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

DEC 18 2008

REPLY TO THE ATTENTION OF:
WW-16J

DEC 22 2008

Brad Moore, Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Dear Mr. Moore:

The U.S. Environmental Protection Agency has conducted a complete review of the final Total Maximum Daily Loads (TMDLs) for the West Fork Des Moines River watershed, including supporting documentation and follow up information. The West Fork Des Moines River watershed is located in southwestern Minnesota, in seven counties. The TMDLs address the Aquatic Recreation Use and Aquatic Life Use impairments due to excessive fecal coliform, turbidity, and phosphorus.

The TMDLs meet the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, EPA hereby approves Minnesota's 32 TMDLs for fecal coliform, turbidity, and phosphorus for the West Fork Des Moines 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 this TMDL report and look forward to future TMDL submissions by the State of Minnesota. If you have any questions, please contact Mr. Kevin Pierard, Chief of the Watersheds and Wetlands Branch at 312-886-4448.

Sincerely,

Timothy C. Henry
Acting Director, Water Division

Enclosure

cc: Chris Zadak, MPCA
Jeff Risberg, MPCA

wq-iw7-13g

TMDL: WF Des Moines River TMDL, Minnesota
Date:

DECISION DOCUMENT FOR THE WEST FORK DES MOINES RIVER WATERSHED, MINNESOTA TMDL

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

1. Identification of 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 nonpoint sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day. The TMDL should provide the identification numbers of the NPDES permits within the waterbody. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of the natural background. This information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation.

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

(1) the spatial extent of the watershed in which the impaired waterbody is located;
(2) the assumed distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and

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

Comments:

Location Description: The Minnesota Pollution Control Agency (MPCA) developed TMDLs for the West Fork Des Moines River (WFDMR) watershed in southwestern Minnesota. By implementing measures to reduce fecal coliform, turbidity, and phosphorus loadings, the TMDLs will address impairments of the aquatic recreation use and aquatic life use in the watershed. Table 1, below, identifies the waterbody segments covered by the TMDL Study as it appears on the Minnesota 2008 303(d) list. Minnesota's priority rankings for TMDL waters are reflected by the target dates for start and completion of TMDL studies. For WFDMR the target completion date is 2008.

Table 1. 2008 303(d) List Summary (modified from Table 1.1 of the TMDL Study)

REACH	DESCRIPTION	YEAR LISTED	ASSESSMENT UNIT ID / DNR LAKE #	AFFECTED USE	POLLUTANT OR STRESSOR
Beaver Creek	CD 20 to Des Moines R	02	07100001-503	Aquatic recreation	Fecal coliform
Beaver Creek	CD 20 to Des Moines R	04	07100001-503	Aquatic life	Turbidity (TSS)
County Ditch 20	Headwaters to Beaver Cr	02	07100001-504	Aquatic recreation	Fecal coliform
Des Moines River	Beaver Cr to Lime Cr	04	07100001-546	Aquatic recreation	Fecal coliform
Des Moines River	Beaver Cr to Lime Cr	04	07100001-546	Aquatic life	Turbidity (TSS)
Des Moines River	Lime Cr to Heron Lk Outlet	04	07100001-533	Aquatic recreation	Fecal coliform
Des Moines River	Lime Cr to Heron Lk Outlet	04	07100001-533	Aquatic life	Turbidity (TSS)
Des Moines River	Windom Dam to Jackson Dam	04	07100001-501	Aquatic recreation	Fecal coliform
Des Moines River	Windom Dam to Jackson Dam	98	07100001-501	Aquatic life	Turbidity (TSS)
Des Moines River	Jackson Dam to JD 66	02	07100001-541	Aquatic life	Turbidity (TSS)
Des Moines River	JD 66 to IA border	04	07100002-501	Aquatic recreation	Fecal coliform
Des Moines River	JD 66 to IA border	02	07100002-501	Aquatic life	Turbidity (TSS)
Des Moines River	Heron Lk Outlet to Windom Dam	06	07100001-524	Aquatic life	Turbidity (TSS)
Des Moines River	Lk Shetek to Beaver Cr	06	07100001-545	Aquatic life	Turbidity(TSS)
Division Creek	Heron Lk to Okabena Cr	06	07100001-529	Aquatic life	Turbidity(TSS)
Elk Creek	Headwaters to Okabena Cr	06	07100001-507	Aquatic life	Turbidity(TSS)
Elk Creek	Headwaters to Okabena Cr	06	07100001-507	Aquatic recreation	Fecal coliform
Heron Lake Outlet	**Heron Lk (32-0057-01) to Des Moines R**	**06**	**07100001-527**	**Aquatic life**	**pH***
Heron Lake Outlet	Heron Lk (32-0057-01) to Des Moines R	06	07100001-527	Aquatic life	Turbidity(TSS)
Jack Creek	JD 26 to Heron Lk	06	07100001-509	Aquatic life	Turbidity (TSS)
Jack Creek	JD 26 to Heron Lk	06	07100001-509	Aquatic recreation	Fecal coliform
Jack Creek, North Branch	Headwaters to Jack Cr	06	07100001-505	Aquatic life	Turbidity(TSS)
Lake Shetek Inlet	Headwaters to Lk Shetek	02	07100001-502	Aquatic recreation	Fecal coliform
Lime Creek	Lime Lk to Des Moines R	04	07100001-535	Aquatic recreation	Fecal coliform
Lime Creek	Lime Lk to Des Moines R	04	07100001-535	Aquatic life	Turbidity (TSS)
Lower Lake Sarah Outlet	First Unnamed Cr on Lk Sarah Outlet stream to Lk Shetek inlet	02	07100001-508	Aquatic recreation	Fecal coliform
Okabena Creek	Elk Cr to South Heron Lk	06	07100001-506	Aquatic life	Turbidity (TSS)
Okabena Creek	Elk Cr to South Heron Lk	06	07100001-506	Aquatic recreation	Fecal coliform
Unnamed Creek	Unnamed Cr to Lk Shetek	02	07100001-519	Aquatic recreation	Fecal coliform
Unnamed Creek	Unnamed Cr to Unnamed Cr	02	07100001-517	Aquatic recreation	Fecal coliform
Upper Lake Sarah Outlet	Lk Sarah Outlet to first Unnamed Cr	02	07100001-513	Aquatic recreation	Fecal coliform
Heron (North Heron)	Lake or Reservoir	02	32-0057-05	Aquatic recreation	Nutrients/eutrophication Biological indicators
Heron (South Heron)	Lake or Reservoir	02	32-0057-07	Aquatic recreation	Nutrients/eutrophication Biological indicators

*** Addressed by phosphorus TMDL for South Heron Lake**

The WFDMR watershed is located in southwestern Minnesota and northern Iowa. The TMDL addresses the Minnesota portion, and covers all or parts of seven counties: Murray, Cottonwood, Jackson, Nobles, Pipestone, Lyon, and Martin (Page 1 of the TMDL). The overall watershed is 1,333 square miles in size, and consists of 5 subwatersheds: Lake Shetek (128 square miles), Beaver Creek (178 square miles), Heron Lake (467 square miles), the West Fork mainstem (473 square miles), and the Lower Des Moines (87 square miles). A detailed map is available as Figure 1.1 of the TMDL. The WFDMR flows southeast into Iowa, and eventually into the Mississippi River.

Topography and Land Use: The major land use in the watershed is row crop agricultural, with over 85% of the land in this category (Section 2.2 of the TMDL). Pasture/open accounts for 10%, and only a small portion is classified as "urban". The largest city in the watershed is Worthington, with a population of approximately 11,000. MPCA determined "agroecoregions" for the watershed, as discussed in detail in Section 2.2 of the TMDL. A summary of the agroecoregions is below:

> Couteau: fine textured, well-drained soils, on moderately steep slopes. Erosion potential is moderate to severe, with numerous intermittent streams present. There is a moderate risk of phosphorus loss due to soil erosion. Over 94% of the cropland is corn or soybeans; there are also significant numbers of animal production operations present.
>
> Poorly Drained Blue Earth Till: fine-textured soils, very flat and poorly drained. Erosion potential is moderate, and a moderate potential for phosphorus loss due to erosion. Over 9% of the land is cropland, which is almost exclusively corn or soybean production.
>
> Dryer Blue Earth Till: fine-textured, poorly to moderately well-drained soils, on flat to moderately steep slopes. Erosion potential is moderate to high, with a moderate risk of phosphorus loss. Over 94% of the cropland is in corn or soybean production, and there is significant animal production in the region.

Pollutant of concern: The pollutants of concern for these TMDLs are fecal coliform, total suspended solids (TSS), and phosphorus.

Fecal coliform: As discussed in Section 3 of the TMDL, MPCA has used data from 1994-2003 to develop the TMDLs. The data was split into spring (April-May) and summer (June-October) results. The data were further separated into wet and dry categories, to help refine the factors contributing to the exceedences. Review of the data shows that spring values were generally lower than summer values, and that wet values were generally higher than dry values. Overall, all segments showed fecal coliform geometric means well above the water quality standards (WQS).

TSS: Section 4 of the TMDL discusses the turbidity impairment in the watershed. Since turbidity is not a mass constituent, MPCA determined that TSS was an appropriate surrogate (Section 2 below). Sampling results showed that the listed segments (Table 1 above) exceeded the turbidity WQS (and TSS target).

Phosphorus: Section 5 of the TMDL discusses the phosphorus impairment in the watershed. Heron Lake was listed as impaired due to excessive nutrients in 2002, and the listing was revised in 2008 to split the lake into two parts, North Heron Lake and South Heron Lake. Sampling results indicate that the lakes exceed the WQSs for lakes (90 µg/L). The lakes have had severe algal blooms, loss of rooted aquatic vegetation, loss of waterfowl, and degradation of the fish community.

Pollutant sources:
Fecal coliform: Numerous sources for fecal coliform were identified in the TMDL (Section 3.2 of the TMDL). Human sources include septic systems and wastewater treatment facilities, while animal sources include run-off from pasture lands, cattle in streams, and run-off from manure spreading on cropland. MPCA believes that wildlife is a very small source of fecal coliform. Appendix A of the TMDL discusses the process used by MPCA to determine the current loading from the various sources. Based upon this data, livestock (particularly swine and beef cattle) are the dominant source of bacteria. Smaller, less-regulated feedlots, as well as surface-applied manure, are the most likely source for livestock bacteria entering the waterbodies. Failing septic systems may be a significant source during dry weather.

TSS: MPCA identified the major TSS sources as being soil run-off from row crop fields and bank slumping and scouring in streams (Section 4.2 of the TMDL). Run-off from feedlots and livestock overgrazing were determined by the state to be relatively lesser sources. MPCA determined that some TSS load may be coming from wastewater treatment facilities in the watershed.

Phosphorus: Sources identified in the TMDL report as contributing to the nutrient impairments for North Heron Lake and South Heron Lake include cropland and pasture run-off, streambank erosion, point sources, and internal phosphorus release. Other, smaller potential sources include septic systems, atmospheric deposition, and feedlots (Section 5.2 of the TMDL). The point sources in the watershed include 5 wastewater treatment plants (WWTPs) that discharge eventually to South Heron Lake. A small portion of the watershed is impacted by the MS4 for the City of Worthington.

Future growth trends: As stated in Section 3.6 (fecal coliform), Section 4.7 (TSS), and Section 5.6 (phosphorus) of the TMDL, future growth was considered in developing the allocations. No explicit amount of load was set aside for any to the pollutants to account for future growth. MPCA did note, however, that for fecal coliform, a number of small, unsewered communities exist in the watershed, and the communities could build WWTPs in the future. MPCA state that this growth could be accounted for in a reduced Margin of Safety, but EPA notes that to do this, MPCA will need to submit, and have approved, a detailed demonstration that the uncertainty in fecal coliform impacts and loads has lessened. This will also require public involvement and review.

EPA finds that the TMDL document submitted by MPCA satisfies all requirements of 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)). 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:
Section 2.1 of the TMDL Study describes designated uses and numeric criteria applicable to this watershed.

Use Designation:
The WFDMR watershed is designated as either Class 2B or 2C for aquatic life use and recreation (MN. R. 7050.0222). From Page 7 of the TMDL;

> Class 2B waters. The quality of Class 2B surface waters shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life, and their habitats. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable.
> Class 2C waters. The quality of Class 2C surface waters shall be such as to permit the propagation and maintenance of a healthy community of indigenous fish and associated aquatic life, and their habitats. These waters shall be suitable for boating and other forms of aquatic recreation for which the waters may be usable.

Numeric Standards:
Fecal coliform: For fecal coliform, the water quality standard (WQS) is found in MN R. Ch 7050.0222. Fecal coliform, between April 1 and October 31 shall:

- not exceed 200 organisms/100ml geometric mean of not less than five samples in any given calendar month,
- nor shall be more than 10% of all samples taken during any calendar month individually exceed 2000 organisms/100ml.

Turbidity: The turbidity WQS is found in MN R Ch. 7050.0222, and is not to exceed 25 nephelometric turbidity units (NTUs).

Nutrients: Minnesota has numeric criteria for nutrients in lakes that limit the quantity of nutrients entering waters (Table 2 below). MN R. 7050.0222(4) defines the numeric criteria, based upon ecoregions. South Heron Lake and North Heron Lake are classified by MPCA as shallow lakes in the Western Corn Belt Plains ecoregion (Section 2.1 of the TMDL). Lakes are to meet the phosphorus target, the chlorophyll-a, and the Secchi disk target. The applicable criteria are:

Table 2. Applicable numeric criteria for North and South Heron Lakes

Parameter	**Criteria**
Phosphorus concentration (µg/L)	90
Chlorophyll-a concentration (µg/L)	32
Secchi Disk transparency (meters)	>0.7

Targets:
Fecal coliform: the target is same as the WQS, 200 organisms/100 ml geometric mean of not less than five samples in any given calendar month, and not to exceed more than 2000 organisms/100ml in more than 10% of all samples taken during any calendar month.

Turbidity: Turbidity is a measure of how the light is scattered through water, and is not a parameter that can have a mass-type load developed (Section 2.1 of the TMDL). In order to develop the TMDLs, MPCA determined that total suspended solids (TSS) is an appropriate surrogate for turbidity. MPCA performed a statistical review of the TSS and turbidity data, and determined that there was significant correlation between the data (Table 4.1 of the TMDL). MPCA also noted that the type of turbidity meter used could affect the data, and therefore performed additional correlations and corrects to ensure the results could be properly interpreted (Appendix C of the TMDL). The TSS targets were determined specifically for each segment, and ranged from 50-73 mg/L.

Nutrients: For North and South Heron Lakes, the targets are the eutrophication WQSs in Table 2 above. MPCA has also determined that the Heron Lake outlet is impaired by high pH (Section 5.7 of the TMDL). MPCA believes that excess phosphorus causes high algal production, causing the pH levels in the water to increase (Section 2.1 of the TMDL). By controlling the phosphorus levels, algal production will be reduced, thus reducing the pH in the waterbody.

EPA finds that the TMDL document submitted by MPCA satisfies all requirements of 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. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

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

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

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

Comments:
Loading capacity: The loading capacities were calculated for each waterbody, and are found in Section 3 of the TMDL. Tables 3-33 below are a summary of the loading capacities for each of the pollutants for each impaired waterbody in the watershed.

Method for cause and effect relationship:
Fecal Coliform, TSS: The loading capacities for these pollutants for impaired segments of the WFDMR were determined by MPCA using the load duration curve method (LDC) (Sections 3 and 4 of the TMDL; Tables 3-32 below). Pollutant concentrations were measured at water quality monitoring stations in the watershed (Appendices A and B of the TMDL). A very simplified explanation is provided below.

1. Flow data - First, continuous flow data are required. There is one long-term flow gage in the watershed, U.S. Geological Survey (USGS) gage 5476000 located on the WFDMR near the downstream end of the watershed at Jackson, Minnesota (Section 3.3 of the TMDL). MPCA determined that several of the upstream segments were separated from the flow gage by lakes or reservoirs, which made interpretation of the flows more difficult. For these segments, MPCA used flow values from several short-term gages (4-5 years of data) operated by MPCA or USGS. MPCA compared the short-term flow data with the longer-term data at the USGS gage, and determined that the responses were similar, and therefore believe it is appropriate to use the short-term gages (Appendix B of the TMDL). EPA has reviewed this analysis, and agrees

that it is appropriate.

2. Water Quality data - This dataset is the monitored pollutant data from 1994-2006.
3. Load Duration Curves - The plots are derived from the flow data and water quality data described above. Existing monitored water pollutant loads, represented by the diamond-shaped points on the plot, are compared to target loads, the water quality standard line. If the existing loads are below (less than) the target line, no reduction needs to occur. Conversely, if the existing loads are above (greater than) the target load, a reduction is necessary to reach the target.
4. Analysis - The final step is to link the geographic locations of load reductions needed to the flow conditions under which the exceedences occur. Specific flow regimes contributing to pollutant loads, represented by the graph, are identified to determine under what flow conditions the pollutant exceedences are occurring. The LDCs in the TMDL show that the exceedences occur under varied flow conditions. By knowing the flow conditions under which exceedences are occurring, MPCA can focus implementation activities on those sources most likely to contribute loads.

The plots show under what flow conditions the water quality exceedences occur. Those exceedences at the right side of the graph occur during low flow conditions; exceedences on the left side of the graphs occur during higher flow events, such as storm runoff. MPCA provided analysis for each LDC, to determine the flow conditions for which exceedences (or the most severe exceedences) occurred (Sections 3 and 4 of the TMDL).

Using the load duration curve approach allows MPCA to determine which implementation practices are most effective for reducing pollutant loads based on flow magnitude. For example, if loads are significant during storm events, implementation efforts can target those best management practices (BMPs) that will most effectively reduce runoff. This allows for a more efficient implementation effort. These TMDLs are concentration-based, and tie directly into Minnesota's water quality standard for the pollutants. The target for these TMDLs is the water quality standard, and therefore meeting this loading capacity should result in attainment of water quality standards. The load duration curve is a cost-effective TMDL approach, to address the reductions necessary to meet WQS for these pollutants.

Weaknesses of the TMDL analysis are that non-point source (NPS) load allocations were not assigned to specific sources within the watershed, and the identified sources of the pollutants were assumed based on the data collected in the watershed, rather than determined by detailed monitoring and sampling efforts. Moreover, specific source reductions were not quantified. However, EPA believes the strengths of the State's proposed TMDL approach outweigh the weaknesses and that this methodology is appropriate based upon the information available. In the event that the pollutant levels do not meet WQSs in response to implementation efforts described in the TMDL submittal, the TMDL implementation strategy may be amended as new information on the watershed is developed, to better account for contributing sources of the impairment and to determine where reductions in the WFDMR watershed are most appropriate.

Phosphorus: MPCA calculated the loading capacity for phosphorus for Heron Lake as **75.50** kg/day (Table 33 below). In 2002, Heron Lake was listed as one assessment unit, and this listing was the basis for the load calculation. In the 2008 303(d) list, MPCA revised the listing to separate the lakes into North Heron Lake and South Heron Lake. However, the TMDL was

already well under development, and MPCA believes the lakes function as very similar waterbodies, as the lakes are considered shallow lakes under the MPCA guidance, and suffer the same impairments (Section 5.1 of the TMDL). The lakes are separated by a short (<1 mile) creek. The EPA concurs with the development of a single load for both lakes, based upon the data available and the reasons discussed above.

The loading capacity determination used for North Heron Lake and South Heron Lake is based on the BATHTUB model (Section 5 of the TMDL, Table 33 below). BATHTUB is a computer model that accounts for pollutant transport and sedimentation (U.S. Corp of Engineers, 2004). BATHTUB performs steady-state water and phosphorus balance calculations in a spatially segmented hydraulic network, accounting for pollutant transport and sedimentation. The model requires tributary flows and concentrations, reservoir bathymetry, in-lake concentrations, and weather data.

Tributary loads were estimated using the FLUX sub-model, which uses continuous flow data and water quality grab samples to determine the loadings from the two tributaries into the lakes, Jack Creek and Okebena Creek. FLUX was also used to determine the load exiting the lakes via the Heron Lake outlet. This allowed MPCA to determine the impact of internal phosphorus loading on the lakes (Section 5.3 of the TMDL). After the loading rates were determined, the BATHTUB model was applied. BATHTUB models apply a series of empirical equations derived from assessments of lake data and perform steady state water and nutrient calculations based on lake morphometry and tributary inputs. The BATHTUB model requires fairly simple inputs to predict phosphorus loading. The model accounts for pollutant transport, sedimentation, and nutrient cycling. Detailed TMDL modeling information is provided in Section 5 and Appendix D of the TMDL.

Critical conditions:
Fecal coliform and TSS: MPCA determined that the critical condition for fecal coliform is following storm events during the summer (Section 3.5 of the TMDL). By separating the sampling data into a spring and summer results, as well as wet results and dry results, MPCA was able to determine the critical condition. This will allow the state to target those conditions for further implementation efforts (Section 7 of the TMDL). Similar results were noted for TSS.

Phosphorus: The critical condition for the Heron Lakes is the summer growing season for an average precipitation year (Section 5.5 of the TMDL). Excessive nutrient problems such as algal blooms and fish kills are most prevalent in Minnesota during the summer recreational season (June through September). The numeric targets developed by MPCA focused on summer season as the critical condition. The annual precipitation conditions are based on actual precipitation received during the monitoring period.

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

4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future nonpoint sources and to natural background. Load

allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Where possible, load allocations should be described separately for natural background and nonpoint sources.

Comments:
Fecal coliform and TSS: Load allocations for the segments are in Tables 3-32 below. To determine the LAs, MPCA calculated the load for point sources (Section 5 below), and subtracted that and the Margin of Safety (MOS; Section 6 below) from the total loading capacity as calculated in Section 3 above (Sections 3.3 and 4.3 of the TMDL).

Although allocations were not developed for components of the load allocation, MPCA did determine the amount of current loading from these components for fecal coliform. Appendix A of the TMDL discusses the process used by MPCA to determine the relative impacts of various sources on the fecal coliform loadings. These impacts can be used by MPCA to determine the appropriate implementation measures. MPCA did not have sufficient data to develop a similar process for TSS.

Phosphorus:
The Load Allocations for Heron Lake is **60.67 kg/d** from February-September, and **45.22 kg/d** from October to January (Table 33 below). To determine the LAs, MPCA calculated the load for point sources (Section 5 below), and subtracted that and the Margin of Safety (MOS; Section 6 below) from the total loading capacity as calculated in Section 3 above (Section 5.4 of the TMDL). Since the WQS applies to the growing season (June-September), and the residence time in the lake is 85 days, MPCA added three months onto the model to account for the residence time. Therefore, the "growing season" load applies from February to September.

Although allocations were not developed for components of the load allocation, MPCA did determine the amount of current phosphorus loading from various sources. Section 5.2 of the TMDL discusses the results from MPCA's review, and provides information that MPCA can use to determine the impacts from potential sources. These impacts can be used by MPCA to determine the appropriate implementation measures.

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

5. Wasteload Allocations (WLAs)

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

The individual WLAs may take the form of uniform percentage reductions or individual mass based limitations for dischargers where it can be shown that this solution meets WQSs and does not result in localized impairments. These individual WLAs may be adjusted during the NPDES permitting process. If the WLAs are adjusted, the individual effluent limits for each permit issued to a discharger on the impaired water must be consistent with the assumptions and

requirements of the adjusted WLAs in the TMDL. If the WLAs are not adjusted, effluent limits contained in the permit must be consistent with the individual WLAs specified in the TMDL. If a draft permit provides for a higher load for a discharger than the corresponding individual WLA in the TMDL, the State/Tribe must demonstrate that the total WLA in the TMDL will be achieved through reductions in the remaining individual WLAs and that localized impairments will not result. All permittees should be notified of any deviations from the initial individual WLAs contained in the TMDL. EPA does not require the establishment of a new TMDL to reflect these revised allocations as long as the total WLA, as expressed in the TMDL, remains the same or decreases, and there is no reallocation between the total WLA and the total LA.

Comments:
Fecal coliform: The WLAs for fecal coliform are in Table 34 below.

The Wasteload Allocations (WLA) for fecal coliform are discussed in Section 3.3 of the TMDL. For the facilities that have a pond discharge system, the WLA was determined by multiplying the permitted discharge volume by the concentration limit (200 organisms/100 ml). MPCA noted that these facilities are limited by permit to discharge only between April 1 to June 15 and September 15 to December 15. For the mechanical systems, the WLA was based upon multiplying the permitted average wet weather design flow by the concentration limit of 200 organism/100ml. For a few facilities, the average wet weather design flow is greater than the flow in the stream under very low flow conditions. In these cases, MPCA has assigned a WLA based upon the flow:

Allocation = flow from source x 200 organism/100 ml.

Livestock facilities that are designated as Confined Animal Feeding Operations (CAFOs) were given a WLA = 0. Straight-pipe septic systems were given a WLA of 0. There is only one area designated as a Municipal Separate Storm Sewer System (MS4), the City of Worthington. The WLA is based upon the area covered under the MS4 permit (4 square miles). For those segments affected by the MS4, the WLAs are found in Tables 3-17 below.

TSS: The WLAs for TSS are in Table 36 below.

The Wasteload Allocations (WLA) for TSS are discussed in Section 4.3 of the TMDL. For the permitted wastewater facilities, the WLA was determined by multiplying the permitted discharge volume by the concentration limit (either 30 mg/l or 45 mg/l). MPCA noted that the pond facilities are limited by permit to discharge only between April 1 to June 15 and September 15 to December 15. For a few facilities, the average wet weather design flow is greater than the flow in the stream under very low flow conditions. In these cases, MPCA has assigned a WLA based upon the flow:

Allocation = flow from source x *XX* mg/l TSS

For wastewater facilities, the *XX* equals 45 mg/l, and equals 30 mg/l for the Red Rock Rural Water System and Hubbards Feed, Inc. For the other sources, the TSS concentration equals the instream target calculated for each segment (Table 4.1 of the TMDL). There is only one area designated as a Municipal Separate Storm Sewer System (MS4), the City of Worthington. The

WLA is based upon the area covered under the MS4 permit (4 square miles). For those segments affected by MS4s, the WLAs are found in Tables 18-32 below.

Phosphorus: The WLAs for phosphorus are in Table 37 below.

The phosphorus WLAs are discussed in Section 5.3 of the TMDL. For the facilities that have a pond discharge system, the WLA was determined by multiplying the permitted discharge volume by a proposed concentration limit of 0.4 mg/l from February to September. MPCA noted that these facilities are limited by permit to discharge only between April 1 to June 15 and September 15 to December 15. For the mechanical systems, the WLA was based upon multiplying the permitted average wet weather design flow by a proposed concentration limit of 0.4 mg/l from February to September. For the remainder of the year, the WLAs were calculated based upon a 1 mg/l concentration limit. To clarify, the EPA approval of these TMDLs is based solely upon the wasteload allocations in Table 37 below; permit concentrations and schedules will be addressed in the NPDES permit process.

Livestock facilities that are designated as Confined Animal Feeding Operations (CAFOs) were given a WLA = 0. Straight-pipe septic systems were given a WLA of 0. There is only one area designated as a Municipal Separate Storm Sewer System (MS4), the City of Worthington. The WLA is based upon the area covered under the MS4 permit (4 square miles) and is found in Table 36 below.

EPA finds that the TMDL document submitted by MPCA satisfies all requirements of 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)). 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:
Fecal coliform and TSS: For these pollutants, MPCA used an explicit MOS of 10% (Section 3.3 and 4.3 of the TMDL; Tables 3-32 below). MPCA noted that there are a number of best management practices that can and are being implemented that have been shown to be effective in reducing fecal coliform and TSS from nonpoint sources in the watershed. In addition, the WLAs were modeled as discharging during the summer season, when in reality they are prohibited to discharge during most of the growing season (June 15-September 15). This effectively overestimates the load from these sources.

This decision clarifies a statement made by MPCA in the MOS section of the TMDL (Page 24 and 72). The MOS cannot serve as a reserve capacity for new dischargers, and the MOS loads

calculated in Tables 3-32 below are considered to be only MOS. To reduce the MOS as calculated in Tables 3-32 below, MPCA will have to demonstrate that the uncertainty has been lessened in the TMDL. This would also involve re-opening the TMDL and ensuring adequate public notice.

Phosphorus: MPCA used both an explicit and implicit MOS for the TMDL (Section 5.3 of the TMDL). The explicit MOS was set at 5% of the total load, or 3.78 kg/d of phosphorus. MPCA believes this is sufficient MOS, as the lake and tributaries have been sampled five of the last ten years, thus providing data over a variety of conditions. In addition, the implicit MOS includes calibrating the BATHTUB model to a wet year (2006), which means the concentrations and resulting loads are likely over-estimated.

EPA finds that the TMDL document submitted by MPCA satisfies all requirements of 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:
MPCA used the Load Duration Curve method for fecal coliform and TSS, which inherently accounts for seasonal variation by using daily flows over a multi-year year period (Sections 3 and 4 and Appendices A and B of the TMDL). EPA agrees that this properly accounts for seasonal variations.

MPCA properly accounted for seasonality for phosphorus by using the BATHTUB model, which uses flows from over a multi-year period (Appendix D of the TMDL). EPA agrees that this properly accounts for seasonal variations.

EPA finds that the TMDL document submitted by MPCA satisfies all requirements of 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 nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be

approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

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

Comments:
Reasonable Assurance is discussed in Section 8 of the TMDL Study. A summary is provided below:

Watershed Management: The advisory board that was formed to assist in developing the TMDL has a wide variety of participants, and has provided significant input into the development of the TMDL. The board has been active on working with local resource managers to adopt some of the best management practices discussed in the Implementation Plan portion of the TMDL. A detailed implementation plan will be developed within the next year.

NPDES Permits: MPCA will be working through the NPDES permit process to develop updated permits consistent with the TMDL. Minnesota's General Permit requires MS4s to amend their NPDES Storm Water Pollution Prevention Programs (SWPPPs) to ensure consistency with applicable TMDL WLA requirements.

EPA finds that the TMDL document submitted by MPCA satisfies all requirements of this eighth element.

9. Monitoring Plan to Track TMDL Effectiveness

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

Comments:
MPCA is proposing that future monitoring for pathogens will focus on *E. coli*, as the water quality standard is expected to change from fecal coliform to E coli in the near future (Section 6 of the TMDL). At a minimum, monitoring is planned for the same sites as previous monitoring efforts, and will be subject to funding constraints. Similar efforts are planned for TSS, and the State is exploring expanding the list of parameters sampled along with TSS, to include total suspended volatile solids and chlorophyll-a, to help determine the mineral versus algal sources.

MPCA is planning to continue monitoring Heron Lake for phosphorus at the inlets to the lake as well as in the lake itself. Monitoring is expected for at least three seasons, and may include biota monitoring.

EPA finds that the TMDL document submitted by MPCA satisfies all requirements of this ninth element.

10. Implementation

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

Comments:
The submitted TMDL Study does not contain a formal implementation plan, since it is not required as a condition for TMDL approval under the current U.S. EPA regulations. However, Section 7 of the TMDL Study does discuss an overview of the implementation options available to MPCA. The formal TMDL implementation plan will be developed by MPCA upon approval of the WFDMR TMDL.

Potential activities, identified by MPCA, for controlling the pollutants in the WFDMR watershed, include various NPDES permit activities for wastewater treatment systems as well as stormwater controls. MPCA will be working with the University of Minnesota Extension Service to develop options for use of various best management practices (BMPs) that will control pathogens, sediment, and nutrients. Appendix E of the TMDL contains a agricultural BMP options in a matrix format that was developed to target sediment reductions. MPCA believes the options will also reduce nutrient and pathogen loads.

EPA reviews, but does not approve, implementation plans. EPA finds that this criterion has been adequately addressed.

11. Public Participation

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

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

Comments:
A technical advisory committee was established for the TMDL Study in order to involve interested stakeholders. The committee included local cities, representatives from the county boards, Soil and Water Conservation Districts, and local residents. All meetings were open to the public. The committee held meetings to discuss watershed TMDL efforts, and display boards were used at various public functions in the watershed. An open house was held on the TMDL in April, 2008.

MPCA placed the Draft WFDMR TMDL on public notice from August 11, 2008 to September 10, 2008, to provide an opportunity for public comment. The draft TMDL was posted at: http://www.pca.state.mn.us/water/tmdl/tmdl-draft.html, the MPCA's TMDL web site. U.S. EPA sent MPCA comments on the draft TMDL, and the comments were adequately addressed in the final TMDL. Four sets of comments were received during the TMDL public notice period. Public comments were addressed appropriately by MPCA.

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

12. Submittal Letter

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

Comments:
On November 11, 2008, EPA received the West Fork Des Moines River TMDL, and a submittal letter dated October 29, 2008, signed by Brad Moore, Commissioner, addressed to Kevin Pierard, U.S. EPA, Region 5, Water Division. In the submittal letter, MPCA stated "I am pleased to submit the West Fork Des Moines River Total Maximum Daily Load (TMDL) study for excess nutrients, turbidity, and fecal coliform bacteria to the U.S. Environmental Protection Agency (EPA) for final approval". The submittal letter included the names and locations of the waterbodies and the pollutants of concern.

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

13. Conclusion

After a full and complete review, EPA finds that the phosphorus TMDL for Burandt Lake satisfies all of the elements of an approvable TMDL. This decision document addresses **32** TMDLs for **32** waterbody segments as identified on Minnesota's 2008 303(d) list (Table 1 above).

EPA's approval of this TMDL does not extend to those waters that are within Indian Country, as defined in 18 U.S.C. Section 1151. EPA is taking no action to approve or disapprove TMDLs for those waters at this time. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.

TABLE 3. Fecal coliform loading capacities and allocations (AUID: 07100001-503).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	1925	533	227	88	20
Wasteload Allocation*					
Wastewater Treatment Facilities	19	19	19	19	19
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	1713	461	185	60	**
Margin of Safety	193	53	23	9	Implicit

TABLE 4. Fecal coliform loading capacities and allocations (AUID: 07100001-504).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	434	120	51	20	4.5
Wasteload Allocation*					
Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	390	108	46	18	4
Margin of Safety	43	12	5	2	0.5

* The individual facilities are listed in Table 34.

TABLE 5. Fecal coliform loading capacities and allocations (AUID: 07100001-502).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	993	232	87	10	0
Wasteload Allocation*					
Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0

"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	893	209	78	9	0
Margin of Safety	99	23	9	1	0

* The individual facilities are listed in Table 34.

TABLE 6. Fecal coliform loading capacities and allocations (AUID: 07100001-508).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	422	99	37	4.1	0
Wasteload Allocation					
Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	NA	NA	NA	NA	NA
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	380	89	33	3.7	0
Margin of Safety	42	10	4	0.4	0

TABLE 7. Fecal coliform loading capacities and allocations (AUID: 07100001-517).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	35	8	3.1	0.35	0
Wasteload Allocation					
Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	NA	NA	NA	NA	NA
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	32	7	2.8	0.31	0
Margin of Safety	4	1	0.3	0.03	0

TABLE 8. Fecal coliform loading capacities and allocations (AUID: 07100001-519).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	85	20	7.5	0.8	0
Wasteload Allocation					
Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	NA	NA	NA	NA	NA
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	77	18	6.7	0.7	0
Margin of Safety	9	2	0.7	0.1	0

TABLE 9. Fecal coliform loading capacities and allocations (AUID: 07100001-513).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	323	76	28	3.2	0
Wasteload Allocation					
Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	NA	NA	NA	NA	NA
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	291	68	26	2.8	0
Margin of Safety	32	8	3	0.3	0

TABLE 10. Fecal coliform loading capacities and allocations (AUID: 07100001-546).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	5629	1202	493	97	19
Wasteload Allocation*					
Wastewater Treatment Facilities	37	37	37	37	**
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	5029	1045	407	50	**
Margin of Safety	563	120	49	10	Implicit

* The individual facilities are listed in Tables 34.
** See Section 3.3 of the TMDL for allocations for these specific categories in these flow zones

TABLE 11. Fecal coliform loading capacities and allocations (AUID: 07100001-535).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	671	328	110	10	1
Wasteload Allocation*					
Wastewater Treatment Facilities	7	7	7	7	**
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	597	288	93	2	**
Margin of Safety	67	33	11	1	Implicit

* The individual facilities are listed in Table 34
** See Section 3.3 of the TMDL for allocations for these specific categories in these flow zones

TABLE 12. Fecal coliform loading capacities and allocations (AUID: 07100001-533).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	7564	1425	435	174	42
Wasteload Allocation*					

Wastewater Treatment Facilities	44	44	44	44	**
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	6764	1238	347	112	**
Margin of Safety	756	142	43	17	Implicit

* The individual facilities are listed in Tables 34.
** See Section 3.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 13. Fecal coliform loading capacities and allocations (AUID: 07100001-501).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	11986	3302	964	220	29
Wasteload Allocation*					
Wastewater Treatment Facilities	131	131	131	131	**
Communities Subject to MS4 NPDES Requirements	34	9	2	0.2	**
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	10622	2831	734	66	**
Margin of Safety	1199	330	96	22	Implicit

* The individual facilities are listed in Tables 34.
** See Section 3.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 14. Fecal coliform loading capacities and allocations (AUID: 07100001-506).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	2299	550	254	75	23
Wasteload Allocation*					
Wastewater Treatment Facilities	63	63	63	63	**
Communities Subject to MS4 NPDES Requirements	55	12	5	0.1	**
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	1951	420	161	4	**
Margin of Safety	230	55	25	7	Implicit

* The individual facilities are listed in Tables 34.
** See Section 3.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 15. Fecal coliform loading capacities and allocations (AUID: 07100001-509).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	3583	940	388	98	12
Wasteload Allocation*					
Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0
"Straight Pipe" Septic Systems	0	0	0	0	0

Load Allocation	3225	846	350	88	11
Margin of Safety	358	94	39	10	1

* The individual facilities are listed in Table 34.

TABLE 16. Fecal coliform loading capacities and allocations (AUID: 07100001-507).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	1214	291	134	39	12
Wasteload Allocation*					
Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	6	1	0.7	0.2	0.06
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	1087	260	120	35	11
Margin of Safety	121	29	13	4	1

* The individual facilities are listed in Table 34.

TABLE 17. Fecal coliform loading capacities and allocations (AUID: 07100002-501).

	FLOW ZONE				
	High	**Moist**	**Mid**	**Dry**	**Low**
	Billion organisms per day				
Average Total Daily Loading Capacity	12891	3552	1037	237	31
Wasteload Allocation*					
Wastewater Treatment Facilities	209	209	209	209	**
Communities Subject to MS4 NPDES Requirements	34	9	2	0.01	**
Livestock Facilities Requiring NPDES Permits	0	0	0	0	0
"Straight Pipe" Septic Systems	0	0	0	0	0
Load Allocation	11358	2978	721	4	**
Margin of Safety	1289	355	104	24	Implicit

* The individual facilities are listed in Table 34.

** See Section 3.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 18. Total suspended solids loading capacities and allocations (AUID: 07100001-503).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY LOADING CAPACITY	75.86	18.08	7.50	2.95	0.61
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	0.48	0.48	0.48	0.48	0.48
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Construction and Industrial Stormwater	0.07	0.02	0.006	0.002	<0.001
Load Allocation	67.73	15.78	6.27	2.17	0.07
Margin of Safety	7.59	1.81	0.75	0.29	0.06

* The individual facilities are listed in Table 36.

TABLE 19. Total suspended solids loading capacities and allocations (AUID: 07100001-545).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY LOADING CAPACITY	61.11	15.18	5.24	0.18	0.002
Wasteload Allocation					
Permitted Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Construction and Industrial Stormwater	0.06	0.01	0.005	<0.001	<0.001
Load Allocation	54.94	13.65	4.72	0.16	0.001
Margin of Safety	6.11	1.52	0.52	0.02	<0.001

TABLE 20. Total suspended solids loading capacities and allocations (AUID: 07100001-546).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY LOADING CAPACITY	226.47	48.38	19.85	3.91	0.75
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	0.65	0.65	0.65	0.65	0.65
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Construction and Industrial Stormwater	0.20	0.04	0.02	0.003	<0.001
Load Allocation	202.97	42.85	17.20	2.86	0.02
Margin of Safety	22.65	4.84	1.98	0.39	0.08

* The individual facilities are listed in Table 36.

TABLE 21. Total suspended solids loading capacities and allocations (AUID: 07100001-535).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY LOADING CAPACITY	19.96	9.75	3.28	0.29	0.02
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	0.16	0.16	0.16	0.16	**
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Construction and Industrial Stormwater	0.02	0.009	0.003	<0.001	**
Load Allocation	17.78	8.61	2.79	0.10	**
Margin of Safety	2.00	0.98	0.33	0.03	Implicit

* The individual facilities are listed in Table 36.

** See Section 4.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 22. Total suspended solids loading capacities and allocations (AUID: 07100001-533).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY LOADING CAPACITY	241.80	45.55	13.90	5.56	1.36
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	0.82	0.82	0.82	0.82	0.82
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Construction and Industrial Stormwater	0.22	0.04	0.01	0.004	<0.001

Load Allocation	216.59	40.14	11.68	4.18	0.40
Margin of Safety	24.18	4.56	1.39	0.56	0.14

* The individual facilities are listed in Table 36.

TABLE 23. Total suspended solids loading capacities and allocations (AUID: 07100001-524).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY L0ADING CAPACITY	231.53	81.95	37.82	8.87	3.20
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	2.30	2.30	2.30	2.30	2.30
Communities Subject to MS4 NPDES Requirements	0.73	0.25	0.11	0.02	0.002
Construction and Industrial Stormwater	0.21	0.07	0.03	0.006	0.001
Load Allocation	205.15	71.13	31.60	5.66	0.58
Margin of Safety	23.15	8.19	3.78	0.89	0.32

* The individual facilities are listed in Table 36.

TABLE 24. Total suspended solids loading capacities and allocations (AUID: 07100001-501).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY L0ADING CAPACITY	330.31	91.00	26.56	6.07	0.80
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	2.52	2.52	2.52	2.52	**
Communities Subject to MS4 NPDES Requirements	0.95	0.26	0.07	0.009	**
Construction and Industrial Stormwater	0.29	0.08	0.02	0.003	**
Load Allocation	293.51	79.04	21.29	2.92	**
Margin of Safety	33.03	9.10	2.66	0.61	Implicit

* The individual facilities are listed in Table 36.

** See Section 4.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 25. Total suspended solids loading capacities and allocations (AUID: 07100001-541).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY L0ADING CAPACITY	332.07	91.49	26.70	6.10	0.80
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	2.52	2.52	2.52	2.52	**
Communities Subject to MS4 NPDES Requirements	0.95	0.26	0.07	0.01	**
Construction and Industrial Stormwater	0.30	0.08	0.02	0.003	**
Load Allocation	295.09	79.48	21.42	2.95	**
Margin of Safety	33.21	9.15	2.67	0.61	Implicit

* The individual facilities are listed in Table 36.

** See Section 4.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 26. Total suspended solids loading capacities and allocations (AUID: 07100001-507).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY LOADING CAPACITY	20.22	5.57	1.63	0.37	0.05
Wasteload Allocation					
Permitted Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	0.11	0.03	0.009	0.002	<0.001
Construction and Industrial Stormwater	0.02	0.005	0.001	<0.001	<0.001
Load Allocation	18.06	4.98	1.45	0.33	0.04
Margin of Safety	2.02	0.56	0.16	0.04	0.005

TABLE 27. Total suspended solids loading capacities and allocations (AUID: 07100001-506).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY LOADING CAPACITY	58.41	18.24	8.79	2.38	0.84
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	1.20	1.20	1.20	1.20	**
Communities Subject to MS4 NPDES Requirements	1.35	0.40	0.18	0.02	**
Construction and Industrial Stormwater	0.05	0.02	0.007	0.001	**
Load Allocation	49.97	14.80	6.53	0.92	**
Margin of Safety	5.84	1.82	0.88	0.24	Implicit

* The individual facilities are listed in Table 36.
** See Section 4.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 28. Total suspended solids loading capacities and allocations (AUID: 07100001-505).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY LOADING CAPACITY	31.01	7.80	3.23	0.69	0.14
Wasteload Allocation					
Permitted Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Construction and Industrial Stormwater	0.03	0.007	0.003	0.001	<0.001
Load Allocation	27.88	7.02	2.91	0.62	0.13
Margin of Safety	3.10	0.78	0.32	0.07	0.01

TABLE 29. Total suspended solids loading capacities and allocations (AUID: 07100001-509).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY LOADING CAPACITY	95.65	24.07	9.97	2.13	0.45
Wasteload Allocation					
Permitted Wastewater Treatment Facilities	NA	NA	NA	NA	NA
Communities Subject to MS4 NPDES Requirements	NA	NA	NA	NA	NA
Construction and Industrial Stormwater	0.09	0.02	0.01	0.002	<0.001

Load Allocation	86.00	21.65	8.96	1.91	0.40
Margin of Safety	9.56	2.41	1.00	0.21	0.05

TABLE 30. Total suspended solids loading capacities and allocations (AUID: 07100001-529).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY L0ADING CAPACITY	63.78	26.96	14.91	3.29	0.03
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	1.30	1.30	1.30	1.30	**
Communities Subject to MS4 NPDES Requirements	1.09	0.45	0.24	0.03	**
Construction and Industrial Stormwater	0.06	0.02	0.01	0.002	**
Load Allocation	54.95	22.49	11.87	1.62	**
Margin of Safety	6.38	2.70	1.49	0.33	Implicit

* The individual facilities are listed in Table 36.
** See Section 4.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 31. Total suspended solids loading capacities and allocations (AUID: 07100001-527).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY L0ADING CAPACITY	137.69	58.21	32.20	7.10	0.07
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	1.45	1.45	1.45	1.45	**
Communities Subject to MS4 NPDES Requirements	1.05	0.44	0.24	0.04	**
Construction and Industrial Stormwater	0.12	0.05	0.03	0.005	**
Load Allocation	121.30	50.45	27.26	4.89	**
Margin of Safety	13.77	5.82	3.22	0.71	Implicit

* The individual facilities are listed in Table 36.
** See Section 4.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 32. Total suspended solids loading capacities and allocations (AUID: 07100002-501).

	Flow Zone				
	High	Moist	Mid	Dry	Low
	Tons/day				
TOTAL DAILY L0ADING CAPACITY	471.14	129.80	37.88	8.65	1.13
Wasteload Allocation					
Permitted Wastewater Treatment Facilities*	3.99	3.99	3.99	3.99	**
Communities Subject to MS4 NPDES Requirements	1.25	0.34	0.09	0.01	**
Construction and Industrial Stormwater	0.42	0.11	0.03	0.004	**
Load Allocation	418.36	112.38	29.98	3.78	**
Margin of Safety	47.11	12.98	3.79	0.87	Implicit

* The individual facilities are listed in Table 36.
** See Section 4.3 of the TMDL for allocations for these specific categories in these flow zones.

TABLE 33. Total phosphorus loading capacities and allocations – Heron Lake

	FEBRUARY—SEPTEMBER	OCTOBER—JANUARY
	kg per day	
Average Total Daily Loading Capacity	75.50	75.50
Wasteload Allocation*		
Wastewater Treatment Facilities	10.42	26.03
Communities Subject to MS4 NPDES Requirements	0.56	0.42
Construction and Industrial Stormwater	0.07	0.05
Livestock Facilities Requiring NPDES Permits	0	0
"Straight Pipe" Septic Systems	0	0
Load Allocation	60.67	45.22
Margin of Safety	3.78	3.78

TABLE 34. Fecal coliform wasteload allocations

FACILITY	NPDES PERMIT #	DISCHARGE, MGD	WLA, BILLIONS/DAY
Lake Wilson	MNG580061	*	4
Slayton	MN0024911	*	15
Fulda	MN0023507	*	7
Brewster	MN0021750	*	16
Worthington-municipal	MN0031186	4.0	30
Worthington-industrial	MN0031178	2.04	15
Okabena	MN0050288	*	2
Currie	MN0025682	*	18
Windom	MN0022217	1.83	14
Heron Lake	MN0023655	*	6
Lakefield	MN0020427	0.58	4
Jackson	MNG580063	*	78

TABLE 35. CAFO facilities – fecal coliform TMDL

FACILITY	NPDES PERMIT #
Schultz Hog Farms Inc	MNG440140
James Tutt Farm	MNG440139
Grandy Pork LLP	MNG440141
Green Prairie Coop - Sec 23	MNG440346
James R & Robert E Buldhaupt Farm	MNG440142
Mark Buldhaupt Farm	MNG440143
Vander Wal Brothers	MNG440347
Gervais Brothers II	MNG440321
Kramer Swine Finishing	MNG440396
Brake Beef Yard	MN0066265
Southwest Prairie Pork	MNG440370
Double K - Finishing Site	MNG440273
Double K - Farrowing Site	MNG440273
Highway 60 Pork	MNG440278
Green Prairie Coop - Sec 7	MNG440337
Lake Shore Pork	MNG440055
Steve Rasche Farm	MNG440010
Christensen Family Farms Site C-13	MNG440063
Douglas Lusk Farm	MNG440047

TABLE 36. Total suspended solids wasteload allocations

Facility	NPDES Permit #	Discharge, mgd	WLA, kg/day
Lake Wilson	MNG580061	*	87
Slayton	MN0024911	*	345
Fulda	MN0023507	*	150
Currie	MN0025682	*	158
Brewster	MN0021750	*	356
Worthington Industrial	MN0031178	2.04	232
Worthington Municipal	MN0031186	4.00	454
Okabena	MN0050288	*	42
Hubbard Feeds Inc.	MN0033375	0.01	1
Lakefield	MN0020427	0.58	99
Heron Lake	MN0023655	*	131
Red Rock Rural WTP	MNG640077	0.25	28
Windom	MN0022217	1.83	208
Jackson	MNG580063	*	1330

* - Seasonal discharge.

TABLE 37. Total phosphorus wasteload allocations – Heron Lake

Facility	NPDES Permit #	Discharge, mgd	Feb.-Sept. WLA, kg/day	Oct.-Jan. WLA, kg/day
Brewster	MN0021750	*	0.29	0.72
Worthington Industrial	MN0031178	2.04	3.2	8.0
Worthington Municipal	MN0031186	4.00	6.0	15.0
Okabena	MN0050288	*	0.05	0.11
Lakefield	MN0020427	0.58	0.88	2.2

* - Seasonal discharge.

TABLE 38. CAFO facilities – phosphorus TMDL

FACILITY	NPDES PERMIT #
Brake Beef Yard	MN0066265
Southwest Prairie Pork	MNG440370
Double K - Finishing Site	MNG440273
Double K - Farrowing Site	MNG440273
Highway 60 Pork	MNG440278
Green Prairie Coop - Sec 7	MNG440337