted from the TMDL document]

E. coli Loading Capacity Methodology

Section 4.3.1 of the TMDL document provides a thorough discussion of the methodology used to develop the load duration curves used to determine the *E. coli* load capacity of Hay Creek consistent with meeting WQS.

The E. coli load reductions were computed using the LDC approach discussed in Section 4.2. The E. coli criteria for this reach are only applicable between April 1 and October 31. For this reason only simulated flow results within the specified period were used for the creation of the LDC. The most recent 10 years of model results were used as the evaluation period (2005 to 2014). Figure 4-2 shows the LDC in blue, which was created by multiplying the FDC by the E. coli criteria of 126 org/100 mL. The LDC shown in blue represents the LC of the system, since the line is based on the water quality criteria. Water quality under the line is below the criteria, while the anything above the line is exceeding the numeric criteria.
[Excerpted from the TMDL document]

The critical conditions for meeting WQS are described and accounted for.

Both TSS and *E. coli* WQS are based on concentration specific water quality criteria. Determination of the loading capacity for both TSS and *E. coli* utilize the load duration curve method to determine the load required to meet WQS under all flow conditions such that the concentration based water quality criterion will not be exceeded. The load duration curve method ensures that the flow conditions critical to meeting WQS are accounted for in the analysis. For both Tables 4.3 and 4.6 of this Decision Document, the loading capacity only shows five points, the midpoint of each designated flow regime. Ultimately, the entire curve in Figures 4-1 and 4-2 of this Decision Document represents the TMDL, and the entire curve is what EPA is approving.

TSS

Section 4.2.5 of the TMDL document provides additional discussion on the impacts of seasonal influences on when critical conditions would apply, and on the flow regime at which current TSS monitoring data indicate it is most important to concentrate load reduction efforts.

Table 4-2 of the TMDL document provides a summary of the critical flow conditions for which TSS load reductions are needed.

Table 4-2: Maximum required TSS loading reductions for Hay Creek

Impaired Water (AUID 09020314-XXX)	Total Suspended Solids	
	Maximum Load Reduction (%)	Critical Flow Regime
Hay Creek (505)	27%	Very High

Excerpted from the TMDL document

E. coli

Section 4.3.5 of the TMDL document provides additional discussion on the impacts of seasonal influences on when critical conditions would apply, and on the flow regime at which current *E. coli* monitoring data indicate it is most important to concentrate load reduction efforts.

Table 4-5 of the TMDL document provides a summary of the critical flow conditions for which *E. coli* load reductions are needed.

Table 4-5: Maximum required *E. coli* loading reductions for Hay Creek

Impaired Water (AUID 09020314-XXX)	*E. coli*	
	Maximum Load Reduction (%)	Critical Flow Regime
Hay Creek (505)	18%	Low
Hay Creek (505)	21%	Very Low

Excerpted from the TMDL document

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 3.

Section 4. Load Allocations (LAs)

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

Section 4 Review Comments

The load allocations for existing NPS are accounted for (and future if applicable).

TSS Load Allocations

Section 4.2.2 of the TMDL document provides a description of how the load allocation for TSS is calculated.

The LA represents the portion of the LC that is designated for nonpoint sources of TSS. The LA is the remainder of the LC once the WLA, MOS, and RC have been allocated. Section 3.6.2 discusses the non-point sources of sediment along Hay Creek in more detail.
[Excerpted from the TMDL document.]

Table 4-3 of the TMDL document and in this Decision Document show the TSS load allocation for Hay Creek in units of tons of TSS per day.

E. coli Load Allocations

Section 4.3.2 of the TMDL document provides a description of how the load allocation for *E. coli* is calculated.

The LA represents the portion of the LC that is designated for non-point sources of E. coli. The LA is the remainder of the LC once the WLA, MOS, and RC have been allocated. Section 3.6.2 discusses the sources of bacteria along Hay Creek in more detail.
[Excerpted from the TMDL document.]

Table 4-6 of the TMDL document and in this Decision Document show the *E. coli* load allocation for Hay Creek in units of billions of organisms per day.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 4.

Section 5. Wasteload Allocations (WLAs)

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

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

Section 5 Review Comments

The waste load allocations are properly assigned

TSS WLAs

Table 4-3 of the TMDL document and in this Decision Document show the TSS waste load allocations for Hay Creek in units of tons of TSS per day.

NPDES Permitted Wastewater Treatment Plants and Industrial Point Source TSS WLAs

Section 4.2.3.3 of the TMDL document provides a discussion of the methodology used to compute the WLA for the Roseau WWTP (MNG580039).

The Roseau WWTP (MNG580039) is the only municipal WWTP discharging to the Hay Creek Subwatershed. Discharge from this WWTP is limited to one secondary treatment cell. The NPDES/SDS permit allows for two discharge windows: between March 1 and June 30 and between September 1 and December 31, with no discharge to ice covered waters. A WWTP is allowed to discharge up to 6 inches of volume from the secondary treatment pond in a 24-hour period. The WLAs were computed for TSS based on the permitted discharge volume, and an NPDES/SDS average monthly discharge limit of 45 mg/L (converted to tons/day) (Table 4-1). The TSS WLA for the Roseau WWTP is consistent with their current permitted limit; therefore, this TMDL study will not result in a change to the WWTP's TSS limit.
[Excerpted from the TMDL document]

Table 4-1 of the TMDL document provides a summary of the Roseau WWTP permitted waste load allocation.

Table 4-1: WWTP design flows and permitted TSS loads

Facility	Permit Number	HUC-10 Subwatershed Name	System Type	Secondary Pond Size (acres)	Discharge Volume (MGD)	TSS Limit - Daily (mg/L)	TSS WLA - Daily (ton/day)
Roseau WWTP	MNG580039	Hay Creek	Pond	31.0	5.05	45	0.95

Excerpted from the TMDL document

Construction and Industrial Stormwater Source TSS WLAs

Sections 4.2.3.1 and 4.2.3.2 of the TMDL document discuss respectively how the construction and industrial stormwater TSS WLAs were allocated.

The MPCA provides guidance for setting WLAs for construction stormwater to 0.05% to 0.15% of the overall TMDL, minus the MOS (MPCA 2011). WLAs for construction stormwater activities were assigned a categorical allocation of 0.1% of the TMDL minus the MOS. A review of the construction stormwater permits in Hay Creek Subwatershed during the analysis period (2005 to 2014) showed the value of 0.1% to be a reasonable approximation of the average annual fraction of the watershed to be under construction activities.
[Excerpted from the TMDL document]

Industrial stormwater is regulated by NPDES/SDS permits if the industrial activity has the potential for significant materials and activities to be exposed to stormwater discharges. The WLAs for industrial stormwater activities were assigned a categorical allocation equal to the construction stormwater WLAs, as industrial activities make up a small fraction of the watershed area.
[Excerpted from the TMDL document]

MS4 TSS WLAs

No waste load allocation is provided in the TMDL for MS4 sources of TSS as there are currently no MS4s within the Hay Creek watershed. Section 5.1 of the TMDL document includes a discussion of how an existing WLA transfer process agreed upon between EPA and the State could be used to accommodate future MS4 designated areas within the watershed.

E. coli WLAs

NPDES Permitted Wastewater Treatment Plants and Industrial Point Source E. coli WLAs

Section 4.3.3.1 of the TMDL document provides a discussion of the methodology used to compute the WLA for the Roseau WWTP (MNG580039). Table 4-4 of this Decision Document contains the approved WLAs for this TMDL.

> *The Roseau WWTP (MNG580039) is the only municipal WWTP discharging to the Hay Creek Subwatershed. Discharge from this WWTP is limited to one secondary treatment cell. The NPDES/SDS permit allows for two discharge windows: between March 1 and June 30 and between September 1 and December 31, with no discharge to ice covered waters. A WWTP is allowed to discharge up to 6 inches of volume from the secondary treatment pond in a 24-hour period. The WLAs were computed for E. coli based on the permitted discharge volume, and an NPDES/SDS discharge limit of 200 org/100 mL fecal coliform. Fecal coliform loading was converted to E. coli by using the ratio of 126 org/100 mL E. coli to 200 org/100 mL fecal coliform. Table 4-4 shows the WLA calculated for the Roseau WWTP discharging into Hay Creek. The E. coli WLA for the Roseau WWTP is consistent with their current permitted limit; therefore, this TMDL study will not result in a change to the WWTP's E. coli limit.*
> *[Excerpted from the TMDL document]*

Table 4-4: *E. coli* WLA for Hay Creek WWTPs

Facility	Permit Number	HUC-10 Subwatershed Name	System Type	Secondary Pond Size (acres)	Discharge Volume (MGD)	Bacteria Load as *E. coli* (billion organisms/day)
Roseau WWTP	MNG580039	Hay Creek	Pond	31.0	5.05	24.1

Excerpted from the TMDL document

Construction, Industrial, and MS4 Stormwater Source E. coli WLAs

WLAs are not provided for construction, industrial, or municipal (MS4) stormwater sources, as these sources are not regulated for *E. coli* within the Hay Creek watershed.

> *Construction stormwater is not regulated for bacteria, but is regulated for sediment. Stormwater controls for sediment also reduce bacteria loading, and are assumed to limit bacteria input from construction stormwater to the streams. Industrial stormwater*

is not regulated for bacteria and industrial stormwater is generally not considered to contribute to bacteria impairments and should not receive a WLA, except in special circumstances (MPCA 2009). Special circumstances include industrial dischargers operating under individual permits that monitor bacteria indicators. Such circumstances are not applicable to industrial dischargers in the RRW. As such, the only regulated sources of E. coli in the Hay Creek Subwatershed is the Roseau WWTP. There are no NPDES/SDS permitted Concentrated Animal Feeding Operation (CAFOs) or MS4s in the drainage area.
[Excerpted from the TMDL document]

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 5.

Section 6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)). EPA's 1991 TMDL Guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

Section 6 Review Comments:

Whether the MOS is expressed explicitly and/or implicitly, a justification must be provided that explains why the MOS chosen is believed to be adequate to account for any uncertainties and errors in the data and calculation of the TMDL.

A margin of safety is provided and justified. If an implicit MOS is used, conservative assumptions are identified, and their relative impacts discussed.

TSS MOS

Section 4.2.4 of the TMDL discusses the selection of a MOS for TSS. An explicit TSS MOS load allocation of 10% is provided for by MPCA in the TMDL along with an additional unquantified implicit MOS provided by utilizing the 30 mg/l water quality criterion as the target for TMDL development without specifically adjusting for the 10% exceedance allowed in the WQS.

An explicit MOS of 10% of the LC was applied to each flow regime for the LDC developed

for this TMDL study. The LDC approach applied in this TMDL study did not directly take into account an allowable exceedance of the 30 mg/L threshold up to 10% of the time, creating an additional implicit MOS in these TMDL study calculations.
[Excerpted from the TMDL document]

Calibration results indicate that the HSPF model is a valid representation of hydrologic and water quality conditions in the watershed (RESPEC 2016a). Additionally, the MPCA and USGS estimate that the recorded/reported data should be within 10% of the actual value for any given measurement. Since the HSPF model is calibrated to measured field data, the MPCA determined that a 10% MOS is suitable because the explicit MOS accounts for uncertainty of the measured data and the calibrated HSPF modeled flow and water quality results.
[Excerpted from the TMDL document]

E. coli MOS

Section 4.3.4 of the TMDL discusses the selection of a 10% explicit MOS for *E. coli.*

An explicit MOS of 10% of the LC was applied to each flow regime for the LDC developed for this TMDL study. Uncertainty in this TMDL is primarily associated with HSPF-simulated flow and limited measured E. coli data, which are the basis for the LDC and TMDL development. Variability in the allocations and loading capacities, which vary from high- to low-flows, is accounted for using the five flow regimes and the LDCs. Calibration results indicate that the HSPF model is a valid representation of hydrologic conditions in the watershed (RESPEC 2016a). Furthermore the MPCA and USGS estimate that the recorded/reported data should be within 10% of the actual value, for any given measurement. Since the HSPF model is calibrated to observed data, the MPCA determined that a 10% MOS is suitable because the explicit MOS accounts for uncertainty of the measured E. coli data and the calibrated HSPF-simulated flow.
[Excerpted from the TMDL document]

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 6.

Section 7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variations. (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)).

Section 7 Review Comments:

Seasonal variation in loads and/or effects are described and accounted for.

Both TSS and *E. coli* WQS are based on concentration specific water quality criteria and include consideration of seasonal effects.

Section 4.2.5 of the TMDL document discusses how considerations of seasonality are incorporated into the TSS WQS.

> *The TSS water quality criteria applies from April through September, during periods of open water and increased biological activity. Generally, high TSS concentrations and loading occur during these periods. The TSS loading varies with season and flow regime. The TSS from the primary sources is driven in the spring by snowmelt and rain on bare soils, in the summer by low flows interspersed with large convective rainstorms, and fall with a changing cultivated landscape and rapid cooling.*
> *[Excerpted from the TMDL document]*

Section 4.3.5 of the TMDL document discusses how considerations of seasonality are incorporated into the *E. coli* WQS.

> *The E. coli water quality criteria applies from April through October, during periods of open water and increased biological activity. The E. coli loading varies with season and flow regime. The E. coli transport is driven in the spring by snowmelt and rain on bare soils, in the summer by low flows interspersed with large convective rainstorms, and fall with a changing cultivated landscape and rapid cooling. Summer months typically have the highest E. coli concentrations.*
> *[Excerpted from the TMDL document]*

Determination of the loading capacity for both TSS and *E. coli* utilize the load duration curve method to determine the load required to meet WQS under all flow conditions such that the concentration based water quality criterion will not be exceeded. This methodology ensures that the seasonal variation in flow conditions are accounted for in the analysis. Additional discussion on how seasonal variation is accounted for is provided under the discussion on loading capacity in Section 3 of this review document.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 7.

Section 8. Reasonable Assurances

When a TMDL is developed for waters impaired by point sources only, the issuance of a National Pollutant Discharge Elimination System (NPDES) permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL. When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

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

Section 8 Review Comments:

Reasonable Assurance that point source load reductions will occur is provided in the document.

Reasonable assurance that point source load allocations will be met by ensuring that NPDES permits reflect the TMDL WLAs. NPDES permits receiving allowable waste load allocations are identified and discussed in the text of the document and their permit numbers are provided.

Reasonable Assurance that NPS load reductions will occur is provided in the document.

The parties responsible for implementation are identified:

Section 6 of the TMDL document identifies a number of parties that have actively been, continue to be, and are expected to remain involved in efforts to achieve the necessary non-point source load reductions identified in the TMDL document.

The LA and reductions originating from various nonpoint sources described in Section 4 can be assured through historical and ongoing collaborations and investments in the RRW. Strong partnerships between Roseau River Watershed District (RRWD), counties, and soil and water conservation districts (SWCDs) have led to implementation of numerous conservation practices in the past. These collaborations have goals pertaining to pollutant reduction and flood mitigation, with plans of additional implementation in the future.
[Excerpted from the TMDL document]

Potential measures to achieve load reductions are identified.

Section 6 of the TMDL document discusses the BMPs that may serve as the primary focus of load reductions efforts. Given that the majority of the NPS load is coming from similar categories of sources, and that the technical methods used to reduce these loads are available and understood, the potential measures needed to achieve the necessary load reductions are considered to be identified and understood.

> *The RRW WRAPS (HDR 2020 Draft), details a number of tools that identify sources of pollutant loading in the RRW and potential strategies to address them. Although the WRAPS goes beyond addressing just the impairments within the RRW, it does show that bacteria and sediment impairments in Hay Creek can be resolved through a number of practices. Improved upland and field surface runoff controls, protecting and stabilizing channel banks, and restoring stream channels were found to be cost-effective practices to reduce TSS loading to surface waters. Restricting livestock access to streams was identified as a cost-effective practice well suited to address bacteria impairments. The practices described are only a few of the many viable options which would address sediment and bacteria loading in Hay Creek. These options, along with the continued collaborations and ability to gain grant funding provides reasonable assurance the impairments can be addressed.*
> *[Excerpted from the TMDL document]*

Section 8.3 of the TMDL document also discusses a number of BMPs that may be used in conjunction with the discussion on the costs of implementation.

> *The BMPs could include regional water retention, riparian vegetative buffers, sediment control basins, pasture management, conservation tillage, vegetative practices, wetland restorations, etc.*
> *[Excerpted from the TMDL document]*

Potential resource needs and means for implementation are identified.

A projection of the costs associated with implementation of the TMDL are discussed in Section 8.3 of the TMDL document.

Section 8.3.1 discusses the potential costs to implement TSS load reductions.

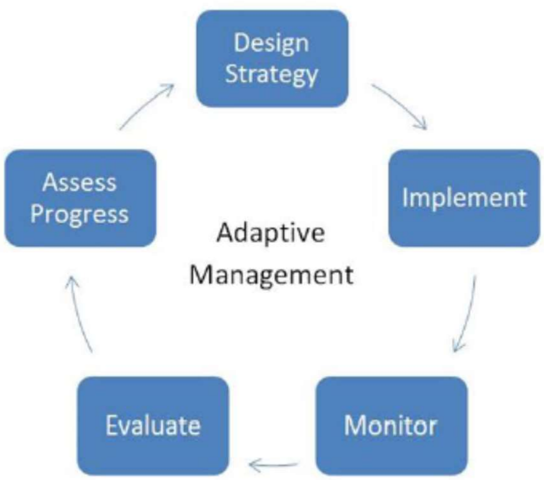
> *Estimated public funding costs to incentivize BMP adoption were estimated using the SAM tool and detailed in the RRW WRAPS report (HDR 2019). Based on the BMP implementation outlined that report, the estimated cost to address the TSS impairment in Hay Creek is approximately $300,000 per year. An interagency work group (BWSR, USDA, MPCA, MASWCD, MAWD, and NRCS) estimated restoration costs for TSS impaired streams to be $117,000 per square mile. The Hay Creek Subwatershed is roughly 116 square miles and would require $13.6 million over 10 years (or $1.4 million per year) using this approach to estimate costs. The BMPs could include regional water retention, riparian vegetative buffers, sediment control basins, pasture management, conservation tillage, vegetative practices, wetland restorations, etc.*
> *[Excerpted from the TMDL document.]*

Section 8.3.2 discusses the potential costs to implement *E. coli* load reductions.

The cost estimate for bacteria load reduction is based on unit costs for livestock manure management and runoff, which was identified as the major source of bacteria in the watershed. The unit costs to supply adequate manure management and feedlot runoff controls is roughly $350 per animal unit (AU). These values are based on USDA EQUIP payments for implementation, including water diversion structures, buffers, manure management plans, waste storage structures, and livestock access control. Providing this level of BMP implementation for the 1,379 AUs in Hay Creek would cost an estimated $500,000.
[Excerpted from the TMDL document.]

The effectiveness and costs of implementation of load reductions measures are estimates based on current knowledge. Therefore, as shown in Figure 8-1 of the TMDL document, the State also expresses an intent to utilize an adaptive management framework when moving forward with implementation efforts to make adjustments as experience is gained.

Figure 8-1: Adaptive management



Excerpted from the TMDL document

Section 6.1 of the TMDL document discusses a number of potential financial resources that may be relied upon for funding implementation of the TMDL.

On November 4, 2008, Minnesota voters approved the Clean Water, Land, and Legacy Amendment to the constitution to:

- *protect drinking water sources;*
- *protect, enhance, and restore wetlands, prairies, forests, and fish, game, and wildlife habitat;*
- *preserve arts and cultural heritage;*
- *support parks and trails; and*
- *protect, enhance, and restore lakes, rivers, streams, and groundwater.*

This is a secure funding mechanism with the explicit purpose of supporting water quality improvement projects. Additionally, there are many other funding sources available for *nonpoint pollutant reduction work. Examples of other funding sources include, but are not limited to, Clean Water Act Section 319 grants, Board of Water and Soil Resources (BWSR) state Clean Water Fund implementation funding, state Clean Water Partnership loans, and National Resources Conservation Service (NRCS) incentive programs. Programs and activities are also occurring at the local government level, where county staff, commissioners, and residents work together to address water quality issues. [Excerpted from the 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 Watershed Restoration and Protection Strategies (WRAPS). The WRAPS are required to contain such elements as the identification of impaired waters, watershed modeling outputs, point and nonpoint sources, load reductions, etc. (Chapter 114D.26; CWLA). The WRAPS also contain an implementation Table of strategies and actions that are capable of achieving the needed load reductions, for both point and nonpoint sources (Chapter 114D.26, Subd. 1(8); CWLA). Implementation plans developed for the TMDLs are included in the table, and are considered “priority areas” under the WRAPS process (Watershed Restoration and Protection Strategy Report Template, MPCA). This Table includes not only needed actions but a timeline for achieving water quality targets, the reductions needed from both point and nonpoint sources, the governmental units responsible, and interim milestones for achieving the actions. MPCA has developed guidance on what is required in the WRAPS (Watershed Restoration and Protection Strategy Report Template, MPCA). The WRAPS document for the RRW was approved by MPCA on December 3, 2020.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 8.

Section 9. Monitoring Plan to Track TMDL Effectiveness

EPA’s 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur. Such a TMDL should provide assurances that nonpoint source controls will achieve expected load reductions and, such TMDL should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring and leading to attainment of water quality standards.

Section 9 Review Comments

An effectiveness monitoring plan is provided. (Recommended for all waterbodies, required for waterbodies with both PS and NPS load allocations to ensure load reductions occur.)

Section 7 of the TMDL document discusses a number of past, present, and anticipated monitoring efforts.

Stream monitoring in the RRW will continue with efforts from numerous entities, including: MPCA, RRWD, county SWCDs, and citizen monitoring. As an overview, the Roseau County SWCD has monitored creek sites within the county since 2001. The SWCD collects turbidity, DO, conductivity, temperature, pH, nitrate, phosphorus, fecal coliform, and E. coli data in an effort to provide a baseline study of Roseau County. In addition to baseline analysis by the SWCD, project-related monitoring data are routinely posted to the EPA STORET site for broader application. River Watch, a program where public high school students work with the Red River Watershed Management Board and local watershed districts, has been active in collecting data since the early 2000s. The MPCA also supports a Watershed Pollutant Load Monitoring Network (WPLMN) where data is collected at the outlet of the RRW 25 to 35 times a year. The MPCA completes a systematic assessment of the water quality in each HUC-8 size watershed in Minnesota on a 10-year cycle. During 2015 and 2016, the MPCA conducted intensive water quality monitoring and reporting in the RRW, preceding the SID, TMDL study, and WRAPS report development. The MPCA is scheduled to begin its Cycle II intensive water quality monitoring effort in the RRW in 2025. The MPCA also coordinates two programs aimed at encouraging long-term citizen surface water monitoring: the Citizen Lake Monitoring Program (CLMP) and the Citizen Stream Monitoring Program (CSMP). Involvement within the RRW has been limited within these Citizen-led programs, but these collaborative relationships can help track water quality changes in years where intensive monitoring by the MPCA is not occurring.
[Excerpted from the TMDL document]

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 9.

Section 10. Implementation

EPA policy encourages Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired by nonpoint sources. Regions may assist States/Tribes in developing implementation plans that include reasonable assurances that nonpoint source LAs established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. In addition, EPA policy recognizes that other relevant watershed management processes may be used in the TMDL process. EPA is not required to and does not approve TMDL implementation plans.

Section 10 Review Comments

Section 8 of the TMDL document provides a discussion of the State's implementation strategy for achieving the TMDL. A discussion of the parties anticipated to be involved, the potential measures taken, and the costs associated with implementation are included in Section 8 of the TMDL document as well as in other locations throughout the document. In additional to the implementation strategies discussed in the TMDL document itself, MN develops a detailed Watershed Remediation and Protection (WRAPS) plan[1] subsequent to or concurrent to TMDL development. EPA reviews and comments on, but does not approve or disapprove the implementation plan associated with TMDLs.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 10.

Section 11. Public Participation

EPA policy is that there should be full and meaningful public participation in the TMDL development process. The TMDL regulations require that each State/Tribe must subject calculations to establish TMDLs to public review consistent with its own continuing planning process (40 C.F.R. §130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval should describe the State's/Tribe's public participation process, including a summary of significant comments and the State's/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. §130.7(d)(2)).

Provision of inadequate public participation may be a basis for disapproving a TMDL. If EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

[1] https://www.pca.state.mn.us/water/watersheds/roseau-river

Section 11 Review Comments

TMDL development provided for adequate public participation.

Public Participation Process is described.

Section 9 of the TMDL document provides a discussion of public participation during the TMDL development process.

Public involvement during this process was led by the RRWD. The TMDL assessment involves numerous local partners involved at varying levels through the process. Technical committee meetings and more widely-open public comments were included at numerous stages through the project duration. The technical committee includes members of the RRWD, SWCDs, DNR, MPCA, and counties within the watershed. Table 9-1 summarizes the outreach meetings held as part of this TMDL assessment.
[Excerpted from the TMDL document]

Table 9-1: Summary of RRW TMDL meetings

Date	Location	Meeting Focus
February 25, 2016	Roseau River Watershed District Office, Roseau, MN	TMDL study and WRAPS report process, timeline, and the importance of water quality.
March 13, 2018		Preliminary results of the Watershed Monitoring and Assessment and Stressor Identification reports.
September 19, 2019		Draft TMDL study and WRAPS report findings and next steps.

Excerpted from the TMDL document

An opportunity for public comment was provided and a summary of significant comments and the State's responses is included in/with the final TMDL submission.

An opportunity for public comment on the draft TMDL study was provided via a public notice in the State Register from September 21, 2020, through October 21, 2020. There were no comment letters received during the public comment period.
[Excerpted from the TMDL document]

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 11.

Section 12. Submittal Letter

A submittal letter should be included with the TMDL submittal and should specify whether the TMDL is being submitted for a *technical review* or *final review and approval*. Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final review and approval, should contain such identifying information as the name and location of the waterbody, and the pollutant(s) of concern.

Section 12 Review Comments:

A Submittal Letter is provided requesting formal review.

A submittal letter was included requesting final review along with the final submission of the TMDL. The submittal letter and accompanying TMDL document include information to identify the impaired waterbody and pollutants of concern.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of Section 12.

Section 13: Conclusions

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

EPA's approval of this TMDL extends to the water bodies identified in TMDL Review Table 2-R, with the exception of any portions of the water body that is within Indian Country, as defined in 18 U.S.C. Section 1151. EPA is taking no action to approve or disapprove TMDLs for those waters at this time. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.

A letter of invitation to consult on this TMDL was sent to the Red Lake Band of Chippewa, however the tribe did not express interest in consultation.

TMDL Review Table 2-R

Water body name	AUID	Water body description	Watershed name	Affected designated use	Pollutant or stressor
Hay Creek	09020314-505	Headwaters to Roseau R	Roseau River	Aquatic Life	Total suspended solids
Hay Creek	09020314-505	Headwaters to Roseau R	Roseau River	Aquatic Recreation	Escherichia coli