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

AUG 2 0 2013

REPLY TO THE ATTENTION OF: WW-16J

Rebecca Flood, Commissioner
Regional Environmental Management Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 551555-4194

Dear Ms. Flood:

The U. S. Environmental Protection Agency has reviewed the final Total Maximum Daily Loads (TMDLs) for the North Fork Crow River and Lower Crow River watershed (Table 1 of enclosed decision document), including supporting documentation and follow up information. Minnesota's submitted TMDLs for *E. coli*, TSS and Oxygen Demand address the bacteria, turbidity and low dissolved oxygen (DO) levels that impair the Recreational Use and Aquatic Life Use Support in the North Fork Crow River and Lower Crow River watershed. Based on this review, EPA has determined that Minnesota's TMDLs for *E. coli*, TSS and Oxygen Demand 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 seven TMDLs for the impaired reaches in the North Fork Crow River and Lower Crow River watershed. 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 TMDL submissions by the State of Minnesota. If you have any questions, please contact Mr. Peter Swenson, Chief of the Watersheds and Wetlands Branch, at 312-886-0236.

Sincerely,

Tinka G. Hyde
Director, Water Division

Enclosure

cc: Jeff Risberg, MPCA
Margaret Leach, MPCA

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MPCA COMMISSIONERS OFFICE

wq-iw8-37g

TMDL: North Fork Crow River and Lower Crow River watershed, Minnesota
Date: AUG 2 0 2013

DECISION DOCUMENT
NORTH FORK CROW RIVER and LOWER CROW RIVER WATERSHED BACTERIA, TURBODITY and DISSOLVED OXYGEN TMDLs

Section 303(d) of the Clean Water Act (CWA) and U.S. 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 U.S. EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and U.S. 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 U.S. 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 U.S. EPA's TMDL regulations should be resolved in favor of the regulations themselves.

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

The TMDL submittal should identify the waterbody as it appears on the State's/Tribe's 303(d) list. The waterbody should be identified/georeferenced using the National Hydrography Dataset (NHD), and the TMDL should clearly identify the pollutant for which the TMDL is being established. In addition, the TMDL should identify the priority ranking of the waterbody and specify the link between the pollutant of concern and the water quality standard (see section 2 below).

The TMDL submittal should include an identification of the point and non-point sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day. The TMDL should provide the identification numbers of the NPDES permits within the waterbody. Where it is possible to separate natural background from non-point sources, the TMDL should include a description of the natural background. This information is necessary for U.S. 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; chlorophyl *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comments:

Waterbody Identification Discussion:

The North Fork Crow River and Lower Crow River watershed is located in eight counties in west-central Minnesota: Wright, Meeker, Kandiyohi, Stearns, Pope, Hennepin, McLeod, and Carver (See Figure 1.1 of final TMDL report). The North Fork - Lower Crow River watershed lies in the North Central Hardwood Forest Ecoregion, and has a watershed area of approximately 950,000 acres (See Figure 1.2 and Table 2.5 of final TMDL report). The submitted TMDLs for North Fork - Lower Crow River watershed include *E. coli*, TSS and Oxygen Demand TMDLs to address bacteria, turbidity and dissolved oxygen (DO) impairments contributing to the nonattainment of the recreational and aquatic life uses affecting the impaired reaches in the watershed (See Table 1 below; and Table 1.3 and Figures 2.1, 2.1, 3.1, 4.1 & 4.2 of the final TMDL report).

Table 1

Impaired Reach Name	Assessment Unit (AU) ID	Affected Use	Pollutant(s)	Impairment(s) Addressed by TMDL
Crow River: South Fork Crow River to Mississippi River	07010204-502	Aquatic Recreation	*E. coli*	Fecal coliform [2]
		Aquatic Life	TSS [1]	Turbidity [2]
Crow River: North Fork, Mill Creek to South Fork Crow River	07010204-503	Aquatic Life	TSS [1]	Turbidity [2]
Grove Creek: Unnamed Creek to North Fork Crow River	07010204-514	Aquatic Life	Oxygen Demand (CBOD, NBOD, SOD[1])	DO [2]
Mill Creek: Buffalo Lake to North Fork Crow River	07010204-515	Aquatic Life	Oxygen Demand (CBOD, NBOD, SOD[1])	DO [2]
Regal Creek: Wetland upstream of CSAH-35 in St. Michael, MN to Crow River	07010204-542	Aquatic Life	Oxygen Demand (CBOD, NBOD, SOD[1])	DO [2]
Jewitts Creek (CD 19, 18, 17): Headwaters (Lake Ripley 47-0134-00) to North Fork Crow River	07010204-585	Aquatic Life	Oxygen Demand (CBOD, NBOD, SOD[1])	DO [2]

[1] Total Suspended Solids (TSS); Carbonaceous Biological Oxygen Demand (CBOD); Nitrogenous Biochemical Oxygen Demand (NBOD); Sediment Biochemical Oxygen Demand (SBOD).

[2] AU/Impairment listed in Minnesota's 2010 303(d) List

The land use in The North Fork - Lower Crow River watershed is primarily composed of agriculture (corn/soybean - 35%, hay/pasture – 32%, grain and other crops – 2%), wetlands/open water (12%), forest/shrub (11%), and urban/roads (8%) (See Table 1.2 of final TMDL report).

Pollutant(s) of Concern Discussion:

Fecal coliform bacteria are indicator organisms that are usually associated with harmful organisms transmitted by fecal contamination. These organisms can be found in the intestines of warm-blooded animals (humans and livestock). The presence of fecal bacteria in water suggests the presence of fecal matter and associated bacteria (i.e. ***E. coli***), viruses, and protozoa that are pathogenic to humans when ingested. Based on bacteria sampling data collected in April through October from 2000 through 2009, Minnesota Pollution Control Agency (MPCA) found *E. coli* exceedances for both the monthly geometric mean and acute criteria (Table 2.4 and Figures 2.2 & 2.6 of the final TMDL report) that indicated bacteria impairment in the North Fork -Lower Crow River watershed.

Turbidity in water is caused by suspended sediment, organic material, dissolved salts, and stains that scatter light in the water column, making the water appear cloudy. Excess turbidity can degrade aesthetic qualities of water bodies, increase the cost of treatment for drinking water or food processing uses, and harm aquatic life. Adverse ecological impacts caused by excessive turbidity include hampering the ability of aquatic organisms to visually locate food, impaired gill function, and smothering of spawning beds and benthic organism habitat. Since turbidity is a measure of light scatter and adsorption, loads need to be developed for a surrogate parameter. **Total suspended solids (TSS)** is a measurement of the amount of sediment and organic matter suspended in water, which is used by MPCA as a turbidity surrogate to define allocations and capacities in terms of daily mass loads. The turbidity, transparency and TSS data collected by MPCA and the Crow River Organization of Water (CROW) from 1999 through 2009 (Figure 3.2 and Table 3.4 of the final TMDL report) suggested than more than 10% of the turbidity, transparency and TSS samples in North Fork - Lower Crow River watershed reaches exceeded their standard or assessment threshold.

Dissolved oxygen (DO) is an important water quality parameter for the protection and management of aquatic life. All higher life forms, including fish and aquatic macroinvertebrates, are dependent on minimum levels of oxygen for critical life cycle functions such as growth, maintenance, and reproduction. DO concentrations go through a diurnal cycle in most rivers and streams with concentrations reaching their daily maximum levels in late afternoon when photosynthesis by aquatic plants is highest. Minimum DO concentrations typically occur early in the morning around sunrise when respiration rates exceed photosynthesis and oxygen is being consumed by aquatic organisms faster than it is replaced. Problems with low dissolved oxygen in river systems are often the result of excessive loadings of biochemical oxygen demanding (BOD) substances, particularly in combination with high temperatures and low flow conditions.

BOD is comprised of two components: carbonaceous biochemical oxygen demand (CBOD) and nitrogenous biochemical oxygen demand (NBOD). CBOD is the reduction of organic carbon to carbon dioxide through the metabolic action of microorganisms. NBOD is the term for the oxygen required for nitrification, which is the biologic oxidation of ammonia to nitrate. NBOD is typically calculated by subtracting CBOD from total BOD. Carbonaceous demand is usually exerted first, normally as a result of a lag in the growth of the nitrifying bacteria necessary for oxidation of the nitrogen forms. High ammonia levels are typically associated with elevated NBOD as it indicates organic matter is decomposing rapidly within the system or there are significant inputs of human/animal waste.

Another factor that influences dissolved oxygen concentrations in streams is sediment oxygen demand (SOD). SOD is the aerobic decay of organic materials that settle to the bottom of the stream. In natural, free-flowing streams, SOD is usually considered negligible because frequent scouring during storm events prevents long-term accumulation of organic materials. The breakdown of organic compounds in the water column and/or sediment consumes water column DO. The amount of oxygen that a given volume of water can hold is a function of atmospheric pressure, water temperature, and the amount of other substances dissolved in the water. Monitoring data collected by MPCA from 2000 through 2009 (Figures 4.1 & 4.2, and Tables 4.1, 4.3, 4.5, 4.7, & 4.9 of the final TMDL report) indicated low levels of dissolved oxygen impairing streams in the Lower Crow and North Fork Crow River watersheds.

Sources Discussion:

Point sources contributing to the impairments in North Fork - Lower Crow River watershed include: twenty two (22) NPDES wastewater dischargers (20 Wastewater Treatment Plants (WWTPs) and 2 Industrial Facilities (Table 2 below)); twelve (12) Municipal Separate Storm Sewer Systems (MS4s) (Table 3 below); and construction and industrial stormwater (Table 4 below).

Table 2

Facility Name	Permit #	Location
Annandale/Maple Lake/Howard Lake WWTP	MN0066966	North Fork Crow
Atwater WWTP	MN0022659	North Fork Crow
Belgrade WWTP	MN0051381	North Fork Crow
Brooten WWTP	MN0025909	North Fork Crow
Bushmills Ethanol	MN0067211	North Fork Crow
Buffalo WWTP	MN0040649	North Fork Crow
Cokato WWTP	MN0049204	North Fork Crow
Darwin WWTP	MNG580150	North Fork Crow
Dassel WWTP	MN0054127	North Fork Crow
Faribault Foods - Cokato	MN0030635	North Fork Crow
Green Lake SSWD WWTP	MN0052752	North Fork Crow
Grove City WWTP	MN0023574	North Fork Crow
Litchfield WWTP	MN0023973	North Fork Crow
Montrose WWTP	MN0024228	North Fork Crow
Paynesville WWTP	MN0020168	North Fork Crow
Rockford WWTP	MN0024627	North Fork Crow
Saint Michael WWTP	MN0020222	North Fork Crow
South Haven WWTP	MN0064611	North Fork Crow
Greenfield WWTP	MN0063762	Lower Crow
Meadows of Whisper Creek WWTP	MN0066753	Lower Crow
Otsego East WWTP	MN0064190	Lower Crow
Rogers WWTP	MN0029629	Lower Crow

Table 3

MS4	Permit #
Hennepin County MS4	MS400138
Loretto City MS4	MS400030
Corcoran City MS4	MS400081
Dayton City MS4	MS400083
Independence City MS4	MS400095
Medina City MS4	MS400105
Buffalo City MS4	MS400242
Monticello City MS4	MS400242
Otsego City MS4	MS400243
St Michael City MS4	MS400246
MNDOT Metro District MS4	MS400170
Litchfield City MS4	MS400253
Albertville City*	MS4 Permit Pending
Rogers City*	MS4 Permit Pending

* Additional municipalities that according to MPCA rules now require NPDES permits since their population exceeded 5,000 in the 2010 census.

Table 4

Stormwater Discharge Type	Permit #
General Stormwater Permit for Construction Activity	MNR100001
Industrial Stormwater Multi-Sector General Permit	MNR050000
General Permit for Construction Sand & Gravel, Rock Quarrying and Hot Mix Asphalt Production facilities	MNG490000

Nonpoint sources contributing to the impairments in North Fork - Lower Crow River watershed include agricultural runoff (from row crops, surface applied manure, over-grazed pastures/hay, and feedlots), non-regulated stormwater runoff, wildlife, failing/nonconforming subsurface sewage treatment systems (SSTS), and streambank erosion.

Runoff from agricultural lands (cropland, pastures and smaller feedlots) can contain significant amounts of pollutants (bacteria, sediments and organic matter). Surface applied manure spread on the land can be a source of bacteria and organic matter load. Tile-drainage lined fields and channelized ditches enable pollutants to move into surface waters. Livestock with access to stream environments can deliver bacteria loads directly to the receiving water.

Failing or noncompliant SSTS can be a source of bacteria load. Septic effluents can leach into groundwater, pond at the surface where they can be washed into surface waters via stormwater runoff events, or discharge directly to surface waterbodies.

Soil loss from agricultural field erosion, livestock grazing, gully erosion, stormwater from impervious surfaces, and streambank erosion can be a source of sediment to surface waters. Channel incision is often associated with changes in hydrologic regime such as adding flow from stormwater, agricultural tiling, or stream straightening. The resulting increase in stream power and shear stress accelerates streambank erosion. Significant changes in land use and land cover in the watershed can alter the historic bankfull elevation, increasing its frequency and subjecting additional streambank to erosive flows.

The sources that contribute **bacteria** to the North Fork - Lower Crow River watershed were found to vary depending on hydrologic conditions. During dry conditions, over-grazed riparian pasture and failing septic systems (including "straight pipe" septics) were determined to be the largest sources of bacteria. During wet conditions, surface applied manure, over-grazed pastures, and feedlots without runoff controls were the largest contributors.

The primary contributing sources to the **turbidity** impairments in the North Fork - Lower Crow River watershed were found to be the soil loss from upland areas and streambank erosion during high flows and algal turbidity during low flow conditions.

The sources that contribute the organic matter loading causing the **DO** impairments in the North Fork - Lower Crow River watershed include both natural sources such as debris from plant, leaf and periphyton, and in-situ primary production from connected wetland areas, and anthropogenic sources such as wastewater effluents and agricultural runoff.

Priority Ranking:

Minnesota's 2010 303(d) list includes a projected schedule for TMDL completions. This schedule reflects the state's priority ranking of impaired waters. The TMDL schedule for the impaired reaches

addressed in the North Fork - Lower Crow River watershed TMDLs identified a completion target date of 2012. This schedule date reflects 7% of Minnesota's listed waters with a medium priority ranking.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this first element.

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)). U.S. 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.

Comments:

The North Fork - Lower Crow River watershed is located in the North Central Hardwood Forest Ecoregion. The TMDL targets were chosen to accommodate Class 2 waters, which are the most protective designated beneficial use class in the project area. Class 2 waters include 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 (Minnesota Rules Ch. 7050.0140). The beneficial use classifications for the impaired reaches in the North Fork - Lower Crow River watershed are included in Table 5 below, and Table 1.4 of final TMDL report.

Table 5

Impaired Reach Name	Assessment Unit ID	Beneficial Use Class
Crow River: South Fork Crow River to Mississippi River	07010204-502	2B, 3C, 4A, 4B, 5, and 6 *
Crow River: North Fork, Mill Creek to South Fork Crow River	07010204-503	2B, 3C, 4A, 4B, 5, and 6 *
Grove Creek: Unnamed Creek to North Fork Crow River	07010204-514	2B, 3C, 4A, 4B, 5, and 6 *
Mill Creek: Buffalo Lake to North Fork Crow River	07010204-515	2B, 3C, 4A, 4B, 5, and 6 *
Regal Creek: Wetland upstream of CSAH-35 in St. Michael, MN to Crow River	07010204-542	2B, 3C, 4A, 4B, 5, and 6 *

Table 5

Impaired Reach Name	Assessment Unit ID	Beneficial Use Class
Jewitts Creek (CD 19, 18, 17): Headwaters (Lake Ripley 47-0134-00) to North Fork Crow River	07010204-585	2C **

* Use Classification made according to Minnesota Rule 7050.0430

** Use Classification made according to Minnesota Rule 7050.0470

E. coli TMDL Target:

The *E. coli* standard for Class 2B waters (Minn. Rules Ch. 7050.0222 subp. 5) states that *E. coli* concentrations shall "not exceed 126 organisms per 100 milliliters as a geometric mean of not less than five samples in any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies only between April 1 and October 31."

Because a fecal coliform standard was in effect prior to the most recent rule revision in 2008 which adopted an *E. coli* standard, some of MPCA's earlier bacteria sampling was based on collecting fecal coliform data. In order to evaluate the collected fecal coliform data, MPCA determined that the fecal coliform standard of 200 cfu/100 ml is reasonably equivalent to the *E. coli* concentration standard of 126 cfu/100 ml from a public health protection standpoint. MPCA's rationale is supported by the SONAR (Statement of Need and Reasonableness) prepared for the 2007-2008 revisions of Minnesota Rule Chapter 7050. The SONAR documents MPCA's analysis of the relationship between the fecal coliform and *E. coli* parameters. The following regression equation was deemed reasonable by MPCA to convert fecal coliform data to *E. coli* equivalents: *E. coli* concentration (equivalents) = 1.80 x (Fecal coliform concentration) $^{0.81}$.

The *E. coli* TMDL target included above is applicable to the North Fork - Lower Crow River watershed bacteria impaired reach (AU 07010204-502).

Turbidity (TSS Surrogate) TMDL Target:

The turbidity standard for 2B waters (Minn. Rules Ch. 7050.0222 subp. 4) is 25 nephelometric turbidity units (NTUs). Since turbidity is a measure of light scatter and adsorption, turbidity cannot be expressed as a mass load, and therefore TSS was evaluated for use as a surrogate for turbidity. In order to determine the corresponding TSS concentration for the turbidity standard, MPCA analyzed a series of paired turbidity and TSS samples collected from 1999 through 2009 in the North Fork - Lower Crow River watershed. Over half of the paired data are based on measurements taken with a meter that reads turbidity in Nephelometric Turbidity Ratio Units (NTRUs), while other data used meters that express turbidity in standard NTUs. The NTRU data were converted to "NTU equivalents" using the following equation: NTU = 10^(-0.0734+0.926*Log(NTRU))/1.003635. A simple regression of the natural logarithm of TSS and turbidity was completed using only paired sampled data with turbidity values $\leq$ 40 NTU and TSS values > 10 mg/L (Figure 3.2 of the final TMDL report). Initially, regression relationships were setup individually for each reach, however differences between the two reaches impaired for turbidity were not statistically significant, and data for both reaches were combined into one dataset and regression. MPCA's analysis indicated that the turbidity standard of 25 NTU corresponds to a surrogate TSS concentration of 72 mg/L for this data set. However, a bias correction method was applied to the data set to account for the bias introduced when re-transforming the non-linear regression (Duan's smearing correction), and the corrected TSS equivalent value to the 25 NTU turbidity standard was determined to be a TSS concentration of 75 mg/L.

The TSS TMDL target included above is applicable to the North Fork - Lower Crow River watershed turbidity impaired reaches (AUs 07010204-502 and 07010204-503).

Oxygen Demand TMDL Target:

The DO standard for Class 2B waters is a daily minimum of 5.0 mg/L (Minn. Rules Ch. 7050.0222 subp. 4) that should be met 50 percent of the days at which the flow of the receiving water is equal to the 7-day, 10 year low-flow condition ($7Q_{10}$).

Oxygen depletion in streams commonly occurs from loading and subsequent breakdown of organic matter within the system. For the Total Oxygen Demand TMDL, three oxygen demanding components were used to determine the organic matter loading contributing to the DO impairments in the North Fork - Lower Crow River watershed: CBOD, NBOD and SOD. CBOD represents the oxygen equivalent (amount of oxygen that microorganisms require to breakdown and convert organic carbon to CO_2) of the carbonaceous organic matter in a sample. NBOD represents the oxygen equivalent (amount of oxygen that microorganisms require to transform organic nitrogen to ammonia nitrogen, and NH_3-N to nitrate) of the nitrogenous organic matter in a sample. SOD represents the aerobic decay of organic material in streambed sediments and in peat soils in wetlands.

The DO target for the Oxygen Demand TMDL included above is applicable to the North Fork - Lower Crow River watershed DO impaired reaches (AUs 07010204-514, 07010204-515, 07010204-542, and 07010204-585).

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this second element.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a waterbody for the applicable pollutant. U.S. 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. U.S. 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 non-point

source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate non-point source loadings, e.g., meteorological conditions and land use distribution.

Comments:

E. coli TMDL:

The total loading capacities, i.e. total maximum daily loads, of *E. coli* determined by MPCA for the North Fork - Lower Crow River watershed are included in Table 6 below, and Table 2.8 of the final TMDL report.

Table 6

***E. coli* TMDL Allocations (*billions of organisms/day*)**						
Impaired Reach	**AU Name**	Crow River: South Fork Crow River to Mississippi River				
	AU ID	07010204-502				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
WLA	**Wastewater Facilities**	109	109	109	109	109
	MS4s	242	138	72	23	7
LA	**NFCR***	5,758	3,236	1,641	454	65
	LCR*	593	333	169	47	7
Upstream Boundary Condition[1]	**SFCR***	5,602	3,190	1,664	528	157
MOS		1,367	778	406	129	38
TMDL		13,671	7,784	4,061	1,290	383

* Subwatersheds: NFCR = North Fork Crow River; LCR = Lower Crow River; SFCR = South Fork Crow River

[1] South Fork Crow River from Buffalo Creek to its confluence with the NFCR (AU ID 07010205-508) is currently impaired for fecal coliform and will be addressed in a future TMDL study. Thus, the entire SFCR upstream of the LCR is considered a boundary condition in this TMDL study. The currently submitted TMDL report does not calculate or assign allocations to wasteload and non-point sources in the SFCR watershed. The SFCR watershed represents approximately 46% of the entire Crow River watershed (Table 2.5 of the final TMDL report). The load allocation for the SFCR boundary condition was calculated by multiplying the South Fork's watershed fraction (46%) by the Crow River's total loading capacity after the margin of safety was subtracted.

The bacteria data used for the development of this TMDL were grab samples collected by multiple agencies over the past 10 years during the bacteria index period of April 1 through October 31. The locations of the monitoring stations at which samples were collected to support this TMDL are shown in Figure 2.1 of the TMDL report. Samples were analyzed for fecal coliform prior to 2004 and more recently *E. coli*. During some sampling events, both parameters were analyzed (Table 2.2 of final TMDL report). All data were obtained through MPCA's STORET online database.

Data from the four monitoring sites on the Lower Crow River bacteria impaired reach were analyzed to help determine spatial and seasonal variability of bacteria exceedances. Since the bacteria standard is now expressed as *E. coli*, all fecal coliform data was converted to *E. coli* "equivalent" values using the following regression equation: *E coli* concentration (equivalents) = 1.80 x (Fecal coliform concentration)$^{0.81}$. These data were combined with *E. coli* data collected since 2004 to develop the database for developing allocations. *E. coli* is presented over *E. coli* equivalent data when both fecal coliform and *E. coli* samples were collected on the same day.

Stream flow data was also used for the development of this TMDL. There are three stations in/or upstream of the bacteria impaired reach watershed with continuous flow data since 2000 (Table 2.3 of the final TMDL report). There is one USGS flow monitoring station (S000-050) located near the upstream boundary of the Lower Crow River impaired reach rather than its outlet to the Mississippi River. In order to simulate flow to the end of the reach, USGS measured flows were multiplied by the watershed ratio (area) of the entire Crow River and the amount draining to the USGS monitoring station. The MPCA also monitored continuous flow at stations S001-256 and S001-255 near the outlets of the North Fork Crow River and South Fork Crow River, respectively.

The load duration curve (LDC) method was used by MPCA to develop the *E. coli* TMDL for the North Fork - Lower Crow River watershed. The LDC method considers how stream flow conditions relate to a variety of pollutant sources (point and nonpoint sources), and can be used to make rough determinations as to what flow conditions result in exceedances of the WQS. The LDC method assimilates flow and pollutant (*E. coli)* data across stream flow regimes, and provides assimilative capacities and load reductions necessary to meet WQSs.

A flow duration curve was developed using the 20-year (1990-2009) average daily flow record from the Rockford USGS station (S000-050) (Figure 2.3 of the final TMDL report). This period was chosen by MPCA because it balances a reasonably long period of record with hydrologic conditions reflective of current landuse. The flow duration curve relates mean daily flow to the percent of time those values have been met or exceeded. The 50% exceedance value is the midpoint or median flow value. The curve is divided into flow zones which including very high (0-10%), high (10- 40%), mid (40-60%), low (60-90%) and dry (90 to 100%) flow conditions. The flow duration curve was transformed to a load duration curve by applying water quality criteria values for *E. coli* and appropriate conversion factors (Figure 2.4 of the final TMDL report). The median load of each flow zone was used to represent the total daily loading capacity (TMDLs) of *E. coli* for that flow zone.

Turbidity (TSS Surrogate) TMDLs:

The total loading capacities, i.e. total maximum daily loads, of total suspended solids (TSS) determined by MPCA for the North Fork - Lower Crow River watershed to address turbidity impairment are included in Table 7 below, and Tables 3.9 & 3.10 of the final TMDL report.

Table 7

TSS TMDL Allocations (*tons/day*)						
Impaired Reach	**AU Name**	Crow River: South Fork Crow River to Mississippi River				
	AU ID	07010204-502				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
WLA	**Wastewater Facilities**	3.4	3.4	3.4	3.4	3.4
	MS4s	53.5	18.3	5.2	2.0	1.4
	Construction Stormwater	4.0	1.4	0.4	0.2	0.1
	Industrial Stormwater	2.0	0.7	0.2	0.1	0.1
LA	**NFCR* – Upstream of Impaired Reach**	308.4	103.2	27.3	8.7	4.8
	NFCR* – Impaired Reach	31.8	10.6	2.8	0.9	0.5
Upstream Boundary Condition[1]	**SFCR***	337.1	115.0	32.9	12.7	8.6
MOS		22.9	20.3	3.4	1.3	0.4
TMDL		**763.1**	**273.5**	**75.6**	**29.3**	**19.3**

Table 7

TSS TMDL Allocations (*tons/day*)						
Impaired Reach	**AU Name**	Crow River: North Fork, Mill Creek to South Fork Crow River				
	AU ID	07010204-503				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
WLA	**Wastewater Facilities**	2.8	2.8	2.8	2.8	2.8
	MS4s	15.4	6.3	1.8	0.7	0.5
	Construction Stormwater	3.6	1.5	0.4	0.2	0.1
	Industrial Stormwater	1.8	0.7	0.2	0.1	0.1
Impaired Reach	**AU Name**	Crow River: North Fork, Mill Creek to South Fork Crow River				
	AU ID	07010204-503				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
LA	**NFCR* – Upstream of Impaired Reach**	297.3	119.7	32.5	11.1	6.0
	NFCR* – Impaired Reach	37.6	15.2	4.1	1.4	0.8
MOS		3.8	12.1	2.0	0.7	0.2
TMDL		**362.3**	**158.3**	**43.8**	**17.0**	**10.5**

* Subwatersheds: NFCR = North Fork Crow River; LCR = Lower Crow River; SFCR = South Fork Crow River

[1] South Fork Crow River from Buffalo Creek to its confluence with the NFCR (AU ID 07010205-508) is currently impaired for turbidity and will be addressed in the future. Thus, the entire SFCR upstream of the LCR is considered a boundary condition in the LCR portion of this TMDL study. The currently submitted TMDL report does not calculate or assign allocations to wasteload and non-point sources in the SFCR watershed. The SFCR watershed represents approximately 46% of the entire Crow River watershed (Table 3.5 of the final TMDL report). The allocation for the SFCR boundary condition was calculated by multiplying the South Fork's watershed area fraction by the Crow River's total loading capacity after the margin of safety was subtracted.

Three types of data were collected to assess turbidity in surface waters: turbidity, transparency and TSS. The Crow River Organization of Water (CROW) and MPCA collected turbidity, T-tube and TSS data at nine monitoring stations on the main-stem Lower Crow River impaired reach and three stations on the North Fork Crow River impaired reach (Table 3.2 and Appendix B of final TMDL report). The turbidity, transparency and TSS data collected from 1999 through 2009 suggested more than 10% of samples in each reach exceeded their standard or assessment threshold (Table 3.4 of the final TMDL report).

Stream flow data was also used for the development of this TMDL. Flow data were used to develop flow regimes so that turbidity exceedances could be characterized based on whether they occurred most often during high, medium, or low flow events. There is one historic flow monitoring station located in each turbidity impaired reach. Both monitoring stations coincide with one of the primary turbidity grab sample sites (Table 3.3 and Figure 3.1 of final TMDL report). The Rockford USGS station (S000-050), located on the Lower Crow River, had the longest and most complete flow record in the Crow River watershed. There were only four seasons of continuous flow data available for the North Fork Crow River impaired reach. Flow regression relationships between the Rockford station and the Farmington Avenue station (S001-256) were used to fill data gaps and create a continuous 10-year flow record for the North Fork listed reach (Appendix C of final TMDL report).

The load duration curve (LDC) method was used by MPCA to develop the turbidity (TSS surrogate) TMDL for the North Fork - Lower Crow River watershed. LDC method assimilated flow and TSS data across stream flow regimes and provided assimilative capacities from which reductions can be derived by comparing to measured loads.

Flow duration curves were developed using the flow data discussed above (Figure 3.3 of final TMDL report). The flow duration curves were transformed to load duration curves by multiplying all average daily flow values by the TSS surrogate target (75 mg/L). The median load of each flow zone was used to represent the total daily loading capacity (TMDLs) of TSS for that flow zone.

Oxygen Demand TMDLs:

The total loading capacities, i.e. total maximum daily loads, of Oxygen Demand (CBOD, NBOD and SOD) determined by MPCA for the North Fork - Lower Crow River watershed to address DO impairment are included in Table 8 below, and Tables 4.12, 4.13, 4.14, 4.16 & 4.17 of the final TMDL report.

Table 8

AU Name/ ID	Allocation - Source Type		Oxygen Demand (OD) (kg/day)				% Reduction
			CBOD	NBOD	SOD	Total OD	
Grove Creek (07010204-514)	WLA	Grove City WWTP	4.2	7.7	---	11.9	
	LA	Headwaters	2.4	18.7	---	21.1	
		Sediment Fluxes	0	130.0	420.4	550.4	
		Tribs/Groundwater	0	14.2	---	14.2	
	MOS		---	---	46.7	46.7	
	TMDL (Option 1)*		6.6	170.6	467.1	**644.3**	64%
	WLA	Grove City WWTP	8.5	3.7	---	12.2	
	LA	Headwaters	2.4	18.7	---	21.1	
		Sediment Fluxes	0	130.0	420.4	550.4	
		Tribs/Groundwater	0	14.2	---	14.2	
	MOS		---	---	46.7	46.7	
	TMDL (Option 2)*		10.9	166.6	467.1	**644.6**	64%
Jewitts Creek (07010204-585)	WLA	Lichfield WWTP	44.9	81.6	---	126.5	
		Lichfield MS4	0	10.4	---	10.4	
	LA	Headwaters	0	16.3	---	16.3	
		Sediment Fluxes	0	4.5	16.0	20.5	
		Tribs Groundwater	0	43.9	---	43.9	
	MOS		---	---	1.8	1.8	
	TMDL		44.9	156.7	17.8	**219.4**	39%
Mill Creek (07010204-515)	WLA		0	0	0	0	
	LA	Dear Lake Headwaters	15.6	13.3	---	28.9	
		Tribs/Groundwater	2.9	2.5	---	5.4	
		Sediment Fluxes	0	0	3.9	4.0	
	MOS		---	---	0.4	0.4	
	TMDL		18.5	15.8	4.3	**38.7**	24%
Regal Creek (07010204-542)	WLA		0	0	0	0	
	LA	Headwaters	315.7	128.1	---	443.8	
		Sediment Fluxes	---	---	---	0	
		Diffuse Sources	---	---	---	0	
	MOS		---	---	---	0	
	TMDL		315.7	128.1	0	**443.8**	0%

* There were two QUAL2K model runs performed to determine the Oxygen Demand allocations to meet the DO standard for Grove Creek (AU ID 07010204-514).
Under Option 1 scenario, WWTP effluent concentrations may not exceed 5.0 mg/L CBOD and 2.1 mg/L ammonia-N.
Under Option 2 scenario, WWTP effluent concentrations may not exceed 10.0 mg/L CBOD and 1.0 mg/L ammonia-N.
Both Scenarios call for an Oxygen Demand TMDL of ~ 644 kg/day, which is a 64% reduction from current conditions.

The DO TMDLs incorporated historic monitoring data as well as specific monitoring conducted for the submitted TMDL report. These data included:

- 2000-2009 historic water quality data for all sites within each impaired stream/reach, downloaded from the MPCA's STORET online database;
- TMDL travel-time dye and synoptic surveys conducted on Jewitts and Grove Creek in September, 2008; Regal Creek in late August, 2009; and on Mill Creek in September, 2009;
- Continuous DO data collected throughout the summer months by the MPCA using in-situ YSI data sondes[1] deployed in Jewitts and Grove Creeks in 2008 and 2009, and Mill and Regal Creeks in 2009;
- Longitudinal DO survey data collected by the CROW and MPCA staff, as part of the NFCR Watershed Project, to assess DO as a stressor to aquatic life.

The Oxygen Demand TMDLs for the North Fork - Lower Crow River watershed were established using the River and Stream Water Quality (QUAL2K) Model (Section 4.8 of the final TMDL report). The QUAL2K model is a surface water quality model used during steady-state flow conditions to model nutrient, algal and dissolved oxygen dynamics in a stream simulation as a well-mixed channel. The data from the summer low-flow synoptic survey, collected in 2008 and 2009, were used to build and calibrate one event specific QUAL2K model for each impaired stream (Appendix H of the final TMDL report). For each model, stream reaches and physical features were built into the model first before proceeding to hydraulic calibration. With the diffuse flow inputs incorporated, the conservative water quality parameters (such as water temperature and conductivity) were adjusted to match monitored observations. Chlorophyll-a (phytoplankton production), nutrients (phosphorus and nitrogen components), and carbonaceous biochemical oxygen demand (CBOD) were also calibrated by adjusting tributary/groundwater contributions and/or kinetic coefficients within the range of published values. Reach specific kinetic rates and in-stream nutrient fluxes were assigned to model geochemical processes believed to be unique to certain reaches. NBOD was calculated by multiplying the sum of organic nitrogen and ammonia nitrogen by 4.33, which is the stoichiometric[2] ratio (mass basis) of oxygen demand to nitrogen. SOD loads from the sediments to the overlying water column were calculated within the QUAL2K model by integrating model-predicted and prescribed SOD and the reductions necessary to meet the TMDL DO targets across the wetted area of each reach. The prescribed model conditions represented the accumulation of organic matter in the channel from overwidened conditions and additional organic substrates from connected wetland areas and watershed runoff. QUAL2K predicted SOD by calculating the delivery and breakdown of particulate organic matter from the water column. SOD rates were adjusted for each reach to match observed dissolved oxygen data. The resultant CBOD, NBOD and SOD loadings, calculated using the QUAL2K Model that was low-flow synoptic survey calibrated and adjusted to meet a DO target of 5.0 mg/L as a daily minimum, were combined to determine the total Oxygen Demand loading capacity in each impaired reach.

Critical Conditions for E. coli TMDLs:

The critical conditions for the *E. coli* TMDLs in the North Fork - Lower Crow River watershed are summer - fall flow related conditions. MPCA's analysis showed that *E. coli* WQS exceedences are

[1] YSI water quality sondes and sensors are instruments for environmental monitoring. YSI data sondes accept multiple water quality sensors (i.e., they are multiparameter sondes) and many of the sensors use the newest optical technology for accurate measurements.

[2] Related to the quantitative relationship between reactants and products in a chemical reaction

occurring during summer - fall months under all flow regimes, indicating that the impairment is due to a variety of sources and conditions. High flows can deliver great amounts of pollutants into the streams in runoff conditions. Low flows can concentrate pollutants because the stream's assimilative capacity is being exceeded and the potential for dilution is the lowest. During wet conditions, surface applied manure, over-grazed pastures, and feedlots without runoff controls were found to be the largest source contributors. During dry conditions, over-grazed riparian pasture and failing septic systems (including "straight pipe" septics) were determined to be the largest sources of bacteria.

The North Fork - Lower Crow River watershed TMDLs accounted for the critical conditions by using the load duration curve approach to develop the *E. coli* TMDLs. The load duration curve approach directly accounts for flow and allows for the evaluation of the flow zones for which the largest load reductions are needed.

Critical Conditions for TSS TMDLs:

The critical conditions for the TSS TMDLs in the North Fork - Lower Crow River watershed are flow related conditions. The data showed TSS exceedances were recorded across all flow regimes, indicating that the impairment is due to a variety of sources and conditions. High flows can deliver great amounts of pollutants into the streams in runoff conditions. Low flows can concentrate pollutants because the stream's assimilative capacity is being exceeded and the potential for dilution is the lowest. During high flows, soil loss from upland areas and streambank erosion were found to be the primary contributing sources to the turbidity impairments. During low flow conditions algal turbidity was found to be the primary contributing source to the turbidity impairments.

The North Fork - Lower Crow River watershed TMDLs accounted for the critical conditions by using the load duration curve approach to develop the TSS TMDLs. The load duration curve approach directly accounts for flow and allows for the evaluation of the flow zones for which the largest load reductions are needed.

Critical Conditions for Oxygen Demand TMDLs:

Historic DO monitoring indicated that the critical conditions for the Oxygen Demand TMDLs in the North Fork - Lower Crow River watershed are summer base-flow conditions, when flows are low and water temperatures and stream metabolism is high. The North Fork - Lower Crow River watershed TMDLs accounted for the critical conditions by using data collected during summer low-flow water quality synoptic surveys in 2008 and 2009 to build and calibrate the QUAL2K model, which was used to calculate the Oxygen Demand TMDLs.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this third element.

4. Load Allocations (LAs)

U.S. EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future non-point 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 non-point sources.

Comments:

E. coli LAs:

The load allocations (LAs) of *E. coli* determined by MPCA for the North Fork - Lower Crow River watershed are included in Table 6 above, and Table 2.8 of the final TMDL report. The existing nonpoint sources contributing to the *E. coli* LA include agricultural runoff (from surface applied manure for row crops, over-grazed pastures/hay, and feedlots), non-regulated stormwater runoff, wildlife, and failing/nonconforming subsurface sewage treatment systems (SSTS) (Table 2.13 of the final TMDL report).

TSS LAs:

The load allocations (LAs) of total suspended solids (TSS) determined by MPCA for the North Fork - Lower Crow River watershed to address turbidity impairment are included in Table 7 above, and Tables 3.9 & 3.10 of the final TMDL report. The existing nonpoint sources contributing to the TSS LA include agricultural runoff (from row crops, and pastures/hay), sediment load from upland field erosion and stream bank erosion, and turbidity from in-stream algae growth (Sections 3.11.3 and 3.12 of the final TMDL report).

Oxygen Demand LAs:

The load allocations (LAs) of Oxygen Demand (CBOD, NBOD and SOD) determined by MPCA for the North Fork - Lower Crow River watershed to address DO impairment are included in Table 8 above, and Tables 4.12, 4.13, 4.14, 4.16 & 4.17 of the final TMDL report. The existing nonpoint sources contributing to the Oxygen Demand LA include organic matter loading from anthropogenic sources such as runoff from agriculture (row crops and grassland/pastures), urban and developed rural land; and from natural sources such as plant, leaf and periphyton debris, and in-situ primary production.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this fourth element.

5. Wasteload Allocations (WLAs)

U.S. 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. U.S. 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.

Comments:

E. coli WLAs:

The wasteload allocations (WLAs) of *E. coli* determined by MPCA for the North Fork - Lower Crow River watershed are included in Table 6 above, and Table 2.8 of the final TMDL report. The point sources contributing to the *E. coli* WLAs in the North Fork - Lower Crow River watershed include: twenty (20) NPDES wastewater dischargers (i.e. WWTPs) (Table 9 below, and Table 2.6 of the final TMDL report); and twelve (12) MS4s and two future MS4 municipalities (Table 10 below, and Table 2.7 of the final TMDL report). The potential future growth impact on the *E. coli* WLAs for wastewater discharge facilities and MS4s in the North Fork - Lower Crow River watershed is discussed in Sections 2.8.1 & 2.8.2 of the final TMDL report.

Table 9

NPDES Facilities – *E. coli* WLA Allocations (*billions of organisms/day*)				
Facility Name	**Permit #**	**Facility Type**	**Effluent Design Flow (MGD)**	**WLA**
Annandale/Maple Lake/Howard Lake WWTP	MN0066966	continuous	1.18	5.7
Atwater WWTP	MN0022659	pond	1.38	6.6
Belgrade WWTP	MN0051381	pond	1.48	7.1
Brooten WWTP	MN0025909	pond	1.06	5.1
Buffalo WWTP	MN0040649	continuous	3.60	17.2
Cokato WWTP	MN0049204	continuous	0.73	3.5
Darwin WWTP	MNG580150	pond	0.33	1.6
Dassel WWTP	MN0054127	pond	1.22	5.8
Green Lake SSWD WWTP	MN0052752	continuous	0.89	4.2
Grove City WWTP	MN0023574	continuous	0.22	1.1
Litchfield WWTP	MN0023973	continuous	2.37	11.3
Montrose WWTP	MN0024228	continuous	0.78	3.7
Paynesville WWTP	MN0020168	pond	1.47	4.2
Rockford WWTP	MN0024627	continuous	0.65	3.1
Saint Michael WWTP	MN0020222	continuous	2.45	11.7
South Haven WWTP	MN0064611	continuous	0.03	0.1
Greenfield WWTP	MN0063762	continuous	0.20	1.0
Meadows of Whisper Creek WWTP	MN0066753	continuous	0.02	0.1
Otsego East WWTP	MN0064190	continuous	1.65	7.9
Rogers WWTP	MN0029629	continuous	1.60	7.6
NPDES Facilities Total WLA			23.31	108.6

Table 10

MS4 – *E. coli* WLA Allocations (*billions of organisms/day*)							
MS4 Name	**Permit #**	**Area (Acres)**	**Flow Zones**				
			Very High	**High**	**Mid**	**Low**	**Dry**
Hennepin County MS4	MS400138	52	0.3	0.2	0.1	< 0.1	< 0.1
Loretto City MS4	MS400030	95	0.5	0.3	0.2	< 0.1	< 0.1
Corcoran City MS4	MS400081	1,211	6.8	3.9	2.0	0.6	0.2
Dayton City MS4	MS400083	754	4.2	2.4	1.3	0.4	0.1

Table 10

MS4 – *E. coli* WLA Allocations (*billions of organisms/day*)							
MS4 Name	Permit #	Area (Acres)	Flow Zones				
			Very High	High	Mid	Low	Dry
Independence City MS4	MS400095	2,182	122	7.0	3.6	1.2	0.3
Medina City MS4	MS400105	425	2.4	1.4	0.7	0.2	< 0.1
Buffalo City MS4	MS400242	5,706	32.0	18.2	9.5	3.0	0.9
Monticello City MS4	MS400242	76	0.4	0.2	0.1	< 0.1	< 0.1
Otsego City MS4	MS400243	2,709	15.2	8.7	4.5	1.4	0.4
St Michael City MS4	MS400246	22,927	128.6	73.2	38.2	12.1	3.6
MNDOT Metro District MS4	MS400170	52	0.3	0.2	< 0.1	< 0.1	< 0.1
Litchfield City MS4	MS400253	3,435	19.3	11.0	5.7	1.8	0.5
Albertville City*	Permit Pending	1,486	8.3	4.8	2.5	0.8	0.2
Rogers City*	Permit Pending	2,071	11.6	6.6	3.5	1.1	0.3
MS4 Total WLA		43,181	242.1	138.1	71.9	22.8	6.8

* Additional municipalities that according to MPCA rules now require NPDES permits since their population exceeded 5,000 in the 2010 census.

The *E. coli* WLAs for continuous wastewater dischargers were calculated by multiplying the facility's influent design flow by the *E. coli* standard (126 cfu/100 ml). The *E. coli* WLAs for stabilization pond facilities were calculated by multiplying the facility's effluent volumes by the *E. coli* standard (126 cfu/100 ml). Since the stabilization pond facilities only discharge a few times a year, effluent volumes greatly exceed daily influent flows. The effluent volumes for these facilities were calculated by multiplying the ponds' surface area, volume and average daily drawdown (typically 6 inches per day) during discharge.

The *E. coli* WLAs for MS4s were calculated using the Q = CiA equation for urban runoff (Section 2.3.4.2 of the final TMDL report). Where, Q = peak runoff rate (cfs); C = runoff coefficient; i = rainfall (inches per hour); and A = urbanized area (acres). MPCA considered this equation to be a simple/minimal inputs equation to account for higher runoff rates in urban areas. To solve the equation, a runoff coefficient (C) value of 0.51 was used. MPCA calculated the C value by: (1st) assigning typical runoff coefficients to developed land according to the MPCA's Stormwater Manual; and (2nd) determining an aggregate MS4 runoff coefficient, calculated as an area-weighted mean runoff coefficient of the developed land within the MS4/municipality boundaries, which represented a mixture of multi and single family residential landuse. According to MPCA, this coefficient value accountes for future growth within the 14 cities/MS4s and provides reserve capacity. To represent watershed rainfall (i) in the equation, monthly rainfall totals for the past 20 years from April through October were downloaded from the Minnesota State Climatology Office website for the Rockford Weather station. The MS4 areas (A) used in the equation were calculated in GIS by clipping the MPCA's MS4 municipality shapefiles to the North Fork - Lower Crow River watershed boundary. Monthly runoff volumes for each MS4 were calculated for the entire 20-year period in which flow monitoring data was available. The 20-year estimated runoff volume for the MS4 coverage area was then divided by total observed flow at the outlet of the Crow River over the past 20 years to estimate the total MS4 runoff fraction (Q). This value was used to calculate the proportion of the Crow River's *E. coli* total loading capacity allocated to each MS4.

Turbidity (TSS Surrogate) WLAs:

The wasteload allocations (WLAs) of total suspended solids (TSS) determined by MPCA for the North Fork - Lower Crow River watershed to address turbidity impairment are included in Table 7 above, and Tables 3.9 & 3.10 of the final TMDL report. The point sources contributing to the TSS WLAs in the North Fork - Lower Crow River watershed include: twenty two (22) NPDES wastewater dischargers (20 WWTPs and 2 Industrial Wastewater Facilities (Table 11 below, and Table 3.6 of the final TMDL report); twelve (12) MS4s and two future MS4 municipalities (Table 12 below, Tables 3.7 & 3.8 of the final TMDL report)); and stormwater from industrial activity (General Permit# MNR50000 and MNG490000), and construction activity (General Permit# MNR100001). The potential future growth impact on the TSS WLAs for wastewater discharge facilities and MS4s in the North Fork - Lower Crow River watershed is discussed in Sections 3.11.1 & 3.11.2 of the final TMDL report.

Table 11

NPDES Facilities – TSS WLAs (*tons/day*)					
Facility Name	**Permit #**	**Facility Type**	**Effluent Design Flow (MGD)**	**WLA**	**Location**
Annandale/Maple Lake/Howard Lake WWTP	MN0066966	continuous	1.184	0.148	NFCR – Upstream of Impaired AUs
Atwater WWTP	MN0022659	pond	1.385	0.260	NFCR – Upstream of Impaired AUs
Belgrade WWTP	MN0051381	pond	1.483	0.278	NFCR – Upstream of Impaired AUs
Brooten WWTP	MN0025909	pond	1.061	0.199	NFCR – Upstream of Impaired AUs
Bushmills Ethanol WWP	MN0067211	continuous	0.144	0.018	NFCR – Upstream of Impaired AUs
Cokato WWTP	MN0049204	continuous	0.726	0.136	NFCR – Upstream of Impaired AUs
Darwin WWTP	MNG580150	pond	0.326	0.061	NFCR – Upstream of Impaired AUs
Dassel WWTP	MN0054127	pond	1.222	0.229	NFCR – Upstream of Impaired AUs
Faribault Foods – Cokato WWP	MN0030635	continuous	0.550	0.089	NFCR – Upstream of Impaired AUs
Green Lake SSWD WWTP	MN0052752	continuous	0.889	0.111	NFCR – Upstream of Impaired AUs
Grove City WWTP	MN0023574	continuous	0.224	0.028	NFCR – Upstream of Impaired AUs
Litchfield WWTP	MN0023973	continuous	2.370	0.237	NFCR – Upstream of Impaired AUs
Paynesville WWTP	MN0020168	pond	1.466	0.274	NFCR – Upstream of Impaired AUs
Montrose WWTP	MN0024228	continuous	0.781	0.147	NFCR – Directly to AU ID 07010204-503
Buffalo WWTP	MN0040649	continuous	3.600	0.451	NFCR – Directly to AU ID 07010204-503
Great River Energy of Dickinson	MN0049077	continuous	0.030	0.004	NFCR – Directly to AU ID 07010204-503
Rockford WWTP	MN0024627	continuous	0.651	0.081	NFCR – Directly to AU ID 07010204-503
Greenfield WWTP	MN0063762	continuous	0.200	0.012	NFCR – Directly to AU ID 07010204-502
Meadows of Whisper Creek WWTP	MN0066753	continuous	0.020	0.003	NFCR – Directly to AU ID 07010204-502
Otsego East WWTP	MN0064190	continuous	1.650	0.138	NFCR – Directly to AU ID 07010204-502
Rogers WWTP	MN0029629	continuous	1.602	0.200	NFCR – Directly to AU ID 07010204-502
Saint Michael WWTP	MN0020222	continuous	2.445	0.306	NFCR – Directly to AU ID 07010204-502
NPDES Facilities WLA Total for AU ID 07010204-503 *			18.092	2.751 *	
NPDES Facilities WLA Total for AU ID 07010204-502 *			23.739	3.410	

* The total TSS WLA for AU 07010204-503 includes facilities located at NFCR – Upstream of Impaired AUs, and NFCR – Directly to AU ID 07010204-503.
The total TSS WLA for AU 07010204-502 includes facilities located at NFCR – Upstream of Impaired AUs, and NFCR – Directly to AU ID 07010204-502.

Table 12

MS4 – TSS WLAs (*tons/day*)							
Impaired Reach	**Name**	Crow River: South Fork Crow River to Mississippi River					
	AU ID	07010204-502					
MS4 Name	**Permit #**	**Area (Acres)**	**Flow Zones**				
			Very High	**High**	**Mid**	**Low**	**Dry**
Hennepin County MS4	MS400138	52	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Loretto City MS4	MS400030	95	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Corcoran City MS4	MS400081	1,211	1.5	0.5	0.1	< 0.1	< 0.1
Dayton City MS4	MS400083	754	0.9	0.3	< 0.1	< 0.1	< 0.1
Independence City MS4	MS400095	2,182	2.7	0.9	0.3	0.1	< 0.1
Medina City MS4	MS400105	425	0.5	0.2	< 0.1	< 0.1	< 0.1
Buffalo City MS4	MS400242	5,706	7.1	2.4	0.7	0.3	0.2
Monticello City MS4	MS400242	76	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Otsego City MS4	MS400243	2,709	3.4	1.1	0.3	0.1	< 0.1
St Michael City MS4	MS400246	22,927	28.4	9.7	2.8	1.1	0.7
MNDOT Metro District MS4	MS400170	52	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Litchfield City MS4	MS400253	3,435	4.3	1.5	0.4	0.2	0.1
Albertville City*	Permit Pending	1,486	1.8	0.6	0.2	< 0.1	< 0.1
Rogers City*	Permit Pending	2,071	2.6	0.9	0.3	< 0.1	< 0.1
MS4 WLA Total		43,181	53.5	18.3	5.2	2.0	1.4
Impaired Reach	**Name**	Crow River: North Fork, Mill Creek to South Fork Crow River					
	AU ID	07010204-503					
MS4 Name	**Permit #**	**Area (Acres)**	**Flow Zones**				
			Very High	**High**	**Mid**	**Low**	**Dry**
Buffalo City MS4	MS400242	5,675	9.5	3.9	1.1	0.4	0.3
St Michael City MS4	MS400246	122	0.2	< 0.1	< 0.1	< 0.1	< 0.1
Litchfield City MS4	MS400253	3,435	5.7	2.3	0.7	0.3	0.2
MS4 Total WLA		9,232	15.4	6.3	1.8	0.7	0.5

* Additional municipalities that according to MPCA rules now require NPDES permits since their population exceeded 5,000 in the 2010 census.

The TSS WLAs for continuous wastewater dischargers were calculated by multiplying the facility's influent design flow by the TSS surrogate target (75 mg/L). The TSS WLAs for stabilization pond facilities were calculated by multiplying the facility's effluent volumes (calculated by multiplying the ponds' surface area, volume and average daily drawdown during discharge) by the TSS surrogate target (75 mg/L).

The TSS WLAs for MS4s were calculated using the same methodology as described in the previous section to determine the *E. coli* WLAs (i.e. Q = CiA equation for urban runoff) (Section 3.8.4. 2 of the final TMDL report). The MS4 runoff fraction (Q) value was used to calculate the proportion of the Crow River's TSS total loading capacity allocated to each MS4.

Oxygen Demand WLAs:

The waste load allocations (WLAs) of Oxygen Demand (CBOD, NBOD and SOD) determined by MPCA for the North Fork - Lower Crow River watershed to address DO impairment are included in Table 8 above, and Tables 4.12, 4.13, 4.14, 4.16 & 4.17 of the final TMDL report. The point sources contributing to the Oxygen Demand WLAs in the North Fork - Lower Crow River watershed include: two (2) NPDES wastewater dischargers (Grove City WWTP - MN0023574, and Litchfield WWTP -

MN0023973); and one (1) Municipal Separate Storm Sewer System (Litchfield City MS4 - MS400253) (Table 13 below).

Table 13

AU Name/ID	Point Source Name	Permit #	Oxygen Demand (OD) WLAs (kg/day)			
			CBOD	NBOD	SOD	Total OD
Grove Creek (07010204-514)	Grove City WWTP	MN0023574	4.2	7.7	---	11.9 (Option 1)*
			8.5	3.7	---	12.2 (Option 2)*
Jewitts Creek (07010204-585)	Lichfield WWTP	MN0023973	44.9	81.6	---	126.5
	Lichfield MS4	MS400253	0	10.4	---	10.4
Mill Creek (07010204-515)	---	---	0	0	0	0
Regal Creek (07010204-542)	St Michael City MS4	MS400246	0	0	0	0

* There were two QUAL2K model runs performed to determine the Oxygen Demand allocations to meet the DO standard for Grove Creek (AU ID 07010204-514).
Under Option 1 scenario, WWTP effluent concentrations could not exceed 5.0 mg/L CBOD and 2.1 mg/L ammonia-N.
Under Option 2 scenario, WWTP effluent concentrations could not exceed 10.0 mg/L CBOD and 1.0 mg/L ammonia-N.

The QUAL2K model was used to calculate the TMDL allocations by setting and adjusting stream conditions and water quality parameters to meet DO standards. The Grove City and Litchfield WWTPs were represented in the QUAL2K model by setting flow, CBOD and ammonia concentrations equal to their permit limits (Table 4.11 of the final TMDL report). Litchfield WWTP was allocated using a flow of 2.37 MGD, and effluent concentrations of 5.0 mg/L $CBOD_5$ and 2.1 mg/L ammonia-N. Grove City WWTP was allocated using two model scenarios. Under Option 1 scenario, the discharge was allocated using a design flow of 0.224 MGD, and effluent concentrations of 5.0 mg/L $CBOD_5$ and 2.1 mg/L ammonia-N. Under Option 2 scenario, the discharge was allocated using a design flow of 0.224 MGD, and effluent concentrations of 10.0 mg/L $CBOD_5$ and 1.0 mg/L ammonia-N.

Litchfield (MS400253) and St. Michael (MS400246) are the only permitted MS4s located in the DO impaired reach watersheds. Litchfield's MS4 boundary accounts for approximately 19% of the Jewitts Creek DO impaired reach watershed downstream of Lake Ripley (Figure 4.2 of the final TMDL report). During the low-flow synoptic survey, there was an estimated 2.4 cfs non-WWTF flow increase between West 4th Street in Litchfield to the stream's confluence with the North Fork Crow River. Since it was impossible to determine the exact location and source of these inflows (i.e. groundwater, tributary, lake/wetland/pond outflow etc.), 19% of this flow was assigned to the Litchfield MS4 WLA. The St. Michael MS4 occupies a majority of the Regal Creek DO impaired reach watershed (Figure 4.1 of the final TMDL report). During the August 26, 2009 synoptic survey, there was no measured flow increase between Regal Creek headwaters (RC-01) and the downstream (RC-03) monitoring station. Thus, no MS4 allocation was given to St. Michael in this TMDL for low-flow conditions. Instead, all of the allocation was assigned to the Regal Creek headwaters.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this fifth element.

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)). U.S. 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.

Comments:

MOS for the E. coli TMDLs:

The MOS incorporated into the *E. coli* TMDLs for the North Fork - Lower Crow River watershed are included in Table 6 above, and Table 2.8 of the final TMDL report. An explicit MOS equal to 10% of the loading capacity for each flow regime was subtracted before allocations were made among wasteload and non-point sources. A 10% MOS was considered appropriate based on the use of load duration curves in the development of the *E. coli* TMDLs. The LDC approach minimized variability because the calculation of the loading capacity was a function of flow multiplied by the target value. Additionally, certain conservative assumptions were included in the development of the *E. coli* TMDLs. No rate of decay, or die-off rate of pathogen species, was incorporated in the calculation of the 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.

MOS for the TSS TMDLs:

The MOS incorporated into the TSS TMDLs for the North Fork - Lower Crow River watershed to address turbidity impairment are included in Table 7 above, and Tables 3.9 & 3.10 of the final TMDL report. An explicit MOS was determined as the difference between the median flow of each flow regime and the 45th percentile flow in each zone. The resulting value was converted to a daily load by multiplying by the TSS target and set as the MOS for each flow category. The explicit MOS incorporated into the TSS TMDLs were considered appropriate based on the methodology used to calculate the MOS, which accounted for the variability in the data set without over protecting the high end of the flow zone and under-protecting the low end of the flow zone. The data in each flow zone were treated as a distribution and reduction efforts were assumed to affect the entire distribution.

MOS for the Oxygen Demand TMDLs:

The MOS incorporated into the Oxygen Demand (CBOD, NBOD and SOD) TMDLs for the North Fork - Lower Crow River watershed to address DO impairment are included in Table 8 below, and Tables 4.12, 4.13, 4.14, 4.16 & 4.17 of the final TMDL report. An explicit MOS equal to 10% of the SOD load allocation was used for the TMDL equation to account for the uncertainty in model predicted SOD loads and how the stream may respond to changes in SOD loading. A 10% MOS was considered appropriate based upon the generally good agreement between the water quality models predicted and observed values that were demonstrated during the calibration and validation processes, which indicated that the model accurately represented the in-stream processes. An implicit MOS was also included in the Oxygen Demand TMDLs through the modeling assumptions. The model scenarios were set to predict the stream meeting the DO standard 100% of the time at the low flow condition whereas the standard only requires meeting the DO standard 50% of the time at the low flow condition.

U.S. EPA finds that the TMDL document submitted by MPCA contains an appropriate MOS satisfying all requirements concerning this sixth element.

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)).

Comments:

Seasonal Variation for E. coli TMDLs:

The *E. coli* impairments in the North Fork - Lower Crow River watershed varied seasonally. The majority of *E. coli* exceedances occur during the summer and fall months (Figure 2.5 of the final TMDL report). Seasonality of bacteria concentrations are also influenced by stream water temperature. Fecal bacteria are most productive when stream temperatures are highest, at temperatures similar to their origination environment in animal digestive tracts.

Seasonal variation was considered in the *E. coli* TMDLs through the use of the Load Duration Curves (LDC) to establish the TMDLs. The development of the LDCs utilized flow measurements, collected from local USGS gages, which represented a range of flow conditions within the watershed and thereby accounted for seasonal variability. The LDC approach captures the variation in pollutant concentrations occurring over a range of flow regime conditions in each waterbody reach.

Seasonal Variation for TSS TMDLs:

The turbidity impairments in the North Fork - Lower Crow River watershed varied seasonally. Exceedances in the North Fork Crow impaired reach were most common during summer (June through August) and fall (September through November) and during mid, low and dry flow conditions. Exceedance occurrences in the Lower Crow River impaired reach were also high during these conditions, but also during the spring (March through May) and very high and high flow conditions. Data analysis suggested efforts in the North Fork Crow River watershed may need to focus on low-flow related turbidity sources whereas the Lower Crow River will need to address sources common during all seasons and flow regimes.

Seasonal variation was considered in the TSS TMDLs through the use of the Load Duration Curves (LDC) to establish the TMDLs. The development of the LDCs utilized flow measurements, collected from local USGS gages, which represented a range of flow conditions within the watershed and thereby accounted for seasonal variability. The LDC approach captures the variation in pollutant concentrations occurring over a range of flow regime conditions in each waterbody reach.

Seasonal Variation for Oxygen Demand TMDLs:

The DO impairments in the North Fork - Lower Crow River watershed varied seasonally. Historic DO monitoring indicated that exceedances in the North Fork - Lower Crow River watershed were most common during summer base-flow conditions, when flows are low and water temperatures and stream metabolism is high. The North Fork - Lower Crow River watershed TMDLs accounted for seasonal variation by using data collected during summer low-flow water quality synoptic surveys in 2008 and 2009 to build and calibrate the QUAL2K model, which was used to calculate the Oxygen Demand TMDLs.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this seventh element.

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 non-point sources, and the WLA is based on an assumption that non-point source load reductions will occur, U.S. EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that non-point source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for U.S. EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

U.S. EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by non-point sources. However, U.S. EPA cannot disapprove a TMDL for non-point 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.

Comments:

Section 6 of the final TMDL report contains a list of several factors at the local, state and federal level that MPCA considers could provide reasonable assurances that the North Fork - Lower Crow River watershed TMDLs will be successfully implemented. These factors include:

Water Management Plans:

The North Fork TMDL project area is comprised of areas of Meeker, Wright and Hennepin Counties. Meeker and Wright Counties have each adopted a county water plan that articulates goals and objectives for water and land-related resource management initiatives. Meeker County's Water Plan was created in 2003 and will expire in 2012. The Wright County Water Plan runs from 2006 through 2015. The area of Hennepin County that impacts the project area for this TMDL project is covered by the Pioneer Sarah Water Management Commission. The Pioneer Sarah WMC has adopted a watershed management plan for the Pioneer-Sarah Creek Watershed, and is currently undergoing an amendment process for the plan. All these plans provide the watershed management framework for addressing water quality issues, and for TMDL projects to restore impaired waters to a non-impaired status.

Additionally, the stakeholder processes associated with this TMDL effort, as well as the broader planning efforts mentioned above have generated commitment and support from the local government units affected by this TMDL, and will help ensure that this TMDL project is carried successfully through implementation. Various sources of technical assistance and funding will be used to execute measures detailed in the implementation plan scheduled to be developed within one year of approval of this TMDL. Funding resources include a mixture of state and federal programs, including (but not limited to) the following: Federal Section 319 Grants for watershed improvements; Funds ear-marked

to support TMDL implementation from the Clean Water, Land, and Legacy constitutional amendment, approved by the state's citizens in November 2008; Local government cost-share funds; Soil and Water Conservation Districts cost-share funds; and NRCS cost-share funds.

Local Management:

The Crow River Organization of Water (CROW), which includes representatives from Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Renville, Sibley, Stearns and Wright Counties, focuses on identifying and promoting the following: Protecting water quality and quantity; Protecting and enhancing fish and wildlife habitat and water recreation facilities; Public education and awareness; and BMP implementation. The CROW is working with the MPCA's Major Watershed Restoration and Protection Project (MWRPP) approach in the North Fork Crow River Watershed. The idea behind the watershed approach is to provide a more complete assessment of water quality and facilitate data collection for the development of TMDLs and protection strategies. In the watershed approach, the streams and lakes within a major watershed are intensively monitored to determine the overall health of the water resources, identify impaired waters, and identify those waters in need of additional protection efforts to prevent impairments. The MWRPP approach process provides a communication tool that can inform stakeholders, engage volunteers, and help coordinate local/state/federal monitoring efforts so the data necessary for effective water resources planning is available, citizens and stakeholders are engaged in the process, and citizens and governments across Minnesota can evaluate the progress.

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

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

Regulatory programs:

Existing regulatory programs such as those under NDPES will continue to be administered to control discharges from industrial, municipal, and construction sources as well as large animal feedlots that meet the thresholds identified in those regulations (Section 6.2 of the final TMDL report).

U.S. EPA finds that the TMDL document submitted by MPCA adequately addresses this eighth element.

9. Monitoring Plan to Track TMDL Effectiveness

U.S. EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (U.S. EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and non-point sources, and the WLA is based on an assumption that non-point source load reductions will occur. Such a TMDL should provide assurances that non-point 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.

Comments:

Two types of monitoring will track the progress toward achieving the load reductions required in the North Fork - Lower Crow River watershed TMDLs, and the attainment of WQS: (1) tracking implementation of Best Management Practices (BMPs) on the ground; and (2) physical and chemical monitoring of the waterbody resource. The CROW and the SWCDs will track the implementation of North Fork - Lower Crow River watershed projects annually. The CROW also plans to monitor the affected resources on a ten year cycle in conjunction with the North Fork Crow River MWRPP process.

Periodic monitoring is necessary for the adaptive management approach that will be utilized in these TMDLs, in which management strategies will be continuously re-evaluated and refined based on lessons learned from previous efforts. The results of the monitoring will identify progress toward benchmarks as well as shape the next course of action for implementation of the TMDLs.

U.S. EPA finds that this ninth element has been adequately addressed in the TMDL document submitted by MPCA, although U.S. EPA is not approving these recommendations for monitoring or any other aspect of Minnesota's monitoring program through this decision.

10. Implementation

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

Comments:

Section 5 of the final TMDL report presents implementation alternatives for resolving the water quality problems associated with the North Fork - Lower Crow River watershed TMDLs. A brief summary of the recommended implementation alternatives is included in Table 14 below. A separate document following this TMDL report will contain the formal TMDL Implementation Plans. Since the

impairments of bacteria, turbidity and low DO have several sources and some common delivery pathways, most of the recommended implementation strategies will have multiple water quality benefits in terms of load reductions through implementation. The selection of appropriate management practices for the pollutant(s) of concern will depend on site-specific conditions, economic factors, and stakeholder attitudes and knowledge.

Table 14

List of Management Practices/ Recommended Specific BMPs	
Vegetative Practices: To minimize sediment mobilization from agricultural lands and decrease sediment transport to receiving waters.	• Contour farming • Strip cropping • Grassed waterways • Grass filter strip for feedlot runoff • Forest management practices • Alternative crop in rotation • Field windbreak • Pasture management, intensive rotation grazing (IRG) • Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program–Minnesota II (CREP–II), or Re-Invest in Minnesota (RIM) Reserve Program
Primary Tillage Practices: To reduce the generation and transport of soil from fields.	• Chisel Plow • One pass tillage • Ridge till • Sustain surface roughness
Structural Practices: To make watershed improvements to decrease sediment loading to the receiving water.	• Wetland restoration • Livestock exclusion • Liquid manure waste facilities
Feedlot Runoff Reduction	• Move Fences/Change Lot Area • Eliminate Open Tile Intakes and/or Feedlot Runoff to the Intake • Install Clean Water Diversions and Rain Gutters • Install Grass Buffers • Maintain Buffer Areas • Construct a Solids Settling Area(s) • Prevent Manure Accumulations • Manage Feed Storage • Manage Watering Devices • Total Runoff Control and Storage • Roofs • Runoff Containment with Irrigation onto Cropland/Grassland • Vegetated Infiltration Area • Tile-Drained Vegetated Infiltration Area with Secondary Vegetated Filter Strip • Sunny Day Release on to Vegetated Infiltration Area or Filter Strip • Vegetated Filter Strip
Manure Management Planning	• County Feedlot Program that ensures feedlot owners get assistance to remain compliant with their permits. • Cost-share programs (i.e. Environmental Quality Incentives Program (EQIP)), sponsor by Soil and Water Conservation Districts or the Natural Resources Conservation Service offices, to put BMPs into place.
Waste Water Treatment Facilities Runoff Reduction	• Counties, Regional Development Commissions and MPCA staff will work with Waste Water Treatment Facilities to ensure continued compliance.
Subsurface Sewage Treatment Systems (SSTS) Runoff Reduction	• Low interest loan dollars are available to aid landowners in upgrading SSTS.

Table 14

List of Management Practices/ Recommended Specific BMPs	
Controlling SOD loads	• Wetland Outlet Reaeration • Channel Morphology Alteration
Watershed Restoration and Protection Plan	The CROW, the North Fork Crow Watershed District, and the Middle Fork Crow Watershed District have partnered with the MPCA to develop the North Fork Crow River Watershed Restoration and Protection Plan (NFC-MWRPP). MPCA expects that the goals and implementation plans presented in the NFC-MWRPP will help reduce total phosphorus, chlorophyll-a (algal turbidity) and $CBOD_5$ in the turbidity and DO impaired reaches addressed in this TMDL study.

Although a formal implementation plan is not required as a condition for TMDL approval under the current U.S. EPA regulations, U.S. EPA finds that the TMDL document submitted by MPCA adequately addresses this tenth element.

11. Public Participation

U.S. 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, U.S. EPA has explained that final TMDLs submitted to U.S. 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 U.S. EPA establishes a TMDL, U.S. EPA regulations require U.S. 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 U.S. EPA determines that a State/Tribe has not provided adequate public participation, U.S. EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by U.S. EPA.

Comments:

Public participation opportunities for the North Fork - Lower Crow River watershed TMDLs were provided in the form of public meetings (Table 15 below), electronic newsletters and CROW's website. MN DNR created a display board ("Our Waters Our Choice") to be taken to county fairs and other presentations in counties in the watershed. CROW staff attended local partner meetings to review the TMDL process and receive input on the project. The CROW's Technical Committee and citizens reviewed project activities and provided comments. The CROW's Technical Committee is comprised of ten counties within the Crow River Watershed and the following local agencies: SWCD, NRCS, Water Planners, BWSR, MN DNR, USFWS, Metropolitan Council and Cities. The CROW also presented information regarding the TMDL project during its regular scheduled Joint Powers Board and Technical Committee meetings.

Table 15

Date	Public Meeting
August 2, 2007	Public Stakeholder Meeting in Buffalo, MN. Meeting provided an overview of the TMDL process, discussed the North Fork TMDL project, reviewed Phase I data results and discussed Phase II and Phase III in the TMDL process.

Table 15

Date	Public Meeting
November 6, 2008	Public Stakeholder Meeting in Litchfield, MN. Meeting provided an overview of the TMDL project and generated discussion that provided information to be used in the models.
July 22, 2009	Public Stakeholder Meeting in Glencoe, MN. Meeting provided information on the bacteria impairment for the North Fork Crow River.
August 13, 2009	Meeting with Wenck, MPCA and City of St. Michael to review and discuss concerns from the City on the DO impairment on Regal Creek.
September 16, 2009	Public Stakeholder Meeting in Buffalo, MN. Meeting provided information on the turbidity impairment for the North Fork Crow River.
May 12, 2010	Meeting with CROW and City of St. Michael attended the MPCA Professional Judgment meeting to discuss concerns the City has with the DO impairment on Regal Creek and provide input to proposed new listings for impairments.
June 3, 2010	Public Stakeholder meeting in Buffalo, MN. The Meeting provided information on the DO impairment for the North Fork of the Crow River.
September 13 & 14, 2011	Two public stakeholder meetings to review the findings of the TMDL study as well as the draft TMDL allocations in Buffalo, MN.
September 22, 2011	Meeting with area WWTF operators to discuss draft TMDL allocations in Buffalo, MN.
September 28, 2011	Two public stakeholder sessions to receive input on the implementation plan for the NF TMDL project in Buffalo, MN.

The North Fork - Lower Crow River watershed TMDLs were public noticed from June 18, 2012 to September 4, 2012. Copies of the draft TMDL Report for North Fork - Lower Crow River watershed were available to the public upon request and on the MPCA website at http://www.pca.state.mn.us/index.php/water/water-types-and-programs/minnesotas-impaired-waters-and-tmdls/tmdl-projects/tmdl-projects-and-staff-contacts.html.

MPCA received six (6) comment letters during the North Fork - Lower Crow River watershed TMDL public comment period. One comment letter was received outside the comment period and therefore was not timely. As a result of the comment letters, MPCA made some changes to impaired reaches that were originally included in the public notice TMDL report as addressed by the TMDL. MPCA decided to remove the DO TMDL that was originally calculated for the CD-31 impaired reach (AU ID 07010204-667) from the final submitted TMDL report. In a letter[3] to EPA, MPCA stated its conclusion that more information about this waterbody system is needed before the CD-31 DO TMDL can be completed.

As part of the final TMDL submittal to EPA, the state provided copies of the press releases of public notice, letters of invitation to interested parties, the mailing list of interested parties, and copies of the written comments received during the public comment period and the state responses to these comments.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this eleventh element.

12. Submittal Letter

A submittal letter should be included with the TMDL submittal, and should specify whether the TMDL

[3] See Letter from Margaret Leach at MPCA to Dave Werbach at EPA, dated March 18, 2013.

is being submitted for a *technical review* or *final review and approval.* Each final TMDL submitted to U.S. 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 U.S. EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and U.S. 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.

Comments:

The U.S. EPA received the formal submission of the final North Fork - Lower Crow River watershed TMDLs on June 12, 2013 along with a cover letter from Rebecca J. Flood, Assistant Commissioner, MPCA dated June 4, 2013. The letter stated that the North Fork - Lower Crow River watershed TMDLs were final TMDLs submitted under Section 303(d) of CWA for EPA review and approval. The letter also contained the waterbody segment names, and the cause/pollutant of concern for the TMDLs submitted.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this twelfth element.

13. Conclusion

After a full and complete review, U.S. EPA finds that the TMDLs for the North Fork - Lower Crow River watershed satisfy the elements of approvable TMDLs. These approvals address six (6) segments for three (3) pollutants for a total of seven (7) TMDLs addressing seven (7) impairments (See Table 1 above).

U.S. EPA's approval of the North Fork - Lower Crow River watershed TMDLs extend to the waterbodies which are identified in this decision document and the TMDL study with the exception of any portions of the waterbodies that are within Indian Country, as defined in 18 U.S.C. Section 1151. U.S. EPA is taking no action to approve or disapprove the State's TMDLs with respect to those portions of the waters at this time. U.S. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under Section 303(d) for those waters.