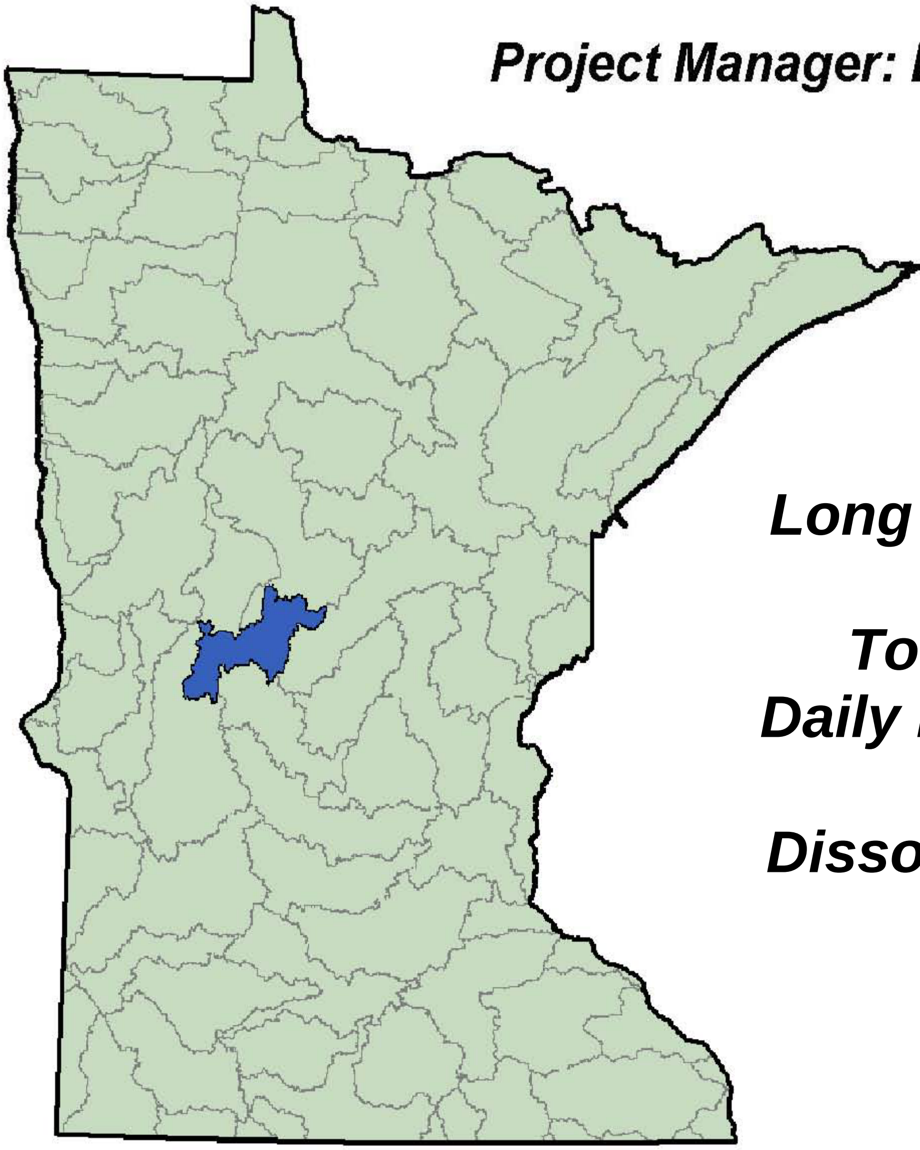
Minnesota Pollution Control Agency

Project Manager: Dr. Hafiz Munir



Long Prairie River Watershed Total Maximum Daily Load (TMDL) For Dissolved Oxygen

June 2005

"Partnering to Improve Minnesota's Waters"

Minnesota Pollution Control Agency

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Table of Contents

Table of Contents (continued)

Table of Contents (continued)

Table of Contents (continued)

Table of Contents (continued)

TABLES

FIGURES

Table of Contents (continued)

Table of Contents (continued)

Table of Contents (continued)

Table of Contents (continued)

Table of Contents (continued)

Appendix F, Figures

Table of Contents (continued)

Table of Contents, continued

Table of Contents (continued)

Acronyms

BOD5	5-Day Biochemical Oxygen Demand
CBOD	Carbonaceous BOD
$CBOD_5$	5-Day Carbonaceous BOD
$CBOD_{20}$	20-Day Carbonaceous BOD
$CBOD_u$	Ultimate Carbonaceous BOD
CE	Computational Element (QUAL-TX)
cfs	cubic feet per second
COC	chain of custody
CRP	Conservation Reserve Program
CWA	Clean Water Act
CWP	Clean Water Partnership
DEM	Digital Elevation Model
DMR	Discharge Monitoring Reports
DO	Dissolved oxygen concentration
ΔDO	Difference, daily maximum minus daily minimum DO
DOQ	Digital Ortho Quadrangle
DRG	Digital Raster Graphic
EC RM	Eagle Creek: River Mile
EPA	Environmental Protection Agency
FTN	FTN Associates, Ltd.
GIS	Geographical Information System
g O_2/sec	grams of oxygen per second
g O_2/m^2 – day	grams of oxygen per square meter per day
HRU	Hydrologic Response Unit
IBI	Index of Biotic Integrity
LA	Load Allocation

Acronyms (continued)

lbs/ac/yr	pounds per acre per year
lbs/day	pounds per day
LPR RM	Long Prairie River: River Mile
MDNR	Minnesota Department of Natural Resources
MGD	million gallons per day
mg/L	milligrams per liter
mg/ft^3	milligrams per cubic foot
mg/sq ft - day	milligrams per square foot per day
mg O_2/ mg Chl a / day	milligrams of Oxygen per milligram chlorophyll-*a* per day
mg N/ mg Chl a / day	milligrams of Nitrogen per milligram chlorophyll-*a* per day
mg P/ mg Chl a / day	milligrams of Phosphorus per milligram chlorophyll-*a* per day
mg O_2/ mg macrophyte / day	milligrams of Oxygen per milligram macrophyte per day
mg N/ mg macrophyte / day	milligrams of Nitrogen per milligram macrophyte per day
mg P/ mg macrophyte / day	milligrams of Phosphorus per milligram macrophyte per day
mi^2	square miles
MOS	Margin of Safety
MPCA	Minnesota Pollution Control Agency
MVTL	Minnesota Valley Testing Laboratory
NBOD	Nitrogenous Biochemical Oxygen Demand
NCHF	North Central Hardwood Forest
NH_3-N	Total Ammonia-Nitrogen
NLF	Northern Lakes and Forests
NO_2/ NO_3-N	Nitrate/ Nitrite- Nitrogen
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Non-point Source
NRCS	Natural Resource Conservation Service

Acronyms (continued)

ON	Organic Nitrogen
QA	Quality Assurance
QC	Quality Control
QUAL2E	Enhanced Stream Water Quality Model
QUAL-TX	Enhanced Stream Water Quality Model
RM	River Mile
7Q10	Seven day low flow average based on a minimum of ten years of data
SCS	Soil Conservation Service
SOD	Sediment Oxygen Demand
STATSGO	State Soil Geographic
SSURGO	Soil Survey Geographic
SWAT	Soil and Water Assessment Tool
TCEQ	Texas Commission on Environmental Quality
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
Todd SWCD	Todd County Soil and Water Conservation District
TP	Total phosphorus
TSS	Total Suspended Solids
USGS	United States Geological Survey
USLE	Universal Soil Loss Equation
Wenck	Wenck Associates, Inc.
WLA	Wasteload Allocation
WQBELs	Water Quality Based Effluent Limits
WWTF	Waste Water Treatment Facility
USDA	United States Department of Agriculture

Acknowledgments

The Long Prairie River Watershed TMDL Project was conducted by Wenck Associates, Inc., Maple Plain, MN, with its partner FTN Associates, Ltd., Little Rock, AR, under contract with the Minnesota Pollution Control Agency, and in cooperation with the MPCA and the Todd Soil and Water Conservation District. Special thanks go to the Todd SWCD's Kitty Tepley, whose local activism gave the project a strong impetus, and to the MPCA's Dr. Hafiz Munir, whose project management kept things rolling. We have very much appreciated assistance from MPCA staff Ron Jacobson, Celine Lyman, Pat Shelito, Jeff Risberg, Jim Hodgson and Bruce Wilson. Thanks also to Larry Koenig of the Texas Commission on Environmental Quality TMDL Team (Texas Natural Resource Conservation Commission), who answered many questions concerning the QUAL-TX model. Wenck's project staff consisted primarily of Pamela Kiel Massaro, Rebecca Kluckhohn, Wes Boll, Bashar Sinokrot, and John Erdmann. FTN's primary staff were Philip Massirer and Dennis Ford. This report was prepared mainly by Ms. Massaro, Ms. Kluckhohn, and Dr. Erdmann, with Mr. Massirer and Dr. Ford contributing Section 10, and considerable support throughout the project.

1.0 Executive Summary

Section 303(d) of the Federal Clean Water Act (CWA) requires the Minnesota Pollution Control Agency (MPCA) to identify water bodies that do not meet water quality standards and to develop total maximum daily pollutant loads for those water bodies. A total maximum daily load (TMDL) is the amount of a pollutant that a water body can assimilate without exceeding the established water quality standards for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point and non-point sources within the watershed that discharge to the water body. This report presents TMDLs developed for maintenance of the dissolved oxygen (DO) standard in the Long Prairie River in central Minnesota. Because ammonia is both an oxygen-demanding substance and a potential toxin, ammonia toxicity was evaluated in those reaches impacted by municipal waste discharges.

Under contract (and in cooperation) with the MPCA, Wenck Associates, Inc., with its partner FTN Associates, Ltd., conducted the TMDL study and prepared this report. The study was completed in three phases. Phase I was an analysis of existing data. Phase II entailed intensive synoptic water quality surveys of the river system in August and September 2001, and February 2002. Modeling and TMDL development were conducted in Phase III of the project. The contractual work plan encompassed nutrient investigations that were not directly relevant to the TMDL study and are reported separately.

The Long Prairie River flows some 92 miles through Douglas, Todd, and Morrison counties, from the outlet of Lake Carlos to the Crow Wing River, an Upper Mississippi River tributary. At the City of Long Prairie, approximately the midpoint of the Long Prairie River, the average flow is 165 cubic feet per second (cfs), and the spring and summer 7-day, 10-year low flows are 38.6 and 11.4 cfs, respectively. For the TMDL study, the Long Prairie River's watershed is considered as the 647-square mile drainage area downstream from Lake Carlos. Watershed land use is 41%

agricultural, 24% grassland (including pasture), 21% forest, and 10% water or wetland. Urban and developed rural land comprises the small remaining area (3%) and includes five municipalities with wastewater treatment facilities (WWTFs) explicitly considered in the TMDL study: the cities of Carlos, Long Prairie, Browerville, Eagle Bend, and Clarissa. The headwater outflow from Lake Carlos, which drains an additional 236 square miles, is of very high quality.

Water quality impairment of the Long Prairie River and its tributary Eagle Creek is summarized below:

Waterbody	**Reach**	**Assessment Unit ID**	**Impairment**	**Pollutants Addressed in this TMDL Study**
Long Prairie River	Fish Trap Ck to Crow Wing R	07010108-501	Low DO	Oxygen-demanding substances
Long Prairie River	Moran Ck to Fish Trap Ck	07010108-502	Low DO	Oxygen-demanding substances
Long Prairie River	Turtle Ck to Moran Ck	07010108-503	Low DO	Oxygen-demanding substances
Long Prairie River	Eagle Ck to Turtle Ck	07010108-504	Low DO Fish IBI	Oxygen-demanding substances Ammonia toxicity
Long Prairie River	Spruce Ck to Eagle Ck	07010108-505	Low DO Fish IBI	Oxygen-demanding substances Ammonia toxicity
Long Prairie River	L Carlos to Spruce Ck	07010108-506	Low DO Fish IBI	Oxygen-demanding substances Ammonia toxicity
Eagle Creek	Headwaters to Long Prairie R	07010108-507	Fish IBI	Ammonia toxicity

Notes:

Reaches 07010108-501 through -506 (Long Prairie River main stem) are also listed for mercury Fish Consumption Advisory [not considered in this TMDL study].

IBI = Index of Biotic Integrity. Formerly listed for biotic impairment.

The pollutants of concern for low DO are carbonaceous and nitrogenous biochemical oxygen demand (CBOD and NBOD). The pollutant of concern for ammonia toxicity is un-ionized ammonia.

CBOD is a general measure of organic materials such as sewage solids, animal wastes, animal and other food processing wastes, and plant litter. CBOD represents the oxygen equivalent (amount of oxygen that micro-organisms require for the respiration, or biochemical "burning up") of the organic matter in a sample. Nitrogen is a constituent of organic matter, and especially of animal and animal processing wastes. A wide variety of micro-organisms rapidly transform organic nitrogen (ON) to ammonia nitrogen (NH_3-N); nitrification of the NH_3-N by certain specialized bacteria then transforms it to nitrate nitrogen while consuming oxygen in the process. NBOD is calculated as the sum (NH_3-N plus ON) multiplied by 4.33, which gives the oxygen equivalent for the nitrification process. The fraction of measured NH_3-N that is un-ionized is calculated (from the water temperature and pH) with a formula specified in the Minnesota water quality standards.

The pollutants of concern originate from both point and non-point sources in the watershed. Pollutant sources requiring permits under the National Pollutant Discharge Elimination System (NPDES) include the above-mentioned municipal WWTFs and treated groundwater pumpage from a Superfund site (former dry cleaner) in the City of Long Prairie. The watershed also contains five Concentrated Animal Feeding Operations (CAFOs). Their NPDES permits (four existing, one in process) do not allow direct discharge to surface waters. However, manure from the CAFOs is ultimately spread on cropland, so the CAFOs contribute to non-point source pollution. The CAFOs include poultry, dairy cattle, and beef cattle operations. All of the NPDES permits in the watershed are minor permits under the classification of the U.S. Environmental Protection Agency ("regular" permits under the MPCA's classification). Potato growers in the watershed reportedly conduct washing operations after harvest, but these washing operations have not required NPDES permits. There are no storm water permits in the Long Prairie River watershed.

Non-point sources include runoff from cropland (major land use) and from urban and other developed areas (minor). The main crops are potatoes, corn, soybeans, and alfalfa. Subwatersheds that exhibit high pollutant export have been identified in this study through modeling based on agricultural practices, topography, soil characteristics, climatology, and other factors. Non-point sources also include many small livestock operations in addition to the above-mentioned CAFOs. Sediment oxygen demand (SOD) in the channel of the Long Prairie River is accounted as a nonpoint source as well. SOD results from the deposition in the river channel of particulate organic matter originating from point and non-point sources and from decaying in-channel plant biomass. SOD also occurs naturally in wetlands. One of the major findings of this TMDL study is that low DO found in the near-headwater reach of the Long Prairie River primarily results from SOD in riparian wetlands that interact with the river's main channel through flow exchange.

The MPCA's projected schedule for TMDL completions implicitly reflects a priority ranking. The Long Prairie River's TMDL schedule places the lowermost reach (07010108-501) second only to the lower Minnesota River in priority. The schedule for the other Long Prairie reaches currently listed for DO impairment indicates an implicit priority ranking within the top 1% of Minnesota's 303(d) List.

The water quality standards applicable to the Long Prairie River for this TMDL study are the Class 2B DO standard of 5 milligrams per liter (mg/L) as daily minimum, and the Class 2B un-ionized ammonia chronic standard of 0.04 mg/L. The low-flow conditions under which these standards are required to be met are the 7-day, 10-year low flow (7Q10) for the DO standard, and the 30-day, 10-year low flow (30Q10) for the un-ionized ammonia standard. As specified in Minnesota Rules, Chapter 7050, the designated uses (and use classes) of the Long Prairie River and its tributaries are aquatic life and recreation (Class 2B), industrial consumption (Class 3B), agriculture and wildlife (Class 4A and 4B), aesthetic enjoyment and navigation (Class 5), and other uses (Class 6). Of the designated use classifications, Class 2B has the most stringent DO and un-ionized ammonia standards.

The Long Prairie River TMDLs were developed using the QUAL-TX model, a variant of U.S. EPA's QUAL2E. The model was calibrated to the synoptic survey data and validated with monitoring data from the Todd Soil and Water Conservation District. The table below presents the TMDLs, with reach loading capacities in bold, at the lower right corner of each data block. The loading capacity is the sum of all point source wasteload allocations (WLAs), non-point source load allocations (LAs), non-point source margins of safety (MOSs), and unallocated capacity. The point source wasteload allocations include implicit MOSs. The margin of safety for the non-point source load allocations equals 10% of the reach's total of all non-point source LAs. The unallocated capacities shown in the table merely complete the determination of the reach loading capacities. The unallocated capacity for each reach represents a "virtual point source" (point mass loading with essentially zero flow) placed at the reach's upstream end. The Eagle Creek residual point source loads are the loads from the Eagle Bend and Clarissa WWTFs, following attenuation in Eagle Creek; WLAs were not developed for Eagle Bend or Clarissa because Eagle Creek is not listed for low DO, and their residual loads do not impair the Long Prairie River main stem. Entries in bold italics denote loads that were reduced to meet the DO standard. Non-point source load reductions on the order of 10% are indicated for the upper and middle portions of the Long Prairie River (reaches 07010108-504 through -506). Point source load reductions are indicated for the Long Prairie and Browerville WWTFs.

Reach 07010108-506: Long Prairie River Headwaters (Lake Carlos) to Spruce Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	147	42	n/a	189
WLA + MOS for Carlos WWTF	233	254	n/a	487
LA for LPR Headwaters @ RM89.9	161	55	n/a	216
LA for other Nonpoint Sources	***999***	***68***	291	1,359
MOS for all Nonpoint Sources	116	12	n/a	128
Total Maximum Daily Load	1,657	432	291	**2,380**

Reach 07010108-505: Spruce Creek to Eagle Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	397	114	n/a	511
WLA + MOS for LP-Superfund	48	17	n/a	65
WLA + MOS for Long Prairie WWTF	***275***	***838***	n/a	1,114
WLA + MOS for Browerville WWTF	542	***504***	n/a	1,045
LA for Spruce Creek	***87***	***29***	n/a	116
LA for Dismal Creek	***17***	***30***	n/a	47
LA for other Nonpoint Sources	***5,329***	***484***	1,750	7,563
MOS for all Nonpoint Sources	543	54	n/a	598
Total Maximum Daily Load	7,239	2,070	1,750	**11,059**

Reach 07010108-504: Eagle Creek to Turtle Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	971	278	n/a	1,249
Eagle Creek Residual Point Source Loads	204	209	n/a	412
LA for Eagle Creek	***587***	***40***	n/a	626
LA for other Nonpoint Sources	***1,442***	***362***	315	2,119
MOS for all Nonpoint Sources	203	40	n/a	243
Total Maximum Daily Load	3,406	928	315	**4,649**

Reach 07010108-503: Turtle Creek To Moran Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	941	269	n/a	1,210
LA for Turtle Creek	238	129	n/a	367
LA for other Nonpoint Sources	620	156	120	895
MOS for all Nonpoint Sources	86	28	n/a	114
Total Maximum Daily Load	1,884	582	120	**2,587**

Reach 07010108-502: Moran Creek To Fish Trap Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	504	144	n/a	648
LA for Moran Creek	93	62	n/a	155
LA for other Nonpoint Sources	682	171	252	1104
MOS for all Nonpoint Sources	77	23	n/a	101
Total Maximum Daily Load	1,356	401	252	**2,008**

Reach 07010108-501: Fish Trap Creek to Crow Wing River

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	435	124	n/a	559
LA for Fish Trap Creek	243	48	n/a	291
LA for other Nonpoint Sources	1,276	320	545	2,142
MOS for all Nonpoint Sources	152	37	n/a	189
Total Maximum Daily Load	2,106	529	545	**3,180**

Note:

Bold italic denotes a load that was reduced to meet DO standard

The Long Prairie TMDLs represent the spring discharge period (April 1 through June 30). Flow conditions for the TMDLs correspond to the spring 7Q10, modified by the addition of small flows at the headwaters of the Long Prairie River and Eagle Creek (added flows of 1.99 and 2.75 cfs, respectively). The added flows allow spring discharge with existing NH_3-N concentrations from the Carlos WWTF (near the Long Prairie River headwaters) and from the Eagle Bend and Clarissa WWTFs (on Eagle Creek). Under both 7Q10 and 30Q10 conditions, ammonia toxicity in the receiving waters was predicted for spring discharges from these three facilities with existing effluent NH_3-N concentrations. The modified flow regime used for the TMDLs implies the need for hydrograph-controlled discharges, based on Long Prairie River and Eagle Creek in-stream flows, from the Carlos, Eagle Bend, and Clarissa WWTFs. The load reduction for the Browerville WWTF's spring discharge is nominal because this facility actually discharges in the fall only, not in the spring.

To account for seasonal variation in flow and temperature, the TMDLs were tested in QUAL-TX simulations of summer/fall and winter low-flow conditions. The first of these used summer 7Q10 and temperature but included all municipal discharges with fall-season effluent quality. The summer/fall simulation indicated further load reductions for the Long Prairie WWTF (incorporated in the TMDL) but not for any of the other municipal facilities. (The Long Prairie WWTF's wasteload allocation assumed that the WWTF's two industrial systems will upgrade to mechanical facilities with ammonia removal and continuous discharges, necessary because of extremely high NH_3-N concentrations in the existing effluents.) The summer/fall simulation was also critical for the unallocated capacity in several reaches. Winter 7Q10 conditions were modeled with all continuous discharges to ensure that the DO standard was met.

Implementation of the Long Prairie River TMDLs will be assured for point sources through the NPDES permitting process. For non-point sources, implementation of best management practices will be an extension of the BMP work that is currently being done in the watershed using Clean Water Partnership grants and loans. Local representatives and MPCA staff will be working with the municipal WWTF operators, watershed county Soil and Water Conservation District staff, and other appropriate partners to assure both point and non-point source compliance with the TMDLs.

Public participation in the Long Prairie TMDL process included public meetings at community centers in the cities of Browerville (Todd County) on May 22, 2003, and Carlos (Douglas County) on June 12, 2003. Direct invitations were mailed to approximately 135 stakeholders, and public service announcements were distributed to all local newspapers and commercial radio stations. At the two meetings, following introductions, a presentation of study results and recommendations by Wenck and FTN, and a question/answer period, participants were divided into small groups to encourage facilitated input. Thirty-two people attended the meeting in Browerville and forty people attended the meeting in Carlos.

Technical analysis and supporting documentation for the Long Prairie River watershed TMDL are contained in Sections 7.0 and 9.0-11.0 of this report.

2.0 Introduction/ Problem Statement

The Long Prairie River flows some 92 miles through Douglas, Todd, and Morrison counties in central Minnesota, from the outlet of Lake Carlos to the Crow Wing River, an Upper Mississippi River tributary (Figure 2-1). For the TMDL study, the Long Prairie River's watershed was considered to be the 647-square mile drainage area downstream from Lake Carlos. The watershed is predominantly agricultural and contains five municipalities with wastewater treatment facilities explicitly considered in the TMDL study. The headwater outflow from Lake Carlos, which drains an additional 236 square miles, is of very high quality.

However, fish kills have occurred in the Long Prairie River, and monitoring in recent years has shown that dissolved oxygen (DO) concentrations in portions of the river intermittently fall below the minimum DO level considered necessary to support aquatic life. Based on long-term DO monitoring near the river's mouth at Motley that began in 1975, the MPCA has observed low DO concentrations in most winters. The Todd Soil and Water Conservation District (Todd SWCD), working in cooperation with the MPCA under a Clean Water Partnership (CWP) grant, has more recently also found low DO in the river's uppermost reach near Carlos and in its middle portion.

Section 303(d) of the Federal Clean Water Act (CWA) requires the Minnesota Pollution Control Agency (MPCA) to identify water bodies that do not meet water quality standards and to develop total maximum daily pollutant loads for those water bodies. A total maximum daily load (TMDL) is the amount of a pollutant that a water body can assimilate without causing a water quality standard violation. Through a TMDL, pollutant loads can be distributed or allocated to point and non-point sources that discharge to the water body. The TMDL process provides science-based pollutant load allocations and information that local officials can use as watershed management tools when making decisions regarding land use that will affect water quality within the watershed.

This report presents TMDLs developed for maintenance of the DO standard in the Long Prairie River. Because ammonia is both an oxygen-demanding substance and a potential toxin, ammonia toxicity was evaluated in those reaches impacted by municipal waste discharges.

Table 2-1 summarizes the MPCA's 2004 CWA 303(d) Impaired Waters List as it pertains to the Long Prairie River watershed. "Impaired waters" are defined as waterbodies that do not meet their water quality standards. All six of the river's main stem reaches appear on the 2004 list for low-DO impairment (Figure 2). Two of these reaches were not previously listed for low DO but were added in 2004 after they were found in the course of this TMDL study to be low-DO impaired. The upper three main stem reaches plus Eagle Creek are also listed for impaired fish Index of Biotic Integrity (IBI). This TMDL study addresses the fish IBI impairment in part, insofar as affected by low DO and ammonia toxicity. The six main stem reaches are listed also for mercury Fish Consumption Advisory, but this TMDL study does not address mercury impairment.

The pollutants of concern for low DO are oxygen-demanding substances, which are measured as carbonaceous and nitrogenous biochemical oxygen demand (CBOD and NBOD). CBOD is a general measure of organic materials such as sewage solids, animal wastes, animal and other food processing wastes, and plant litter. CBOD represents the oxygen equivalent (amount of oxygen that micro-organisms require for the respiration, or biochemical "burning up") of the organic matter in a sample. Nitrogen is a constituent of organic matter, and especially of animal and animal-processing wastes. A variety of microorganisms rapidly transforms organic nitrogen (ON) to ammonia nitrogen (NH_3-N); nitrification of the NH_3-N by certain specialized bacteria then transforms it to nitrate nitrogen while consuming oxygen in the process. NBOD is calculated as the sum (NH_3-N plus ON) multiplied by 4.33, which gives the oxygen equivalent for the nitrification process.

The pollutant of concern for ammonia toxicity is un-ionized ammonia. The fraction of measured NH_3-N that is un-ionized is calculated (from the water temperature and pH) with a formula specified in the Minnesota water quality standards.

In March 2001, the MPCA contracted Wenck Associates, Inc., with Wenck's partner FTN Associates, Ltd., to conduct a Long Prairie River watershed TMDL study. The contractual objectives pertinent to the Long Prairie River watershed TMDL for DO are listed below.

- Define the spatial extent, persistence, and severity of the DO depletion problem;
- Define the causes of severe oxygen depletion that occur in the DO depletion zones;
- Quantify point and non-point pollutant sources and their contributions to water quality impairments in the Long Prairie River by land use category and main-stem river and tributary sub-watershed for targeting priority areas for rehabilitation as well as protection;
- Allocate the Long Prairie River assimilative capacity to both point and non-point sources of pollution, and develop safety margins protective of water quality standards.

The TMDL project for the Long Prairie River watershed occurred in three phases. Phase I was an analysis of existing data to determine what additional data were needed to complete the project objectives and what technical issues needed to be addressed within the scope of the project. During Phase II, additional data were collected, analyzed, and reported. Modeling and TMDL development were conducted in Phase III of the project. Reports were prepared documenting Phase I and II. This report documents the entire TMDL process.

3.0 Applicable Water Quality Standards

The water quality standards applicable to the Long Prairie River for this TMDL study are the Class 2B DO standard of 5 milligrams per liter (mg/L) as daily minimum, and the Class 2B un-ionized ammonia chronic standard of 0.04 mg/L. The low-flow conditions under which these standards are required to be met are the 7-day, 10-year low flow (7Q10) for the DO standard, and the 30-day, 10-year low flow (30Q10) for the un-ionized ammonia standard. As specified in Minnesota Rules, Chapter 7050, the designated uses (and use classes) of the Long Prairie River and its tributaries are aquatic life and recreation (Class 2B), industrial consumption (Class 3B), agriculture and wildlife (Class 4A and 4B), aesthetic enjoyment and navigation (Class 5), and other uses (Class 6). Of the designated use classifications, Class 2B has the most stringent DO and un-ionized ammonia standards.

4.0 Background Information

4.1 GENERAL DESCRIPTION OF RIVER AND WATERSHED

The Long Prairie River flows some 92 miles through Douglas, Todd, and Morrison counties, from the outlet of Lake Carlos to the Crow Wing River, an Upper Mississippi River tributary (Figure 2-1). The river is wide, shallow, meandering, and flat, except for its last ten miles, which are steeper and less sinuous. The average slope for the whole length of the Long Prairie is 2.0 feet per mile, and the average sinuosity is about 0.7 (Tepley, 1999). For the TMDL study, the Long Prairie River's watershed was considered to be the 647-square mile drainage area downstream from Lake Carlos. Agriculture dominates the landscape: 41% of land within the watershed is used for row crops, potatoes and other agricultural uses (Appendix A, Table A-1, and Figure A-1). In addition, 24% of the watershed is grassland, some of which may be used as pasture. The remaining watershed area is comprised of forest, water and wetland, and urban and developed rural land. The watershed includes five municipalities with wastewater treatment facilities explicitly considered in the TMDL study: the cities of Carlos, Long Prairie, Browerville, Eagle Bend, and Clarissa. The headwater outflow from Lake Carlos, which drains an additional 236 square miles (including a portion in Ottertail County), is of very high quality.

4.1.1 Sub-watersheds

Ninety-six Minnesota Department of Natural Resources (MDNR) sub-watersheds are delineated within the Long Prairie watershed based on GIS data compiled by Todd SWCD. Detailed data regarding the sub-watersheds and their tributaries are shown in Appendix A (Table A-2 and Figure A-1).

4.1.2 Land Use

Land use for the Long Prairie watershed has been compiled by the Todd SWCD (Appendix A, Table A-1 and Figure A-1). The dominant land use is agricultural (41%), with the main crops being potatoes, corn, soybeans, and alfalfa. The remainder of the watershed is 24% grassland (including some pasture), 21% forest, 10% water or wetland, and 3% urban and developed rural land. The land use immediately adjacent to the river is dominated by agriculture and wetlands because the floodplain is wide and flat. Some reaches of the river have well-developed riparian zones.

4.1.3 Soils

In the Long Prairie River watershed the thickness of unconsolidated material ranges from 0 to 150 feet. Watershed soils are primarily loam, sand, or alluvial soils (Appendix A, Figure A-2).

4.2 CLIMATE AND METEOROLOGICAL DATA

Within the Long Prairie River watershed, average annual precipitation for 1971 through 2000 generally ranges from 25 to 26 inches in the upstream portion and from 26 to 28 inches in the middle and downstream sections (State Climatology Office - Minnesota Department of Natural Resources, December 2002). Average annual precipitations for 1971 to 2000 observed at National Oceanic and Atmospheric Administration stations are 29.48 inches at Long Prairie and 26.02 inches at the Alexandria Airport station.

Average annual lake evaporation is estimated to range from approximately 28 inches in the lower watershed to 30 inches in the upper watershed (USDA, 1966). Average annual runoff in the Long Prairie Watershed ranges from approximately 4 to 6 inches, increasing from west to east (Moody et al., 1986).

4.3 HYDROLOGY

Average daily flows have been monitored at the United States Geologic Survey (USGS) monitoring station at Long Prairie (LPR 47.8) since 1971. The mean annual flow for water years 1972 through 2002 is 165 cubic feet per second (cfs), which represents 5.17 inches of runoff from the 434-square mile drainage area located upstream of Long Prairie. Monthly average flows for this station range from 63 cfs in January to 361 cfs in April. The maximum average daily flow, 2900 cfs, was recorded July 22, 1972. The minimum average daily flow, 0.84 cfs, was recorded January 12 through 18, 1977. These statistics are based on flows observed through September 2002. Appendix B includes additional flow data.

The 7-day, 10-year low flow (7Q10) is 6.9 cfs during the winter months of December through March, 11.4 cfs during the summer months of June through September, and 38.6 cfs during the months of April through June, representing the spring discharge period for municipal wastewater treatment facilities in the watershed. The spring period 30-day, 10-year low flow (30Q10) is 61.4 cfs. The 7Q10 and 30Q10 statistics are based on USGS data for water years 1971 through 1999.

Groundwater yields are typically high within the watershed. Average annual recharge to the surficial aquifer was estimated to be 8.0 inches, and base-flow measurements conducted by the USGS along the Long Prairie River between Long Prairie and Motley during 1978 and 1979 indicated net gains of 0.85 and 1.3 cfs per river mile, respectively (Myette, 1984).

4.4 POINT SOURCES

Table 4-1 inventories known point sources of pollutants in the Long Prairie River watershed. Seven municipalities in the watershed discharge treated wastewater under National Pollutant Discharge Elimination System (NPDES) permits issued by the MPCA (Figure 4-1). These include the five cities explicitly considered in this TMDL study: Carlos, Long Prairie, Browerville, Eagle Bend, and Clarissa. The other two municipalities are the Alexandria Lake Area Sanitary District and Miltona. The Alexandria Lake Area Sanitary District is included for completeness, though it does not impact the Long Prairie River (it discharges effluent of high quality to a chain of lakes upstream from Lake Carlos). The Miltona facility also does not impact the Long Prairie River (it is small relative to the facilities explicitly considered in this study, and its discharge is attenuated by a slough before reaching an unnamed tributary of the river). Currently, the municipal wastewater systems discharge only during the spring (April through June) and fall (September through December 15), however a new facility is under construction for the City of Long Prairie that will discharge continuously. Effluent limits for municipal wastewater treatment systems within the watershed are listed in Table 4-2. Present and future limits for the Long Prairie facility are included.

In addition to the municipal facilities, a Superfund site (former dry cleaner impacted with tetrachloroethene) in the City of Long Prairie also discharges treated groundwater pumpage to the Long Prairie River under an NPDES permit, and the watershed contains five Concentrated Animal Feeding Operations (CAFOs). The CAFOs include poultry, dairy cattle, and beef cattle operations. Their NPDES permits (four existing, one in process) do not allow direct discharge to surface waters. All of the NPDES permits in the watershed are minor permits under the classification of the U.S. Environmental Protection Agency ("regular" permits under the MPCA's classification). Potato growers in the watershed reportedly conduct washing operations after harvest, but these washing operations have not required NPDES permits. There are no storm water permits in the Long Prairie River watershed.

A group of communities neighboring the Lake Carlos watershed has formed the Central Lakes Region Sanitary District with the intention of providing publicly owned sanitary sewerage and treatment facilities to its residents. This body is analyzing options for possible outfall locations on the Long Prairie River, among other possibilities.

Wetlands riparian to the upper reach of the Long Prairie River near the City of Carlos, and wetlands west of Carlos, have been suspected to be a source of oxygen demand. The riparian wetlands near Carlos were formerly subject to impacts from wastewater that infiltrated from an adjacent, now-abandoned municipal treatment pond. The City of Carlos's former wastewater treatment pond operated for 21 years, from 1968 to 1989. The system's operator, Dave Schaekels, indicated that the former wastewater treatment pond did not discharge during the entire period of operation. The wastewater infiltrated into the subsurface and ultimately discharged into the riparian wetland (or, possibly, directly into the Long Prairie River or into a small ditch that is next to the former pond). The infiltrated wastewater may have induced an oxygen demand in the wetlands that persists today.

The wetland on the west side of the City of Carlos was apparently subject to discharge formerly from a meat packing plant. Dave Schaekels recalled that a small-scale meat processor located on the west side of the City of Carlos at 103 Main Avenue, one block off County Road 9, began operation in 1858 and has operated since that time under various owners. A sanitary sewer system was installed in the City of Carlos in 1968. The packing plant may have discharged untreated waste with high oxygen demand into the nearby wetland for 110 years, from 1858 to 1968. This also may be contributing to the low DO observed in the upper reach of the Long Prairie River today.

Figure 4-2 is a detailed map of upper Long Prairie River point sources and related features, including wetlands in the area, the present and former wastewater treatment ponds, ditches and flow directions, and the meat packing plant.

4.5 NON-POINT SOURCES

Non-point sources of pollutants in the Long Prairie River watershed include runoff from cropland (major land use) and from urban and other developed areas (minor). Since oxygen-demanding substances are the pollutants of concern, any organic matter carried by runoff is detrimental to the river. Plant detritus (including crop residue) and animal waste consist of organic matter, and a significant percentage of topsoil is organic matter. Fertilizers containing nitrogen in the form of ammonia can also be detrimental if runoff-producing precipitation occurs within hours or days of the fertilizer's application. In general, then, both agricultural runoff and urban runoff are important sources of oxygen-demanding substances, including ammonia. A major portion of the watershed is cropland. Also, manure from the above-mentioned CAFOs is ultimately spread on cropland. Therefore, the CAFOs contribute to non-point source pollution even though their NPDES permits do not allow direct discharge to surface waters. The watershed also has many small livestock operations in addition to the CAFOs.

Sediment oxygen demand (SOD) in the channel of the Long Prairie River is accounted as a non-point source as well. SOD results from the deposition in the river channel of particulate organic matter originating from point and non-point sources and from decaying in-channel plant biomass. SOD also occurs naturally in wetlands. One of the major findings of this TMDL study is that low DO found in the near-headwater reach of the Long Prairie River primarily results from SOD in riparian wetlands that interact with the river's main channel through flow exchange.

4.6 PREVIOUS STUDIES

The MPCA has collected samples approximately monthly (generally excluding November, December, and January) since 1974 from the Long Prairie River near Motley (LPR 3.2). Todd SWCD conducted intensive water quality monitoring under the CWP grant between 1996 and 2002. These data are summarized and analyzed in the following section of this report. Additional Todd SWCD findings are summarized in the "Long Prairie River Monitoring Project Report," (Tepley, 1999).

5.0 Review and Analysis of Data from Other Sources

5.1 INTRODUCTION AND SUMMARY OF FINDINGS

This section reviews and analyzes Long Prairie River water quality data collected by the Todd SWCD between 1996 and 2002 and by the MPCA between 1974 and 2000 (Appendix C). Data from both sources include DO measurements and nutrient analyses, among other parameters. The Todd SWCD generally sampled during the growing season at a number of stations up and down the river, on a frequency ranging from approximately weekly to monthly. The MPCA sampled year-round at a single station near the river's mouth at Motley, on an approximately monthly frequency (much less frequently in some years, and generally less frequently in winters). In the TMDL study, monitoring stations were identified by their river mile location. Station designations used by others have been cross-referenced to river mile locations in this report (Table 5-1). Figure 5-1 shows the monitoring station locations with cross-referenced designations.

Table C-4 (Appendix C) summarizes violations of the DO standard observed by the Todd SWCD in and near Long Prairie River reaches 07010108-503 and -505, which were not included in the MPCA's 2002 303(d) Impaired Waters List. Altogether, 55 DO violations are listed. Reach -503 has three DO violations, plus 13 violations within approximately 1 mile upstream, and two violations 0.5 mile downstream. Reach -505 has 29 violations, plus eight violations some 2 miles upstream. Because of the data summarized in Table C-4, the MPCA added reaches 07010108-503 and -505 to the 2004 CWA 303(d) List.

5.2 WATER QUALITY DATA

Dissolved oxygen was recorded by the Todd SWCD at weekly to monthly intervals at several sites between 1998 and 2002. Graphs of average monthly DO data for each site in downstream order are presented in Appendix C, Figure C-1. The values graphed in Appendix C, Figure C-1 represent the average of between one to seven grab sample results recorded during each month at various times during the day. These averages do not take into account diurnal fluctuations in DO concentrations.

Between 1971 and 1999 the MCPA measured DO monthly at LPR 3.2 (the MPCA monitoring station at Motley near the Crow Wing River) (Appendix C, Figure C-2). The MPCA observed DO concentrations less than 5 mg/L in most winters. The measurements do not characterize the daily fluctuations of DO and are daytime biased. The data were analyzed to identify recurring seasonal fluctuations in DO. Comparisons of monthly DO and DO percent saturation for the monitoring record are presented in Appendix C, Figure C-3. Monthly temperature values recorded at LPR-3 are shown in Appendix C, Figure C-4.

Continuous water quality monitors were installed at three locations on September 11 and 12, 2000: at LPR 49.3 LRP 47.2, and at LPR 42.2. The meters were calibrated once during the monitoring period, prior to installation, and readings were compared to field measurements every two weeks (Appendix C, Table C-1). Water temperature, DO, pH, and conductivity measurements were recorded at irregular intervals between one and five times daily at LPR 49.3 between September 11 and November 19, 2000 (Appendix C, Figure C-5a). The above-referenced water quality parameters were recorded every two hours between September 12 and November 18, 2000, at LPR 47.2 and LPR 42.2. However, no readings were collected at LPR 42.2 between October 14 and 18, and data recorded at LPR 42.2 prior to October 5, 2000, do not correlate with field readings collected. Figures showing DO concentrations, pH, and water temperature recorded at these sites are presented in Appendix C, Figures C-5b and C-5c.

Maximum and minimum DO concentrations at LPR 42.2 and LPR 47.2 are presented in Appendix C, Figure C-6. Daily minimum DO concentrations were generally observed between 2 a.m. and 8 a.m. at LPR 42.2 and LPR 47.2. Daily maximum DO concentrations were observed between 2 p.m. and 6 p.m. The irregular frequency of the recorded values at LPR 49.3 complicates a direct comparison of the data from this site to data recorded at LPR 42.2 and LPR 47.2. Water quality parameters were not recorded at LPR 49.3 during the time periods when daily maximum and minimum DO values were generally observed in the Long Prairie River. As a result, the daily maximum and minimum DO values could not be accurately calculated at LPR 49.3. DO concentrations at each of the three sites are compared in Appendix C, Figure C-7.

Daily minimum water temperatures were observed between 10 a.m. and 2 p.m. at LPR 47.2. Most days, the temperature dropped several degrees abruptly at 10 a.m. and remained at the same temperature until 2 p.m. This effect is less evident as the overall water temperature cooled. The same effect is observed intermittently at LPR 42.2, downstream of Long Prairie, though the pattern is not as clearly defined. The data collected at the three sites are summarized in Appendix C, Table C-2, ΔDO calculations and statistics for LPR 47.2 and LPR 42.2 are presented in Appendix C, Table C-3. Calculation of ΔDO is used to make rough estimate of community gross primary productivity (Erdmann, 1979a and 19799b; Chapra and Di Toro, 1991). Continuous DO data collected by the MPCA indicate that DO variations near Long Prairie are typically 2 mg/L.

In addition to DO and DO percent saturation, several other water quality parameters including TP and total nitrogen (TN) concentrations were recorded at irregular intervals ranging from weekly to monthly at CWP sites. (TN is calculated as the sum of total Kjeldahl nitrogen [TKN] plus NO_3/NO_2-N.) Average monthly TP and TN for each site are graphed and arranged in downstream order in Appendix C, Figure C-8. Data shown in this graph represent both average values from several samples collected during the month, and discrete sample points for months during which only one sample was collected.

Monthly grab samples collected by the MPCA at LPR 3.2 were analyzed for various water quality parameters. TP and TN concentrations at LPR 3.2 for grab samples collected between 1974 and 1999 (samples were collected most months) are shown in Appendix C, Figure C-9. The TP and TN data at LPR 3.2 in a monthly format to show seasonal variations are also shown in Appendix C, Figures C-10a and C-10b.

River profile data for various water quality parameters collected at CWP sties between 1996 and 2002 are presented in Appendix C, Figures C-11a, C-11b, and C-11c. June, July, and August data are shown for TP, NH_3-N, NO_3/NO_2-N, DO, DO percent saturation, and 5-day biochemical oxygen demand (BOD_5). The data presented in this figure represent both average values and discrete data points, as sampling was performed at irregular intervals ranging from weekly to monthly between 1996 and 2002.

5.3 DATA ANALYSIS

Long-term monitoring data collected by the MPCA at Motley provide an integrated, basin-scale portrayal of water quality changes in the Long Prairie Watershed. Historical TN, TP, and were plotted (Appendix C, Figure C-9) to identify any long-term trends in water quality from the early 1970s through the 1990s. The plots indicate significant scatter due to seasonal changes during the year but the overall trends appear to indicate that the water quality of the Long Prairie River has remained similar over the 30-year period.

Seasonal variations in DO, TP, and TN at Motley are shown in Appendix C, Figures C-1, C-10a, and C-10b. The lowest DO reading typically occurs in February, and the summer minimums occur in July. DO is highest in April and May during the period of spring runoff and also in October and November when temperatures drop and flow increases with the fall rains. TP concentrations (Appendix C, Figure C-10b) are highest in March and then decrease to a minimum during the winter months of December and January. In contrast, TN concentrations are higher in the winter months and decrease to a minimum during July and August.

The CWP data set provides insights into the longitudinal variation along the Long Prairie River. As previously mentioned, DO minimums below 5 mg/L have been observed during the summer months downstream of Carlos and downstream of Browerville (Appendix C, Table C-4). TP concentrations generally increase in a downstream direction with a significant increase downstream of Long Prairie. NO_3/NO_2-N also increases significantly downstream of Long Prairie.

The Todd SWCD and MPCA data sets and data collected within the scope of this project are analyzed more comprehensively in later sections.

6.0 Field Investigation Methods

To eliminate gaps in the existing data and improve calibration of the QUAL-TX model, additional monitoring was performed during Phase II of this project. The Phase I Report recommended a scope of work and QA/QC methods for field data collection, water quality sample analysis, and data analysis. The proposed work plan followed EPA approved methods and was reviewed and approved by MPCA staff prior to the start of work on Phase II. Work performed during Phase II was conducted in accordance with the work plan except where field conditions required otherwise. During Phase II, adjustments made in the field were in accordance with the specified tolerances in the Phase I Report. Field modifications made during Phase II have no impact on the outcome of the project. Work performed during Phase II and changes to the initial scope of work are documented in this section of the report.

Three intensive synoptic surveys were conducted under different critical flow and temperature conditions. Synoptic survey 1 was conducted during summer low flow, synoptic survey 2 was conducted during the fall while some point sources discharged, and synoptic survey 3 was conducted during winter low flow with ice cover. The synoptic surveys included the collection of physical, chemical, and biological data at 23 stations along the 100-mile Long Prairie River. Existing main stem stations established by the CWP program and Todd SWCD were sampled in addition to several new stations. Stations were added to better define conditions in DO depletion zones. An inventory of monitoring locations is presented in Table 5-1.

In addition, the following special tasks were completed:

- A special survey of the Long Prairie River from River mile 89.9 to 85.5 was conducted during August 2001 at the request of MPCA staff in response to Todd SWCD observations of DO depletion in that segment of the river during routine monitoring.

- A second special survey was conducted in August 2002. This special survey was undertaken to provide further data relative to the cause of the low DO in the Carlos reach.
- A dye study was conducted to quantify time of travel downstream of Carlos, Long Prairie, and Browerville.
- Continuous diurnal temperature and DO measurements were taken over 24-hour periods at several locations in the DO depletion zones to quantify net photosynthesis/respiration.
- Long-term continuous temperature and DO measurements at two locations in the DO depletion zones to better define the temporal extent of the impairment and provide an estimate of DO productivity that is easier to calibrate to than chlorophyll-*a* and also more accurate because you do not need to make assumptions concerning biomass-to-oxygen equivalents.
- Long-term BOD time series measurements were conducted at three locations, LPR 85.5, LPR 38.5, and LPR 21.1. This information was used to determine the ultimate BOD (BOD_u) and provide information on laboratory de-oxygenation rates.

6.1 PARAMETERS

Specific parameters measured included channel width, depth, flow, temperature, DO, pH, conductivity, carbonaceous biochemical oxygen demand ($CBOD_5$ and $CBOD_{20}$), TP, orthophosphate phosphorus (OP), total Kjeldahl nitrogen (TKN), ammonia nitrogen (NH_3-N), nitrate- nitrite nitrogen (NO_2/NO_3-N), chloride, total suspended solids (TSS), chlorophyll-*a*, and algae identification and enumeration. Ultimate CBOD ($CBOD_U$) samples were collected at selected sites. Three point sources were known to be discharging during synoptic survey 2, two were sampled (grab samples) for all parameters except chlorophyll-*a* and algae identification and enumeration. Parameters, analytical method, holding time, and detection limits are summarized in Appendix D, Table D-1.

6.2 LOCATIONS

Data was collected at 23 locations where the Long Prairie River was accessible along the 100-mile Long Prairie River. Data was also collected at six locations on tributaries to the Long Prairie River. Field-work performed at each location during the three synoptic surveys is summarized in Table 6-1. Some sites were not sampled due to lack of safe access points. When possible, other sites were added to replace sites that were not accessible.

6.3 SCHEDULE

Scheduling for August and September synoptic field surveys was based on flow in the Long Prairie River as measured at the USGS station at Long Prairie. Target flows were set in Phase I of this project to obtain optimum data for model calibration. The target flows to conduct the surveys were: 100 cfs for the August 2001 survey (synoptic survey 1) and 200 cfs for the survey in September 2001 (synoptic survey 2). Actual flows (based on the average daily flows recorded during each survey at the USGS station in Long Prairie) during the surveys were about 162.4 cfs during synoptic survey 1 conducted in late August, 2001 and 154.0 cfs during synoptic survey 2 conducted in late September 2001. Although the flows during synoptic survey 1 were higher than the targets identified in the Phase I report, they were believed to be the lowest we could expect in 2001 and still provide model data for Phase III of this project.

The third synoptic survey was to be conducted during under-ice flow conditions in January. The occurrence of below freezing temperatures for about a week was the criteria used to schedule the third synoptic survey. Todd SWCD staff was also consulted to determine the extent of ice cover prior to scheduling the start of the third synoptic survey. January was abnormally warm during 2002, which prevented normal freezing. The required conditions did not occur in January, as such the third synoptic survey was conducted in February 2002. During the third synoptic survey, the river between LPR 83.1 and LPR 3.2 was 90 to 100% covered with ice. The river, however, was free flowing at LPR 89.9 and 80% covered at LPR 85.5.

In addition to the three synoptic surveys, two special surveys were undertaken in the Carlos reach (LPR 89.9 to LPR 85.5) to determine the spatial extent and severity of the DO depletion in that area, and provide additional data to determine the causes. The dates of each survey are listed below along with the rational behind monitoring during that period:

- **Synoptic survey 1 was conducted August 20–24, 2001**

Historical data document DO concentrations less than 5 mg/L during this period. This is also the period of highest water temperatures historically recorded. During this survey, the critical reaches were expected to be located downstream of Carlos, Long Prairie, and Browerville

- **Synoptic survey 2 was conducted September 24-25, 2001**

Existing point sources typically discharge during two periods: April through June and September through December 15. June or September was selected as a critical period for point source loadings because discharge normally occurs then and measured DO concentrations approach the 5 mg/L standard. This period typically has the lowest flows and the warmest temperatures during the discharge periods. During this survey, critical reaches were expected to include those downstream of wastewater treatment facilities that are discharging.

- **Synoptic survey 3 was conducted February 7-8, 2002:**

Ice cover during winter limits reaeration. This is also the period of lowest monthly flows. During the winter period, limited DO data are available to define the critical reaches in the Long Prairie River.

- **Special survey 1 was conducted August 2, 2001:**

Todd SWCD staff had recorded DO levels well below 5 mg/L during on-going monitoring. This prompted the MPCA to request a special survey of the area. The goal of the survey was to determine the extent of the DO depletion zone spatially.

- **Special survey 2 was conducted August 5-6, 2002:**

A two-day special field survey was conducted to provide further data relative to the cause of the low DO in the Carlos reach.

6.4 DATA COLLECTION METHODS

Data collection methods identified in the Phase I report were followed in the field except where field conditions prevented it. The methods used to collect data presented in this report are described in detail below, along with any necessary deviations from that plan.

Flow measurements: Two field crews comprised of two field staff members each measured flow in the upper and lower watershed respectively. Field crews first measured flow together at LPR 47.8 to ensure that each crew was using the same procedure and documentation. After measuring flow at the LPR 47.8, one crew proceeded to measure flow in the upper watershed, while the other crew measured flow in the lower watershed.

Flow measurements were made with a Marsh McBirney model 2000 digital velocity meter. Velocity measurements were taken at 0.6 of the depth at locations with shallow depths (less than 2.5 ft deep) or at 0.2 and 0.8 of the depth at locations with depths of 2.5 ft or deeper. A staked tag-line placed perpendicular to flow was used to ensure horizontal spacing of velocity measurements taken so that in general no more than 10% of the total discharge was accounted for by any single velocity measurement. At some locations, due to lack of access or limited daylight remaining, some velocity measurements accounted for 11% - 17% of the total discharge. At selected locations, flow was measured two to three times during the survey to determine variation of flow during the survey.

Stream-flow was measured at 13 main-stem stations and six tributaries during synoptic surveys 1 and 2. Ice cover present during synoptic survey 3 prevented flow measurements at all but one main-stem station, LPR 89.9, however under-ice flow velocity was measured at some locations by inserting the digital velocity meter in the auger-hole drilled to collect in situ parameters and water quality samples. During special survey 2, flow was gauged upstream (LPR 89.9) and downstream of the Carlos Reach (LPR 83.1). From the canoe, observations of mid-channel depth were also noted in field notes.

In the Phase I report, it was proposed that the MPCA install pressure transducers to continuously measure flow at the model boundaries, LPR 89.9 and LPR 3.2. This was not accomplished during 2001. Wenck made discrete measurements of discharge at Lake Le Homme Dieu as part of a study for the Alexandria Lakes Area Sanitary District (ALASD), these measurements will be used to generate a flow record at the upstream model boundary.

At all sites, depth to water and existing staff gauges were measured for comparison with discharge measurements. At existing CWP stations, depth to water was measured at locations used by Todd SWCD, at new stations a suitable location was chosen, coordinates were recorded via GPS, site diagram, and written description. The depth to water location was then marked with spray paint. During synoptic survey 3, depth to ice and ice thickness were each measured.

During synoptic survey 2, the Long Prairie WWTF, the Eagle Bend WWTF, and the Superfund Site were discharging. It was not possible to measure discharge from these point sources. Discharge Monitoring Reports (DMRs) provided by the MPCA were used instead to determine discharge corresponding to water quality samples collected at these locations. Data obtained from DMRs for point sources discharging during synoptic survey 2 are summarized in Table 6-2, and discussed in later sections of this report.

Water Quality Samples: Water quality samples were collected by two, 2-person crews during synoptic surveys 1 and 2 and one, 2-person crew during synoptic survey 3. During these synoptic surveys, the field manager supervised both crews together in sample collection at the first station. The field manager went over the field sampling objectives and schedule, equipment use and calibration, documentation and field sheets, the sampling plan, gauging, water quality sampling, in situ monitoring, and all QA/QC procedures. This ensured that both crews were collecting samples and measurements and documenting observations in the same manner. All field staff was required to read the field sampling plan (the Phase I Report) prior to field work. After performing work together at LPR 47.8, the two crews split up and one crew obtained samples and data in the upper watershed, while the other crew sampled the lower watershed. Timing of sample collection and its affect on observed DO measurements will be discussed in later sections of this report.

Water quality samples were collected for the parameters mentioned in Section 6.1 of this report during synoptic survey 1 and 2. Water quality samples were collected for all parameters listed in Section 6.1 except $CBOD_u$, chlorophyll-*a*, and algae identification and enumeration in synoptic survey 3. Water quality samples for special survey 1 (August 2001) were analyzed for all parameters listed in Section 6.1 except $CBOD_u$. Additional parameters for samples collected during special survey 1 included total and dissolved organic carbon, color, fecal coliform, *e. coli*, and suspended volatile solids. Water quality parameters for samples collected during special survey 2 included total organic carbon and those listed in Section 6.1 (except $CBOD_{20}$, OP, chlorophyll-*a*, and algae identification and enumeration).

At each sample location, a bucket was used to composite sufficient volume of sample to fill all sample bottles. Prior to sample collection, the bucket was rinsed with sample water. The rinse water was then dumped on the riverbank or road next to the site. In all cases, samples were collected prior to disruption of bottom sediments required for discharge measurements and sediment sampling to ensure accurate data. Water quality samples collected at bridge crossings were collected from the bridge, while water quality samples collected in between bridge crossings (such as those collected during special survey 1 and 2) were collected from a canoe.

In situ monitoring: Hydrolabs from FTN and rented YSI instruments were used to measure in situ parameters (temperature, DO, conductivity, and pH) concurrently with water quality sample collection. With each survey, measurement of in situ parameters and collection of water quality samples were completed the same day. Often, additional in situ parameters were collected through the duration of the survey. Readings were taken when the probe was suspended mid channel, at mid depth. The meter was allowed to stabilize before readings were recorded. The field manager reviewed procedures for taking readings with both field crews together at one site prior to the beginning of work.

Calibration procedures for YSI and Hydrolabs used to measure temperature, pH, DO and conductivity were performed as specified by the manufacturers. DO meters were air calibrated at the beginning of each day of each synoptic survey. Also, an air calibration was performed for the Hydrolabs and YSIs immediately before they are deployed for continuous measurements. When more than one meter was used, two meters were tested side-by side to rule out significant variation between meters.

During the first survey, after completing measurements associated with water quality samples, the Hydrolabs were deployed at LPR 85.5 and LPR 21.1 for continuous monitoring of in situ parameters over a 24-hour period. YSI's were deployed for continuous measurement at LPR 85.5 and LPR 18.2 September 12 to September 24, 2001. Each unit was deployed to measure data at a depth equivalent to the middle of the photic zone. The middle of the photic zone was mid-depth since the sechi depth was equal to the total depth at all locations. The Hydrolabs were set to record measurements of temperature, DO, conductivity, and pH at 15 minute and 1 hour intervals (15 minute intervals for the 24-hour monitoring event, 1 hour intervals for the 12-day event).

During the second synoptic survey, two YSI sondes were retrieved from long-term continuous DO monitoring prior to their use during synoptic survey 2. Because equipment owned by FTN, or Wenck was not available, YSIs for the second survey were rented from a reputable dealer of environmental equipment. Calibration solutions for pH and conductivity were requested but not shipped along with the YSI displays. The meters were air calibrated for DO side by side prior to use each day they were used during the survey. A one-point pH calibration was performed side-by-side on both YSIs using de-ionized (DI) water. Measured pH from the YSI sonde used between LPR 89.9 and LPR 47.8 indicate that one-point calibration of that instrument was not sufficient to yield usable values of pH for that segment of the river. As such, these results are not included in the final data set.

During special surveys 1 and 2, DO concentration was measured along the channel profile between LPR 89.9 and LPR 55.5 by suspending the Todd SWCD YSI mid-channel and mid-depth from a canoe and paddling from LPR 89.9 to LPR 85.5. In addition to DO measurements taken from the canoe, MPCA staff installed continuous DO meters at LPR 89.9 and LPR 85.5 during special survey 1. Data from these meters is not presented in this report because of a major discontinuity in the DO measurements at both stations. The data record shows that DO concentrations dropped 2 mg/L in 30 minutes at LPR 89.9 and 8 mg/L in 30 minutes at LPR 85.5. This does not likely represent actual conditions at the two stations, and more likely the result of equipment malfunction. The cause of the equipment malfunction is unclear as further data regarding equipment installation and calibration was not available from MPCA staff. Wenck installed two Hydrolabs for 24-hours of photic zone, continuous DO measurement at LPR 88.3 (rail road crossing bridge) and LPR 85.5 during special survey 2.

Time of Travel Study: Slugs of tracer, Rhodamine WT dye, was injected into the Long Prairie River at several locations in September and one location (LPR 85.5) during the special survey 2. Samples were collected at fixed locations downstream of the injection point until the dye cloud passed. Grab samples were collected manually and with the use of an ISCO 6700 Automated sampler set to collect discrete samples at 30-minute intervals. Samples were analyzed for relative concentrations of Rhodamine WT dye on a Turner Flourometer. This method is described by the USGS ("Measurement and Computation of Streamflow: Volume 1. Measurement of Stage and Discharge." p. 214). The fluorometer was calibrated per manufacturers' specifications at the beginning of each day the machine was used.

In the process of collecting the ISCO automated sampler used to collect samples at LPR 76.7 during the September dye study, the sampler, full of samples, tipped over when field staff tripped over vegetation on the stream bank at 2:15 am. Varying sample volumes in the individual bottles indicated that some samples inside the machine were mixed as the ISCO tipped over. Manual grab samples were collected at this site as the peak passed. Also, concentrations of Rhodamine WT dye made visual observation of the dye cloud possible. Analysis of the manual grab samples augment the samples lost to show the dye center of mass as it passed this location.

River Sediment Characterization and Macrophyte Survey: During synoptic survey 1, each field crew visually observed and recorded the abundance and major types of macrophytes observed at each station, and the types of sediment at each station. Sediment samples were collected in Ziploc® bags and labeled with river mile. The sediment samples were reviewed in order (upstream to downstream). Macrophyte and sediment data is summarized in Table 6-3.

Under-Ice Sampling: After visually inspecting the ice to assess the safest point of access, ice thickness was tested with an ice chisel. If ice supported three chips from the ice chisel without breaking through, the ice was considered sufficient to support the weight of field staff and equipment. A hand ice auger was then used to drill a hole in the ice. Ice thickness and water depth was measured. Care was taken not to stir up sediment with the auger. If sediment was stirred up, field staff waited and then chose a location upstream of the first hole and drilled another hole. As soon as possible after drilling the auger hole, the YSI was inserted to mid-depth to obtain the DO reading and the rest of the field parameters. This was done to ensure that under-ice DO was measured accurately. Field staff then used a sample bailer to obtain a sample. The bailer and sample bucket used to collect samples were each rinsed with sample water. Rinse water was dumped off to the side so that it did not go back into the auger-hole. Sample water from individual bailers was emptied into the bucket. The sample bottles were filled from the composite sample in the bucket. Samples were then labeled and time of sampling was recorded on the chain of custody (COC) forms. Samples were then placed in a cooler containing not less than 4 bags of ice. Chlorophyll-*a* and algae identification and enumeration samples were not collected during the synoptic survey 3.

Other field observations were made as well, including but not limited to ice cover, snow cover. For safety reasons, most samples were collected not more than 15 feet from the river bank, so not mid channel but as close as possible to it. At two locations the depth of water flowing under the ice was not sufficient to obtain a sample.

6.4.1 Sample Handling and Custody

For all parameters except $CBOD_u$, Minnesota Valley Testing Laboratory (MVTL) provided sample bottles and analyses for the three synoptic surveys. Each sample bottle was labeled with the station ID, date, and time just prior to sample collection. Samples were packed in coolers containing not less than four bags of ice to ensure they were chilled to 4 degrees Celsius as soon as possible after collection. MVTL staff transported samples by truck from Long Prairie to the lab in New Ulm to ensure arrival at the lab in less than 24 hours of sample collection. Sample containers for and analysis of the $CBOD_u$ samples, were provided by Metropolitan Council Environmental Services (MCES). These samples were transported, by Wenck staff, from Long Prairie to the MCES lab in St. Paul, Minnesota.

Chain-of-custody (COC) forms for water quality samples were also provided by MVTL. The COC forms indicated operator and sample ID, analyses to be performed, and date and time of sampling. Special notes or instructions for the laboratory were included in the COC.

The Minnesota Department of Health (MDH) provided sample bottles and analysis for the special survey 1. Dr. Howard Markus of the MPCA performed microscopic analysis for the algae identification for the special surveys.

6.4.2 Quality Control Measures

Laboratory QA/QC procedures: The MPCA contract laboratory followed its own internal QA/QC procedures. The laboratory maintains written documentation of these QA/QC procedures. The analytical methods used by the laboratory are listed (Appendix D, Table D-1). Duplicate in situ measurements: Consistency between instruments being used to collect in situ measurements was checked by measuring temperature, DO, conductivity, and pH with both Hydrolab instruments side by side at the beginning and end of the water quality sample collection.

Duplicate water quality samples: For approximately 10% of the water quality samples, a split sample was collected and submitted to the laboratory as a blind duplicate. Two sets of sample bottles were filled from the same bucket of water; one set was labeled with the actual station ID, date, and time and the other set was labeled with a fictitious station ID, the actual date, and a fictitious time. The purpose of labeling the duplicate samples with a fictitious station ID and time was to prevent the laboratory personnel from realizing that the sample is a duplicate. Both sets of samples bottles were filled from the same bucket of water to allow analytical variability to be evaluated with minimal interference from sampling variability. Results of duplicate samples are presented (Appendix D, Table D-2). A summary of data quality is presented (Appendix D, Table D-3). No sample blanks were submitted because the laboratory's internal QA/QC procedures include analyzing blank samples.

Sample filtration: Samples to be used for dissolved ortho-phosphorus analysis were field filtered for all samples except samples collected on the second day of synoptic survey 3. These samples were filtered as soon as possible after collection on the day of sampling at the lab due to lack of time. Samples for chlorophyll-*a* measurements were filtered upon arrival at the laboratory. None of the CBOD samples were filtered.

6.4.3 Data Assessment and Oversight

The Field Sampling Leader evaluated Field data in the field for completeness. The Project Manager and QA Officer evaluate results of laboratory analyses. Questionable laboratory analytical data was discussed with the technical and QA representatives of the contract laboratory. No changes were made to final data set, though one data point (Kjeldahl nitrogen at LPR 83.1 collected during synoptic survey 1) was omitted from the final data set. Four samples and one duplicate sample from the second day of sampling during the third synoptic survey were analyzed after holding time. The samples were first analyzed within holding time, however, the analyst had made a mistake and the data was incorrect. The error was not realized until after the 48-hour holding time. The samples were re-analyzed as soon as possible after discovery of the error. Data in the database is flagged.

7.0 Results of Field Investigations

River profiles of flow and water quality data collected during the three synoptic surveys and two special surveys are presented in Appendix D, Figures D-1 through D-3. Figure D-1 compares flow profiles during the three synoptic surveys and the two special surveys. Figure D-2 presents profiles of temperature, DO, DO percent saturation, $CBOD_5$, $CBOD_{20}$, TP, OP, NO_2/NO_3-N, NH_3-N, TKN, pH, TSS, conductivity, and chloride. Chlorophyll-*a*, and algae identification and enumeration data are presented in Figure D-3. The time of travel study results are presented in Appendix D, Figure D-4. Data collected during the TMDL study are presented in STORET form and submitted to the MPCA on CD. Lab reports and field data sheets from Phase II are presented in Appendix E. The results are discussed in the sections below.

7.1 POLLUTANT LOADINGS

7.1.1 Point Source Loadings

Table 6-2 shows wastewater treatment facility pollutant loadings estimated from Discharge Monitoring Reports (source: MPCA). Of the three synoptic surveys, known point sources discharged only during survey 2. The only point sources discharging during synoptic survey 2 were the Long Prairie WWTF, the Superfund site in Long Prairie, and the Eagle Bend WWTF. Pollutant loading for the Superfund site was estimated based on remediation system operation manuals and observed concentrations. The groundwater discharge from the system is small, less than 300 gpm (0.7 cfs), less than 1% of the flow at Long Prairie during the synoptic surveys.

7.1.2 River Loadings

Tables 7-1a and 7-1b summarize in-stream pollutant loadings for synoptic surveys 1 and 2. Flow data is not available for February 2002 so calculation of daily river loads for synoptic survey 3 was not possible.

7.1.3 Discussion of Point Sources and Non-point Sources

Based on Tables 6-2, 7-1a and 7-1b, in-stream pollutant load increases during survey 2 between stations LPR 47.8 and LPR 38.5 primarily signal the discharges from the Long Prairie WWTF. For example, the phosphorus load increase of 190 pounds per day (lbs/day) was reasonably consistent with reported discharge loadings totaling 270 lbs/day.

Apart from the LPR 47.8-to-LPR 38.5 increase during survey 2, virtually all in-stream loadings reflect non-point pollutant sources. During both surveys, the TP loading at the upstream boundary station LPR 89.9, representing approximately 240 square miles (mi^2) of drainage area, was almost negligible (1 to 2 lbs/day) due to the affects of the Alexandria area lakes. The TP loadings during survey 1 at both LPR 47.8 (47 lbs/day; drainage area 434 mi^2) and LPR 30.8 (75 lbs/day; drainage area 564 mi^2) suggest phosphorus export coefficients of 0.13 pounds per acre per year (lbs/ac/yr) if extrapolated over a whole year. The TP loading at LPR 47.8 during survey 2 (19 lbs/day) would imply an even lower export value of 0.05 lbs/ac/yr if extrapolated. These export coefficients are quite low, but of course they reflect dry weather and moderately low in-stream flows. They therefore suggest a lower bound of about 0.1 lb/ac/yr for TP export from most of the upper watershed.

In-stream TP loadings in the lower 30 miles of the river tend to decrease slightly, apparently reflecting in-stream losses and suggesting even lower export values for the lower watershed. This correlates with the ecoregion boundary separating the upper and lower watersheds.

Additional conclusions regarding point and non-point source data are discussed further in the modeling sections of this report.

7.2 STATISTICAL ANALYSIS

7.2.1 DO

Todd SWCD On-going Monitoring: On-going monitoring by Todd SWCD, conducted between April and October 2001, shows that lowest DO concentrations at monitored CWP sites were recorded during warm summer months of June, July, or August with one exception. At LPR-21.1, the lowest average monthly DO concentration was observed in October. The lowest monthly average DO concentrations are at or below the 5 mg/L standard at CWP monitoring sites between LPR 85.5 and LPR 21.1. River profiles constructed from average monthly DO data from the CWP study for June, July, and August 2001 show DO sags to 5 mg/L and below downstream of Carlos, and downstream of Long Prairie. Data also show that average monthly values rebound to 10 mg/L before reaching the confluence with the Crow River.

Three Synoptic Surveys: Discrete DO measurements taken during the three synoptic surveys confirm what was determined by existing data. Measurements indicate sags in DO concentration between LPR 89.9 and LPR 85.5 (upstream and downstream of Carlos), and a gradual decrease in DO concentrations during under-ice flow. Measurements showed only a slight sag in DO concentration at Long Prairie (LPR 47.8). Comparison of sample time and DO concentration to daily DO range (discussed below) did not indicate that any DO sags were masked or hidden by the time of day samples were collected.

7.2.2 DO Daily Range

Continuous DO readings were taken August 22-23, 2001 at LPR 85.5 and LPR 21.1, September 12- 24, 2001 at LPR 85.5 and LPR 21.1, and August 5-6, 2002 at LPR 88.3 and LPR 85.5 are presented in Appendix D, Figures D-4 through D-9. Based on these measurements, maximum daily DO concentrations generally occur between 4 pm and 6 pm, minimum daily DO concentrations generally occur between 8 am and 10 am. The delta DO (ΔDO) is the difference between the daily maximum and daily minimum DO concentration observed in 24 hours. The ΔDO values can be used to make a rough estimate of community gross primary productivity (Erdmann, 1979a and 1979b; Chapra and Di Toro, 1991). Tables D-4a and D-4b in Appendix D summarizes ΔDO for data collected during this study.

Continuous DO data collected during these surveys indicate that DO variations were typically 2 mg/L upstream of Carlos and downstream of Browerville. This is consistent with data collected previously by the MPCA and indicates substantial primary productivity, roughly on the order of 4 mg/L of oxygen per day. (Simplified Diurnal Curve Analysis states that a rough estimate of community gross primary productivity is two times the ΔDO [Erdmann, 1979b].)

7.3 DO IMPAIRMENT ANALYSIS

The State standard for DO to support the aquatic life designated use is 5.0 mg/L. All six segments of the Long Prairie River main stem are on the MPCA's 2004 CWA 303(d) List as impaired with respect to support of aquatic life due to low DO (Table 2-1). In these segments, Wenck, MPCA, DNR, and Todd SWCD have each observed intermittent DO impairments, DO concentrations below 5.0 mg/L.

Todd SWCD On-going Monitoring: Based on on-going monitoring by Todd SWCD, DO impairment typically occurs during warm summer months of June, July, and August in the reaches of Long Prairie River just downstream of Carlos (downstream of LPR 89.9 to upstream of LPR

79.4) and just downstream of Long Prairie (LPR 47.8 to upstream of LPR 38.5). Some DO impairment is observed in late fall, no winter data was collected.

Synoptic Surveys: Concentrations of DO measured during synoptic survey 1 showed DO impairment (DO concentrations below 5 mg/L) at LPR 85.5 and LPR 83.1. Concentrations measured at LPR 79.4 and all measured sites downstream rebound to above 6 mg/L. During synoptic survey 2, the DO sag was again observed at LPR 85.5 but concentrations remained above 5 mg/L in the main stem of the Long Prairie River. During synoptic survey 3, under-ice conditions, the DO concentration measured at LPR 85.5 (which was free- flowing) was about 15 mg/L. DO concentrations decreased gradually at sites measured over the length of the Long Prairie River to about 7 mg/L at LPR 3.2. All measured DO concentrations were above 5 mg/L during synoptic survey 3, but the effect of limited re-aeration by ice cover was evident along the length of the river.

8.0 Overview of Modeling Approach

BASINS 3.0 was selected for this project because it meets the model selection criteria specified by the MPCA to address the project objectives, it includes models that have the relevant physical, chemical, and biological processes, and it has been successfully used for DO TMDLs throughout the United States. BASINS is a main-stream public domain model that was developed by and is currently supported by the U.S. Environmental Protection Agency (EPA).

BASINS is a suite of interrelated components for performing watershed and water quality analysis. The five categories of components in BASINS are: 1) national databases; 2) assessment tools; 3) utilities for local data import, land use and DEM reclassification, watershed delineation, and management of water quality observation data; 4) watershed and water quality models; and 5) post-processing output tools for interpreting model results.

Of the available models in BASINS, the QUAL2E model was originally selected to simulate the Long Prairie River and the SWAT model was selected to simulate the non-point source (NPS) contributions to the Long Prairie River. This combination of models addressed all of the project objectives.

QUAL2E is a steady state model that can simulate interactions of nutrients, chlorophyll-*a*, carbonaceous BOD (CBOD), nitrification, sediment oxygen demand (SOD), and DO. The QUAL2E model was developed by EPA and has been widely used and tested across the United States. The QUAL2E model was originally selected to address the following technical issues:

1) Predicting the effect of reducing point and non-point sources of BOD (carbonaceous and nitrogenous) and nutrients on DO under a range of flow conditions;

2) Evaluating the nutrient- chlorophyll-*a* -CBOD-DO relationships in the river;
3) Predicting the effects of nutrient reductions in reducing algal biomass and maintaining DO concentrations for fisheries;
4) Characterizing the impacts and interaction of point and non-point sources on water quality in the river;
5) Assessing the assimilative capacity of the river in the Carlos and Browerville-to-Crow Wing River areas; and
6) Predicting the cumulative impact of pollutant contributions by the minor watersheds on the main-stem of the Long Prairie River.

The SWAT model is a watershed model developed by the U.S. Department of Agriculture's Agricultural Research Service. This model is based on many years of research and has been used and tested in numerous applications throughout the United States. The SWAT model is a continuous simulation model (as opposed to a single event model) that simulates flow, sediment, nutrients, and other parameters for large watersheds. The model is physically based and is designed to evaluate the impacts of different land management practices on flow and water quality, especially in rural basins. The SWAT model was used to:

1) Distinguish levels of long-term effectiveness of different watershed management strategies,
2) Summarize the atmospheric, point, and non-point source contributions to water quality in the Long Prairie River, and
3) Assess the impact of loss of CRP lands near the river as projected to occur over the next five years.

To simulate the Long Prairie River system from Carlos downstream to its confluence with the Crow Wing River and achieve the project objectives it was necessary to:

1) Simulate approximately 100 miles of stream with one to two branches.

2) Include eight point sources (Carlos, Long Prairie (3), Long Prairie Superfund site, Browerville, Clarissa, Eagle Bend) including detailed resolution downstream of point sources to describe DO sag.
3) Include up to six tributary inputs.
4) Include variable distributed loads to account for groundwater inputs and NPS inputs from adjacent watersheds.
5) Include DO, BOD, nitrification, re-aeration, SOD, and a conservative substance.
6) Simulate both algae and macrophytes (through net productivity).
7) Simulate winter conditions – low temperatures and ice cover (no reaeration).
8) Simulate 96 sub-watershed basins of differing characteristics.

The QUAL2E/SWAT model combination, as originally proposed, has the capabilities to address most of these requirements. However, after careful analysis, it was recommended that QUAL-TX be used in this study instead of QUAL2E. QUAL-TX (version 3.4), like QUAL2E, is public-domain steady-state one-dimensional water quality model developed by the water quality standards and Evaluation Section of the Texas Natural Resource Conservation Commission and its' predecessor agencies. This model is a modified version of the United States Environmental Protection Agency (EPA) distributed model, QUAL-II. QUAL-TX is a model of moderate complexity that predicts DO concentrations in response to loading of BOD and NH_3-N. The model also has the ability to simulate nitrogen and phosphorus series, temperature, conservative pollutants, chlorophyll-*a*, and macrophytes. The QUAL-TX model has successfully been used on DO TMDL projects in several states. It is a modified version of QUAL-II, which has become QUAL2E. The specific reasons for this recommendation are listed below:

1) QUAL-TX is similar to QUAL2E with the same basic kinetic formulations and structure – not a distinctly different model.
2) QUAL-TX has the ability to simulate variable element lengths. This will allow the use of shorter element lengths downstream of point sources for better resolution and longer element lengths in other parts of the system.

3) QUAL-TX has both macrophytes and algae state variables. QUAL2E has only one type of algae that can be modified by eliminating the transport terms to simulate macrophytes. However, to simulate both algae and macrophytes simultaneously in QUAL2E would require adding another state variable.
4) QUAL-TX has more options for reaeration, including specifying a surface transfer coefficient (K_L). The surface transfer coefficient is useful for providing a minimum reaeration when velocities are low, especially under 7Q10 conditions.
5) QUAL-TX has the capability to specify mass loads (without additional flows) to handle internal loads from wetland areas.

By selecting QUAL-TX over QUAL2E, the following capabilities were lost, but were not critical to the success of the project:

1) QUAL-TX is not part of BASINS.
2) QUAL-TX does not have all the uncertainty analysis tools that QUAL2E has, but it does have a good sensitivity analysis component.
3) QUAL-TX does not have the option of calculating depth and velocity based on a trapezoidal cross section. The characteristics of a trapezoidal channel can be represented in QUAL-TX using the power functions for depth and velocity (velocity = a * Flow^b and depth = c * Flow^d).

8.1 CONCEPTUAL MODEL APPROACH AND SETUP

The overall modeling approach for this project is:

A. To use the QUAL-TX receiving stream water quality model to develop the TMDLs for DO in the Long Prairie River, including estimation of required reductions in pollutant loads, and,
B. To use the SWAT watershed model to investigate land management practices needed in the watershed to achieve the required NPS load reductions predicted by QUAL-TX.

8.1.1 QUAL – TX

The QUAL-TX model was set up for the entire length of the main stem of the Long Prairie River from Carlos (LRP 89.9) downstream to the confluence with the Crow Wing River. The model includes one branch for Eagle Creek so that the two point sources located on Eagle Creek are included in the analysis. A model schematic is shown in Figure 8-1. This diagram shows the model reach breaks, model inflow points, and existing point sources. Inflows from major tributaries other than Eagle Creek are specified as inputs to the model, but the QUAL-TX model does not extend up into any of the tributaries (i.e., no branches other than Eagle Creek). The Miltona WWTF discharge is not included in the model because it is small (i.e., 40,000 gals/day) and it goes through a slough and unnamed tributary that will assimilate the waste. There does not appear to be a direct pathway from the Miltona WWTF to the Long Prairie River. This schematization includes all of the reaches on the 2004 303(d) List identified as not meeting the water quality standard for DO. The field data were collected at stations downstream from point source discharges in addition to those sampled in the past in order to provide adequate data resolution for model calibration.

State variables in the QUAL-TX model included DO, CBOD, nitrogen series, and phosphorus. Model processes include CBOD decay, nitrification, reaeration, SOD, and net productivity. Inputs to the QUAL-TX model include flow rates and concentrations from point sources, non-point sources, headwater inflow, and tributary inflows.

QUAL-TX was calibrated to the main stem of the Long Prairie River using data collected as part of the comprehensive field surveys under different flow conditions during Phase II of this project in 2001-2002. The three critical periods of the year were simulated:

1) September, when temperatures were warm and point sources were discharging,
2) August which is characterized by low flows, no point source discharges, and high temperatures; and
3) February, which was characterized by low flows and ice cover.

First, the model hydraulics were calibrated to match time of travel and depth measurements; then the nutrients and BOD were calibrated. Kinetic coefficients were determined using in-stream DO, BOD, and N concentrations. Equations are used to estimate reaeration rates, the DO exchanged between atmosphere and water column, from reach-specific hydraulic data.

The QUAL-TX model was validated using a sub-set of historical monitoring data collected between 1996 through 2002 by Todd SWCD. Two validation scenarios were simulated: one with point source discharges and one without. Major discrepancies outside the recommended calibration tolerances were resolved prior to using the model for completing the TMDL.

Section 303(d) of the Federal CWA and EPA's regulations in 40 CFR 130.7 require the consideration of seasonal variation of conditions affecting the constituent of concern and inclusion of a Margin of Safety (MOS) in the development of a TMDL. Projection simulations will be run for both winter and summer critical conditions to represent the required seasonality. All point sources will be assumed to be discharging at design capacity for critical conditions.

The MOS accounts for any lack of knowledge or uncertainty concerning the relationship between load allocations and water quality.

Projection simulations were made with QUAL-TX to examine the in-stream effects of different loading scenarios (i.e., scenarios with different point and/or non-point source loadings to the main stem of the Long Prairie River). These scenarios were then simulated under critical conditions for flow and water temperature for each season (see table below). The results are presented in the following sections.

Critical Conditions		
	7Q10 Flow at LPR 47.8 (cfs)	**Temperature (degrees C)**
Summer	11.4	23
Winter	6.9	0
Spring	38.6	21

8.1.2 SWAT Model

The SWAT model was used to analyze land management practices needed in the watershed to achieve certain loading scenarios. SWAT was applied using existing watershed data (e.g., land use, soils, etc.) as inputs and calibrated to 1997-1999 values of flow, sediment, and nutrients. SWAT was validated using one year of data collected during the Phase II monitoring program in 2001-2002.

With respect to segmentation, land use specifications, and model components, the SWAT model was developed at the tributary watershed level for calibration and validation. In other words, the SWAT model was first calibrated for each tributary that has daily flow data (e.g., Eagle Creek, Moran Creek, and Turtle Creek). Calibration parameters in SWAT were held at the same value for all tributary watersheds unless there is a reason for varying them (the principle of parameter unification was followed).

Calibration of the hydrologic model was complicated because the one long-term USGS monitoring station is located in the middle of the basin and outflow from Lake Carlos was not monitored continuously. Initially, tributary hydrologic parameters were determined by calibrating existing flow data from Eagle (CWP Site 4), Moran (CWP Site 8), and Turtle (CWP Site 3) Creeks. Then data from the USGS gage at Long Prairie and upstream and downstream main stem stations were used to develop consistent watershed parameters. Some flow data was available from the outlet of Lake Carlos for 2000 and 2001, which helped with the model calibration. If the model had been calibrated for the entire Long Prairie basin first, the model might have under-predict flows in one tributary and over-predict flows in another tributary such that main stem calibration results might look good even though the model incorrectly simulated the hydrologic processes occurring in each tributary. Emphasis was first placed on annual runoff totals followed by seasonal totals. These calibrated basin parameters were used to develop the basin model that separated out the storage component in the upstream lakes.

After the flow was calibrated, the suspended sediment and nutrient loads were calibrated following the same general procedure. Basin parameters were determined using data from T LPR 15.8, T LPR 33.6, and TLPR 20.8 and basin parameters from LPR 56.0 downstream.

Again, the priority was placed first on annual loads followed by seasonal loads. There was insufficient data to consider storm loads in the scope of this modeling effort. The SWAT model, calibrated for the entire basin, includes inputs from each calibrated tributary as well as runoff from intervening areas, headwater inflow (from the lakes area upstream of Carlos), and groundwater inputs. The portion of the Long Prairie basin upstream of Carlos was not simulated with either SWAT or QUAL-TX. The flow in the Long Prairie River just upstream of Carlos at LPR 89.9 served as the upstream boundary condition for both models.

Climatalogical data used for calibration and verification of the SWAT model were obtained from both NOAA stations and the local observation network. NOAA stations at Long Prairie, Wadena, Brainerd, and the Alexandria Airport provide daily precipitation data, and the Wadena, Brainerd, and Alexandria stations also provided daily air temperature. Additional precipitation data from the Todd SWCD's local network was also obtained. Evaporation data was procured from the NOAA station at the University of Minnesota at Morris.

For the evaluation of management alternatives with SWAT, input data was incorporated so that management alternatives could be analyzed at the MDNR sub-watershed level (about 9 square miles). This scale will aid in the identification and control of load sources.

8.1.3 Sensitivity Analysis

All modeling studies necessarily involve uncertainty and some degree of approximation. It is therefore of value to consider the sensitivity of the model output to changes in model coefficients, and in the hypothesized relationship among the parameters of the model.

To perform a sensitivity analysis with QUAL-TX, the user only needs to specify a list of input parameters and the desired percentage variation for each parameter and then execute the model one time. For each parameter, the model calculates the minimum in-stream DO with that parameter adjusted up or down while all other parameters are kept at their original values. Thus the sensitivity of each parameter is reviewed separately. The sensitivity analysis will be performed on one of the projection simulations.

Sensitivity analyses were conducted on "critical" input parameters for the SWAT model. A range of reasonable and acceptable values for each of the critical input parameters was established during the calibration process. The SWAT model was run using different values (within the established range) for each critical input parameter and the model output was compared to the original input values. The sensitivity analysis results served not only as a guide to parameter adjustments during calibration, but also as a preliminary indicator of the effectiveness in improving water quality of various possible BMPs.

8.1.4 Calibration/Validation Tolerance Goals

Calibration/validation tolerance goals are typically established for watershed models such as SWAT to evaluate annual or long-term results rather than short-term results. The table below summarizes tolerance levels. The tolerances apply to the time-averaged (SWAT calibration) or spatially averaged (QUAL-TX calibration) values used for comparison, considering the calibration or validation period as a whole. The errors in model simulations can never be less than the errors in the model-input parameters. For comparison, the table below also includes a summary of typical analytical and field measurement errors by parameter. The specific analytical and field errors for this study may be larger or smaller than these values. In the table presented below, the analytical and field measurement errors apply to individual measurements, whereas the tolerance levels for model calibration/validation apply to time-averaged values.

Proposed Calibration and Validation Tolerances			
	Model Tolerance	**Analytical Error**	**Field Error**
Flow	10%	5%	10-20%
Sediment Loads	25%	1 mg/L	50%
DO	25%	0.5 mg/L	2 mg/L
BOD	25%	0.5 mg/L	2 mg/L
Phosphorus	25%	0.02 mg/L	20%
NH_3-N	20%	0.05 mg/L	0.1 mg/L
NO_2/NO_3-N	50%	0.02 mg/L	0.05 mg/L
Chlorophyll-*a*	100%	20%	100%

The 2 mg/L field error tabulated for DO is based on FTN studies where multiple DO measurements were made within a singe stream cross-section. A careful measurement in the main flow of a cross section would be expected to be much closer than 2 mg/L to a "representative" value (say, within 0.5 mg/L). However, interpretations of DO data must also take account of potentially even larger diurnal variability. Such diurnal variability does not imply that a field measurement at a point in time is erroneous; but a point-in-time DO measurement must be interpreted within the framework of known or probable diurnal variability. Errors in DO measurement were minimized through daily calibration of each instrument, proper measurement techniques by experienced field personnel (e.g., waiting until the reading on the meter has stabilized before recording the data), and duplicate measurements and other QA/QC procedures.

Long-term average calibration tolerances are only one measure of model calibration, however, and can sometimes lead to a false sense of model usefulness. As part of the calibration/validation process, it is also important to interpret results from the viewpoint of a practical, physical understanding. To accomplish this practical interpretation, simulated results were plotted as time series and longitudinal profiles and compared directly with measured data and associated errors to determine if the model accurately represents significant features of the data. Loading relationships, such as nutrient load versus flow, were also developed and compared with confidence limits.

8.2 MODEL CALIBRATION AND VALIDATION SITES

The QUAL-TX model was calibrated using data from sites monitored under the CWP study, by the MPCA, and new stations located on the main stem of the Long Prairie River monitored during Phase II. These stations are shown in Figure 3-2 and listed in Table 5-1. The calibrated QUAL-TX model was validated using historical data from the CWP stations and one MPCA station located on the main stem of the Long Prairie River.

The SWAT model was calibrated and validated using data from the three tributary stations, two main stem stations, the USGS station at Long Prairie, and the MPCA station at Motley.

9.0 QUAL-TX Modeling

9.1 INTRODUCTION

The QUAL-TX model was selected to:

- Characterize existing conditions in the water body.
- Determine the steady state assimilative capacity of the Long Prairie River during low-flow conditions.
- Determine the effects of both point and non-point source pollutant load reductions during low-flow conditions.

Existing conditions were characterized through model calibration to three synoptic stream surveys conducted as part of this study:

Synoptic Survey	Dates	Scenario
1	August 20, 22-24, 2001	Without point source discharges
2	September 24-25, 2001	With point source discharges
3	February 7-8, 2002	Under Ice, without point source discharges

Low-flow conditions are simulated for three 7-day, 10-year low flows (7Q10) corresponding to summer, spring, and winter seasons (Section 8.1.1).

This section of the report documents technical details of the QUAL-TX modeling. The QUAL-TX model (Texas Water Development Board, 1995) is a variant of the USEPA's QUAL2E model (Brown and Barnwell, 1987; NCASI, 1985; and Roesner et al., 1981). Sections 9.2 through 9.6 of this report explain how various parameters in the model were determined. Section

9.7 describes the model calibration to existing conditions, model verification to historical conditions, and model sensitivity to various parameters. Low-flow condition modeling is summarized in Section 9.8.

9.2 MODEL CONFIGURATION

The QUAL-TX model was set up to simulate temperature, flow, velocity, depth, chloride, ON, NH_3-N, NO_2/ NO_3-N, $CBOD_u$, DO, SOD, TP, chlorophyll-*a*, and macrophytes. The data used to build the model input files are organized by Data Type Blocks, numbered 1 to 31.

The following table summarizes the configuration.

Water Bodies	Reaches	Headwaters	Computational Elements	Point Sources	Tributaries	Water body Tributary to:
Long Prairie River	24	1	431	6	6	Crow Wing River
Eagle Creek	1	1	25	2	0	Long Prairie River
Totals	25	2	456	8	6	--

The QUAL-TX model's average reach length is 4 miles. The longest reach is 12.5 miles and the shortest reach is 0.3 miles (Appendix F, Table F-1). Each reach is sub-divided into internal computational elements of 0.1 to 0.5 miles in length. The small computational element divisions allow for variation in water quality along the length of the reaches. This level of detail is particularly important when assessing the Long Prairie River's assimilative capacity downstream of point sources. One modeled junction element joins the Long Prairie River main stem and the tributary Eagle Creek (Data Type 23).

For the final model, a short dummy reach was added at the downstream end of the Long Prairie River to circumvent a minor QUAL-TX glitch that only occurs in the last reach of a model that includes macrophytes. The glitch causes spurious, extremely high photosynthetic productivity rates in the last reach of the model.

The model reach relationships to the 1998 and 2002 TMDL reach numbering and the CWP reach divisions are presented in Appendix F, Table F-1. Additional information about the model configuration is available in Appendix F, Table F-2.

9.3 HYDRAULICS

QUAL-TX uses five coefficients (Data Type 9) to define reach hydraulics, as follows:

- Velocity (fps) = a Q^b
- Depth (ft) = c Q^d + e

in which Q is flow in cubic feet per second (cfs).

The hydraulic coefficients were used to create plots of depth and velocity versus flow (Appendix F, Figures F-1; open symbols denote extrapolated low flow values, filled symbols denote gaged data). In addition to the curves used by the model, these plots also show the synoptic survey stream gauging data, Todd SWCD data, USGS data, and the low-flow extrapolation values (see below). Details on the various data sources used to estimate the hydraulic coefficients are summarized in Appendix F, Table F-3, and discussed below.

9.3.1 Stream Flow Gauging

Stream flows gauged during the synoptic surveys yielded sufficient data for a first estimate of the hydraulic coefficients using linear regression analysis of logarithmically scaled data:

- Velocity versus flow yielded hydraulic coefficients a and b.
- Depth versus flow yielded hydraulic coefficients c and d. The hydraulic coefficient e was assumed to be zero.

When applicable, these plots were supplemented with additional data. Sources of supplemental data included gauging records of the MPCA and Todd SWCD for various sites along Long Prairie River between April 1996 and February 2002, and USGS real-time provisional stage and discharge data for LPR 47.8 (Station: 05245100) collected between April 18, 2002 and June 7, 2002.

9.3.2 Low-flow Extrapolation

Critical water quality modeling conditions occur under low-flow scenarios. Since low-flow gauging data were unavailable, Wenck calculated estimates of average depth and velocity for low-flow scenarios to further supplement the hydraulic coefficient plots. For different low-flow depths, average bottom cross-sections were used to determine estimates of cross-sectional area and hydraulic radius. Flow values were calculated using Manning's equation and the documented average slopes (Appendix F, Table F-4).

9.3.3 Dye Studies

MPCA and Wenck conducted a total of eight dye studies along Long Prairie River (Appendix F, Table F-5). Times of travel determined between dye injection and monitoring locations were used to refine the QUAL-TX hydraulic coefficients. Model-calculated travel times were compared with the monitored travel times, and the velocity intercept value (hydraulic coefficient a) was adjusted to ensure that the difference between modeled and observed travel times was less than 10% for all dye studies (Appendix F, Table F-6).

The final hydraulic coefficients used in the QUAL-TX model are summarized in Appendix F, Table F-7.

9.3.4 Carlos Reach Hydraulics

The dye study completed in the Carlos reach (LPR 89.9 to 85.5) on August 5 - 6, 2002 gave evidence that the riparian wetland interacts with the main channel in this reach. During the dye study, gauged flows were 112 cfs at LPR 89.9 and 105 cfs at LPR 83.1. The average flow through the Carlos reach was therefore estimated to be 110 cfs, and it was considered that there was no significant inflow occurring within the Carlos reach during the dye study. The observed travel time through the Carlos reach was 20 hours. The travel time (expressed in seconds) multiplied by the average flow through the reach determined the reach's total water volume at the time of the study as 7.9 x 10^6 cubic feet.

Wenck, FTN, and Todd SWCD staff canoed the Carlos reach on August 5, 2002 to collect samples and measure DO at in-channel and off-channel locations, and to observe channel depths, among other purposes. The observations of channel depth on August 5, 2002, combined with width measurements from aerial photos (refer to following table) gave an independent determination of the reach's water volume (specifically within the channel) of 6.1 x 10^6 cubic feet.

Model Reach	River Mile Upstream	River Mile Downstream	Reach Length (mile)	Field Observed Average Channel Depth (ft)	Aerial Photo Estimate of Average Reach Width (ft)	Reach Channel Volume (millions of cubic feet)
1	89.9	89.5	0.4	2.4	41.1	0.2
2	89.5	87.5	2.0	4.6	45.1	2.2
3	87.5	85.5	2.0	6.3	56.3	3.7
					Total:	**6.1 million cubic feet**

Therefore, the channel volume fell short of the total volume by 23%. Water depths in the Carlos reach's riparian wetland were generally 1 to 2 feet on August 5, 2002. The observed discrepancy between channel volume and total volume indicated that a substantial portion of the water in the riparian wetland was participating in the main flow of the river and was not simply "in storage."

The QUAL-TX model is not suited for modeling this type of hydraulic interaction. In its final form, the model does not explicitly represent the hydraulic exchange between the wetland and the Long Prairie River through the Carlos reach, but it does include some of the water quality effects of the wetland interaction. Under flow regimes where the average depth at LPR 89.9 is greater than 0.85 ft, the Carlos reach has special model inputs, as described subsequently. The average depth of 0.85 ft is estimated to be the critical depth where the Long Prairie River starts to interact with the Carlos reach wetland, based on water depths observed in the riparian wetland on August 5, 2002, and on the average depth at LPR 89.9 on that date. The following table summarizes wetland interactions by event.

Date or Condition	Flow at LPR 89.9 (cfs)	Average Depth at LPR 89.9 (ft)	Approximate Water Depth in Wetland (ft)	Wetland Interacts With Main Channel
August 5, 2002	112	2.35	1.5	Yes
August 20, 2001	125	3.00	2.15	Yes
August 24, 2001	133	3.20	2.35	Yes
September 24, 2001	93.5	2.14	1.29	Yes
February 8, 2002	51.1	0.97	0.12	No, frozen
Summer 7Q10	0.6	0.10	0	No
Spring 7Q10	1.9	0.20	0	No
Winter 7Q10	0.4	0.08	0	No

9.4 KINETIC RATES

Kinetic rates or rate constants specified in the QUAL-TX model describe reaeration, photosynthetic productivity, SOD, $CBOD_u$ decay, benthic nutrient release, mineralization of organic nitrogen, and nitrification.

9.4.1 Reaeration Rates

The model uses equations to estimate rates of reaeration, the exchange of oxygen between the atmosphere and the water column, from reach hydraulic data.

9.4.1.1 Selected Reaeration Equations

After reviewing reaeration literature including O'Connor and Dobbins (1958) and Covar (1976), we selected two reaeration options (Data Type 12) for the final QUAL-TX model. The main option is option 8:

$$K_a = 86{,}400 * c_a * U * S$$

where K_a is the reaeration coefficient (day $^{-1}$, at 20 C), 86,400 is the number of seconds in one day, c_a is the escape coefficient ($c_a = 0.054$ ft^{-1}), S is the channel slope in ft/ft, and U is average velocity in feet per second. (Because QUAL-TX requires inputs in a fixed format that limits the number of decimal places, slopes were multiplied by 10 for input, and $c_a/10 = 0.0054$ ft^{-1} was input in place of c_a.) The equation used in option 8 is very generally valid and has been used successfully in modeling of Minnesota rivers in the past.

Alternatively, reaeration option 1 (user specified) is used in a reach if the Tsivoglou and Wallace (1972) equation predicts a K_a value that is lower than the minimum K_a value for shallow-gradient streams based on depth. The following Hydroscience (1971) equation was used to determine this minimum value:

$$(K_a)_{min} = \frac{(K_L)_{min}}{H}$$

where $(K_L)_{min}$ is the minimum value of the oxygen transfer coefficient (ft/day), and H is the average depth (ft). Hydroscience (1971) reports $(K_L)_{min} \approx$ 2-3 ft/day, and we specified $(K_L)_{min}$ = 2.5 ft/day for the Long Prairie River model.

9.4.1.2 Percent Ice Cover in February

Ice cover on streams during winter low-flow conditions may significantly affect reaeration. Reaeration rates are decreased because ice cover reduces the area of the air-water interface through which reaeration occurs (TenEch, 1978). Wenck's field crew took pictures documenting the percentage of ice cover on the Long Prairie River and its tributaries during the third synoptic survey completed in February 2002. The modeled ice cover percentages by Long Prairie river mile are documented in Appendix F, Table F-8. In order to account for the effect of ice cover on reaeration, we assumed that the reduction in the reaeration coefficient is directly proportional to the percent of ice cover.

9.4.2 Photosynthetic Productivity

Photosynthetic productivity rates in terms of oxygen (mg O_2/L-day) were calculated from diurnal DO and temperature records using the "Delta Method" of DiToro and Chapra (1991). The rates calculated in this way represent the photosynthesis of planktonic algae, attached algae, and macrophytes. A summary of productivity is included in Section 7.2.2 and Appendix F, Table F-9b. For modeling purposes, the Delta Method gross productivity rates were initially reduced by 5% to account for endogenous respiration. The resulting net productivity rates served as a benchmark for the modeling of phytoplankton and macrophytes. The net productivity rates were ultimately adjusted downward in the model calibration process.

9.4.2.1 Phytoplankton

Chlorophyll-*a* (Data Type 3 and 11) as used in the QUAL-TX model refers to planktonic algae. Observed chlorophyll-*a* concentrations during synoptic surveys 1 and 2 were very low (Appendix D, and Figure D-3). Based on the observed chlorophyll-*a* and QUAL-TX default parameters, the phytoplankton accounted for less than 10% of the initially estimated net productivity throughout the Long Prairie River. Therefore, algal growth was not explicitly simulated; rather, chlorophyll-*a* was specified, as monitored, in the initial condition cards (Data Type 11). The bulk of the productivity was represented by macrophytes.

The QUAL-TX chlorophyll-*a* model settings (Data Type 3) are summarized in the following table.

Parameter	Units	Default Value	Final Modeled Value
Net oxygen production	mg O_2/ µg chlorophyll-*a* / day	0.05	0.05
Net nitrogen uptake	mg N/ µg chlorophyll-*a* / day	0.0025	0.0025
Net phosphorus uptake	mg P/ µg chlorophyll-*a* / day	0.0002	0.0
Nitrogen Preference	Ranges from 1.0 (total NO_3-N preference) to 0.0 (total NH_3-N)	1.0	0.7

9.4.2.2 Macrophytes

Macrophytes (Data Type 3 and 11) are rooted aquatic plants, and in the Long Prairie River during surveys 1 and 2, they accounted for nearly all of the net productivity in the oxygen balance. The following table summarizes the dominant macrophytes observed in the Long Prairie River.

Common Name	Scientific Name	Form	Plant Biomass Die-off in October / November
Wild rice	*Zizania aquatic*	emergent	100%
Wild celery	*Vallisneria americana*	submergent	100% (down to the tuber)
Canadian waterweed	*Elodea canadensis*	submergent	90%

Wild rice grows mainly in riparian wetland areas, whereas the other two plants grow mainly within the channel. Wild celery is dominant in the river's upper reaches. Canadian waterweed, which dominates in the lower reaches, is an evergreen perennial. If conditions are favorable, it can form dense canopies at the water surface, which can lead to constant DO consumption by plant parts at depths with low light levels. All three plants also provide a surface for periphyton (attached algae) and bacteria growth.

As for phytoplankton, macrophyte growth was not explicitly modeled. Instead, macrophytes were directly specified in the initial condition cards (Data Type 11) in units of density (mg/ft^3). The modeled macrophyte density was actually a surrogate for net productivity. Initially, macrophyte densities were adjusted so that net productivity predicted by QUAL-TX using default kinetic parameters matched the Delta Method values throughout the river. In the course of model calibration, the macrophyte densities were not altered, but the net oxygen production per unit of macrophyte biomass was adjusted downward from the default value initially assumed.

During the model calibration, nutrient uptake rates were also adjusted downward from their default values. Rooted river plants take up nutrients from both sediment and water, but the sediment is usually the more important source (Haslam, 1978). Moreover, despite a difference in units of expression, the default QUAL-TX model settings for macrophytes, normalized to biomass rather than to chlorophyll-*a*, are numerically the same as for chlorophyll-*a*.

The QUAL-TX macrophyte settings(Data Type 3) are summarized in the following table.

Parameter	Units	Default Model Value	Final Calibrated Value
Net oxygen production	mg O_2/ mg macrophyte / day	0.05	0.01
Net nitrogen uptake	mg N/ mg macrophyte / day	0.0025	0.0005
Net phosphorus uptake	mg P/ mg macrophyte / day	0.0002	0.00007
Nitrogen preference	Ranges from 1.0 (total NO_3-N preference) to 0.0 (total NH_3-N)	1.0	0.7

9.4.3 Sediment Kinetic Rates

There are several kinetic rates that describe the sediment's interaction with the water column. Sediment oxygen demand (SOD) removes DO from the water column. On the other hand, bottom sediments can also be a source of water-column nutrients.

9.4.3.1 Sediment Oxygen Demand

Studies have determined that different sediments take up DO from the water column at different rates. Field notes document the sediments along the Long Prairie River and its tributaries as predominantly sandy. The QUAL-TX model has SOD (Data Type 12) generally at a published value (Thomann and Mueller, 1987) for sandy sediments (0.5 g O_2/m^2-day at 20 C). Model calibration required an elevated SOD (1.5 g O_2/m^2-day at 20 C), attributed to riparian wetland interactions, from 3.4 miles upstream to 17.3 miles downstream from the inflow of Dismal Creek (between LPR 76.7 and LPR 56.0). The elevated SOD value is within published Midwestern stream SOD ranges summarized by Bowie et al. (1985) as follows:

SOD (g O_2/m^2-day)	Environment
0.022 – 0.92	Upper Wisconsin River
0.27 – 9.8	Northern Illinois rivers (89 Stations)
0.10 – 5.30 (at 20 C)	Eastern Michigan rivers (6 stations)

The Carlos reach also required special consideration.

9.4.3.2 Carlos Reach SOD

As discussed in Section 9.3.4, the Carlos reach has unique hydraulic conditions that affect the water quality. The following points are unique to the Carlos reach:

- The wetland is hydraulically unusual.
- Nothing in the in-stream water quality data (Appendix D) supports significant contaminant input to the reach from a point source.
- DO depletion observed in the reach cannot be accounted for by incremental inflow (groundwater or runoff) or by point source inflow.

An analysis of potential DO depletion from riparian wetland SOD in the Carlos reach is summarized in Appendix F, Table F-10. The main idea of the analysis is that flow through the riparian wetland is subjected to a very large area (much larger than the channel area) in which

SOD can occur. The Carlos reach consists of the first three QUAL-TX model reaches. In each of these reaches, an estimated “active” riparian wetland area was calculated by multiplying half the average riparian wetland width by the Thalweg length for the reach. SOD rates of 1.0, 3.0 and 5.0 g O_2/m^2-day were then assumed for trial calculations. These values are reasonable in light of the studies cited in Section 9.4.3.1. The resulting total mass removal rates ranged from 5.8 to 29 g O_2/sec. At a typical flow rate through the reach of 100 cfs (2.8 cubic meters/sec), these mass removal rates can account for combined DO losses of roughly 2 to 10 mg/L. Riparian wetland SOD thus provides a plausible cause for the observed DO sags in the Carlos reach. Moreover, no other plausible cause presents itself. It is noteworthy that MPCA investigators are speculating that headwater reaches of the Upper Mississippi and Ottertail Rivers also have low DO in the absence of anthropogenic sources.

The effects of the riparian wetland SOD on the Carlos reach are modeled in QUAL-TX with a specified mass out-take of DO that corresponds to an SOD rate on the “active” riparian wetland area of 4.0 g O_2/m^2-day before temperature correction (i.e., at 20 C). When this SOD rate is corrected for temperatures observed during the August and September 2001 calibration events, the corresponding mass out-take of DO in the QUAL-TX model consistently reproduces the observed DO responses in the Carlos reach. This mass out-take of DO is implemented only for flow regimes under which the wetland-channel interaction is considered to occur.

9.4.3.3 Upper River Benthic Nutrient Sources

Monitoring data from the synoptic surveys indicated that the Carlos reach plus the next five reaches were exporting phosphorus. This is especially evident from the mass loading plots (Appendix F, Figure F-2). These reaches were considered to be nutrient sources under conditions where the water depth in the Carlos reach allows exchange with the riparian wetland. In the August and September 2001 calibration event models, the first eight reaches had benthic sources of TP and NH_3-N at 2.0 and 1.0 mg/sq ft-day respectively.

9.4.4 Ultimate Carbonaceous BOD

Biochemical oxygen demand (BOD) was specified in the QUAL-TX model program constants (Data Type 3) as ultimate carbonaceous BOD ($CBOD_u$). This is important to keep in mind when comparing the TMDL loadings and model results to other studies, which typically report only 5-day values ($CBOD_5$).

9.4.4.1 $CBOD_u$ Ratios to $CBOD_5$ and $CBOD_{20}$

Values of $CBOD_u$ were estimated from monitored $CBOD_5$ and 20-day ($CBOD_{20}$) data. The water quality data collected during Phase II included $CBOD_5$ analyses for all samples, plus $CBOD_{20}$ analyses for all Long Prairie River and tributary samples in surveys 1 and 2 (August and September 2001), three discharging point sources during survey 2, and two stream samples in survey 3 (February 2002). In addition, three stream samples each from surveys 1 and 2 were analyzed for $CBOD_u$ directly (using very large initial sample volumes and very long testing periods) at the Metropolitan Council Environmental Services laboratory. However, the three directly measured $CBOD_u$ values for survey 2 were substantially smaller than the corresponding $CBOD_{20}$ values (from 7 to 62% smaller). Although the survey 1 data did not show discrepancies similar to those shown by the survey 2 data, we decided to set aside the directly measured $CBOD_u$ values from both surveys and to base further analysis only on the $CBOD_5$ and $CBOD_{20}$ data. Profiles of $CBOD_5$ and $CBOD_{20}$ by Long Prairie river mile for synoptic surveys 1-3 are presented in Appendix D (Figures D-2a through D-2c).

In order to estimate $CBOD_u$ from the monitored $CBOD_5$ and $CBOD_{20}$ values, it was necessary to invoke a lag time. This is because the first-order decay model for CBOD places a theoretical lower limit on the ratio of $CBOD_5$ / $CBOD_{20}$. For very large values of the CBOD decay rate constant K_d, this ratio approaches 1; but for very small K_d, the ratio does not approach 0, but instead approaches 0.25. According to the first-order decay model:

$$CBOD_5 / CBOD_{20} = (1 - e^{-5K_d}) / (1 - e^{-20K_d})$$

and application of L′ Hopital's rule to the right-hand side of this equation yields the above-stated result that $CBOD_5$ / $CBOD_{20}$ approaches 5/20, or 0.25, in the limit as $K_d \rightarrow 0$. If a lag time t_L is assumed (t_L = 1, 2, 3, or 4 days), then the limiting value of the ratio $CBOD_5$ / $CBOD_{20}$ becomes $(5 - t_L) / (20 - t_L)$. Numerical values of this lower limit are as follows:

Lag Time t_L (days)	**Lower Limit of Ratio $CBOD_5$ / $CBOD_{20}$**
1	0.211
2	0.167
3	0.118
4	0.063

Nearly all of the $CBOD_5$ analyses from surveys 1 and 2 were reported as non-detections (< 2 mg/L in most cases), and in each of these cases the $CBOD_5$ value was set equal to one half the reported detection limit for purposes of analysis. After excluding samples from surveys 1 and 2 which also had non-detections reported for 20-day CBOD values, the ratios of $CBOD_5$ / $CBOD_{20}$ were less than 0.25 for eight of 17 samples in survey 1, and 17 of 18 samples in survey 2. (For survey 2, even if $CBOD_5$ values were set equal to the detection limit rather than half the detection limit, the ratios were less than 0.25 for 15 of 18 samples.) The average ratio was 0.391 for survey 1 and 0.123 for survey 2.

The $CBOD_5$ and $CBOD_{20}$ data for surveys 1 and 2 were reconciled with a single-valued decay rate constant by invoking time lags of 1 day for survey 1 and 4 days for survey 2. The value of the decay rate constant K_d is 0.104 day^{-1} (20 C). The ratio of $CBOD_u$ / $CBOD_{20}$ is accordingly 1.16 for survey 1 and 1.23 for survey 2. The corresponding ratios of $CBOD_u$ / $CBOD_5$ are 2.94 and 10.1, respectively. In general, $CBOD_5$ and $CBOD_{20}$ data will yield somewhat different estimates of $CBOD_u$; estimates based on 20-day values, wherever available, are preferable. The 20-day ratios were applied to the monitored $CBOD_{20}$ data to give estimated $CBOD_u$ values for survey 1 and 2 stream samples used for QUAL-TX calibration (Appendix F, Table F-11).

Time lags were also invoked for discharges SD-002 and SD-001 of the Long Prairie WWTF and for the Long Prairie Superfund site discharge. Long Prairie SD-002 had a $CBOD_5$ / $CBOD_{20}$ ratio of 0.25, which was accommodated by a 2-day lag and a K_d value of 0.060 day^{-1} (20 C). A $CBOD_u$ / $CBOD_5$ ratio of 6.1 corresponds to these parameters. For the September 2001 calibration event, the combined Long Prairie discharges SD-001 and SD-003 had a $CBOD_u$ / $CBOD_5$ ratio of 10.5 (3-day lag and K_d = 0.050 day^{-1} [20 C] for $CBOD_5$ / $CBOD_{20}$ ratio of 0.167). For 7Q10 scenarios, Long Prairie discharge SD-001 used a $CBOD_u$ / $CBOD_5$ ratio of 8.3, equal to the average of 6.1 (ratio for discharge SD-002) and 10.5 (ratio for discharges SD-001 and SD-003 combined). The Long Prairie Superfund site discharge used a 3-day lag time with K_d = 0.081 day^{-1} (20 C), equivalent to a $CBOD_u$ / $CBOD_5$ ratio of 8.9.

For the new (currently under construction) discharge SD-003 of the Long Prairie WWTF, and for the Carlos, Browerville, Eagle Bend, and Clarissa WWTFs, a typical $CBOD_u$ / $CBOD_5$ ratio equal to 2.84 (Thomann and Mueller 1987, page 273) was assumed.

For modeling of winter conditions during survey 3 (February 2002), $CBOD_u$ model results were compared directly with the two stream sample results for $CBOD_{20}$.

9.4.4.2 $CBOD_u$ Decay Rate

For all modeled reaches the $CBOD_u$ decay rate (Data Type 12) was 0.104 day^{-1} (20 C). This is the K_d value derived in Section 9.4.4.1, and it is consistent with published values for comparable natural streams (Bowie et al., 1985). It is recognized that in-stream $CBOD_u$ decay rates are often greater than the so-called "bottle rates" used, for example, to convert $CBOD_{20}$ to $CBOD_u$. However, in simulations with higher K_d values, extremely high $CBOD_u$ concentrations were needed in the incremental inflow (combination of groundwater and runoff) to maintain the generally flat longitudinal in-stream $CBOD_u$ profile that was observed in the Long Prairie River. In the end, since the correct in-stream K_d appeared to be in the vicinity of the bottle rate, the bottle rate was simply adopted as the in-stream value.

For this modeling analysis, we assumed that there was no settling of $CBOD_u$ and neglected the effects of anaerobic BOD decay.

9.4.5 Nitrogen Kinetic Rates

Mineralization of organic nitrogen (transformation of ON to NH_3-N) and nitrification (transformation of NH_3-N to NO_3-N) are included in the QUAL-TX model. Not included were settling of ON and in-stream denitrification (transformation of NO_3-N to N_2 gas, which usually occurs only under anaerobic conditions).

9.4.5.1 Mineralization

The modeled ON mineralization rate is 0.03 day^{-1} (20 C) for all reaches.

9.4.5.2 Nitrification

During synoptic survey 2 (September 2001), the Long Prairie WWTF discharged a sufficiently large ammonia load that the NH_3-N and NO_2/ NO_3-N mass loading plots clearly illustrate the effects of nitrification (Appendix F, Figure F-2). A nitrification rate of 1.02 day^{-1} (20 C) was determined from a linear regression analysis of the logarithm of in-stream NH_3-N mass loading versus travel time downstream from the Long Prairie WWTF (Appendix F, Figure F-3). This rate is used in all model reaches downstream of the Long Prairie WWTF. Nitrification rates greater than 1 day^{-1} are not uncommon in smaller streams (Thomann and Mueller, 1987). Upstream of the WWTF, a nitrification rate of 0.80 day^{-1} (20 C) is used in the model. Both of these rates are reasonable when compared to published values (Bowie et al., 1985).

9.4.6 Temperature Corrections for Kinetics

The following default temperature correction factors are used in the model:

- Correction for reaeration computed ($\approx$ 1.021 at 20 C)
- Correction for BOD Decay 1.047
- Correction for SOD 1.074
- Correction for Organic N decay 1.047
- Correction for Ammonia N decay 1.083

9.5 BOUNDARY AND INITIAL CONDITIONS

The QUAL-TX model requires that concentrations be specified for headwaters, tributaries, point sources, and initial conditions for the water quality parameters noted with an "X" in the following table.

Parameter	Headwaters	Tributaries	Point Sources	Initial Conditions
Flow (cfs)	X	X	X	---
Temperature (C)	X	X	X	X
Chloride (mg/L)	X	X	X	---
DO (mg/L)	X	X	X	X
$CBOD_u$ (mg/L)	X	X	X	---
ON (mg/L)	X	X	X	---
NH_3-N (mg/L)	X	X	X	X
NO_2/ NO_3-N (mg/L)	X	X	X	X
TP (mg/L)	X	X	X	X
Chlorophyll-*a* (ug/L)	X	X	X	X
Macrophytes (mg/ft^3)	---	---	---	X

9.5.1 Headwaters and Tributaries

Event-specific water quality boundary conditions are defined for headwaters (Data Type 20-22) and tributaries (Data Type 24-26) as monitored in the August and September calibration events (Appendix F, Table F-12).

In the August calibration event, Turtle, Morgan, and Fish Trap Creeks had measurable flow rates and were modeled as inflows. Under the September calibration event conditions, the contributing tributaries were Spruce, Turtle, Morgan, and Fish Trap Creeks. In February, all tributaries were frozen.

9.5.2 Point Source Inputs

Point sources inflows are also described in the same model block (Data Type 24-26) as the tributaries. Point source inflows are modeled as monitored in the September calibration event (Appendix F, Table F-13). Under the September calibration event conditions, the point source discharges were Long Prairie Superfund, Long Prairie WWTF and Eagle Bend WWTF. In the August and February calibration events, the point sources were not discharging.

9.5.3 Initial Conditions

Each reach in the model requires initial condition cards (Data Type 11). The QUAL-TX model uses initial conditions to start iterations toward the final solution. Initial conditions also directly specify in-stream temperature, chlorophyll-*a* concentrations, and macropyte densities in the Long Prairie River model. Initial conditions are specified as the arithmetic average by reach of monitored values during the monitoring periods. Non-detect values were assumed to be half the detection limit for the calculations of arithmetic averages by reach. The initial condition parameters were assumed to be that of the upstream reach where there were no data collected for a particular reach.

River profiles of the initial conditions are plotted and tabulated in Appendix D, Figures D-1 through D-3, and discussed in Section 7.0.

9.6 NON-POINT SOURCE INPUTS

Modeled non-point source (NPS) inputs represent all inflows that are not accounted for by tributary inflows or point source discharges, plus benthic nutrient sources and SOD. NPS inflows are modeled using the incremental inflow block. The incremental inflow block of the QUAL-TX model represents groundwater and runoff inflows. Published historical groundwater discharge rates and stream gauging data both aid in the estimation of groundwater discharge to the Long Prairie River.

9.6.1 Published Historical Groundwater Discharge Rates

Two USGS papers provide historical data on groundwater discharge to the Long Prairie River:

- Myette et al. (1984) reports groundwater discharge rates of 0.85 and 1.3 cfs per river mile in 1978 and 1979, respectively, along the lower reaches (Todd County portion).
- Base-flow stream gauging data in McBride (1975) imply a groundwater discharge rate of 0.6 cfs per river mile during October 1-2, 1973 along the upper reaches (Douglas County portion).

9.6.2 Calculated Incremental Inflows for Monitoring Periods

The incremental inflows to the river for the synoptic surveys were determined by fitting a uniform inflow rate for each survey to stream flows gauged by Wenck and the USGS (Appendix F, Figures F-4). The incremental inflows are summarized by model run in the following table. The splitting of inflows between groundwater and runoff is described below.

	Incremental Inflow (cfs/RM)	Groundwater Inflow (cfs/RM)	Runoff Inflow (cfs/RM)
August 2001	0.64	0.64	0
September 2001	1.18	0.64	0.54
February 2002	1.59	0.64	0.95

Based on antecedent moisture conditions, incremental inflow during the August 2001 synoptic survey was considered groundwater inflow only. No precipitation occurred during any of the three synoptic surveys. However, precipitation totals for the 20-day periods preceding surveys 1 and 2 were 0.22 and 2.27, respectively (Appendix F, Table F-14). In light of the very dry conditions preceding the August survey (Appendix F, Figure F-5a), it is reasonable to identify all of the incremental inflow as groundwater at that time. The closeness in time of the three surveys also makes it reasonable to assume that the groundwater inflow rate is the same for all three. And, the much higher precipitation antecedent to survey 2 justifies the expectation that the incremental inflow during survey 2 should include runoff in addition to groundwater discharge (Appendix F, Figure F-5b).

The February 2002 synoptic survey had virtually no precipitation during the preceding month (Appendix F, Figure F-5c). However, temperatures well above freezing occurred during this survey and about half of the days in the preceding month (Appendix F, Table F-14). Consequently, the incremental inflow during survey 3 included snow- and ice-melt in addition to groundwater.

For further reference, continuous rainfall data and USGS observed flow rates are plotted in Appendix B, Figure B-1f, and a detailed breakdown of the incremental inflows appears in Appendix F, Table F-15.

9.6.3 Water Quality of Incremental Inflows

In addition to August 2001, the summer 7Q10 and winter 7Q10 scenarios have incremental inflows that consist only of groundwater. For the September 2001, February 2002, and spring 7Q10 scenarios, the incremental inflows represent a combination of groundwater and runoff. The QUAL-TX incremental inflow block defines the water quality parameters for the flow-weighted averages (if applicable) of groundwater and runoff inflows. As summarized below, some parameters were modeled as the mean of groundwater quality data published by USGS, EPA STORET, Todd SWCD, Myette et al. (1984), McBride (1975), and Anderson (1989) (Appendix F, Table F-16), while other parameters were adjusted during the calibration to reflect event-specific conditions.

		Calibrated Incremental Inflow Block (Data Types 16-18)					
Water Quality Parameters	**Mean of Published Groundwater Data**	**August 2001 (groundwater inflow)**		**September 2001 (groundwater-runoff combination)**		**February 2002 (groundwater-runoff combination)**	
		Value	Reaches	Value	Reaches	Value	Reaches
Incremental Inflow (cfs/RM)	0.92	0.64	1-25	1.18	1-25	1.59	1-25
Temperature (C)	9.15	9.15	1-25	9.15	1-13;15-25	9.15	1-25
				7.5	14		
Chloride (mg/L)	15.75	15.75	1-25	15.75	1-25	15.75	1-25
DO (mg/L)	1.6	1.6	1-25	3.3	1-25	1.6	1-25
$CBOD_u$ (mg/L)	---	17.0	1-25	122	1-3	11.5	1-25
				25.0	4-25		
ON (mg/L)	0.2	0.3	1-11;14	0.3	1-11;14	0.3	1-25
		1.2	12-13;15-25	1.4	12-13;15-25		
NH_3-N (mg/L)	0.38	0.19	1-25	0.19	1-25	0.19	1-10;20-25
						0.35	11-19
NO_2/ NO_3-N (mg/L)	5.2	0.8	1-10;20-25	0.8	1-10;20-25	0.8	1-10;20-25
		1.8	11-19	1.8	11-19	3.0	11-19
TP (mg/L)	0.05	0.08	1-25	0.08	1-25	0.028	1-25
Chlorophyll-*a* (ug/L)	---	0	1-25	0	1-25	0	1-25

For groundwater and runoff inflows, temperature and chloride were modeled as the mean of published groundwater water quality data. In the September event, the incremental inflow temperature was lowered for Eagle Creek (model reach 14) to match the monitored in-stream temperature. Incremental inflow of chlorophyll-*a* was set to zero for all modeling events.

To determine groundwater quality inputs, all groundwater quality inputs were initially set to the mean of published groundwater quality data. These values were modified, as necessary, within the range of the published data, to calibrate the August 2001 groundwater inflows to monitored in-stream values. For $CBOD_u$, a groundwater mean of 16 mg/L and range of 3.7 to 35 mg/L were estimated from published dissolved organic carbon (DOC) data and $CBOD_u$/DOC ratios of 2.7 (Thomann and Mueller, 1987) and 3.5 (Snoeyink and Jenkins, 1980). The calibrated August 2001 incremental inflow parameters summarized above represent groundwater quality for all model runs except for ON in February 2002 (assumed to be 0.3 mg/L for all reaches rather than being reach-variable).

The September 2001 and February 2002 calibrations implicitly defined the water quality of runoff inflows. The implied runoff concentrations of $CBOD_u$, ON, NH_3-N, NO_2/NO_3-N, TP are shown in Appendix F, Table F-17. This table also shows the spring 7Q10 scenario's runoff water quality, which is based on the September 2001 results. (For $CBOD_u$, however, runoff concentrations were unusually high in September 2001 in the Carlos reach because of riparian wetland effects, but these effects were not reflected in the spring 7Q10 inputs.) For September 2001 and the spring 7Q10 scenario, runoff DO concentrations were set equal to one half the saturation value corresponding to the in-stream temperature (APHA, 1998); the resulting runoff DO concentrations were 5.4 and 5.0 mg/L, respectively.

9.7 MODEL CALIBRATION, VERIFICATION, AND SENSITIVITY

The QUAL-TX model was calibrated using data from the three synoptic surveys, then verified using Todd SWCD monitoring data spanning several years. The model's sensitivity to key inputs was also quantified.

9.7.1 Model Calibration

The QUAL-TX model was calibrated to the water quality data collected during the synoptic surveys using a combination of visual best fit and error minimization techniques. Best professional judgment was used as parameters were adjusted to the final calibrated values.

The general calibration procedure was as follows. First, the hydraulic calibration was completed to match time of travel and depth measurements. Next, reaeration rates were specified, and calibration of nutrients and BOD was undertaken. Where necessary, decay rates were adjusted to fit the model predictions to in-stream field data. As the last step, photosynthetic productivity and sediment oxygen demand were balanced.

The calibration goals were reasonably met both numerically and graphically across three different calibration events. Plots of model-predicted and observed water quality are presented in Appendix F, Figures F-6. Detailed tables of observed water quality values, model predicted values, and percent differences by river mile are presented for each calibration period in Appendix F, Table F-18. The following summary of average percent differences was calculated using the detailed reach-by-reach comparisons. The high percentage differences occurring in some cases for TP and NH_3-N resulted because these parameters were close to their detection limits, so that small concentration differences corresponded to large percentage differences.

Average Calibration Tolerance	Detailed Reach Summary in Appendix F, Table:	Proposed Model Calibration Tolerance	August Model Calibration	September Model Calibration	February Model Calibration
Flow	F-22	10%	-1%	1%	0%
Sediment Loads [a]	---	25%	---	---	---
DO	F-19	25%	-6%	-8%	-3%
BOD [b]	F-19	25%	11%	10%	0%
TP [c]	F-19	25%	-19%	64%	31%
NH_3-N [b], [c]	F-19	20%	-58%	84%	4%
NO_2/NO_3-N [c]	F-19	50%	-4%	7%	3%
Chlorophyll-*a* [d]	F-19	100%	0%	0%	---

(a) Sediment loads not modeled in QUAL-TX model.
(b) Measurements below the detection limit excluded from average.
(c) Relatively small variations in modeled concentrations (0.10 mg/L or less) result in large percent differences (100% or greater) because the monitored concentrations are very small.
(d) Chlorophyll-*a* not explicitly modeled.

Nearly all of the monitored DO samples available for calibration were grab samples. In order to remove the time-of-day bias from the grab sample data and account for the daily fluctuations in DO, continuous DO measurements obtained at a few sampling locations were used to define diurnal DO ranges and time-of-day correlations with respect to these ranges. The model-predicted versus observed DO plots were then supplemented to display the diurnal variability superimposed on the grab sample data (Appendix F, Figures F-6). The diurnal variability at locations with grab samples was based on the time of day the grab sample was taken, and DO data from the nearest continuous DO monitoring location. The August and September plots reflect the DO diurnal ranges summarized below (Appendix F, Table F-9a). It was assumed that under winter conditions the DO diurnal variation is negligible.

	Monitored during:	**August 22-23, 2001**	**September 22-23, 2001**
TMDL Site ID	Site description	Average DO diurnal range (mg/L)	Average DO diurnal range (mg/L)
LPR 85.5	County Highway HWY 65	2.8	2.7
LPR 21.1	Oak Ridge Road	2.5	---
LPR 18.2	400th Street bridge	---	2.8

The model properly predicts the DO violation in the Carlos reach attributed to the unique wetland hydraulics and modeled by a mass removal of oxygen in August and September, and an elevated incremental loading of $CBOD_u$ in September.

Downstream from the Long Prairie WWTF discharge, model-predicted NH_3-N was higher than monitored in the September calibration event. It appears that nutrient uptake by macrophytes is greater in this part of the river (lower river in general), but QUAL-TX does not allow for reach-variable macrophyte nutrient uptake without modeling macrophytes explicitly. Several different scenarios were tried that provided better matches of model-predicted NH_3-N downstream of the Long Prairie WWTF in September, but the model predictions for August and February under these scenarios were much worse. The final calibration of nitrogen is a reasonable representation of the average conditions, with the best average fit between modeled results and monitored data.

9.7.2 Model Verification

The QUAL-TX model was validated with monitoring data independently collected by Todd SWCD between 1996-2002. The goal of the validation was to substantiate the model's predictive power under environmental conditions generally similar to those under which the model was calibrated, but using independent data. For validation of the August 2001 and September 2001 models, the Todd SWCD data were filtered according to the following flow, season, and point discharge criteria:

<table>
<tr><th>Data Criterion</th><th>August 2001 Model</th><th>September 2001 Model</th></tr>
<tr><td>Upper Flow Limit (cfs)</td><td>400</td><td>400</td></tr>
<tr><td>Periods Included:</td><td>July – August</td><td>Fall & Spring discharge periods</td></tr>
<tr><td rowspan="2">Exclusions due to emergency discharge:</td><td>Jul–Aug, 99[a]</td><td>---</td></tr>
<tr><td>Jul, 01[b]</td><td>---</td></tr>
</table>

[a] Emergency discharge: Eagle Bend WWTF
[b] Emergency discharges: Eagle Bend and Clarissa WWTFs

Note that not every sample in the validation data set has an associated flow measurement. Although some samples lacking a flow measurement could in fact violate the above flow criterion, such samples were not excluded from the validation data set if they met the other criteria.

River profile validation plots for discharge, temperature, DO, TP, ON, NH_3-N, NO_3/NO_2-N, $CBOD_u$, and chlorophyll-*a* for the August and September models are provided in Appendix F, Figures F-7 and F-8, respectively. These figures present the filtered validation data collected by Todd SWCD, the synoptic survey data collect by Wenck, and the model calibration results. Under warm-season conditions both with and without point source discharges, water quality predicted by the Long Prairie River QUAL-TX model, as calibrated for August and September 2001, fits well within observed ranges.

For the August comparison of modeled versus observed DO (Appendix F, Figure F-7), a number of observed data points are well below the model predictions and below 5 mg/L. Most of these points are from one specific month and year. Although similar data from other periods were excluded due to known emergency discharges, the DMRs for this period show no such discharges. There seems to be no ready explanation for this discrepancy.

9.7.3 Model Sensitivity

To evaluate the sensitivity of model predictions to changes in model variables, the sensitivity analysis block of QUAL-TX executes the model in succession, changing one of 15 input parameters at a time by specified percentages. The resulting percentage variations are then calculated for the six state variables DO, $CBOD_u$, ON, NH_3-N, NO2/NO3-N, and TP.

The August calibration event Model File was selected for sensitivity analysis. Summarized below are the values of the six state variables, averaged over the whole Long Prairie River, as predicted by the August 2001 model:

	DO	$CBOD_u$	ON	NH_3-N	NO_2/NO_3 – N	TP
Average Value (mg/L)	7.31	5.41	0.56	0.013	0.16	0.045

Variations of + 25% / -25% were specified for the input parameters. The following table summarizes the resulting state-variable variations, averaged over the river and expressed as a percentage of the above overall average state-variable values. Percent variation in the table is bolded if its absolute value is greater than 10%, and gray shaded in addition if greater than 20%. A detailed summary of averages and percent variations is presented in Appendix F, Table F-20.

		Percent Variations					
QUAL-TX Input Parameter	**QUAL-TX CODE Word**	**DO**	**$CBOD_u$**	**ON**	**NH_3-N**	**NO_2/ NO_3-N**	**TP**
Stream Velocity	VELOCITY	-1%	**10%**	4%	**27%**	**22%**	**-17%**
Stream Depth	DEPTH	3%	0%	0%	**-10%**	-5%	**-37%**
Stream Reaeration	REAERATI	5%	0%	0%	-2%	0%	0%
$CBOD_u$ Aerobic Decay Rate	BOD DECA	-1%	**-10%**	0%	0%	0%	0%
NH_3-N Decay Rate	NH3 DECA	0%	0%	0%	**-33%**	2%	**36%**
ON Decay Rate	ORGN DEC	0%	0%	-4%	**31%**	**11%**	0%
Background NH_3-N Benthos Source Rate	NH3 SRCE	0%	0%	0%	8%	5%	0%
Background SOD	BENTHAL	-3%	0%	0%	1%	0%	0%
Initial Chlorophyll-*a*	CHLOR A	0%	0%	0%	-2%	-2%	0%
Initial Macrophytes	MACRO	3%	0%	0%	**-30%**	**-36%**	**-19%**
Incremental Inflow	INC INFL	-1%	7%	-1%	**17%**	**25%**	1%
Incremental CBODu	INC BOD	-1%	**11%**	0%	0%	0%	0%
Incremental NH_3-N	INC NH3	0%	0%	0%	**24%**	4%	0%
Incremental NO2/NO3-N	INC NO3	0%	0%	0%	0%	**28%**	0%
Incremental ON	INC ORGN	0%	0%	3%	3%	0%	0%

Changes of 25% in reaeration created the largest change (5%) in DO, which was relatively insensitive to other inputs. Nutrient concentrations were the most sensitive state variables, with sensitivities in several cases exceeding 25% in absolute value.

9.8 CRITICAL CONDITION PROJECTIONS

The calibrated and verified QUAL-TX model was used to evaluate summer, spring, and winter 7Q10 critical conditions. Minnesota's water quality standards specify the 7Q10 as the critical condition for evaluating the effects of point source discharges on DO. Although non-point sources exert their greatest water quality impacts in general at high flow, this is not the case for DO because of increased turbulence and reaeration at high flow. Therefore, the 7Q10 is the appropriate critical condition for a DO TMDL. Minnesota's water quality standards for DO, as set forth in Minnesota Rules, Chapter 7050, specify the 7Q10 as the critical condition in recognition of the above.

The summer season 7Q10 condition was evaluated because it is the most extreme in terms of both low flow and high temperature. The Spring season 7Q10 was considered to address seasonal effects, especially the seasonal variation of NH3-N concentrations in municipal stabilization ponds. The winter season 7Q10 was evaluated because of observed winter DO violations and the limitation of reaeration by ice cover.

9.8.1 7Q10 Model Setup

The 7Q10 models for summer and spring were based on the calibrated August 2001 model, and the winter 7Q10 model was based on the calibrated February 2002 model. Various input parameters had to be modified as discussed below.

9.8.1.1 General Model Features

Stream flow rates and temperatures for the 7Q10 events were modeled as shown below. Summer 7Q10 conditions were used for evaluating both continuous, year-round discharges and fall seasonal discharges. Since the fall discharge period begins September 1, early-fall discharges can be subject to in-stream flows and water temperatures typical of summer conditions.

Temperatures from the following table were assumed constant for all reaches and tributary inflows.

	Temperature (degrees C)	7Q10 Flow* (cfs)	Incremental inflow (cfs/RM)	Groundwater inflow (cfs/RM)	Runoff inflow (cfs/RM)
Summer	23	11.4	0.23	0.23	0
Winter	0	6.9	0.16	0.16	0
Spring	21	38.6	0.78	0.23	0.55

* Flow at Long Prairie USGS gauge, apportioned by drainage area to tributaries (except in winter, when tributaries were assumed to be frozen and to have zero flow), with the balance apportioned by river mile along the main stem (Appendix F, Table F-21).

For summer 7Q10 and winter 7Q10 conditions, all incremental inflow was considered to be groundwater discharge. Groundwater inflow for spring 7Q10 conditions was assumed the same as for summer 7Q10, and the excess inflow for spring was attributed to runoff. Details appear in Appendix F, Table F-15.

As noted in Section 9.3.4, the Carlos reach riparian wetland is not expected to interact with the main channel under critical low-flow conditions. For this reason, the following features of the August 2001 model were not included in the summer and spring 7Q10 scenario models:

- The mass removal of oxygen representing SOD in the riparian wetland of the Carlos reach (uppermost three model reaches).
- Benthic nutrient sources in the uppermost eight model reaches.
- Elevated SOD between river miles 76.4 and 56.0 (model reaches 7-9).

The February 2002 model already excluded these same features, so these features were also absent from the winter 7Q10 model.

The same equations and general approach for estimating reaeration were used for 7Q10 scenarios as for calibration. The lower depths under 7Q10 conditions resulted in fewer reaches using reaeration option 8 (Tsivoglou and Wallace, 1972) and more reaches using the minimum K_a value for shallow-gradient streams based on depth (Hydroscience, 1971). As for the calibration events, plots of model-predicted DO display the diurnal DO variability as a minimum and maximum. The August 2001 diurnal DO ranges were assumed for the spring and summer 7Q10 plots. Diurnal variability of DO was not considered during the winter 7Q10.

Initial conditions for the August calibration event were used for the summer and spring 7Q10 model runs, while those for the February calibration were used for the winter 7Q10. For the summer and spring 7Q10 runs, macrophyte densities were assumed unchanged from the August calibration event values. Winter 7Q10 runs assumed no macrophytes, as for the February 2002 calibration. In addition, winter 7Q10 runs assumed the same percent ice cover as for February 2002 (Appendix F, Table F-8).

For headwater and tributary inflows, DO was modeled at saturation (based on in-stream temperature), chlorophyll-*a* was assumed zero, and $CBOD_u$, nitrogen species and TP were modeled as seasonal averages (Appendix F, Table F-12).

9.8.1.2 Point Source Inputs

Model inputs for existing point sources are summarized in Appendix F, Table F-13. The existing point sources are the Carlos, Long Prairie, Browerville, Eagle Bend, and Clarissa WWTFs, and the Long Prairie Superfund site.

The Long Prairie WWTF currently consists of three systems: one industrial disposal system (SD-001), one combined domestic-industrial disposal system (SD-002), and one domestic disposal system (SD-003). Discharge from SD-002 enters the Long Prairie River at LPR 46.6, while SD-001 and SD-003 discharges combine in one outfall that enters the Long Prairie River at LPR 44.9. A new continuous-discharge mechanical plant is being built for domestic wastewater and will replace the current SD003 pond discharge upon completion. The new mechanical plant is expected to have a dry weather design flow of 0.566 million gallons per day (MGD). Critical-condition modeling of existing point sources actually assumed the near-future plant configuration for Long Prairie that will follow completion of the new mechanical plant.

Flow for the Long Prairie Superfund site is based on the remediation system operation manual. Pumped groundwater is discharged from the Superfund site at approximately 300 gallons per minute (0.67 cfs), and this rate was assumed constant.

Except for Long Prairie's new mechanical plant and the Long Prairie Superfund site, existing point source discharge rates were based on a maximum drawdown rate of 6 inches/day from the secondary treatment ponds. Existing point source flow rates are as follows:

Point Source	Secondary Treatment Pond Area (acres)	Maximum Discharge Rate (MGD)	(cfs)
Carlos	4.8	0.78	1.21
LP Superfund	n/a	0.43	0.67
LP SD-002	10.7	1.74	2.70
LP SD-001	5.67	0.92	1.43
LP SD-003	n/a	0.57	0.88
Browerville	24.4	4.00	6.16
Eagle Bend	4.0	0.65	1.01
Clarissa	5.64	0.92	1.42

Existing water quality for point sources was mainly based on discharge monitoring report (DMR) data as follows:

- Temperature: Modeled as ambient in-stream values.
- DO: Average DMR values for Long Prairie WWTF discharges, saturation for others.
- $CBOD_u$: Average DMR values.
- Nitrogen and phosphorus constituents: Average DMR values where available, based on MPCA (1992) for others.
- Chlorophyll-*a*: Assumed zero.
- 7Q10 Water Quality Based Effluent Limits

Long Prairie River loading capacities were assessed with and without point source inflows for summer, spring, and winter 7Q10 critical conditions. Load reduction alternatives for summer and spring scenarios were required to meet in-stream water quality standards.

9.8.1.3 Critical Conditions without Point Sources

The critical-event model predictions without point source inflows are plotted in Appendix F, Figures F-9. Model-predicted DO was above 5 mg/L throughout the river for summer, spring and winter 7Q10 scenarios without point source inflows.

9.8.1.4 Critical Conditions with Point Sources and No Load Reductions

With existing point sources discharging, model-predicted DO was below 5 mg/L (in violation of the DO standard) at multiple locations in the summer and spring 7Q10 scenarios. The model results are plotted in Appendix F, Figures F-10. In the DO figures, the locations of the point source inflows are indicated on the x-axis. On both DO figures with point source inflows, jumps in the DO resulted from the assumption that the Browerville (LPR 36.1) and Eagle Creek (LPR 33.6) inflows were at saturated DO.

9.8.1.5 Ammonia Toxicity Limitations

Ammonia toxicity was found to be limiting for the Carlos, Eagle Bend, and Clarissa WWTFs. Location-specific ammonia standards in terms of analytical NH_3-N concentrations were found to be 1.34 mg/L at the Long Prairie River headwaters (for the Carlos WWTF) and 1.62 mg/L in Eagle Creek (for Eagle Bend and Clarissa). These were derived from the 0.04-mg/L un-ionized ammonia standard using the following April-June median values of temperature and pH:

Monitoring Location	Temperature, C	pH
LPR 89.9	12.1	8.15
Eagle Creek	14.0	8.00

Based on existing effluent characteristics (Appendix F, Table F-13), the three WWTFs would cause ammonia toxicity under 30Q10 conditions. At the 30Q10, the calculated in-stream NH_3-N concentration below the Carlos WWTF, after mixing, was 1.54 mg/L, which exceeded the local standard of 1.34 mg/L. The calculated mixed in-stream NH_3-N concentration below the Eagle Bend WWTF was 4.42 mg/L, which exceeded the Eagle Creek local standard of 1.62 mg/L. For the Clarissa WWTF, the in-stream mixed concentration was 1.69 mg/L with Eagle Bend also discharging, and 1.80 mg/L without Eagle Bend, in both cases exceeding the 1.62-mg/L local standard. (Clarissa's mixed concentration is lower with Eagle Bend's discharge than without it because Eagle Bend's discharge provides substantial dilution water, whereas its ammonia loading largely nitrifies before reaching Clarissa.)

The following 30Q10 data were used in calculating the in-stream mixed concentrations:

Municipal WWTF	Stream	River Mile	Stream Flow (cfs)	NH3-N (mg/L)
Carlos	Long Prairie River	LPR 89.5	3.49	0.06
Eagle Bend	Eagle Creek	EC 12.0	0.33	0.19
Clarissa (with E.B.)	Eagle Creek	EC 7.0	4.54	0.40
Clarissa (alone)	Eagle Creek	EC 7.0	3.53	0.19

Ammonia toxicity can be prevented for the above facilities if their discharges are limited to periods when the in-stream flows are moderately increased. In terms of flows at the model headwaters, the requisite in-stream minimum flows are as shown below.

Municipal WWTF	Stream	Headwater River Mile	Stream Flow (cfs)
Carlos	Long Prairie River	LPR 89.9	3.87
Eagle Bend	Eagle Creek	EC 12.5	2.75
Clarissa	Eagle Creek	EC 12.5	2.75

The corresponding in-stream flow at the Carlos WWTF location, LPR 89.5, which is 0.4 mile below the model headwater, is 4.18 cfs (versus 3.49 cfs at the 30Q10). The corresponding in-stream flow at the Eagle Bend WWTF location is 2.95 cfs (versus 0.33 cfs at the 30Q10), and at the Clarissa WWTF it is 4.81 cfs (versus 4.54 cfs at the 30Q10).

9.8.1.6 Point Source Load Reduction

The reduced point source loads required to meet the Class 2B DO and un-ionized ammonia standards throughout the Long Prairie River are summarized in Appendix F, Table F-23. DO and other water quality output plots reflecting the reduced point source loads are shown in Appendix F, Figures F-11, F-12, and F-13. The required load reductions were determined as described below.

To determine point source load reductions necessary for spring conditions, the 7Q10 flow regime was modified according to the table immediately above in Section 9.8.2.3 so as to allow the Carlos, Eagle Bend, and Clarissa WWTFs to discharge with existing effluent quality as permitted. Under the modified 7Q10, no load reductions were required for these three municipal systems or for Long Prairie's new domestic wastewater system (discharge SD-003). The Browerville WWTF was initially also modeled with existing spring effluent quality and permitted flow rate, but the extremely high flow rate that its large secondary pond area allowed caused severe limitations on discharge from the upstream Long Prairie WWTF. These limitations were unnecessary because the Browerville WWTF in fact does not discharge in the spring but only discharges in the fall. Therefore, a nominal spring NH_3-N limit of was placed on the Browerville WWTF that would allow Browerville to discharge half its annual wastewater volume in the spring in case of need. The daily NH_3-N load implied by the concentration limit (0.3 mg/L) and Browerville's permitted flow rate (6.16 cfs) is the same as that corresponding to the estimated actual spring NH_3-N concentration (5.8 mg/L) and a flow rate of 0.335 cfs, equal to half of Browerville's 1999-2001 maximum annual wastewater volume discharged at a constant rate over 75 days. Even with this accommodation, Long Prairie discharges SD-001 and SD-002 (industrial wastewater systems) were found to require substantial NH_3-N and $CBOD_u$ load reductions under the modified spring 7Q10. However, the critical condition for Long Prairie discharges SD-001 and SD-002 was found to be summer low flow.

The two treatment systems for Long Prairie discharges SD-001 and SD-002 were modeled as a combined system with a single discharge, designated SD-004, at the upstream location (that of existing discharge SD-002). A mechanical system with continuous discharge was assumed, the flow rate being the sum of the two existing systems' design flow rates (0.500 MGD) rather than the currently allowed seasonal maximum rates (2.67 MGD). The effluent limits for Long Prairie discharge SD-004, as determined by summer critical low-flow conditions, are as follows:

Characteristic	Limit	Units
Flow	0.500	MGD
Flow	0.77	cfs
DO	6.0	mg/L
$CBOD_u$	30.	mg/L
NH_3-N	22.1	mg/L
ON	2.0	mg/L
NO_2/NO_3-N	94	mg/L

In considering the load reductions for discharge SD-004, the baseline concentrations were the flow-weighted averages for discharges SD-001 and SD-002. A reduction in $CBOD_u$ was accompanied by a reduction in ON by approximately the same ratio. In adjusting the nitrogen species, the total nitrogen concentration was held fixed. Thus, a reduction in ON resulted in an increase in NH_3-N, and a reduction in NH_3-N resulted in an increase in NO_2/NO_3-N. The large initial NH_3-N concentration, together with the very high degree of nitrification that is required for this point source, resulted in the extremely high NO_2/NO_3-N in the effluent.

For the summer 7Q10, Long Prairie discharge SD-004 was modeled as above, and SD-003 was modeled as permitted. All other point sources were also assumed to be discharging with fall-discharge period effluent characteristics. The fall effluent from the municipal WWTFs other than Long Prairie (i.e., Carlos, Browerville, Eagle Bend, and Clarissa) has very low NH_3-N because of nitrification throughout the summer. Under these conditions, the summer 7Q10 model showed no violations of either DO or ammonia toxicity criteria throughout the Long Prairie River.

Since the in-stream flow and temperature are more severe for the summer 7Q10 than for the fall 7Q10, the summer 7Q10 model serves to demonstrate the absence of DO and ammonia toxicity violations for the fall as well as the summer.

For the winter 7Q10, modeling with the continuous discharges only (Long Prairie SD-003 and SD-004, and the Long Prairie Superfund discharge) as previously determined showed no DO or ammonia toxicity violations. Therefore, the effluent characteristics given in Appendix F, Table F-23, define the TMDL point-source loads.

9.8.2 TMDL Projection Simulation

To complete the TMDLs for the Long Prairie River, each reach's unallocated capacity for oxygen-demanding loads was determined by adding a hypothetical or "virtual" point source at the reach head and finding the largest possible load there that would not cause a DO violation. The virtual point sources were essentially mass loads; they all had the same nominal, low flow rate (0.1 cfs) to avoid significant hydraulic effects, and effluent concentrations were allowed to be arbitrarily high to yield the largest possible non-violating loads. The critical condition for most of the virtual point sources was the summer 7Q10, however the modified spring 7Q10 was critical in the uppermost reach (reach 506). For reach 504, the summer 7Q10 and modified spring 7Q10 were equally restrictive. The unallocated capacity determinations are further discussed in Section 11.7.

The inflow of Eagle Creek to the Long Prairie River does not cause DO or ammonia toxicity violations in the river main stem. However, the TMDL projection simulation includes DO violations within Eagle Creek. Eagle Creek is not at present a 303(d)-listed reach, but further investigation here appears to be warranted.

The TMDL projection simulation showed no violations of DO or ammonia toxicity standards in the Long Prairie River. The model results are plotted in Appendix F, Figures F-14a, F-14b, and F-14c.

10.0 SWAT Model

As discussed in Section 8, the SWAT model was used to simulate the effect of land management practices on loads of sediment and nutrients in the Long Prairie River. The objective was to provide a tool that could be used during the implementation phase of this project. The SWAT model results were not used to develop the TMDL allocations. This section of the report describes the model configuration and set up, the various data that were used as inputs to the model, the calibration results for flow and water quality, and the results of the model projections.

10.1 MODEL CONFIGURATION

The SWAT model was configured to cover the entire Long Prairie River watershed between the outlet of Lake Carlos and the mouth of the Long Prairie River. The SWAT model includes an ArcView interface that delineates the watershed boundary and subbasin boundaries using digital elevation model (DEM) data. These elevation data were originally developed by the USGS and were provided to the Wenck/FTN team by the Todd County GIS Department. These data consisted of elevations on a 30 meter × 30 meter grid. The watershed boundary delineated by the model was checked to make sure it was close to the boundary of the USGS hydrologic unit for the Long Prairie River basin.

The model divides the whole watershed into subbasins based on outlets specified by the user. Subbasins are the smallest units in the model that are geo-referenced (i.e., the model considers the location of each subbasin when routing water, sediment, and nutrients from subbasin outlets to the mouth of the watershed). The subbasin outlets were specified so that the model would delineate subbasins that were similar to the subbasins established by the Minnesota Department of Natural Resources (MDNR). In a few cases, additional outlets were inserted to further divide the MDNR subbasins. This resulted in a total of 61 subbasins in the SWAT model (Appendix G,

Figure G-1). The subbasins are numbered in Appendix G, Figure G-1 for easy reference. The average size of the delineated subbasins is approximately 6000 acres.

The SWAT ArcView interface also draws stream channels through the whole watershed based on the digital elevation data. If desired, the user can "burn in" stream channels that are already mapped in ArcView. This option forces the model to draw the stream channels close to the channels that are already mapped. Because accurate stream channel mapping was available from the Todd County GIS Department, the "burn in" option was used. The “burned in” stream channels are depicted in Appendix G, Figure G-1. After the model draws the stream channels, it calculates stream length and stream slope. For both stream length and stream slope, the values calculated by the model had to be adjusted manually because the grid size of the elevation data was not small enough for the model algorithms to reproduce the sinuosity of certain parts of the river. These manual adjustments were based on information from Tepley (1999).

10.2 WATERSHED DATA

The watershed data that are required by the SWAT model include soils and land use, both of which must be in GIS format (i.e., ArcView). The preferred source of soils data was the Soil Survey Geographic (SSURGO) database, which is published by the Natural Resource Conservation Service (NRCS) and is the same information as shown in the published county soil survey books except it is in GIS format. However, the SSURGO data were not available for most of the Long Prairie River basin when the SWAT modeling was initiated. Therefore, a less detailed level of soils data, referred to as the State Soil Geographic (STATSGO) database, was used. The STATSGO data are also published by the NRCS, but are slightly more generalized than the SSURGO data. The STATSGO soils data are shown on Appendix G, Figure G-2. Major features of the uplands and river bottoms are depicted in the map.

The land use data used for the SWAT model were the International Coalition Land Use / Land Cover data, which are based on 1990 aerial photography. These data were obtained from the MDNR web site and are shown on Appendix G, Figure G-3. In general, the different types of land are well distributed throughout the basin without large concentrations of agricultural lands. Appendix A, Table A-1 summarizes the major classes of land use by the three river reaches; upper, middle, and lower. Agricultural was the dominant land use comprising 41% of the total basin. The largest concentrations of agricultural lands were found in the middle reach (48% agricultural) and the upper reach (43% agricultural). The lower reach was 28% agricultural.

The land use data were modified slightly to account for land that was enrolled in the Conservation Reserve Program (CRP) during 1990 but has returned to cropland since then. Using CRP data for Todd County that was provided by the NRCS in GIS format, all CRP areas that had contract expiration dates prior to 2003 were assumed to be cultivated land now. This amounted to approximately 13,000 acres and represented 8.2% of the total cropland in the Long Prairie watershed.

Because the land use data included only one category for all cultivated land, rotations of individual crops were specified in the SWAT model based on local information and observations from a site reconnaissance during August 2002. The cultivated land in the vicinity of Long Prairie and Browerville (ie, the middle reach) was assigned a 2-year rotation of potatoes and soybeans. Cultivated land in other parts of the watershed was assigned a 5-year rotation of corn, corn, oats overseeded with alfalfa, alfalfa, and alfalfa. Table 10-1 summarizes the percentages of various crops in Todd County.

Table 10-1. Acreages of primary crops in Todd County during 1997-2001.

Crop	Average Acres Harvested	Percent of total
Corn for grain	51,080	26%
Corn for silage	22,080	11%
Hay (alfalfa)	48,120	25%
Hay (other)	28,460	15%
Soybeans	23,420	12%
Oats	12,360	6%
Wheat	5,480	3%
Potatoes	2,440	1%
Sunflowers	1,770	1%

Source: National Agricultural Statistics Service (www.nass.usda.gov:81/ipedbcnty/c_MNcrops.htm)

After the user inputs the soils and land use data, the model overlays these two data sets and produces a third data set that identifies unique combinations of soil type and land use that occur within each subbasin. Each unique combination of soil type and land use within a subbasin is considered to be a hydrologic response unit (HRU). For example, all alfalfa fields on a certain type of soil in a subbasin are grouped into one HRU. The HRU is the smallest scale at which land is represented in the model (i.e., the watershed is divided into subbasins, and each subbasin is divided into HRUs). HRUs are not geo-referenced or located within the subbasin. Therefore, the portion of a subbasin that is comprised of alfalfa fields on a particular type of soil is known but the model does not keep track of where the individual fields are actually located within the subbasin. Each HRU usually represents an aggregation of numerous individual parcels of land that are not contiguous within a subbasin.

Initially, the model generated over 840 HRUs for the Long Prairie River watershed, including many that were small and represented negligible percentages of a subbasin. In most applications of the SWAT model, the user will limit the number of HRUs to make the model more manageable and to be consistent with the accuracy and detail of available data. This is done by choosing threshold values for land use and soil type, which were set to 3% for land use and 10% for soil type for the Long Prairie River watershed. The model eliminated land uses that covered less than 3% of each subbasin and then reapportioned the areas of the remaining land uses so that 100% of the land area in each subbasin was modeled. Next, for each remaining land use, the model eliminated soil types that covered less than 10% of an individual land use in each subbasin and then reapportioned the areas of the remaining soil types. This process reduced the number HRUs in the Long Prairie River watershed to 396. The average size of the resulting HRUs was approximately 930 acres.

Based on recommendations in the SWAT User Manual, land that was classified as open water (i.e., ponds and lakes) was simulated as ponds rather than a terrestrial land use (i.e., modeled as a waterbody rather than dry land). In SWAT, ponds are simulated with fluctuating water levels where the outflow varies as a function of water level. The model will not let water flow out of ponds when the water level is below the outlet level. The water level can fluctuate due to inflow, outflow, seepage into groundwater, and evaporation. SWAT simulates wetlands in a similar manner (i.e., water level can fluctuate, outflow varies as a function of water level, etc.). Therefore, all land that was classified as wetlands was simulated as wetlands (i.e., waterbodies) rather than a terrestrial land use.

The model also requires some information concerning land management practices. Planting dates and harvesting dates were entered into the model based on information obtained from the National Agricultural Statistics Service web site. Fertilization rates were based on recommended values from the University of Minnesota web site.

10.3 CLIMATIC DATA

The primary climatic data that are required by the SWAT model are precipitation and minimum and maximum temperatures for each day. Daily precipitation data were obtained for 11 stations from the high density volunteer monitoring network data on the University of Minnesota web site. These 11 stations are (named by county and township): Todd Bertha, Douglas Carlos, Morrison Darling, Todd Iona, Todd Little Elk, Todd Leslie, Todd Long Prairie, Todd Round Prairie, Todd Ward SW, Todd Ward NE, and Todd Staples. Daily minimum and maximum temperatures were obtained for 4 stations from the National Oceanic and Atmospheric Administration (NOAA) web site. The 4 temperature stations are Alexandria, Brainerd, Long Prairie, and Wadena. The locations of these stations are shown in Appendix G, Figure G-4.

For each of the precipitation and temperature stations, latitude and longitude coordinates were input to the model. For each subbasin, the model identifies the precipitation and temperature stations that are closest to that subbasin and uses the data from those stations. The model does not interpolate between stations.

The model also uses daily data for solar radiation, wind speed, and relative humidity. These values are used for simulating processes such as plant growth and potential evapotranspiration. Following the recommendation in the SWAT User's Manual, daily values of these three parameters were generated by the model (because there were no measured values from weather stations located in the watershed). The model has a national database of weather statistics that it uses to generate daily values of solar radiation, wind speed, and relative humidity. The model automatically chooses the nearest station for each subbasin. For the Long Prairie River watershed, the nearest stations in the SWAT database were located near Wadena and Glenwood.

10.4 HYDROLOGIC INPUTS

A number of hydrologic parameters are necessary for the model to simulate hydrology in the watershed. For most of those parameters, the model automatically reads or calculates values from databases that are provided with the model. For example, the model reads soil parameters such as saturated hydraulic conductivity, available water capacity, and hydrologic soil group from the STATSGO database. Another example is how the model determines SCS curve numbers based on land use, hydrologic soil group, and information from published literature.

For the Long Prairie River watershed, an upstream boundary had to be specified to account for flow coming into the modeled area from Lake Carlos and upstream areas. The daily flow data for Station 9 (Long Prairie River before Carlos) were used to specify this inflow rate.

The SWAT model also has the capability to simulate irrigation withdrawals from surface or groundwater sources. The timing and quantity of irrigation water that is applied can be explicitly specified by the user or automatically determined by the model based on simulated stress of crops due to lack of water. For the base simulations, it was assumed that all irrigation withdrawals would occur from shallow groundwater and that application rates and timing would be determined by the model so that crop growth would not be limited from lack of water. Previous experience with the model indicates that in order for the model to predict an accurate water budget, realistic crop growth is required. If crop growth is limited, evapotranspiration from the plant cover will be less than expected and the model water budget will be off. Since farmers in the area will irrigate when necessary to maximize crop yield, the assumption to let the model optimize application rates is reasonable.

Permitted NPDES discharges were also included in the model as point sources to the river using average effluent flow rates.

10.5 HYDROLOGIC CALIBRATION

The hydrology in the SWAT model for the Long Prairie River basin was calibrated by comparing predicted and observed flow data at various stations for June 1997 through September 1999. The model was started in January 1995 so that the first 29 months could be considered as a startup period so that estimates of initial conditions in the watershed would not influence the model results during the calibration period. Prior to June 1997, there were no flow data for the upstream boundary; the upstream flow during that time was set to the period of record average of the Station 9 flow data (i.e., the average for June 1997 through September 1999).

The model predictions were compared to observed flow data at 5 locations along the main stem; these were Station 10 (after Carlos), Station 6 (Highway 11upstream of Long Prairie), Station 7 (USGS gage in Long Prairie), Station 5 (Highway 14 near Browerville), and Station 2 (near Philbrook). Observed flow data were also available at 3 tributary locations; these were Station 4 (Eagle Creek), Station 3 (Turtle Creek), and Station 8 (Moran Creek). However, the observed flow data for Eagle Creek and Turtle Creek were both unusually low. The average flows per unit of drainage area (i.e., inches of runoff and groundwater inflow per year) were approximately

3.6 inches per year for Eagle Creek and 5.0 inches per year for Turtle Creek. As mentioned in Section 4.2, published values of average annual surface runoff (excluding groundwater inflow) are approximately 4 to 6 inches per year. Therefore, the observed flows for Eagle Creek and Turtle Creek were not used for calibration.

The initial predictions of flow were generally higher than the observed values, partly because of surface runoff predictions that appeared to be too high. Following guidance in the SWAT User's Manual, the calibration parameters that were adjusted included curve numbers, available soil water capacity, groundwater "revap" coefficient (affects the evapotranspiration from shallow groundwater), and groundwater delay time (time for water to percolate from the bottom of the root zone to the saturated zone). After adjusting these calibration parameters within ranges allowed by the model, the average predicted and observed flows during the calibration period were as shown in the table below.

Table 10-2. Flow calibration results from SWAT model.

Location	Average observed flow (cfs)	Average predicted flow (cfs)	Percent difference
Station 10 (after Carlos)	2.2	2.4	+8%
Station 6 (Highway 11upstream of Long Prairie)	4.8	5.0	+5%
Station 7 (USGS gage in Long Prairie)	5.2	5.3	+1%
Station 5 (Highway 14 near Browerville)	7.5	6.0	-20%
Station 2 (near Philbrook)	12.4	11.4	-8%
Station 8 (Moran Creek)	1.5	1.3	-13%

A few of the percent difference values are greater than the proposed calibration tolerance of 10% for flow. However, at the station farthest downstream on the main stem (Station 2), the percent difference is low. The predictions at this station represent the cumulative effects of the model predictions over the entire drainage area upstream of that location.

10.6 WATER QUALITY INPUTS

A number of water quality parameters are necessary for the model to simulate hydrology in the watershed. As with the hydrologic parameters, the model automatically reads or calculates most of these values from databases that are provided with the model.

For the upstream boundary (outflow from Lake Carlos), concentrations of sediment and nutrients had to be specified in the model. Because there was relatively little variation in the observed concentrations at Station 9 (Long Prairie River before Carlos), average concentrations of total suspended solids (TSS), total nitrogen, and total phosphorus for Station 9 were input to the model as constant values. Total nitrogen was calculated by adding values of total Kjeldahl nitrogen (TKN) and nitrate+nitrite nitrogen (NO_2/ NO_3-N).

10.7 SEDIMENT CALIBRATION

For the calibration of sediment in the SWAT model, the model predictions were compared with measured concentrations of TSS at various stations for June 1997 through September 1999. TSS was the parameter that provides the closest approximation to sediment concentration in the water column. However, it should be noted that TSS values from grab samples collected near the surface of the stream do not represent the entire quantity of sediment being transported along a stream. These samples do not include sediment from bedload, which is the process of relatively heavier sediment particles being transported downstream along the bottom of the stream bed. In contrast, the sediment concentration predicted by the SWAT model represents all sediment being transported along a stream, including bedload.

Considering the differences between what is represented by measured TSS concentrations versus SWAT predicted sediment concentrations, it was not surprising that the sediment concentrations predicted by SWAT were mostly higher than the observed TSS concentrations. Because observed TSS concentrations were not available for every day, averages of predicted concentrations were calculated using values only on days when observed data were available.

One of the problems with the model predictions appeared to be unusually high sediment concentrations during storms. Because sediment transport and scour in the SWAT model are affected by channel velocity and channel erodibility, the model default values for Manning's *n* and channel erodibility were adjusted. Also, the P factor in the Universal Soil Loss Equation (USLE) was decreased to reduce erosion from the watershed. After these adjustments, the average predicted and observed concentrations for the calibration period were as shown in the table below.

Table 10-3. Sediment calibration results from SWAT model.

Location	Average observed TSS (mg/L)	Average predicted sediment (mg/L)	Percent difference
Station 10 (after Carlos)	4.5	5.7	-9%
Station 6 (Highway 11upstream of Long Prairie)	10.5	6.6	-28%
Station 7 (USGS gage in Long Prairie)	9.1	6.7	-26%
Station 5 (Highway 14 near Browerville)	11.2	8.1	-37%
Station 2 (near Philbrook)	9.7	8.8	+27%

Some of these percent difference values are greater than the proposed calibration tolerance of 25% for sediment, which is assumed to be due to the inconsistency between observed TSS concentrations and predicted sediment concentrations.

10.8 NUTRIENT CALIBRATION

For the nutrient calibration of the SWAT model, the model predictions were compared with measured concentrations of total nitrogen and total phosphorus at various stations for June 1997 through September 1999. Total nitrogen values were calculated by adding values of TKN and NO_2/ NO_3-N.

The nitrogen concentrations were underpredicted by the model at the upper end of the watershed and overpredicted at the lower end, while the phosphorus concentrations were overpredicted throughout the system. The average predicted and observed nutrient concentrations for the calibration period were as shown in the tables below.

Table 10-4. Nitrogen calibration results from SWAT model.

10.8.1.1 Location	Average observed total nitrogen (mg/L)	Average predicted total nitrogen (mg/L)	Percent difference
Station 10 (after Carlos)	0.68	0.57	-16%
Station 6 (Highway 11upstream of Long Prairie)	0.85	0.69	-19%
Station 7 (USGS gage in Long Prairie)	0.84	1.00	+19%
Station 5 (Highway 14 near Browerville)	1.21	1.29	+5%
Station 2 (near Philbrook)	1.08	1.67	+54%

Table 10-5. Phosphorus calibration results from SWAT model.

Location	Average observed total phosphorus (mg/L)	Average predicted total phosphorus (mg/L)	Percent difference
Station 10 (after Carlos)	0.020	0.028	+39%
Station 6 (Highway 11upstream of Long Prairie)	0.060	0.064	+8%
Station 7 (USGS gage in Long Prairie)	0.061	0.114	+88%
Station 5 (Highway 14 near Browerville)	0.083	0.155	+17%
Station 2 (near Philbrook)	0.055	0.185	+239%

10.9 MODEL VERIFICATION

As mentioned in Section 8.1.2, it was originally planned to verify the SWAT model using data from the 2000-2001 period. However, no continuous flow data were available for the upstream end of the model (the outlet of Lake Carlos) for this time period. Without this data, it was not possible to accurately simulate flow, sediment, or nutrients at any of the monitoring stations along the main stem of the river. Comparison of predicted and observed concentrations of sediment and nutrients would not provide an accurate assessment of the model's ability to simulate conditions other than the calibration period. Therefore, verification of the SWAT model was not performed.

10.10 MODEL RESULTS

The calibrated model input and output files are included in the electronic submission of the report and modeling files. These files provide the model input and output on a subbasin basis. Overall results are discussed in this section.

Sediment, total phosphorus, and total nitrogen loads are presented by subbasin in Appendix G, Figures G-5, G-6, and G-7, respectively. Darker colors represent higher loadings per unit area. These figures can be used to identify hot spots or subbasins with the highest loadings that should be prioritized for implementation of best management practices to reduce the loadings. For example, in Appendix G, Figure G-6, subbasins 21, 34, 29, and 49 were identified as having the highest phosphorus loadings. These subbasins also correspond with the subbasins with the highest sediment loads. A different loading pattern is shown in Appendix G, Figure G-7 for nitrogen. This difference is because nitrogen is not tied to the sediment erosion as phosphorus is.

Sediment and nutrient loads per unit area are summarized by land use in Appendix G, Figures G-8, G-9, and G-10. Appendix G, Figures G-9 and G-10 show that the export rate (load/unit area/year) is highest from agricultural lands for both phosphorus and nitrogen. Appendix G, Figures G-11, G-12, and G-13 show pie charts with the percentages of sediment, nitrogen, and phosphorus load for each land use in the basin. These pie charts are based on percentages of total loads for the watershed (not loads per unit area); therefore, they are dependent on both the load per unit area and the area of each land use.

Loadings of sediment, nitrogen, and phosphorus for the whole watershed are compared for wet and dry years in Table 10-6. The years selected for wet and dry years were 1995 and 1992, respectively, because the annual precipitation values for those years were at least one standard deviation above and below the long term average. The loadings for the wet year were 2 to 3 times as high as the loadings for the dry year. This shows the dynamic nature that is typical for non-point source loading in most watersheds.

Table 10-6. Comparison of simulated loadings for wet and dry years.

	Dry Year (1992)	Wet Year (1995)
Sediment Yield (tons/ha)	0.32	1.00
Nitrogen Yield (kg N/ha)	2.10	4.89
Phosphorus Yield (kg P/ha)	0.19	0.57
Annual Precipitation (in/yr)*	21.9	37.0

* For annual precipitation, average is 28.2 in/yr and standard deviation is 6.0 in/yr.

1.1 MODEL PROJECTIONS

As mentioned in Section 8.1, the intended use of the SWAT model for the Long Prairie River basin was to investigate land management practices needed to achieve the required NPS load reductions predicted by QUAL-TX. The SWAT model has the capability to simulate numerous types of BMPs to reduce nutrient loadings. In this section, two alternatives are presented to illustrate how the SWAT model can be used to evaluate BMPs in the Long Prairie watershed.

The objective of the SWAT modeling was to identify watershed management practices that would yield the non-point source load reductions that are necessary for the main stem of the river to maintain the DO standard according to the QUAL-TX modeling. In other words, if the QUAL-TX modeling showed that a 10% reduction of non-point source sediment and nutrient loads was needed, then the SWAT model would be used to identify management practices that would yield a 10% reduction of non-point source loads. The QUAL-TX modeling showed that non-point source reductions on the order of 10% are in fact necessary in reaches 504, 505, and 506 (upper and middle portions of the river). To provide some useful information on non-point load reductions, the SWAT model was used to simulate two different scenarios.

The first scenario was implementation of 10-meter wide filter strips in the four subbasins with the highest sediment loading per unit area. These filter strips were assumed to be implemented for all cropland within these subbasins. As shown in Table 10-7, the results of this scenario indicate that loadings from each of these four subbasins would be significantly reduced by the use of filter strips. For the whole watershed, the reductions in loadings would not be as significant as on the subbasin level.

Table 10-7. Simulated loadings before and after implementation of filter strips.

Subbasin	Sediment (tons/ha)		Total Nitrogen (kg N/ha)		Total Phosphorus (kg P/ha)	
	Before	After	Before	After	Before	After
21	4.49	1.23	13.88	4.21	2.11	0.58
34	4.07	1.06	15.95	4.08	2.33	0.51
29	3.96	1.11	12.75	4.73	1.88	0.64
49	3.82	1.40	6.02	2.12	0.90	0.29
Watershed	69.1	55.9	321.4	285.8	40.9	35.3

The second scenario was conversion of all land in the potatoes/soybeans rotation to Conservation Reserve Program (CRP). These areas were assumed to be converted to grass. As shown in Table 10-8, the results of this scenario indicated that the reductions in loadings would be small in most cases. This is presumably due to the relatively small amount of area that is planted in potatoes (compared to other crops; see Table 10-1).

Table 10-8. Simulated loadings before and after conversion of potato land to CRP.

Subbasin	Sediment (tons/ha)		Total Nitrogen (kg N/ha)		Total Phosphorus (kg P/ha)	
	Before	After	Before	After	Before	After
21	4.49	4.15	13.88	10.76	2.11	1.48
23	1.00	0.99	5.04	4.74	0.67	0.62
26	3.35	2.71	12.59	11.88	1.79	1.61
29	3.96	3.96	12.75	10.09	1.88	1.37

10.12 MODEL IMPROVEMENTS

Development and application of the SWAT model is an ongoing process that requires continual updates and improvements. It is recommended that the SWAT model for the Long Prairie watershed continue to be used and developed as an implementation tool for the watershed. Specific recommendations include updating and improving the management practices in the model (e.g., crop rotations; fertilizer application rates, methods, and timing; tillage methods and timing; etc.) and incorporating the SSURGO soils data into the model.

11.0 Loading and Allocation

11.1 TMDL CALCULATIONS

A total maximum daily load (TMDL) for DO has been calculated for each Long Prairie River main stem reach (07010108-501 through -506) based on the TMDL projection simulation. The TMDL projection simulation corresponds to the modified spring 7Q10 conditions. The modified spring 7Q10 conditions were critical for, and therefore determined, most of the point source wasteload allocations and all of the non-point source load allocations. The few loads determined by the summer 7Q10 (unallocated capacities of several reaches and wasteload allocation for the Long Prairie WWTF's two industrial wastewater systems) were the same in the modified spring 7Q10 as in the summer 7Q10 models.

The DO TMDLs for the Long Prairie River are presented as oxygen demand from $CBOD_u$, NBOD (decay of both ammonia and organic nitrogen), and SOD. The NBOD loads were calculated as 4.33 times the sum of ammonia nitrogen (NH_3-N) plus organic nitrogen (ON). The assumption is that all ON ultimately decays to NH_3-N. The factor 4.33 is the stoichiometric ratio (mass basis) of oxygen demand to nitrogen that was used in the QUAL-TX modeling. The SOD component was integrated over the streambed area of each reach and reflects temperature correction for the ambient conditions of the projection simulation.

Table 11-1 shows the load reductions that the TMDLs require for ensuring maintenance of the DO standard. Non-point source load reductions on the order of 10% are indicated for the upper and middle portions of the Long Prairie River (reaches 504, 505 and 506). Point source load reductions are indicated for the Long Prairie and Browerville WWTFs. However, Browerville's load reduction is nominal because this facility actually discharges in the fall only, not in the spring. Browerville's wasteload allocation is equivalent to a flow rate of 0.335 cfs (equal to half of Browerville's 1999-2001 maximum annual wastewater volume discharged at a constant rate over

75 days) with a spring NH3-N effluent concentration of 5.8 mg/L. Thus, in case of need, a spring discharge would be feasible for Browerville with existing effluent quality.

The following sections present the TMDLs, discuss seasonal variation and margins of safety, and summarize point source discharge restrictions required to prevent ammonia toxicity, based on minimum in-stream flows.

11.2 TMDLS FOR DO IN THE LONG PRAIRIE RIVER

Table 11-2 presents the DO TMDLs for the Long Prairie River. In Table 11-2, reach loading capacities are in bold at the lower right corner of each data block. The reach loading capacity is the sum of all point source wasteload allocations (WLAs) and implicit margins of safety (MOSs), non-point source load allocations (LAs), non-point source margin of safety (MOS), and unallocated capacity. The unallocated capacity represents a "virtual" point source (point mass loading with essentially zero flow) at the reach's upstream end that is just large enough, in combination with all other loadings, to cause a 5-mg/L DO minimum under critical low flow conditions. The unallocated capacity thus merely completes the determination of the reach loading capacity.

The DO TMDLs for the Long Prairie River are illustrated as bar charts in Figure 11-1. Figure 11-2 shows the DO profile that resulted from the TMDL simulation projection, and Figures 11-3 and 11-4 show DO profiles for summer and winter 7Q10 conditions. For further details, see Appendix F, Figures F-14a through F-14j.

WLAs were not developed for the Eagle Bend and Clarissa WWTFs because Eagle Creek is not listed as impaired for low DO, and these communities' residual loads do not impair the Long Prairie River main stem. However, these two municipal loads are included in the TMDL projection simulation. The Eagle Creek "residual point source loads" in Tables 11-1 and 11-2 are the loads from the Eagle Bend and Clarissa WWTFs, following attenuation in Eagle Creek. Eagle Creek's non-point sources also reflect in-stream attenuation. For Eagle Creek, the TMDL projection simulation had a gross $CBOD_u$ load from all sources of 1200 lb/day and a net $CBOD_u$ load (to the Long Prairie River) of 849 lb/day, and gross and net NBOD loads of 620 and 252 lb/day, respectively. The following table is consistent with these overall values and the assumption that each individual load's attenuation was proportional to the load itself and to the length of Eagle Creek's channel through which it flowed.

Eagle Creek Pollutant Load Component	Attenuation Length (miles)	$CBOD_u$			NBOD		
		Gross Load (lb/day)	Load Attenuation (lb/day)	Net Load (lb/day)	Gross Load (lb/day)	Load Attenuation (lb/day)	Net Load (lb/day)
Eagle Bend WWTF	12.0	88	42	**46**	212	166	**46**
Clarissa WWTF	7.0	219	61	**158**	299	136	**162**
Headwater	12.5	101	51	**50**	52	42	**10**
Incremental Inflow	6.25	793	198	**595**	57	23	**34**
Totals	--	1200	351	**849**	620	368	**252**

In Tables 11-1 and 11-2, the Eagle Creek residual point source loads are the sums of Eagle Bend's and Clarissa's net loads in the above table. The non-point source LAs for Eagle Creek, similarly, are the sums of the headwater and incremental inflow net loads in the above table, minus small contributions to the MOSs.

11.3 AMMONIA TOXICITY RESTRICTIONS

To prevent ammonia toxicity during the spring discharge period (April 1 – June 30), the Carlos, Eagle Bend, and Clarissa municipal WWTFs should restrict their discharges to periods when the headwater flows in their receiving waters are greater than or equal to the following minimums:

Municipal WWTF	Stream	Headwater River Mile	Stream Flow (cfs)
Carlos	Long Prairie River	LPR 89.9	3.87
Eagle Bend	Eagle Creek	EC 12.5	2.75
Clarissa	Eagle Creek	EC 12.5	2.75

Consistent with the above restrictions, the TMDL projection simulation incorporated headwater flows of 3.87 cfs in the Long Prairie River and 2.75 cfs in Eagle Creek. The modified flow regime used for the TMDLs implies the need for hydrograph-controlled discharges, based on Long Prairie River and Eagle Creek in-stream flows, from the Carlos, Eagle Bend, and Clarissa WWTFs.

Effluent limits for the Long Prairie WWTF that are required for DO maintenance also serve to prevent ammonia toxicity; limits based only on preventing downstream ammonia toxicity would be considerably more relaxed than Long Prairie's DO-based limits.

11.4 SEASONAL VARIATIONS

To account for seasonal variation in flow and temperature, the TMDLs were tested in QUAL-TX simulations of summer/fall and winter low-flow conditions (Figures 11-3 and 11-4, respectively). The summer/fall simulation used summer 7Q10 and temperature but included all municipal discharges with fall-season effluent quality. The summer/fall 7Q10 simulation thus served as a conservative test for the municipal WWTFs with seasonal discharges. The summer/fall simulation defined load limitations for the Long Prairie WWTF's SD-004 but not for any other municipal facility. The summer/fall simulation also determined the unallocated capacities for reaches 501, 502, 503, 504, and 505.

In both the summer/fall and winter scenarios, the continuous discharges from the Long Prairie WWTF (discharges SD-003 and SD-004) were modeled with the effluent characteristics as determined for the TMDL (Appendix F, Table F-23). Both scenarios also included the only other continuous discharge, that of the Long Prairie Superfund site, a minor source of oxygen-demanding substances.

11.5 MARGIN OF SAFETY

The margin of safety (MOS) accounts for the uncertainty or lack of knowledge concerning the relationship between load allocations and water quality. The Long Prairie River TMDLs incorporate implicit MOSs for point source WLAs and explicit MOSs for non-point source LAs. The WLAs have implicit MOSs because of conservative assumptions inherent in the WLA determinations and because the science and practice on which the WLA determinations are based is well developed.

The WLA determinations depend strongly on the conservative assumption that extreme low flow and extreme high temperature coincide with the simultaneous discharge of all possible point sources (the last phenomenon in itself a rare occurrence). Because this scenario is so improbable, its assumption introduces a significant safety margin for the WLAs.

In addition, when effluent concentration limits for conventional pollutants are derived using a steady-state modeling analysis, the MPCA normally assigns these as monthly average permit limits not to be exceeded. In so doing, an additional MOS is inherent in waste load allocations for biological treatment facilities because the variability in pollutant removal efficiencies that always exists in these facilities implies that their design and operation must target significantly stricter effluent limits than their NPDES permits allow. For example, considering the 12 monthly average $CBOD_5$ concentrations for a biological treatment facility's effluent, the maximum monthly average is typically 1.5 times greater than the average of the 12 monthly averages. In recognition of this, the facility must target and generally meet an effluent limit that is at least 33% smaller than the NDPES limit. If instead the facility's target effluent limit equaled the NPDES limit, the facility would be virtually guaranteed to have one or more effluent violations every year. Thus, a well-run biological treatment facility's effluent will only occasionally approach its NPDES permit limits and will have long-term average quality that is substantially better than its permit allows.

In addition to this conservatism, a large knowledge base and long experience underlie the point source WLA determinations. The use of mathematical models of river DO for determining allowable wasteloads began in the early 20th century and is a well-developed practice. The particular model used in the Long Prairie River TMDL study has had a long history of successful use and on-going development. The model originated as the U.S. EPA's QUAL-II (Roesner et al., 1981) and subsequently underwent further development as QUAL2E (NCASI, 1985; Brown and Barnwell, 1987). More recent modifications by the Texas Water Development Board (1995) have added capabilities to QUAL2E, culminating in the QUAL-TX model, the particular model used in the Long Prairie study.

The point source WLAs for the Long Prairie River also rest on a very substantial and diverse body of site-specific scientific data. As part of the TMDL study, three extensive synoptic water quality and hydrologic surveys of the river, its tributaries, and discharging point sources were conducted in August 2001, September 2001, and February 2002. The TMDL study also included two additional focused water quality surveys in August 2001 and August 2002. Other monitoring data utilized in the Long Prairie TMDL study included the Todd SWCD's extensive water quality and flow gauging record for the years 1996 – 2002, and the MPCA's long-term (1974 – 2000) water quality record for the Long Prairie River at Motley. The U.S. Geological Survey has maintained a stream flow gauging station on the Long Prairie River at the City of Long Prairie since 1971 and has undertaken and published three groundwater investigations that provided water quality and hydrologic data relevant to the TMDL study. Groundwater proved to represent substantial portions of the Long Prairie River's water and pollutant budgets.

In light of the above factors, we estimate that the implicit MOS for the Long Prairie River WLAs easily exceeds 10%.

Most of the discussion concerning the MOSs for point source WLAs also applies to the MOSs for non-point source LAs. However, non-point source pollutant loads are inherently more difficult to quantify than point source loads. Therefore, non-point source LAs incorporate an explicit additional MOS of 10%.

In the Long Prairie River's three lower reaches (501, 502, and 503), the initially determined virtual loads provided the non-point source MOSs as well as the unallocated capacities. These reaches' virtual loads were split in this way because the reaches have no actual point sources within or directly above them, and their non-point source MOSs equaled a relatively minor portion (< 20%) of their virtual loads. In the three upper Long Prairie River reaches (504, 505, and 506), the non-point source MOSs were deducted from the initially determined non-point source loads themselves. Non-point source load reductions are required in the three upper reaches because of this procedure.

11.6 ALLOWANCE FOR FUTURE GROWTH

The use of design flows and permitted maximum flows for the point source WLAs can be regarded as incorporating growth allowances for the watershed's municipalities. This is because the design flows and permitted maximum flows are in general substantially greater than the flows the municipalities actually require.

In the TMDL projection simulation, the design flows used in the QUAL-TX model for the Long Prairie WWTF were about 17% greater than the flows actually needed. Long Prairie's design flows are as follows:

	Modeled Flow Rate	
Long Prairie Discharge	**(cfs)**	**(MGD)**
Long Prairie SD-002	0.62	0.400
Long Prairie SD-001	0.15	0.100
Long Prairie SD-003	0.88	0.566
Total	**1.65**	**1.066**

For the years 1999-2001, during which time the Long Prairie WWTF discharged seasonally from its pond systems, the actual discharge volumes in millions of gallons per year (MGY) were as follows:

Long Prairie Discharge	Actual Discharge Volume (MGY)		
	1999	2000	2001
Long Prairie SD-002	138	141	155
Long Prairie SD-003	39	33	32
Long Prairie SD-001	88	95	145
Total	**265**	**269**	**332**

The current reconstruction of system SD-003 involves rearrangement of the individual system flow rates, so a system-by-system flow comparison cannot be done. However, the total flow rates can be compared. Since the maximum actual total discharge of 332 MGY is equivalent to a continuous flow rate of 0.91 MGD, the modeled flow rate (1.066 MGD) provides a growth allowance of about 17%.

For the seasonally discharging municipal ponds, the implicit growth allowances are 30 to 89%. The modeled flow rates from the municipal point source discharges other than Long Prairie were as follows:

Municipal WWTF	Modeled Flow Rate	
	(cfs)	(MGD)
Carlos	1.21	0.782
Browerville	6.16	3.982
Eagle Bend	1.01	0.653
Clarissa	1.42	0.918

These modeled flow rates correspond to the permissible maximum drawdown rate of 6 inches per day, taken over each system's secondary pond area. The table below shows the corresponding growth allowances based on comparisons with actual seasonal discharge volumes, taking into account the periods of allowable discharge. The table shows the actual maximum seasonal discharge volumes, in millions of gallons (MG), for the above four WWTFs during the years 1999 – 2001 (all seasonal maximums occurred in 2001). The allowable discharge periods are April 1 - June 30 (91 days) and September 1 – December 15 (106 days). The equivalent flow rates shown in the table correspond to the maximum seasonal volumes, assumed to be discharged over 75 days (conservative) at a constant rate.

Municipal WWTF	Maximum Seasonal Discharge Volume		Equivalent Flow	Implicit Growth Allowance
	(MG)	Season	(MGD)	
Carlos	10.2	spring 2001	0.136	83%
Browerville	32.5	fall 2001	0.434	89%
Eagle Bend	34.5	spring 2001	0.460	30%
Clarissa	28.3	spring 2001	0.378	59%

11.7 UNALLOCATED CAPACITY

The Long Prairie River TMDLs incorporate an unallocated capacity for each reach. In terms of total oxygen demand, the unallocated capacities range from about 200 to 1,200 lb/day. These are comparable to individual municipal WWTF loads affecting the Long Prairie River. State and local decision makers will need to consider carefully what the ultimate fate of these unallocated capacities will be.

12.0 Alternatives Analysis

Alternatives for reducing point source and non-point source pollutant loads are discussed here in light of the data analysis and modeling results from this and previous studies. In general, point source load reductions are necessary for maintaining adequate dissolved oxygen (DO) and preventing ammonia toxicity in the Long Prairie River under critical low-flow conditions. With regard to non-point sources, landowners and local agencies such as the Todd Soil and Water Conservation District (SWCD) must continue to promote and implement best management practices throughout the watershed. This will maintain the generally good water quality of the Long Prairie River that exists under normal and high-flow conditions. The reach of the Long Prairie River near the City of Carlos that extends from Highway 29 to County Road 65 is unusual in several respects, and is discussed below.

12.1 CRITERIA AND RATIONALE

The water quality criterion which prompted the Long Prairie TMDL study is the Minnesota Rules, Chapter 7050, DO standard of 5 milligrams per liter (mg/L). This DO standard is an instantaneous minimum, so it is important to keep in mind that photosynthesis often causes DO concentrations to vary throughout the day, the early-morning minimum DO typically being a few mg/L below the afternoon maximum.

In the course of the TMDL study, the potential for municipal discharges to cause ammonia toxicity in the Long Prairie River became known. The state standard in Class 2B waters for ammonia is a maximum non-ionic ammonia concentration of 0.04 mg/L as nitrogen. Measured concentrations of ammonia nitrogen (NH_3-N) include both the ionic form (ammonium, NH_4^+)

and the non-ionic form (dissolved NH_3). The non-ionic form is toxic to fish. The water temperature and pH together determine what fraction of the measured NH_3-N is actually non-ionic (discussed in Section 9.8.2.3).

12.2 POINT SOURCES

The TMDL modeling and analysis focused on existing point sources: the Carlos, Long Prairie, and Browerville municipal wastewater treatment facilities (WWTFs), plus the Long Prairie Superfund site, all of which discharge to the Long Prairie River; and the Eagle Bend and Clarissa WWTFs, which discharge to Eagle Creek. The Long Prairie WWTF actually comprises three treatment systems with separate discharges. Discharge SD-001 is an industrial wastewater treatment system, discharge SD-002 is a system that will soon treat only industrial wastewater (but at present includes some domestic wastewater), and discharge SD-003 is a domestic wastewater treatment system. A new mechanical treatment facility that will discharge continuously is now under construction for Long Prairie discharge SD-003. All of the other municipal WWTFs (including the other two Long Prairie systems) are stabilization ponds with seasonal (spring and fall) discharges. The Long Prairie Superfund site is a former dry cleaning facility; groundwater is pumped out at the site and treated for chlorinated volatile organics prior to discharge. All treatment facilities currently discharge in compliance with their existing NPDES permits. However, there has been the need for some emergency discharges from Eagle Bend and Clarissa.

The Alexandria Lake Area Sanitary District (ALASD) and Miltona WWTFs were not considered significant pollutant sources to the Long Prairie River and were not included in the TMDL modeling and analysis. Although a large facility, the ALASD plant provides advanced treatment that yields effluent of extremely high quality, and its effects on the Long Prairie River are buffered by Lake Carlos and a series of lakes upstream from Lake Carlos. The Miltona WWTF is very small, and its discharge is assimilated by a slough before entering an unnamed tributary to the Long Prairie River.

Five additional pollutant sources in the watershed are Concentrated Animal Feeding Operations (CAFOs). Their National Pollutant Discharge Elimination System (NPDES) permits (four existing, one in process) do not allow direct discharge to surface waters. However, manure from the CAFOs is ultimately spread on cropland, so the CAFOs contribute to non-point source pollution. The CAFOs include poultry, dairy cattle, and beef cattle operations. All of the NPDES permits in the watershed are minor permits under the classification of the U.S. Environmental Protection Agency ("regular" permits under the MPCA's classification). Potato growers in the watershed reportedly conduct washing operations after harvest, but these washing operations have not required NPDES permits. There are no storm water permits in the Long Prairie River watershed.

12.2.1 Existing Point Sources

Two alternatives were investigated to resolve water quality problems associated with the existing point sources: improved treatment and restricting discharges to periods of higher flows to provide more dilution.

Low-flow conditions occurring in the spring were found to be critical for existing point sources because the municipal WWTFs rely on stabilization ponds, which have relatively high NH_3-N concentrations following the cold winter season. It was determined that one municipal WWTFs can discharge safely with current effluent quality under the critical spring 7-day, 10-year low flow (7Q10). The one municipal facility is Long Prairie's new domestic wastewater-only facility (currently under construction). The Long Prairie Superfund site can also discharge safely under the spring 7Q10.

For the Carlos WWTF, it was found that ammonia toxicity could be prevented by restricting spring discharge to periods of higher flow in the Long Prairie River. The minimum in-stream flow for Carlos's safe discharge was determined to be 3.87 cubic feet per second (cfs) in the Long Prairie River at Highway 29. Alternatively, a substantial reduction in Carlos's spring-season effluent NH_3-N concentration would be required to enable discharge at the spring 7Q10. This would entail an advanced mechanical facility providing nitrification.

For the Eagle Bend and Clarissa WWTFs, it was also found that restricting spring discharge to periods of higher receiving water flow could prevent ammonia toxicity in Eagle Creek. For safe discharge from Eagle Bend and Clarissa, the minimum flow in Eagle Creek was found to be 2.75 cfs at the modeled headwater location (approximately 0.5 mile upstream from the Eagle Bend WWTF). It is emphasized that the in-stream flow restriction for Eagle Bend and Clarissa is for the protection of Eagle Creek, not the Long Prairie River. Eagle Creek is not currently on the water quality non-attainment list for ammonia toxicity (or for DO), but further investigation of Eagle Creek is warranted. As for Carlos, an alternative to in-stream flow restrictions for Eagle Bend and Clarissa could be advanced mechanical plants that provide nitrification.

To prevent DO violations in the Long Prairie River, the Long Prairie WWTF's discharges SD-001 (industrial) and SD-002 (soon to be industrial-only) were found to require large load reductions that will entail continuously discharging mechanical plants with advanced capabilities for providing a high degree of nitrification. Modeling at 7Q10 and 30Q10 conditions indicated that the spring-season loadings of oxygen-demanding pollutants from the combined discharges of the Long Prairie WWTF must be reduced by 92% relative to the maximum loading rates now permitted. These reductions assume that the loading from Long Prairie discharge SD-003 is in accordance with its latest existing permit (which applies to the mechanical system now in construction) and Browerville's spring discharge flows are restricted. The load reduction for the Browerville WWTF's spring discharge is nominal because this facility actually discharges in the fall only, not in the spring. An alternative approach would be to redistribute the allowable loadings developed here for discharges SD-001, SD-002, and SD-003 so as to relax the effluent limits for SD-001 and SD-002 while further restricting the limits for SD-003. The discharge locations could also be varied. In the TMDL modeling, the location for the combined discharges SD-001 and SD-002 (termed discharge SD-004) was assumed the same as for the existing discharge SD-002, some 2 miles upstream from SD-003. However, modeling with all Long Prairie WWTF discharges at one location (that of discharge SD-003) produced in-stream water quality results comparable to those for the TMDL scenario. Another alternative that could be investigated for the Long Prairie WWTF is a discharge scenario where the effluent flow rate would be dependent on the stream flow rate. This would allow the Long Prairie WWTF to discharge at higher effluent concentrations, but would require storage of effluent during low flow periods.

The Browerville WWTF actually does not discharge in the spring but discharges in the fall only. By restricting Browerville's WWTF spring discharge rate from the ponds, the Long Prairie Load reductions can be achieved with available nitrogen removal technology without severely limiting Browerville's typical operations or future capacity. Browerville's spring NH3-N loading rate is modeled to represent a restricted discharge rate of 0.335cfs, equal to half of Browerville's 1999-2001 maximum annual wastewater volume discharged at a constant rate over 75 days, and the existing typical spring effluent concentration of 5.8 mg/L.

12.2.2 Prospects for Additional Point Sources

The recently formed Central Lakes Region Sanitary District has raised questions concerning the potential for adding new point sources to the Long Prairie River. The district is considering wastewater treatment options for an area that extends near the river's headwaters. A new municipal WWTF discharging into the upper Long Prairie River has been among the options under consideration. The TMDL modeling did not include such an additional point source on the upper river, but this does not preclude the possibility. For example, a new continuously discharging mechanical plant with sufficiently high effluent quality to meet in-stream DO and ammonia standards under spring 7Q10 conditions, could conceivably provide additional dilution for the Carlos WWTF so that it could discharge in the spring with a lower natural in-stream flow than required under the present scenario. Or, a new facility could take Carlos' wastewater, ultimately discharging it as part of a larger, higher-quality effluent. A proposed new point source would need to be modeled with specific effluent characteristics in order to explore whether the upper river has adequate reserve capacity to accommodate the additional source while falling within the unallocated oxygen demand loadings specified in Table 11-2.

12.3 NON-POINT SOURCES

The discussion of non-point sources is divided into two broad subject areas. First is the Carlos reach, where DO violations have been observed under moderate to high flow regimes. Second is the watershed taken in general and as a whole, wherein agricultural land use is the predominant concern with regard to non-point sources of pollutants.

12.3.1 The Carlos Reach

Approximately four river miles long, the Carlos reach extends from Highway 29, some 2.5 miles downstream from the Carlos outlet dam, to County Road 65. Monitoring conducted in this study and in previous studies by the Todd SWCD has revealed DO concentrations below 5 mg/L in the Carlos reach in the absence of discharging point sources and under relatively high flow conditions (e.g., 100 cfs). Lingering effects from a former point source, Carlos's abandoned wastewater stabilization pond, were initially suspected as the cause of these DO violations. However, one of the major findings of the TMDL study is that the Carlos reach DO violations primarily result from natural interaction with the riparian wetland that is a prominent feature of the upper Long Prairie River. In recent investigations, MPCA staff have found similar DO violations in headwater reaches of the Ottertail and Mississippi rivers, also with riparian wetlands prominent and pollutant sources absent. The apparent mechanism is sediment oxygen demand occurring over large riparian wetland areas that exchange flow with the main channel.

It is plausible that lingering effects of Carlos's abandoned stabilization pond do contribute in some small measure to the Carlos reach DO violations. Before the City of Carlos replaced its now-abandoned pond, all wastewater that entered it evidently seeped out of it, as the pond reportedly never discharged to the river directly. A remnant plume of polluted groundwater between the abandoned pond and the river channel may still exist. However, such a plume's volume rate of discharge into the river must be extremely small because the plume width would be on the order of one tenth of a mile, and groundwater discharge to the river is on the order of 1 cfs per mile (or 0.5 cfs per mile from each side of the river). Water quality monitoring results for the Carlos reach have confirmed that the impacts from such a plume cannot be large, as the results failed to indicate substantial upstream-to-downstream increases in oxygen-demanding pollutant concentrations.

Load reduction alternatives for the Carlos reach pollutant sources discussed above could be contemplated, but it appears unreasonable to pursue these alternatives. Isolating the riparian wetland from the channel throughout the Carlos reach would presumably increase river DO concentrations but would severely disrupt the natural ecological characteristics of the reach. Excavating Carlos's abandoned stabilization pond, implementing a groundwater pumpout scheme between the pond and the river, or other remedial actions in the old pond's locale could be considered; however, these actions would yield virtually no water quality improvement in the Long Prairie River while incurring large costs. The TMDL study results do not support the pursuit of any of the above alternatives.

12.3.2 Non-point Sources in the Watershed Generally

Because Lake Carlos's water quality is very good, the TMDL study considered non-point sources only in the portion of the Long Prairie River watershed that is downstream from the Lake Carlos outlet. This portion of the watershed encompasses some 650 square miles. For the present discussion, the terms "Long Prairie River watershed" and "the watershed" will actually refer to this 650-square mile drainage area downstream from Lake Carlos.

The predominant land use in the Long Prairie River watershed is agricultural, with cropland representing over 40% of the watershed. Grassland accounts for some 20% more of the watershed, and a portion of this grassland is used for pasture. Only 3% of the watershed is in urban use. Therefore, non-point pollutant sources in the Long Prairie River watershed are mainly agricultural.

Non-point sources include runoff from cropland (major land use) and from urban and other developed areas (minor). The main crops are potatoes, corn, soybeans, and alfalfa. Subwatersheds that exhibit high pollutant export have been identified in this study through modeling based on agricultural practices, topography, soil characteristics, climatology, and other factors. Non-point sources also include many small livestock operations in addition to the above-mentioned CAFOs. Sediment oxygen demand (SOD) in the channel of the Long Prairie River is accounted as a non-point source as well. SOD results from the deposition in the river channel of particulate organic matter originating from point and non-point sources and from decaying in-channel plant biomass. SOD also occurs naturally in wetlands.

Non-point source load reduction alternatives for the watershed include a variety of soil conservation measures. Buffer strips, grassed waterways, contour plowing, terracing, conservation tillage, crop residue management, animal waste management, and maintenance of lands in the Conservation Reserve Program (CRP) are examples of such measures. The US Department of Agriculture and local agencies such as the Todd SWCD work to promote the implementation of best management practices (BMPs) such as these. The Todd SWCD has had a good deal of success in fostering BMPs implementation in the Long Prairie River watershed. However, because implementation of BMPs on agricultural lands is accomplished on a voluntary basis, is very important that strong programs for promoting and implementing BMPs continue into the future.

12.4 RECOMMENDATIONS

This study has led to the following recommendations for pollutant load reductions in the Long Prairie River watershed:

1. Restrict the spring-season discharge from the Carlos WWTF to periods when flow in the Long Prairie River is at least 3.87 cfs at the Highway 29 bridge.
2. To the extent feasible, restrict spring-season discharge from the Eagle Bend and Clarissa WWTFs to periods when the flow in Eagle Creek is at least 2.75 cfs at the modeled headwater location, approximately 0.5 mile upstream from the Eagle Bend WWTF. In addition, investigate DO and ammonia toxicity issues more fully in Eagle Creek.
3. Implement a mechanical, continuous-discharge, advanced wastewater treatment facility (or facilities) for the Long Prairie WWTF's two industrial wastewater systems. On a daily load basis, the required overall load reductions for the Long Prairie WWTF are 93% for NBOD and 81% for CBOD.
4. If a new municipal WWTF is proposed to discharge into the upper Long Prairie River, perform modeling to investigate whether the upper river has adequate reserve capacity to accommodate the additional source. Any new point source on the upper river would have to produce an extremely high-quality effluent, the load being constrained by the relevant reach's unallocated capacity.
5. Continue to promote and implement best management practices on agricultural land throughout the Long Prairie River watershed, targeting sub-watersheds with high nonpoint source loading potential as identified by the SWAT model.
6. Continue water quality monitoring to evaluate the effectiveness of TMDL implementation.

13.0 Public Participation

13.1 INTRODUCTION

The Long Prairie River has been identified as an "impaired water" under the Clean Water Act. Parts of the Long Prairie River do not meet the water quality standard for dissolved oxygen. This means that the Minnesota Pollution Control Agency (MPCA) is required to develop "load allocations" for the river to make sure that the pollution is adequately assimilated and diluted. Load allocation is the amount of pollution that a particular discharger will be allowed to put into the river.

As part of the strategy to achieve successful response and implementation of the necessary allocations, the MPCA seeks public engagement and participation regarding their concerns, hopes, and questions regarding the Total Maximum Daily Load (TMDL) program. Specifically, for the Long Prairie TMDL, public meetings were held at:

- Browerville Community Center, May 22, 2003 (Todd County)
- Carlos Community Center, June 12, 2003 (Douglas County)

Subsequent to the public meetings, two parties requested contested case hearings. The Alexandria Lake Area Sanitary District and the Central Lakes Region Sanitary District both requested contested case hearings in August 2003. However, the two sanitary districts ultimately withdrew their requests in April-May 2005.

Appendix H contains the public participation documentation, including the contested case hearing correspondence.

13.2 PUBLICITY AND PROMOTION OF EVENT

Publicity for each public meeting was coordinated by MPCA staff, the Todd County Soil and Water Conservation District, Douglas County Water Planner and the Initiative Foundation.

Direct invitations to the event were mailed to approximately 135 stakeholders, including elected officials, representatives of NPDES permit holders, trade associations, and other opinion leaders within the watershed. In addition, public service announcements were distributed to all local newspapers and commercial radio stations.

13.3 FORMAT AND STRUCTURE OF PUBLIC MEETINGS

Both meetings began with welcoming comments from local representatives of the host County, followed by brief introductions of key personnel. The consulting firm of Wenck Associates, Inc., with its partner FTN Associates, Ltd., made a PowerPoint presentation on the chemical and biological evaluations that have previously been conducted on the Long Prairie River, followed by their recommendations on an allocation strategy. Following question/answers from the audience, participants were divided into small groups (of 8-12 members each) to encourage facilitated input directed by questions developed by the design team.

13.4 ATTENDANCE

Thirty-two people attended the meeting in Browerville and forty people attended the meeting in Carlos.

14.0 Reasonable Assurances

14.1 POINT SOURCES

The wastewater facilities on the Long Prairie River are in various stages of upgrading. The Implementation Committee members and staff from the MPCA will be working with the wastewater operators to bring their discharges into compliance with the waste load allocations in the TMDL, through the permitting process. It is anticipated that it may take more than one permit cycle (1 permit cycle is five years) to reach compliance with the waste load allocation.

14.2 NON-POINT SOURCES

The main goal of the implementation phase is to use certain BMP's in priority watersheds targeted by the SWAT model. These BMP's which appear in Minnesota's list of approved BMP's for agriculture, include manure management, contour cropping, grassed waterways, riparian buffer strips, nutrient management and conservation tillage. This will be an extension of the BMP work that is currently being done in the watershed using Clean Water Partnership grant and loan dollars. The Implementation Committee members and staff from the MPCA will be working with the watershed county Soil and Water Conservation District staff and other appropriate partners.

14.3 FOLLOW-UP MONITORING

Monitoring, an important component of the TMDL process, helps to determine whether allocated loads and waste loads have improved water quality. Monitoring will continue after BMP's and point source permits are implemented until September 2005. At that time the monitoring plan will be re-evaluated.

Sampling locations will be at the beginning and end of the listed reaches as well as the mouths of the main tributaries to assess the pollutant loads each is carrying. Sampling will also be conducted at the confluence of the Long Prairie River with the Crow Wing River to measure the cumulative effect of all sources entering the river. The major objectives of the sampling will be to monitor DO, flow, and sources and loadings of CBOD, NH_3-N, and other nutrients.

Wastewater facility permits will include a monitoring schedule consisting of frequent (weekly or biweekly) sampling for pH, temperature, and NH_3-N.

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Table 2-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Final Project Report

Summary of 303(d) Listing of Impaired River Reaches in the Study Area

Waterbody	Reach	Assessment Unit ID	Year First Listed	Affected Use	Impairment	Pollutants Addressed in this TMDL Study
Long Prairie River	Fish Trap Ck to Crow Wing R	07010108-501	1994	Aquatic life	Low DO	Oxygen-demanding substances
Long Prairie River	Moran Ck to Fish Trap Ck	07010108-502	2002	Aquatic life	Low DO	Oxygen-demanding substances
Long Prairie River	Turtle Ck to Moran Ck	07010108-503	2004	Aquatic life	Low DO	Oxygen-demanding substances
Long Prairie River	Eagle Ck to Turtle Ck	07010108-504	2002	Aquatic life	Low DO Fish IBI	Oxygen-demanding substances Ammonia toxicity
Long Prairie River	Spruce Ck to Eagle Ck	07010108-505	2004	Aquatic life	Low DO Fish IBI	Oxygen-demanding substances Ammonia toxicity
Long Prairie River	L Carlos to Spruce Ck	07010108-506	2002	Aquatic life	Low DO Fish IBI	Oxygen-demanding substances Ammonia toxicity
Eagle Creek	Headwaters to Long Prairie R	07010108-507	2002	Aquatic life	Fish IBI	Ammonia toxicity

Notes:

Year first listed refers to low DO impairment (except for Eagle Creek, 07010108-507, listed in 2002 for biotic impairment).
Reaches 07010108-501 through -506 (Long Prairie River main stem) were listed in 1998 for mercury Fish Consumption Advisory [not considered in this TMDL study].
IBI = Index of Biotic Integrity (new designation in 2004). Listed in 2002 for biotic impairment.

Table 4-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Known Point Source Inventory

Facility Name	NPDES Permit Number	Discharge	Description
Municipal Waste Water Treatment Facilities (WWTFs):			
Alexandria Lake Area Sanitary District	MN0040738	SD-010	Discharges into the Lake Carlos chain of lakes
City of Carlos WWTF	MNG580005	SD-001	Total Facility Discharge of Effluent to Surface Water
		SD-002	Bypass
City of Long Prairie WWTF	MN0020303	SD-001	Industrial Discharge, serving Central By-Products SC, of Effluent to Surface Water
		SD-002	Combined domestic and industrial Discharge of Effluent to Surface Water
		SD-003	Domestic Discharge of Effluent to Surface Water
		SD-005	Discharge of drain-tile under holding pond #3 to catch groundwater, not treated.
City of Long Prairie WWTF	MN0066079	SD-001	Continuous Discharge of Effluent to Surface Water (proposed facility to replace Domestic Pond Discharge when operational)
City of Browerville WWTF	MN0022926	SD-001	Total Facility Discharge of Effluent to Surface Water
City of Clarissa WWTF	MNG580008	SD-001	Total Facility Discharge of Effluent to Surface Water
City of Eagle Bend WWTF	MN0023248	SD-001	Facility Lift Station Bypass Discharge of Effluent to Surface Water
		SD-002	Total Facility Discharge of Effluent to Surface Water
City of Miltona WWTF	MN0024155	SD-010	Existing facility
		SD-020	Overflow
		SD-030	(proposed facility to replace SD-010 when operational)
Treated Groundwater Discharge:			
Long Prairie Superfund Site	MND980904072	---	Discharges treated groundwater into the Long Prairie River at Long Prairie
Potential Source:			
Former meat packing plant, Carlos	---	---	Opened in 1858; installation of sanitary sewer in 1968 indicates that high-oxygen demand effluent from the plant may have discharged to wetland for 110 years.
Confined Animal Feedlot Operations (CAFOs):			
Steve Woge	MNG440181	---	No discharge to surface water. Location T131 R34 S2 (Eagle Creek subwatershed). 80,000 turkeys over 5 pounds (1440 AU).
Jennie-O Turkey Store - Toddco Blue	MNG440238	---	No discharge to surface water. Location T131 R34 S36 (Eagle Creek subwatershed). 69,600 turkeys over 5 pounds (1252.8 AU).
Jennie-O Turkey Store - Toddco Green	MNG440235	---	No discharge to surface water. Location T130 R33 S6 (Eagle Creek subwatershed). 55,575 turkeys over 5 pounds; 58,500 turkeys under 5 pounds (1292.85 AU).
Long Prairie Packing, Long Prairie	In process	---	No discharge to surface water. Location T129 R33 S17 (main stem subwatershed).
Ridgeway Enterprises	MNG440407	---	No discharge to surface water. Location T129 R33 S33 (Turtle Creek subwatershed). 945 dairy cattle (1323 AU).

Source: MPCA and Todd SWCD

Table 4-2

MPCA Long Prairie River Watershed TMDL Final Project Report

NPDES Permit Limits for Point Source Discharges to the Long Prairie River

				Design Parameters			Permit Limits (Monitoring required 2 time per week, grab sample. Flow monitored daily)									
Site	**Outfall Description**	**Acceptable Discharge Period 1**	**Acceptable Discharge Period 2**	**Influent Flow (gpd)**	**Outflow (GPD)**	**Influent CBOD (mg/L)**	**BOD (mg/L) Calendar month average**	**Fecal Coliform (# per 100 ml) Calendar month geometric mean**	**TSS (mg/L) calendar month average**	**Max pH (S.U.)**	**Min pH (S.U.)**	**Chloride, Total (mg/L)**	**Total P**	**Oil & Grease (mg/L) Calendar month average**	**Specific Conductance (umh/cm)**	**Nitrogen, Ammonia, Total (as N)**
ALASD																
Long Prairie-Serving Central Bi-Products SC	SD-001: Industrial Discharge	April 1 - June 30	September 1 - December 15	313,000	100,000	3662	25	200	45	9.0	6.0	---	Monitor Only	10	---	Monitor Only
	SD-005: Draintile under holding pond #3 to catch groundwater, not treated.			---	---	---	---	Monitor Only	---	---	---	Monitor Only	---	---	Monitor Only	---
Long Prairie-Serving Domesting and Industrial	SD-002: Combined domestic and industrial effluent			400,000	400,000	1738	25	200	45	9.0	6.0	---	Monitor Only	---	---	Monitor Only
	SD-003: Domestic facility elfluent (1)			281,660	281,660	235	25	200	45	9.0	6.0	---	Monitor Only	---	---	Monitor Only
Browerville SD-001	Effluent to Surface Water	April 1 - June 30	September 1 - December 15	386,000		829	25	200	45	Monitor Only	Monitor Only	---	---	---	---	---
Carlos and Clarissa	SD-001: Facility discharge to surface water	April 1 - June 30	September 1 - December 15	0			25	200	45	9.0	6.0	---	Monitor Only	---	---	---
Carlos and Clarissa	SD-002: Bypass			0			Monitor only	Monitor only	Monitor only	---	---	---	---	---	---	---
Eagle Bend	SD:010	April 1 - June 30	September 1 - December 15	85,000		380	25	200	45	---	---	---	---	---	---	---

Table 4-2

MPCA Long Prairie River Watershed TMDL Final Project Report

NPDES Permit Limits for Point Source Discharges to the Long Prairie River

Site	Outfall Description	Acceptable Discharge Period 1	Acceptable Discharge Period 2	Design Parameters: Influent Flow (gpd)	Outflow (GPD)	Influent CBOD (mg/L)	Permit Limits (Monitoring required 2 time per week, grab sample. Flow monitored daily): BOD (mg/L) Calendar month average	Fecal Coliform (# per 100 ml) Calendar month geometric mean	TSS (mg/L) calendar month average	Max pH (S.U.)	Min pH (S.U.)	Chloride, Total (mg/L)	Total P	Oil & Grease (mg/L) Calendar month average	Specific Conductance (umh/cm)	Nitrogen, Ammonia, Total (as N)
Miltona	SD:010 Existing facility	April 1 - June 30	September 1 - December 15	40,000		400	40	200	45							
	SD:020 Overflow			0												
(to replace SD:010 when operational)	SD:030 (proposed facility)			40,000		195										

Note: Acceptable range for pH for all discharges: 6<n<9

(1) Lists present conditions, future conditions listed below:

Future Conditions: Site	Outfall Description	Discharge	Design Parameters: Dry-Weather Design Flow (MGD)	Wet-Weather Design Flow (MGD)	Influent $CBOD_5$ (mg/L)	Permit Limits: Parameter:	$CBOD_5$ (mg/L) Calendar Month Average	Fecal Coliform (# per 100 ml) Calendar Month Geometric Mean	TSS (mg/L) Calendar Month Average	DO (mg/L) Calendar Month Minimum	Chlorine, Total Residual (mg/L) Daily Maximum	Total P (mg/L) 12 Month Average	Nitrogen, Ammonia, Total as N (mg/L) Calendar Month Average
Long Prairie	SD-001 (formerly SD-003)	Continuous	0.566	0.923	538	Sample Type:	24-hour composite	Grab	24-hour composite	Grab	Grab	24-hour composite	24-hour composite
						Frequency:	Weekly, Jan. to Dec.	Weekly, April to Oct.	Weekly, Jan. to Dec.	Daily, Jan. to Dec.	Daily, Jan. to Dec.	Weekly, Jan. to Dec.	Weekly June to Sept.
						Limit:	15	200	30	6.0	0.038	1.0	16

Table 5-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Final Report

Monitoring Station Location and Inventory

TMDL Site Name	River Mile	Site Type	CWP SITE NAME	LOCATION/ DESCRIPTION	Other Names Used
LPR 89.9	89.9	Main Stem	Site 9	Long Prairie River before Carlos T129N R37W S14 SE 1/4 SW 1/4	L.P. River Before Carlos
	87.5		NOT USED	Bridge between 9 & 10 (not safe or accessible, rail road bridge only)	
LPR 85.5	85.5	Main Stem	Site 10	Long Prairie River After Carlos T129N R36W S6 NW1/4 SW1/4. County Highway HWY 65, Upstream Side of Culverts. (HWY 65 becomes HWY 13 as you head south)	L.P. River After Carlos
LPR 83.1	83.1	Main Stem	Douglas, Cty Rd 3, Bell River 8/9	Cty Rd 3 Just after Site 10, upstream of Spruce Creek	
T LPR 80.9	**80.9**	**Tributary**	Site 12, Spruce Creek	Spruce Creek at Hwy 5 T130N R36W S33	Spruce Creek
LPR 79.4	79.4	Main Stem	Cty Rd 3 Belle River 11/14	Cty Rd 3 Bridge downstream of Spruce cr (too deep to gauge and not a safe stop)	
LPR 76.7	76.7	Main Stem	Cty Rd 3 Belle River 14/23	Cty Rd 3 Bridge, second crossing downstream of Spruce Creek	
T LPR 73.3	**73.3**	**Tributary**	Site 13, Dismal Creek	Dismal Creek at HWY 5 T130N R35W S33	Dismal Creek
LPR 72.6	72.6	Main Stem	Old Site 1 (used 1997)	County Road 1	
LPR 67.0	67	Main Stem	Site 1, Deibele's	Cty Rd 69 South and West of Clotho Long Prairie River near Clotho T129N R35W S10 NE 1/4SE1/4	Clotho
LPR 56.0	56	Main Stem	Site 6	Long Prairie River and HWY 11 T129N R34W S9 NE1/4 SE1/4	Long Prairie at CR-11, LP11, LPR-55
LRP 49.3	49.3	Main Stem	Byer, TMDL SITE 1	1/2 Mile west of Long Prairie on Cty Rd 38	byer, MPCA 143
LPR 47.8	47.8	Main Stem	Site 7	Long Prairie River at Riverside Drive in Long Prairie T129 N R33W S20 NE1/4NW1/4	USGS site no. 05245100, LPLP, Hwy 71 LP (MPCA)
LPR 47.2	47.2	Main Stem	Superfund, TMDL Site 2	Middle of Long Prairie behind WWTP	zinter, MPCA 145
LPR 42.2	42.2	Main Stem	Zinter, TMDL Site 3	1 mile downstream of WWTP discharge. NE qtr of NE qtr of Section 5 Long Prairie Township	superfund, MPCA 144
LPR 38.5	38.5	Main Stem	Site 11	Jasmine Rd. T130N R33W S20 SE 1/4 SE 1/4	Hoelkers, CR 90 (MPCA)
LPR 34.2	34.2	Main Stem	Site 5	Cty Hwy 14 T130N R33W S9 NW 1/4 SW1/4	Long Prairie at CR-14, LP14
TLPR 33.6	**33.6**	**Tributary**	Site 4, Eagle Creek	T130N R33W S5 SE 1/4 SW 1/4	Eagle
LPR 30.8	30.8	Main Stem	Horseshoe Bridge	Lagos Road, Bridge before Sta 15	CR 79/62 (MPCA)
LPR 26.1	26.1	Main Stem	DNR Boat Access	Intermediate farm road on RD Offutt Property (Time of travel sampling point)	
LPR 21.1	21.1	Main Stem	Site 15	Long Prairie River at Oak Ridge Road T131N R33W S2 (no gauging possible here)	Tyrell's
T LPR 20.8	**20.8**	**Tributary**	Site 3, Turtle Creek	T131N R32W S6 SW 1/4SW1/4	Turtle Creek
LPR 18.2	18.2	Main Stem	Paskewitz	Bridge after 15, 400th Street	
T LPR 15.8	**15.8**	**Tributary**	Site 8, Moran Creek	T132N R33W S16 SE1/4 SE1/4	Moran
LPR 15.3	15.3	Main Stem	Cty Rd 26	1/2 way between site 15 and Cty 7	
LPR 11.8	11.8	Main Stem	Cty Rd 7	Before Philbrook	
T LPR 10.3	**10.3**	**Tributary**	Site 14, Fish Trap Creek	Fish Trap Creek at Quicken Road	Fish Trap Creek
LPR 9.2	9.2	Main Stem	Site 2	Long Prairie River at Philbrook T133N R32W S33 NE 1/4 SE 1/4	Philbrook
LPR 3.2	3.2	Main Stem	LPR-3	L. P. River Bridge on US-10 South of Motley, Morrison County	MPCA Station

Table 6-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Summary of Work Performed During Three Synoptic Surveys

			August 20-24, and September 10-11, 2001						September 20-24, 2001					February 7-8, 2002			
TMDL Site Name	**Site Type**	**CWP SITE NAME**	In Situ	Water Quality	Physical Characteristics	Flow	Dye Test	Continuous	In Situ	Water Quality	Flow	Dye Test	Continuous	In Situ	Water Quality	Ice Cover	Flow
LPR 89.9	Main Stem	Site 9	X	X	X	X			X	X	X			X	X	X	X
		NOT USED															
LPR 85.5	Main Stem	Site 10	X	X	X		I	X	X	X			X	X	X	X	
LPR 83.1	Main Stem	Douglas, Cty Rd 3, Bell River 8/9	X	X	X	X	X		X	X	X	I		X		X	
T LPR 80.9	**Tributary**	Site 12, Spruce Creek	X	X	X	X			X	X	X			no flow		X	
LPR 79.4	Main Stem	Cty Rd 3 Belle River 11/14			X							X				X	
LPR 76.7	Main Stem	Cty Rd 3 Belle River 14/23	X	X	X	X			X	X	X	X		X	X	X	
T LPR 73.3	**Tributary**	Site 13, Dismal Creek	X	X	X	X			X	no flow				no flow		X	
LPR 72.6	Main Stem	Old Site 1 (used 1997)										X				X	
LPR 67.0	Main Stem	Site 1, Deibele's	X	X		X			X	X	X	X		X	X	X	
LPR 56.0	Main Stem	Site 6	X	X		X			X	X	X			X	X	X	
LRP 49.3	Main Stem	Byer, TMDL SITE 1							X								
LPR 47.8	Main Stem	Site 7	X	X	X	X			X	X	X	I		X	X	X	
LPR 47.2	Main Stem	Superfund, TMDL Site 2			X				X								
LPR 42.2	Main Stem	Zinter, TMDL Site 3			X				X			X				X	
LPR 38.5	Main Stem	Site 11	X	X	X	X	I		X	X	X	X		X	X	X	
LPR 34.2	Main Stem	Site 5	X	X	X	X	X		X	X	X	X		X	X	X	
TLPR 33.6	**Tributary**	Site 4, Eagle Creek	X	X	X	X			X	X	X			X	X	X	
LPR 30.8	Main Stem	Horseshoe Bridge	X	X	X	X	I		X	X	X	X		X	X	X	
LPR 26.1	Main Stem	DNR Boat Access			X	X	X									X	

Table 6-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Summary of Work Performed During Three Synoptic Surveys

			August 20-24, and September 10-11, 2001						September 20-24, 2001					February 7-8, 2002			
TMDL Site Name	**Site Type**	**CWP SITE NAME**	**In Situ**	**Water Quality**	**Physical Characteristics**	**Flow**	**Dye Test**	**Continuous**	**In Situ**	**Water Quality**	**Flow**	**Dye Test**	**Continuous**	**In Situ**	**Water Quality**	**Ice Cover**	**Flow**
LPR 21.1	Main Stem	Site 15	X	X	X	X	X	X	X	X						X	
T LPR 20.8	**Tributary**	Site 3, Turtle Creek	X	X	X	X			X	X	X			X	X	X	
LPR 18.2	Main Stem	Paskewitz	X	X	X	X	X		X	X	X		X	X	X	X	
T LPR 15.8	**Tributary**	Site 8, Moran Creek	X	X	X	X			X	X	X			X	X	X	
LPR 15.3	Main Stem	Cty Rd 26	X	X	X	X			X	X	X			X	X	X	
LPR 11.8	Main Stem	Cty Rd 7	X	X	X	X			X	X						X	
T LPR 10.3	**Tributary**	Site 14, Fish Trap Creek	X	X	X	X			X	X	X			X	X	X	
LPR 9.2	Main Stem	Site 2	X	X	X	X			X	X	X			X		X	
LPR 3.2	Main Stem	LPR-3	X	X	X	X			X	X	X			X	X	X	
SD002 and SD003	Point Source	Long Prairie WWTP (SD002: WWTP lagoons discharge, SD003: combined Long Prairie and Central Bi-Products outfall)								x							
SD 47.8	Point Source	Superfund, TMDL Site 2								x							
			22	22	24	22	8	2	25	24	18	10	2	20	16	26	1

Monitoring:

In- Situ- DO, temperature, conductivity, and pH
Water Quality- Sample for lab analysis
Physical- Cross Sections, etc.
Flow- measure
Dye Test- travel time measurements, I= injection, X= sample
Continuous- continuous in-situ records

Table 6-2

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Point Sources Discharging During Synoptic Survey 2
Conducted September 24-25, 2001

(Source: MPCA Discharge Monitoring Reports)

Eagle Bend Discharge Began 9/10/01 Prior to Synoptic Survey 2

Site	Date	Effluent Flow (MGD)	Effluent Flow (cfs)	$CBOD_5$ lb/day	$CBOD_5$ (mg/L)	TSS lb/day	TSS (mg/L)	TP lb/day	TP (mg/L)
Eagle Bend	9/10/01				6.4		41		---
Eagle Bend	9/18/01	0.651	1.01	16	3	11	2		---
Eagle Bend	9/19/01	0.651	1.01	27	5	16	3		---
Eagle Bend	9/20/01	0.651	1.01		---		---		---
Eagle Bend	9/21/01	0.651	1.01		---		---		---
Eagle Bend	9/22/01	0.651	1.01		---		---		---
Eagle Bend	9/23/01	0.651	1.01		---		---		---
Eagle Bend	9/24/01	0.651	1.01		---		---		---

Long Prairie WWTP Discharge 010 Began 9/13/01 Prior to Synoptic Survey 2

Site	Date	Effluent Flow (MGD)	Effluent Flow (cfs)	$CBOD_5$ lb/day	$CBOD_5$ (mg/L)	TSS lb/day	TSS (mg/L)	TP lb/day	TP (mg/L)
LPWW 10	9/4/01				15		36		7
LPWW 10	9/13/01	0.857	1.33	114	16	350	49	57	8
LPWW 10	9/14/01	0.857	1.33	100	14	329	46	114	16
LPWW 10	9/15/01	0.857	1.33		---		---		---
LPWW 10	9/16/01	0.857	1.33		---		---		---
LPWW 10	9/17/01	0.857	1.33	143	20	415	58	98	14
LPWW 10	9/18/01	0.857	1.33	79	11	358	50	109	15
LPWW 10	9/19/01	0.857	1.33		---		---		---

Long Prairie WWTP Discharge 020 Began 9/12/01 Prior to Synoptic Survey 2

Site	Date	Effluent Flow (MGD)	Effluent Flow (cfs)	$CBOD_5$ lb/day	$CBOD_5$ (mg/L)	TSS lb/day	TSS (mg/L)	TP lb/day	TP (mg/L)
LPWW 20	9/21/01	1.75	2.71		---		---		---
LPWW 20	9/22/01	1.75	2.71		---		---		---
LPWW 20	9/23/01	1.75	2.71		---		---		---
LPWW 20	9/24/01	1.75	2.71	58	4	88	6	95	6.50
LPWW 20	9/25/01	1.75	2.71	29	2	161	11	88	6.04
LPWW 20	9/26/01	1.75	2.71		---		---		---
LPWW 20	9/27/01	1.75	2.71		---		---		---
LPWW 20	9/28/01	1.75	2.71		---		---		---
LPWW 20	9/29/01	1.75	2.71		---		---		---
LPWW 20	9/30/01	1.75	2.71		---		---		---

Table 6-2

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Point Sources Discharging During Synoptic Survey 2
Conducted September 24-25, 2001

(Source: MPCA Discharge Monitoring Reports)

Long Prairie WWTP Discharge 030 Began 9/12/01 Prior to Synoptic Survey 2

Site	Date	Effluent Flow (MGD)	Effluent Flow (cfs)	$CBOD_5$ lb/day	$CBOD_5$ (mg/L)	TSS lb/day	TSS (mg/L)	TP lb/day	TP (mg/L)
LPWW 30	9/4/01	---	---		12		27		1.3
LPWW 30	9/12/01	2.24	3.47	112	6	224	12	19	1.0
LPWW 30	9/13/01	2.24	3.47	112	6	224	12	26	1.4
LPWW 30	9/14/01	2.24	3.47		---		---		---
LPWW 30	9/15/01	2.24	3.47		---		---		---
LPWW 30	9/16/01	2.24	3.47		---		---		---
LPWW 30	9/17/01	2.24	3.47	93	5	336	18	67	3.6
LPWW 30	9/18/01	2.24	3.47	150	8	355	19	80	4.3
LPWW 30	9/19/01	2.24	3.47		---		---		---

Long Prairie WWTP Discharge 030 Began 9/12/01 Prior to Synoptic Survey 2 (continued)

Site	Date	Effluent Flow (MGD)	Effluent Flow (cfs)	$CBOD_5$ lb/day	$CBOD_5$ (mg/L)	TSS lb/day	TSS (mg/L)	TP lb/day	TP (mg/L)
LPWW 30	9/20/01	2.24	3.47		---		---		---
LPWW 30	9/21/01	2.24	3.47		---		---		---
LPWW 30	9/22/01	2.24	3.47		---		---		---
LPWW 30	9/23/01	2.24	3.47		---		---		---
LPWW 30	9/24/01	2.24	3.47	75	4	243	13	65	3.5
LPWW 30	9/25/01	2.24	3.47	93	5	243	13	73	3.9

Long Prairie Superfund Site Discharges Continuously

(discharge estimated from system operation plan, concentrations from Synoptic Suryve 2)

Site	Date	Estimated Effluent Flow (cfs)	$CBOD_5$ lb/day	$CBOD_5$ (mg/L)	TSS lb/day	TSS (mg/L)	TP lb/day	TP (mg/L)
Superfund Site	9/24/01	0.7	3.6	1	3.6	1	0.4	<0.2

Table 6-3

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Phase II

River Sediment and Macrophyte Data

TMDL Site Name	Site Type	CWP SITE NAME	SEDIMENT DESCRIPTION	Macrophytes Observed
LPR 89.9	Main Stem	Site 9	Medium to coarse sand, gravel, assorted colors	90% cattail downstream; some oak, elm, boxelder upstream; green filamentous algae in water
		NOT USED	---	---
LPR 85.5	Main Stem	Site 10	Fine to coarse sand, gray	90% cattail; some dogwood, boxelder
LPR 83.1	Main Stem	Douglas, Cty Rd 3, Bell River 8/9	---	80% cattail, some bulrush and wild rice
T LPR 80.9	**Tributary**	Site 12, Spruce Creek	---	mix of cattail and dogwood, and upland grasses
LPR 79.4	Main Stem	Cty Rd 3 Belle River 11/14	---	---
LPR 76.7	Main Stem	Cty Rd 3 Belle River 14/23	10% dark organic silt; 90% fine to coarse sand, white to light tan	predominantly cattail and bulrush, some reed canary grass along bank
T LPR 73.3	**Tributary**	Site 13, Dismal Creek	---	predominantly reed canary grass and goldenrod
LPR 72.6	Main Stem	Old Site 1 (used 1997)	---	---
LPR 67.0	Main Stem	Site 1, Deibele's	---	predominantly bulrush and reed canary grass; cattail downstream; some wild rice and goldenrod
LPR 56.0	Main Stem	Site 6	---	predominantly reed canary grass; willow and dogwood upstream; floating leaf pondweed and wild rice in channel
LRP 49.3	Main Stem	Byer, TMDL SITE 1	---	---
LPR 47.8	Main Stem	Site 7	medium to very coarse sand, brown. Shell fragments	60% reed canary grass; some cattail, bulrush, willow, boxelder; wild rice and filamentous algae in channel
LPR 47.2	Main Stem	Superfund, TMDL Site 2	---	---
LPR 42.2	Main Stem	Zinter, TMDL Site 3	---	---
LPR 38.5	Main Stem	Site 11	---	75% cattail upstream; 70% willow and dogwood downstream; some reed canary grass and wild rice
LPR 34.2	Main Stem	Site 5	---	50% reed canary grass, 30% cattail, 20% sedge upstream; 30% sedge, 30% reed canary grass, 20% willow and dogwood, 20% wild rice downstream

Table 6-3

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Phase II

River Sediment and Macrophyte Data

TMDL Site Name	Site Type	CWP SITE NAME	SEDIMENT DESCRIPTION	Macrophytes Observed
TLPR 33.6	**Tributary**	Site 4, Eagle Creek	fine to coarse sand, dark brown. Gravel. 5% dark silt.	upstream 70% reed canary grass; downstream 60% dogwood, boxelder, ash; some sedge and arrowhead
LPR 30.8	Main Stem	Horseshoe Bridge	---	75% reed canary grass; some oak, boxelder, ash; wild rice and floating leaf pondweed in channel
LPR 26.1	Main Stem	DNR Boat Access	---	---
LPR 21.1	Main Stem	Site 15	---	---
T LPR 20.8	**Tributary**	Site 3, Turtle Creek	very fine to fine sand, brown. 5% black silt	grasses and trees
LPR 18.2	Main Stem	Paskewitz	---	---
T LPR 15.8	**Tributary**	Site 8, Moran Creek	Medium to very coarse sand, dark brown.	---
LPR 15.3	Main Stem	Cty Rd 26	Dark organic silt 75%, fine to medium brown sand	---
LPR 11.8	Main Stem	Cty Rd 7	Black organic silt 95%, 5% fine sand.	channel clogged with pondweed
T LPR 10.3	**Tributary**	Site 14, Fish Trap Creek	fine to coarse sand, brown.	---
LPR 9.2	Main Stem	Site 2	fine grained sand, white, brown; 25% dark silt	grasses and trees
LPR 3.2	Main Stem	LPR-3	medium sand, dark brown; some gravel.	grasses and trees

Note:
---: Sample not required.

Table 7-1a

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

In-River Loads During Synoptic Survey 1 Conducted August 20-24, 2001

TMDL STUDY NAME	Long Prairie River Mile	FLOW cfs	Chloride mg/L	Chloride Load lbs/day	TSS mg/L	TSS lbs/day	Ammonia mg/L	Ammonia lbs/day	Kjeldahl mg/L	Kjeldahl lbs/day	NO2+3 mg/L	NO2+3 lbs/day	OP mg/L	OP lbs/day	TP mg/L	TP lbs/day	CBOD 5-Day mg/L	CBOD 5-day lbs/day	CBOD 20-Day mg/L	CBOD 20-Day lbs/day
Tributaries																				
T LPR 80.9	80.9	0	7.8	0	7	0	**0.01**	0	0.8	0	**0.1**	0	0.025	0	0.048	0	**<2**	---	4	0
T LPR 73.3	73.3	0	6.5	0.0	12	0	**0.01**	0	0.5	0	0.55	0	0.007	0	0.02	0	**<2**	---	2	0
T LPR 33.6	33.6	0	25.4	23	10	9	**0.01**	0	0.7	1	0.77	1	0.024	0	0.033	0	**<6**	---	**1**	1
T LPR 20.8	20.8	10	5.1	278	9	490	**0.01**	1	1.3	71	**0.1**	5	0.01	1	0.084	5	**<2**	---	5	272
T LPR 15.8	15.8	5	6.4	161	**0.5**	13	**0.01**	0	0.7	18	**0.1**	3	0.005	0	0.009	0	**<6**	---	8	201
T LPR 10.3	10.3	8	5	216	5	216	**0.01**	0	0.7	30	**0.1**	4	0.02	1	0.041	2	**<2**	---	**1**	43
Main Stem Stations																				
LPR 89.9	89.9	125	28	18,849	9.5	6,395	**0.01**	7	0.8	539	**0.1**	67	**0.0025**	2	**0.0025**	2	**<2**	---	5.5	3,703
LPR 85.5	85.5	126	27.8	18,865	7	4,750	**0.01**	7	0.6	407	**0.1**	68	0.011	7	0.016	11	**<2**	---	4	2,714
LPR 83.1	83.1	127	26.7	18,264	10	6,840	**0.01**	7			**0.1**	68	0.025	17	0.026	18	**<2**	---	**1**	684
LPR 76.7	76.7	184	26.1	25,847	7	6,932	**0.01**	10	0.6	594	**0.1**	99	0.031	31	0.037	37	**<2**	---	5	4,952
LPR 67.0	67.0	173	26.1	24,338	9	8,392	**0.01**	9	0.4	373	**0.1**	93	0.037	35	0.06	56	2	1,865	2	1,865
LPR 56.0	56.0	173	24.8	23,125	8	7,460	**0.01**	9	0.5	466	**0.1**	93	0.023	21	0.047	44	**<2**	---	2	1,865
LPR 47.8	47.8	161	25.1	21,865	6.5	5,662	**0.01**	9	0.4	348	**0.1**	87	0.03	26	0.054	47	**<2**	---	**3**	2,613
LPR 38.5	38.5	195	26.1	27,504	9	9,484	**0.01**	11	0.3	316	**0.1**	105	0.042	44	0.064	67	**<2**	---	**1**	1,054
LPR 34.2	34.2	166	25.9	23,234	6	5,382	0.03	27	0.6	538	**0.1**	90	0.044	39	0.067	60	**<2**	---	5	4,485
LPR 30.8	30.8	193	26.8	27,940	10	10,425	0.02	21	0.3	313	0.27	281	0.048	50	0.072	75	**<2**	---	2	2,085
LPR 21.1	21.1	195	26.7	28,077	6	6,309	**0.01**	11	0.7	736	0.33	347	0.042	44	0.055	58	**<2**	---	3	3,155
LPR 18.2	18.2	197																		
LPR 15.3	15.3	167	20.8	18,684	**0.5**	449	**0.01**	9	0.9	808	0.3	269	0.041	37	0.052	47	**<2**	---	6	5,390
LPR 11.8	11.8	189	21.6	21,991	5	5,091	**0.01**	10	0.6	611	0.22	224	0.035	36	0.063	64	**<2**	---	2	2,036
LPR 09.2	9.2	211	19.8	22,532	6	6,828	**0.01**	11	0.3	341	**0.1**	114	0.031	35	0.049	56	**<2**	---	**1**	1,138
LPR 03.2	3.2	223	21.3	25,668	5	6,025	**0.01**	12	0.7	844	**0.1**	121	0.026	31	0.043	52	**<6**	---	4	4,820

Note: For values below detection limit, half the detection limit was used to calculate load. These values are indicated in Bold.

Table 7-1b

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

In-River Loads During Synoptic Survey 2 Conducted September 24-25, 2001

TMDL STUDY NAME	FLOW cfs	Chloride mg/L	Chloride Load lbs/day	TSS mg/L	TSS lbs/day	Ammonia mg/L	Ammonia lbs/day	Kjeldahl mg/L	Kjeldahl lbs/day	NO2+3 mg/L	NO2+3 lbs/day	OP mg/L	OP lbs/day	TP mg/L	TP lbs/day	CBOD 5-Day mg/L	CBOD 5-day lbs/day	CBOD 20-Day mg/L	CBOD 20-Day lbs/day
Tributaries																			
T LPR 80.9	15.73	6.7	569	3	255	**0.01**	1	0.6	51	0.55	47	0.031	3	0.032	3	**<2**	---	9	764
T LPR 73.3	0		0		0		0		0		0		0		0				0
T LPR 33.6	12.75	28.2	1940	5	344	**0.01**	1	0.5	34	0.85	58	0.026	2	0.032	2	**<2**	---	12	825
T LPR 20.8	6.18	7.2	240	**0.5**	17	**0.01**	0	0.9	30	**0.1**	3	0.008	0	0.014	0	**<2**	---	12	400
T LPR 15.8	10.09	6.2	338	**0.5**	27	**0.01**	1	0.9	49	**0.1**	5	0.012	1	0.014	1	**<2**	---	12	653
T LPR 10.3	8.97	4.1	198	3	145	**0.01**	0	0.9	44	**0.1**	5	0.01	0	0.022	1	**<2**	---	12	581
Main Stem Stations																			
LPR 89.9	94	26.2	13,222		---	**0.01**	5	0.9	454	**0.1**	50	**0.0025**	1	**0.0025**	1	**<2**	---	6	3,028
LPR 85.5	94	25.5	12,955	22	11,176	**0.01**	5	0.9	457	**0.1**	51	0.009	5	0.01	5	**<2**	---	9	4,572
LPR 83.1	95	24.9	12,734	4	2,046	**0.01**	5	0.9	460	**0.1**	51	0.008	4	0.009	5	**<2**	---	2	1,023
LPR 76.7	115	22.6	14,065	3	1,867	**0.01**	6	0.8	498	**0.1**	62	0.016	10	0.061	38	**<2**	---	15	9,336
LPR 67.0	140	21.1	15,891	2.5	1,883	**0.01**	8	0.5	377	**0.1**	75	0.02	15	0.024	18	**<2**	---	10	7,531
LPR 56.0	148	20.8	16,638	3	2,400	**0.01**	8	0.6	480	**0.1**	80	0.022	18	0.023	18	**<2**	---	11	8,799
LPR 47.8	148	20.8	16,592	4.5	3,590	**0.01**	8	0.6	479	**0.1**	80	0.024	19	0.024	19	**<2**	---	**3**	2,393
LPR 38.5	204	35.9	39,435	7	7,689	0.23	253	1.3	1,428	0.35	384	0.158	174	0.192	211	**<2**	---	5	5,492
LPR 34.2	159	35.8	30,694	8	6,859	0.19	163	0.9	772	0.41	352	0.148	127	0.176	151	**<2**	---	10	8,574
LPR 30.8	197	35.0	37,189	8	8,500	0.14	149	0.9	956	0.56	595	0.129	137	0.156	166	**<2**	---	10	10,625
LPR 21.1	223	34.1	40,935	7	8,403	0.08	96	1	1,200	0.68	816	0.108	130	0.14	168	**<2**	---	13	15,606
LPR 18.2	248																		
LPR 15.3	266	32.2	46,124	2	2,865	**0.01**	14	0.7	1,003	0.76	1,089	0.101	145	0.108	155	**<2**	---	10	14,324
LPR 09.2	257	29.4	40,835	4	5,556	**0.01**	14	1	1,389	0.62	861	0.068	94	0.078	108	**<2**	---	13	18,056
LPR 03.2	259	28.6	39,927	**0.5**	698	**0.01**	14	0.7	977	0.57	796	0.073	102	0.079	110	**<2**	---	12	16,753

Note: For values below detection limit, half the detection limit was used to calculate load. These values are indicated in Bold.

Table 11-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Load Reductions Needed to Meet DO Standard

Reach 07010108-506: Long Prairie River Headwaters (Lake Carlos) to Spruce Creek

	Existing Load (lbs/day)		Allocated Load (lbs/day)		Load Reduction (%)	
	CBOD	NBOD	CBOD	NBOD	CBOD	NBOD
Carlos WWTF	233	254	233	254	0%	0%
LPR Headwaters @ RM89.9	161	55	161	55	0%	0%
Other Nonpoint Sources	1,115	81	***999***	***68***	***10%***	***16%***

Reach 07010108-505: Spruce Creek to Eagle Creek

	Existing Load (lbs/day)		Allocated Load (lbs/day)		Load Reduction (%)	
	CBOD	NBOD	CBOD	NBOD	CBOD	NBOD
Long Prairie - Superfund	48	17	48	17	0%	0%
Long Prairie WWTF	1,431	12,545	***275***	***838***	***81%***	***93%***
Browerville WWTF	542	1,295	542	***504***	0%	***61%***
Spruce Creek	96	32	***87***	***29***	***9%***	***10%***
Dismal Creek	19	33	***17***	***30***	***11%***	***8%***
Other Nonpoint Sources	5,862	533	***5,329***	***484***	***9%***	***9%***

Reach 07010108-504: Eagle Creek to Turtle Creek

	Existing Load (lbs/day)		Allocated Load (lbs/day)		Load Reduction (%)	
	CBOD	NBOD	CBOD	NBOD	CBOD	NBOD
Eagle Creek Residual Point Source Loads	204	209	204	209	0%	0%
Eagle Creek Nonpoint Sources	645	43	***587***	***40***	***9%***	***8%***
Other Nonpoint Sources	1,586	398	***1,442***	***362***	***9%***	***9%***

Reach 07010108-503: Turtle Creek To Moran Creek

	Existing Load (lbs/day)		Allocated Load (lbs/day)		Load Reduction (%)	
	CBOD	NBOD	CBOD	NBOD	CBOD	NBOD
Turtle Creek	238	129	238	129	0%	0%
Other Nonpoint Sources	620	156	620	156	0%	0%

Reach 07010108-502: Moran Creek To Fish Trap Creek

	Existing Load (lbs/day)		Allocated Load (lbs/day)		Load Reduction (%)	
	CBOD	NBOD	CBOD	NBOD	CBOD	NBOD
Moran Creek	93	62	93	62	0%	0%
Other Nonpoint Sources	682	171	682	171	0%	0%

Reach 07010108-501: Fish Trap Creek to Crow Wing River

	Existing Load (lbs/day)		Allocated Load (lbs/day)		Load Reduction (%)	
	CBOD	NBOD	CBOD	NBOD	CBOD	NBOD
Fish Trap Creek	243	48	243	48	0%	0%
Other Nonpoint Sources	1276	320	1276	320	0%	0%

Notes:

Bold italic denotes a load that was reduced to meet DO standard

Table 11-2

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River DO TMDLs

Reach 07010108-506: Long Prairie River Headwaters (Lake Carlos) to Spruce Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	147	42	n/a	189
WLA + MOS for Carlos WWTF	233	254	n/a	487
LA for LPR Headwaters @ RM89.9	161	55	n/a	216
LA for other Nonpoint Sources	***999***	***68***	291	1,359
MOS for all Nonpoint Sources	116	12	n/a	128
Total Maximum Daily Load	1,657	432	291	**2,380**

Reach 07010108-505: Spruce Creek to Eagle Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	397	114	n/a	511
WLA + MOS for LP-Superfund	48	17	n/a	65
WLA + MOS for Long Prairie WWTF	***275***	***838***	n/a	1,114
WLA + MOS for Browerville WWTF	542	***504***	n/a	1,045
LA for Spruce Creek	***87***	***29***	n/a	116
LA for Dismal Creek	***17***	***30***	n/a	47
LA for other Nonpoint Sources	***5,329***	***484***	1,750	7,563
MOS for all Nonpoint Sources	543	54	n/a	598
Total Maximum Daily Load	7,239	2,070	1,750	**11,059**

Reach 07010108-504: Eagle Creek to Turtle Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	971	278	n/a	1,249
Eagle Creek Residual Point Source Loads	204	209	n/a	412
LA for Eagle Creek	***587***	***40***	n/a	626
LA for other Nonpoint Sources	***1,442***	***362***	315	2,119
MOS for all Nonpoint Sources	203	40	n/a	243
Total Maximum Daily Load	3,406	928	315	**4,649**

Reach 07010108-503: Turtle Creek To Moran Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	941	269	n/a	1,210
LA for Turtle Creek	238	129	n/a	367
LA for other Nonpoint Sources	620	156	120	895
MOS for all Nonpoint Sources	86	28	n/a	114
Total Maximum Daily Load	1,884	582	120	**2,587**

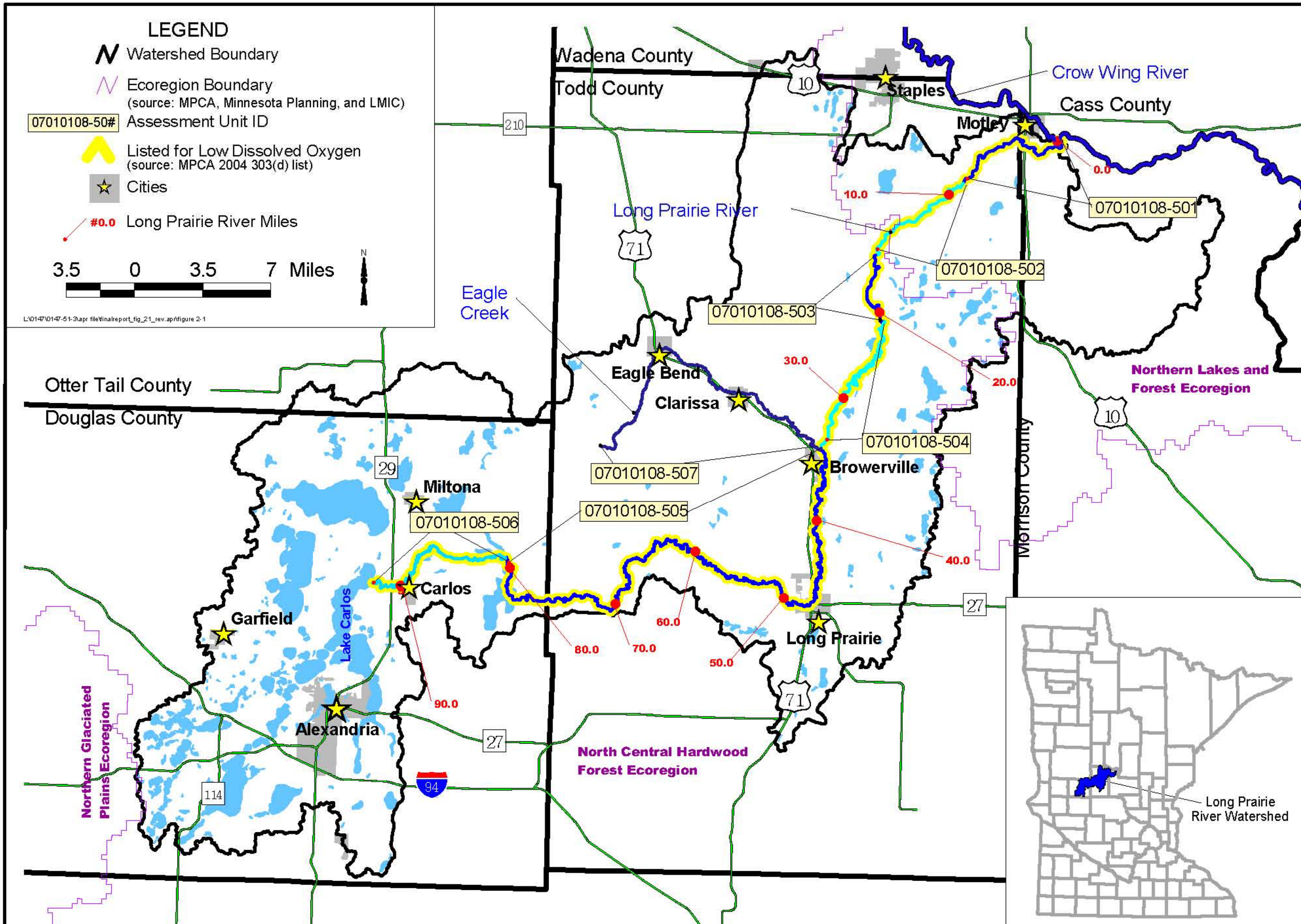
Reach 07010108-502: Moran Creek To Fish Trap Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	504	144	n/a	648
LA for Moran Creek	93	62	n/a	155
LA for other Nonpoint Sources	682	171	252	1104
MOS for all Nonpoint Sources	77	23	n/a	101
Total Maximum Daily Load	1,356	401	252	**2,008**

Reach 07010108-501: Fish Trap Creek to Crow Wing River

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Capacity	435	124	n/a	559
LA for Fish Trap Creek	243	48	n/a	291
LA for other Nonpoint Sources	1,276	320	545	2,142
MOS for all Nonpoint Sources	152	37	n/a	189
Total Maximum Daily Load	2,106	529	545	**3,180**

Notes:
Bold italic denotes a load that was reduced to meet DO standard



MPCA - LONG PRAIRIE RIVER WATERSHED TMDL: FINAL PROJECT REPORT

Watershed Map Showing 303(d) Listed Segments

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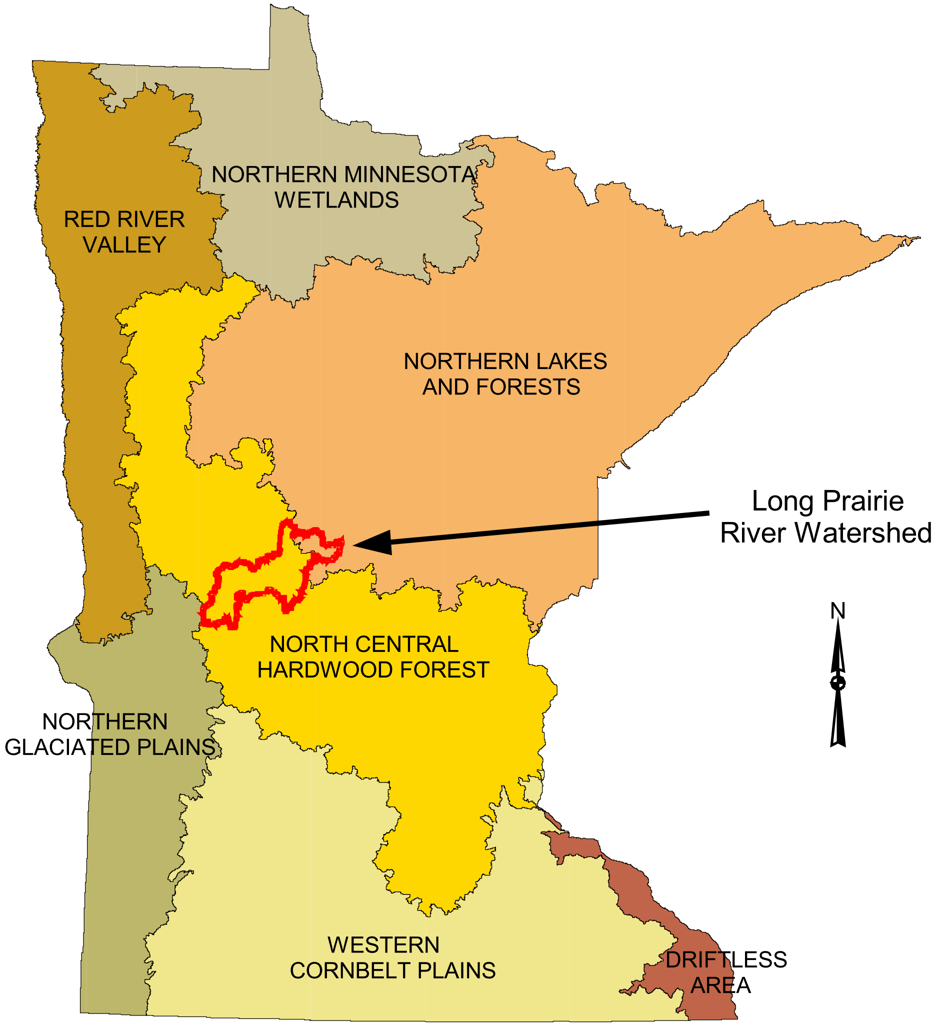
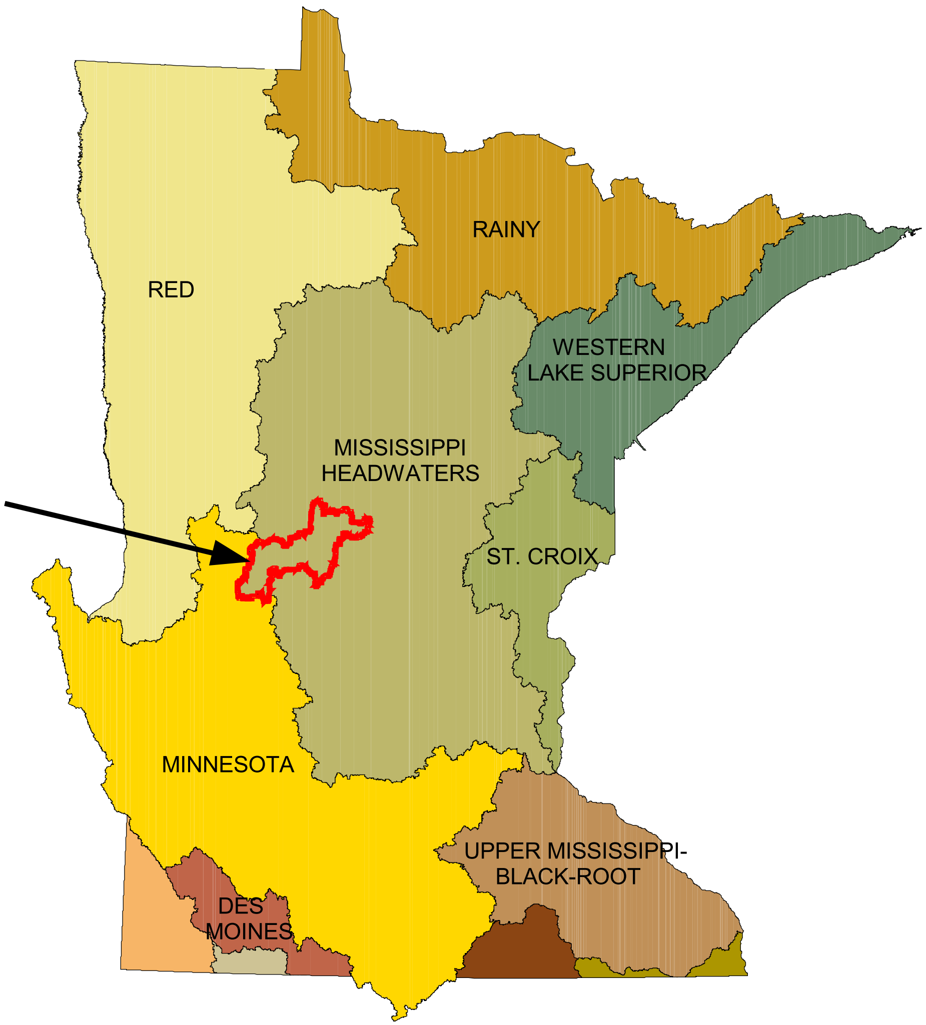
Figure 2-1



Level III Ecoregions of the Conterminous United States
(source: Minnesota Planning, Minnesota Pollution Control Agency, and Land Managment Information Center)



USGS 4-digit Hydrologic Unit Boundaries (HUC4) derived from 1995 DNR Major/Minor Watershed File
(source: Minnesota Planning, and Land Managment Information Center)

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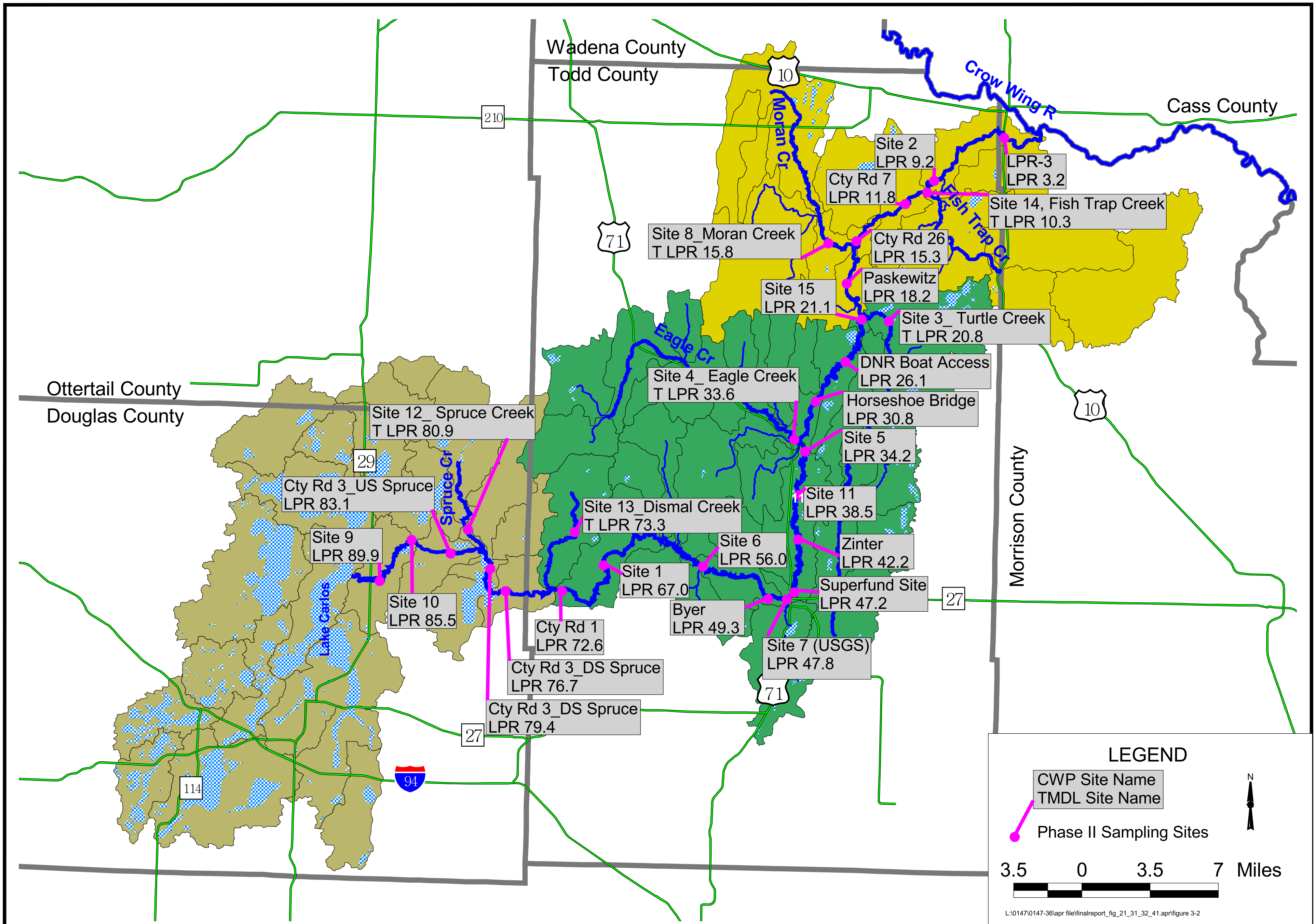
MPCA - LONG PRAIRIE RIVER WATERSHED TMDL: FINAL PROJECT REPORT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	JULY 2003
Minnesota Ecoregions and Major River Basins		Figure 3-1



MPCA - LONG PRAIRIE RIVER WATERSHED TMDL: FINAL PROJECT REPORT

Sampling Sites & CWP Reach Divisions

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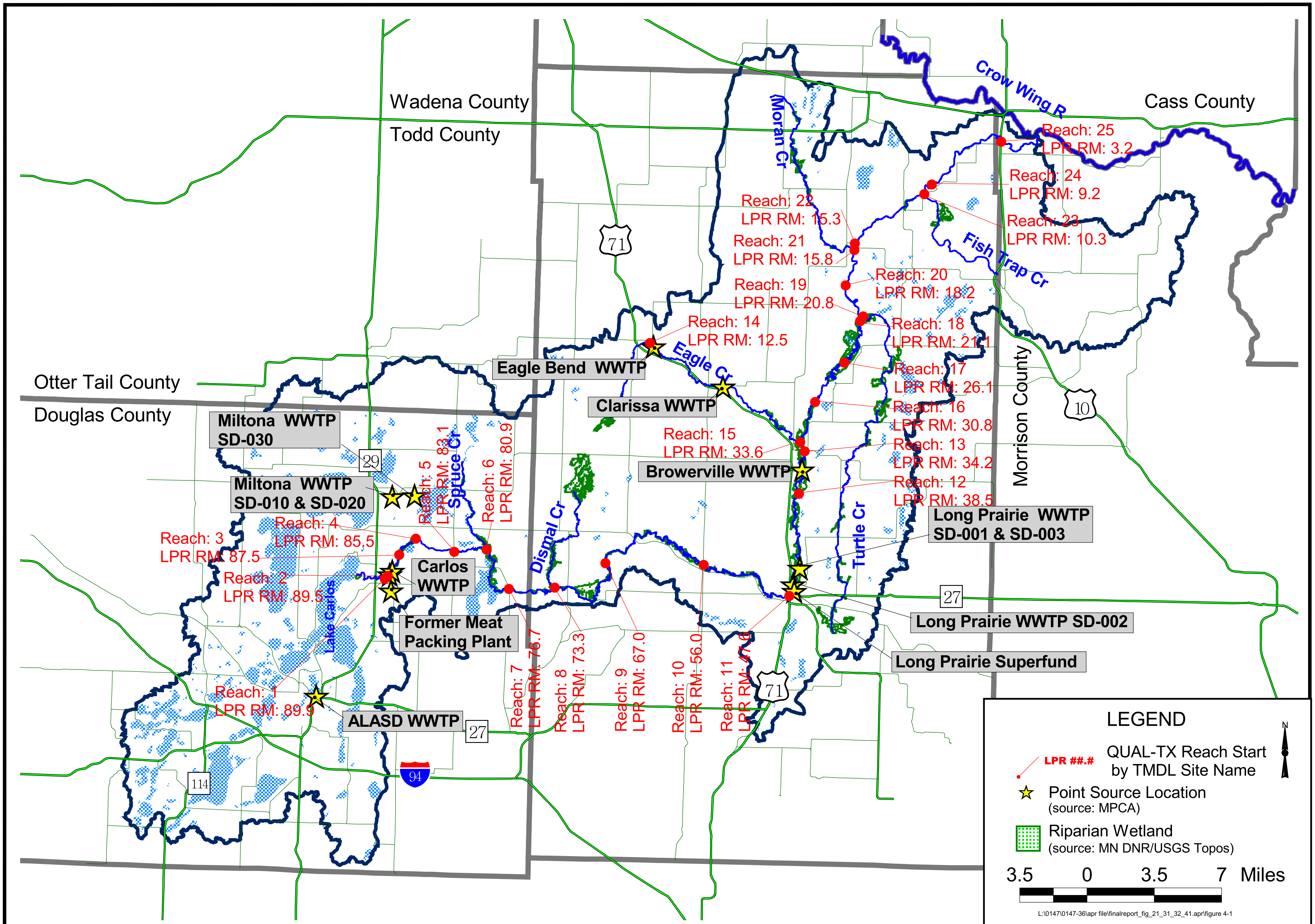
Maple Plain, MN 55359-0429

JULY 2004

Figure 3-2



MPCA - LONG PRAIRIE RIVER WATERSHED TMDL: FINAL PROJECT REPORT

Locations of Known Point Sources in the Long Prairie River Watershed

Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

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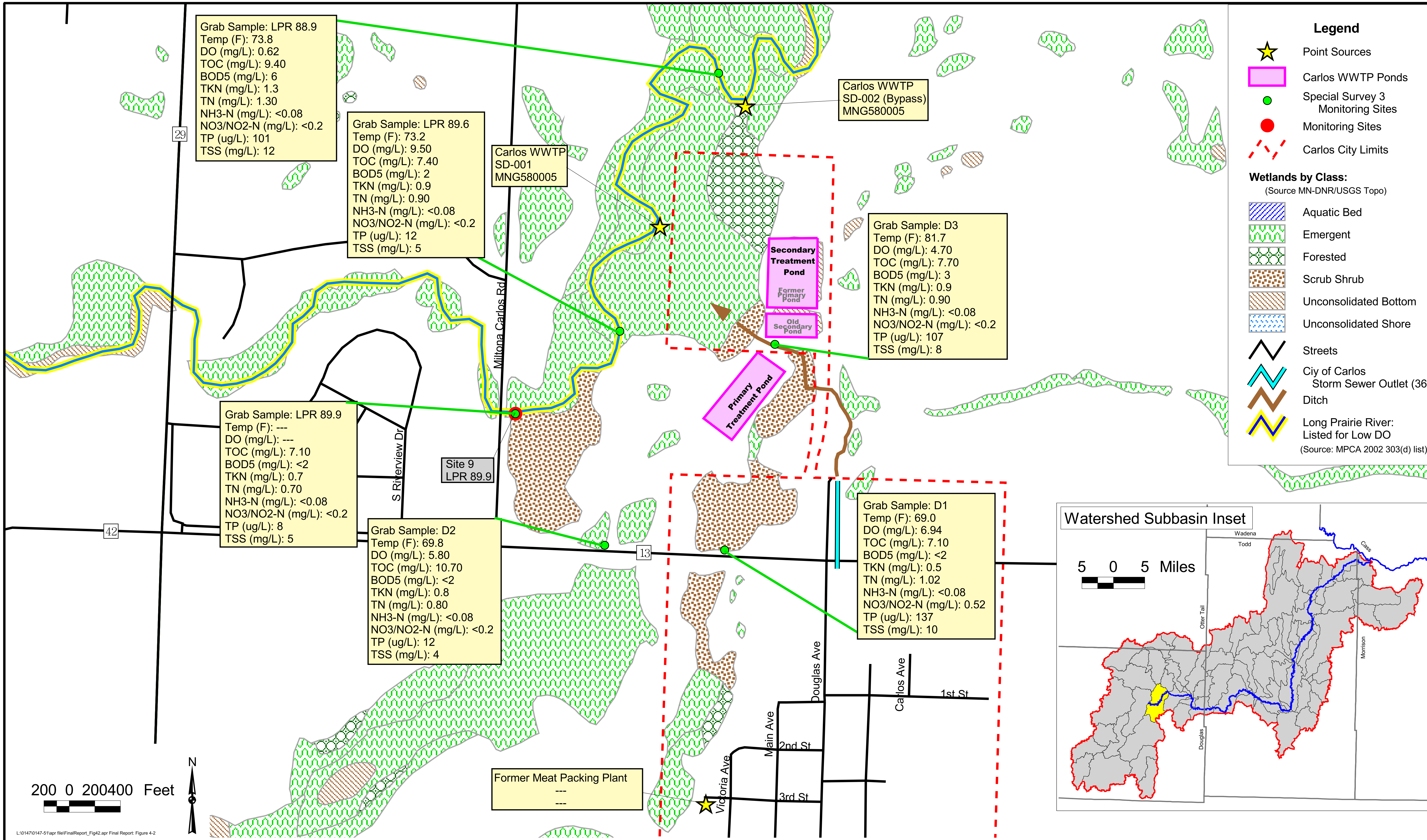
Figure 4-1



MPCA - LONG PRAIRIE RIVER WATERSHED TMDL FINAL PROJECT REPORT

Location of Known Point Sources Near the Carlos Reach of the Long Prairie River

Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Center P.O. Box 249 Maple Plain, MN 55359-0249

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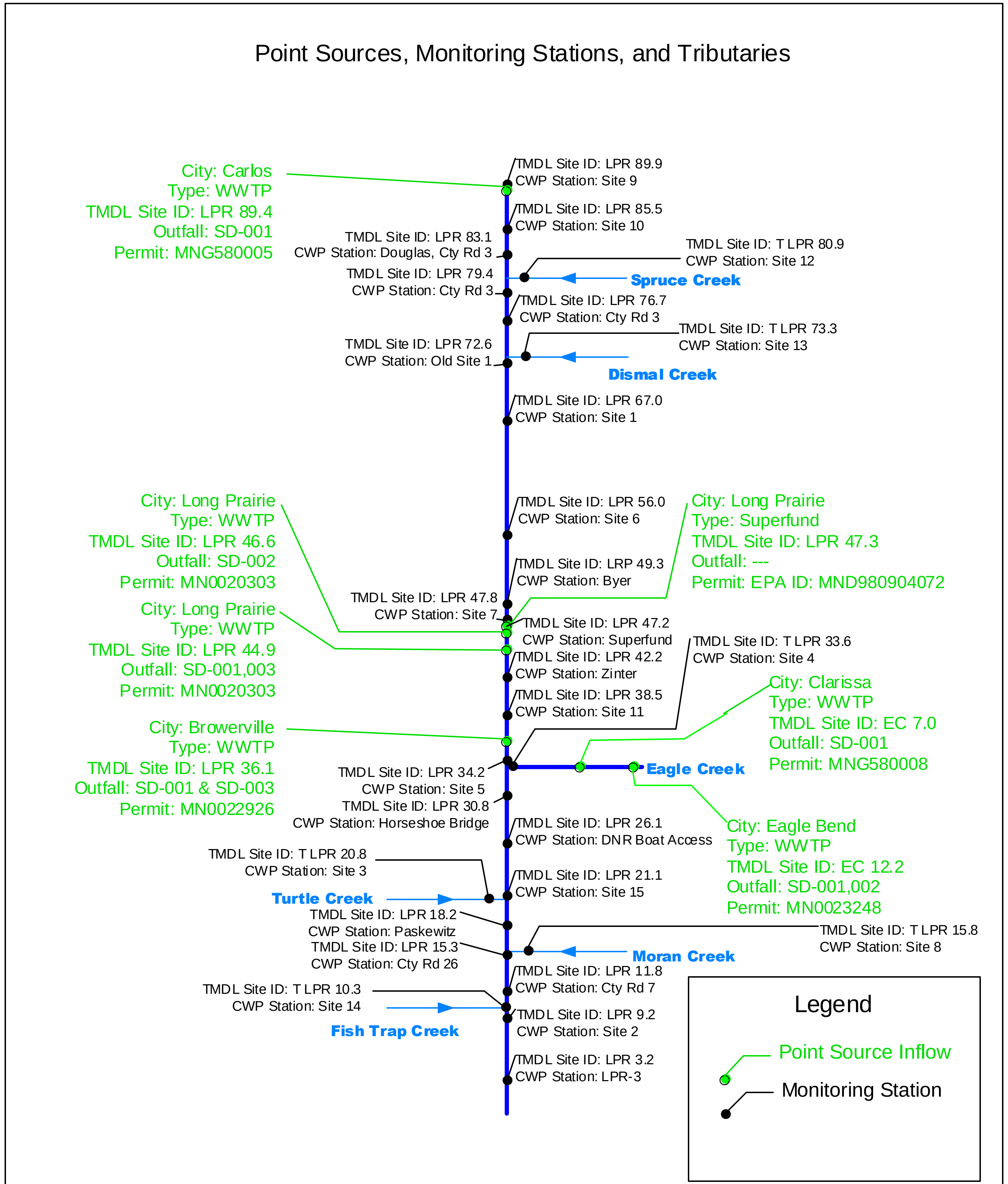
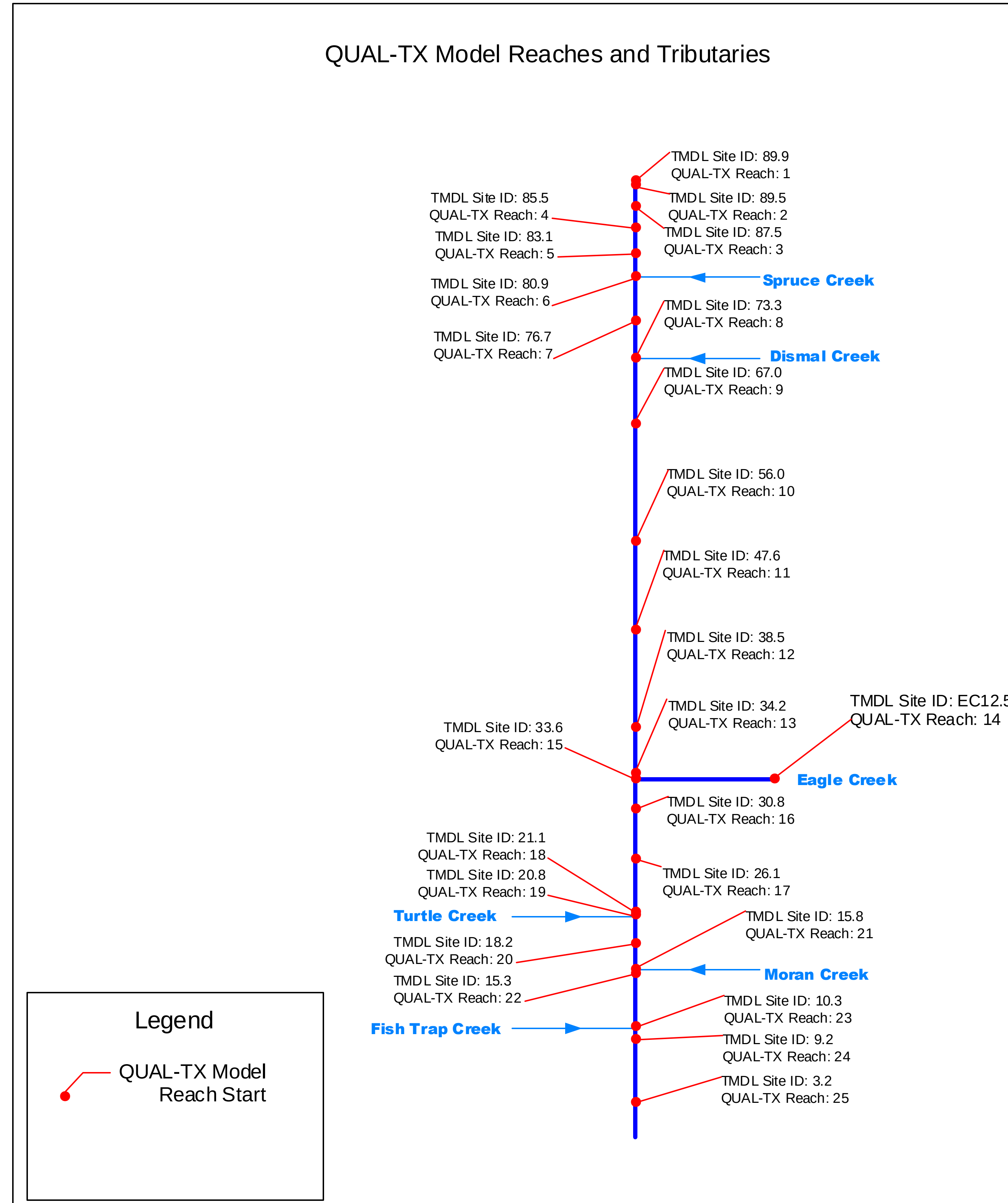
Figure 4-2

Note: Figure 5-1

Long Prairie River Monitoring Locations

Hardcopy in Final Report





L:\0147\0147-51\apr files\schematic.apr\Figure 8-1

MPCA - LONG PRAIRIE RIVER WATERSHED TMDL FINAL PROJECT REPORT

Schematics

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JULY 2003

Figure 8-1

Figure 9-1

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profiles: Modified Spring 7Q10 for TMDL Projection Simulation

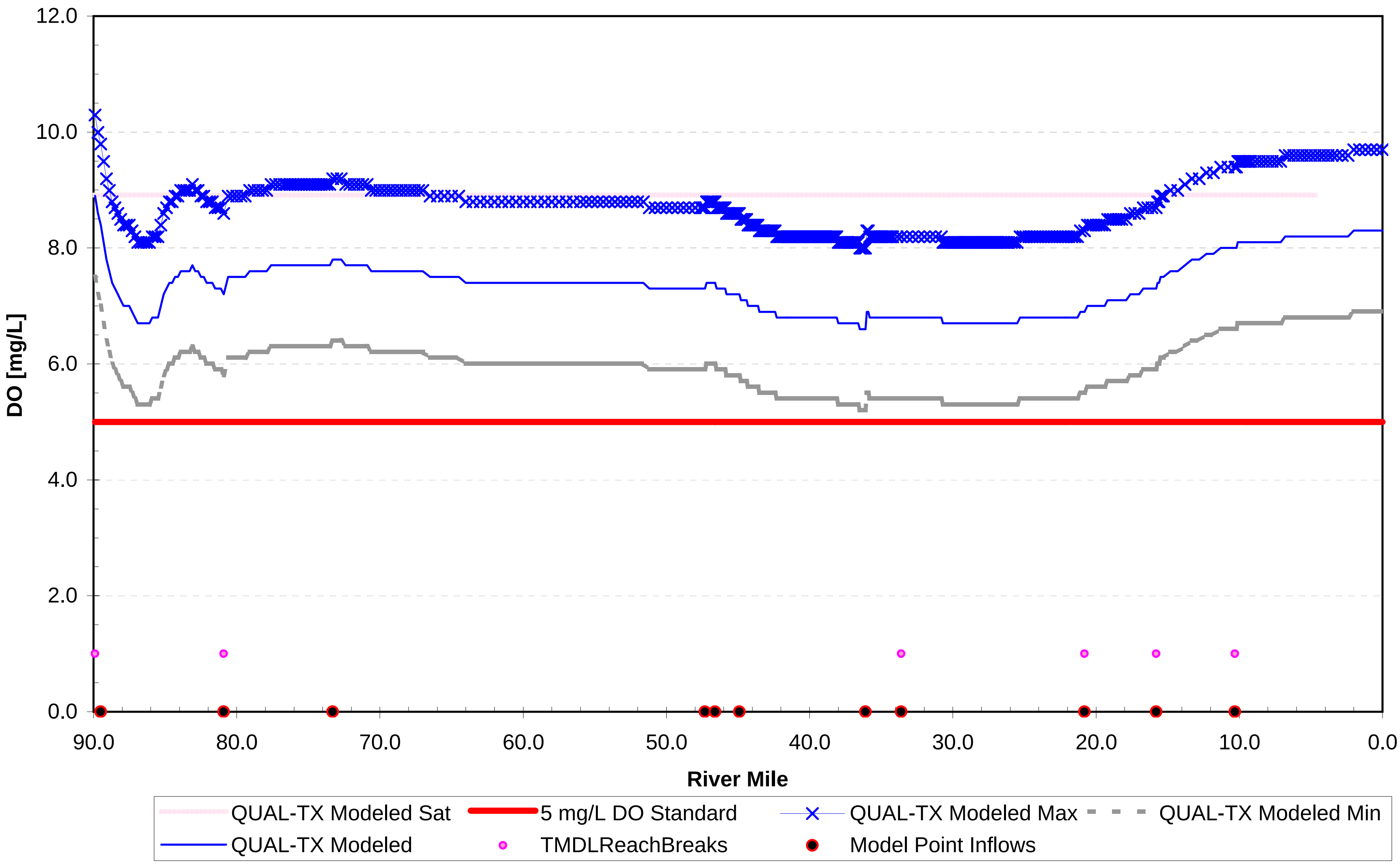


Figure 9-2

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs: QUAL-TX Summer DO
7Q10 Point Source Load Reduction

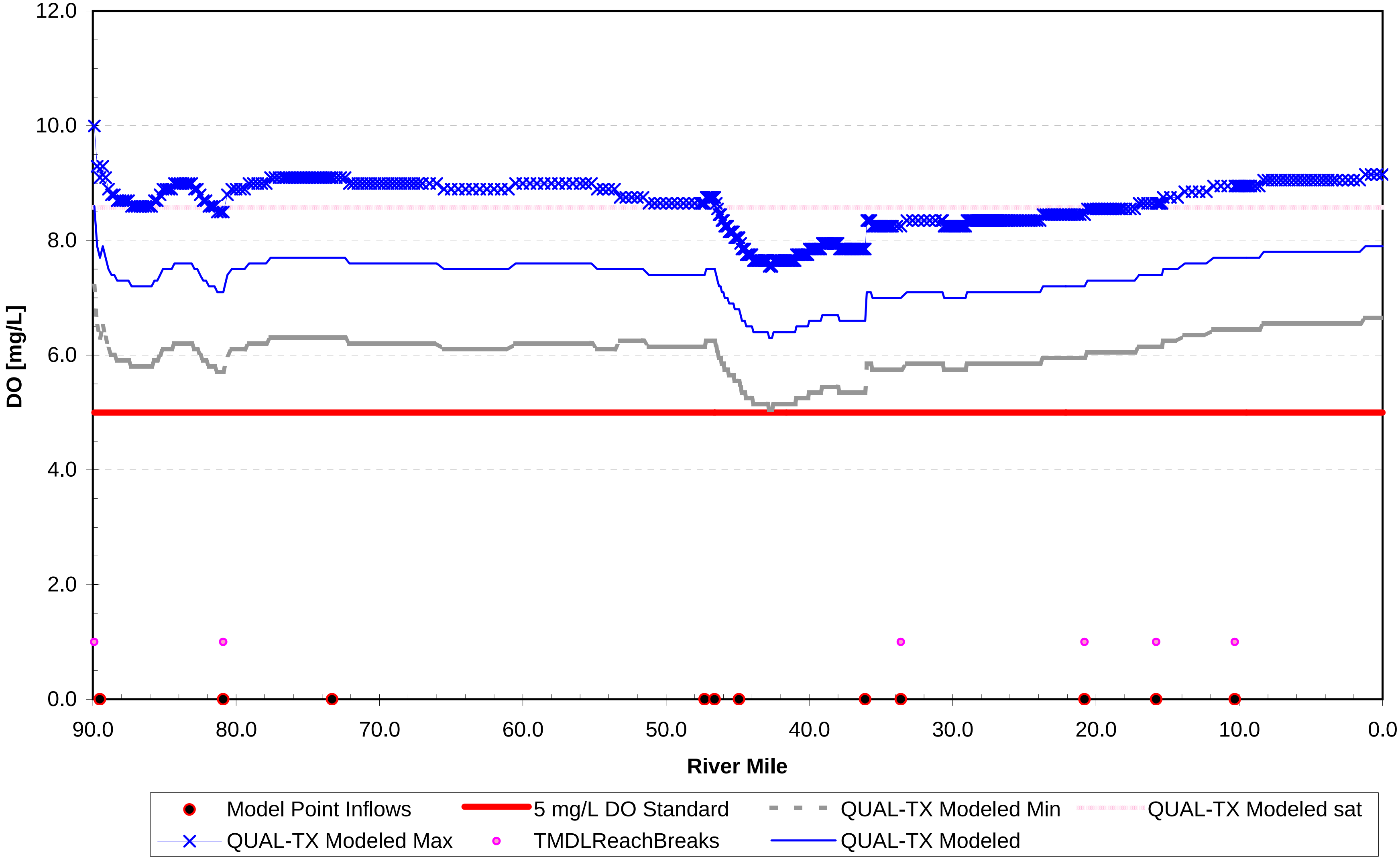


Figure 9-3

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs: QUAL-TX Winter DO
7Q10 Point Source Load Reduction

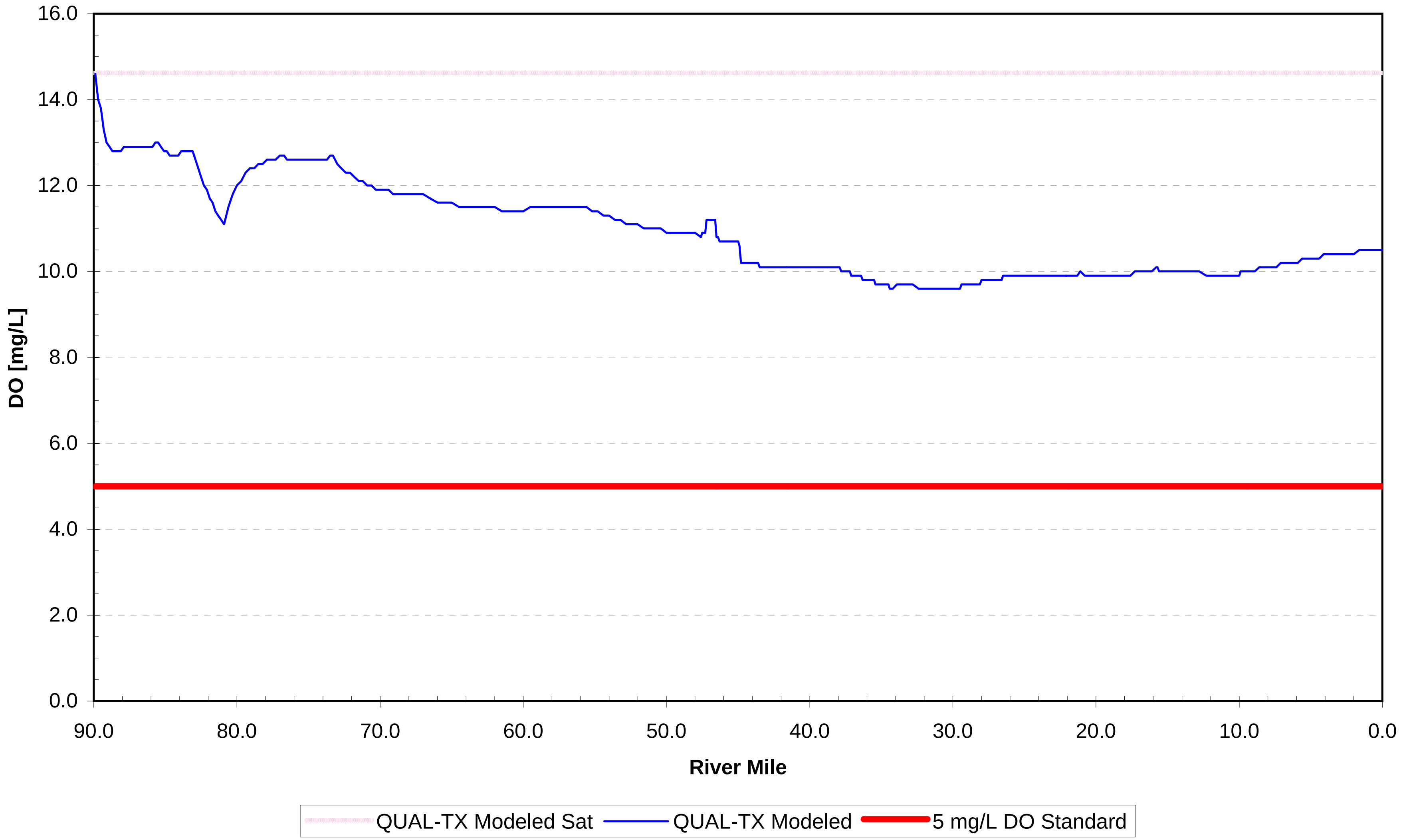
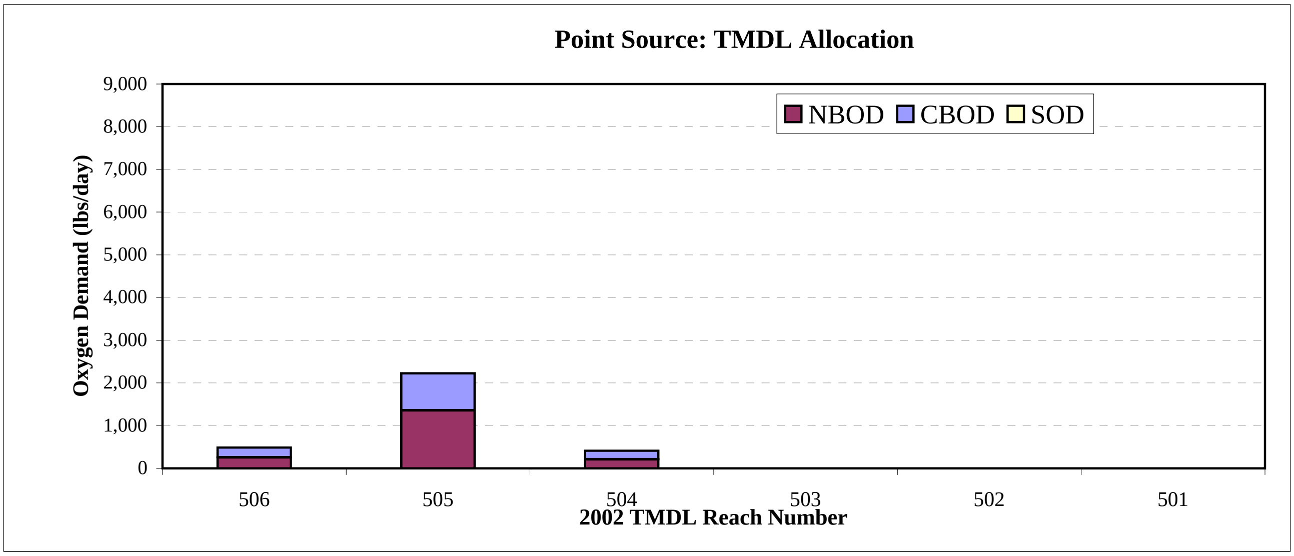
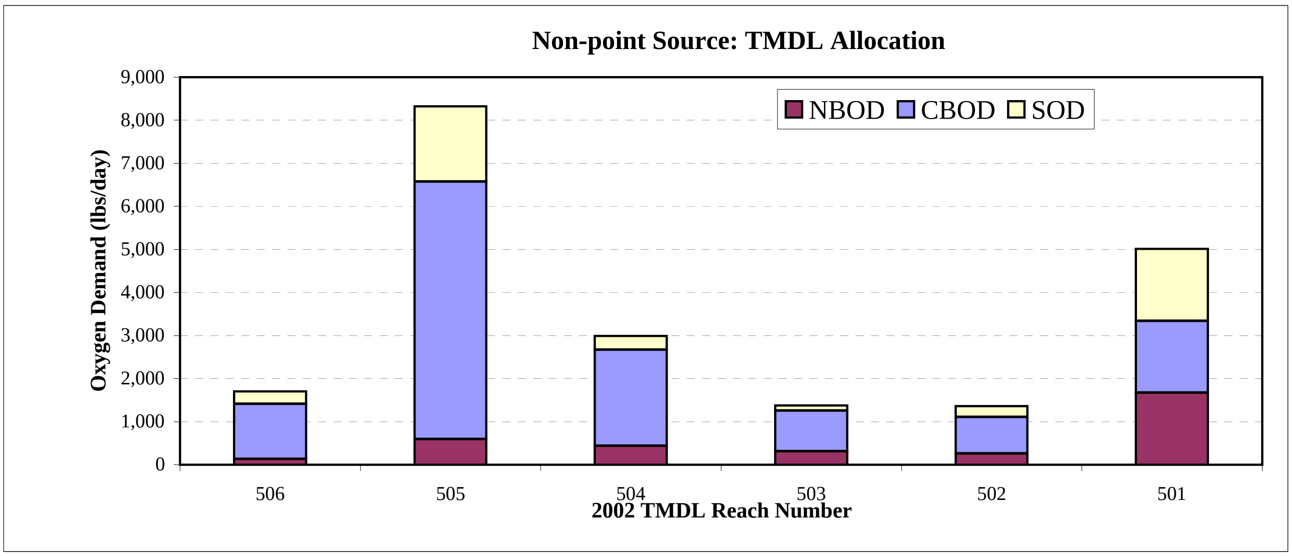


Figure 11-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

DO TMDLs for Long Prairie River by Reach and Category





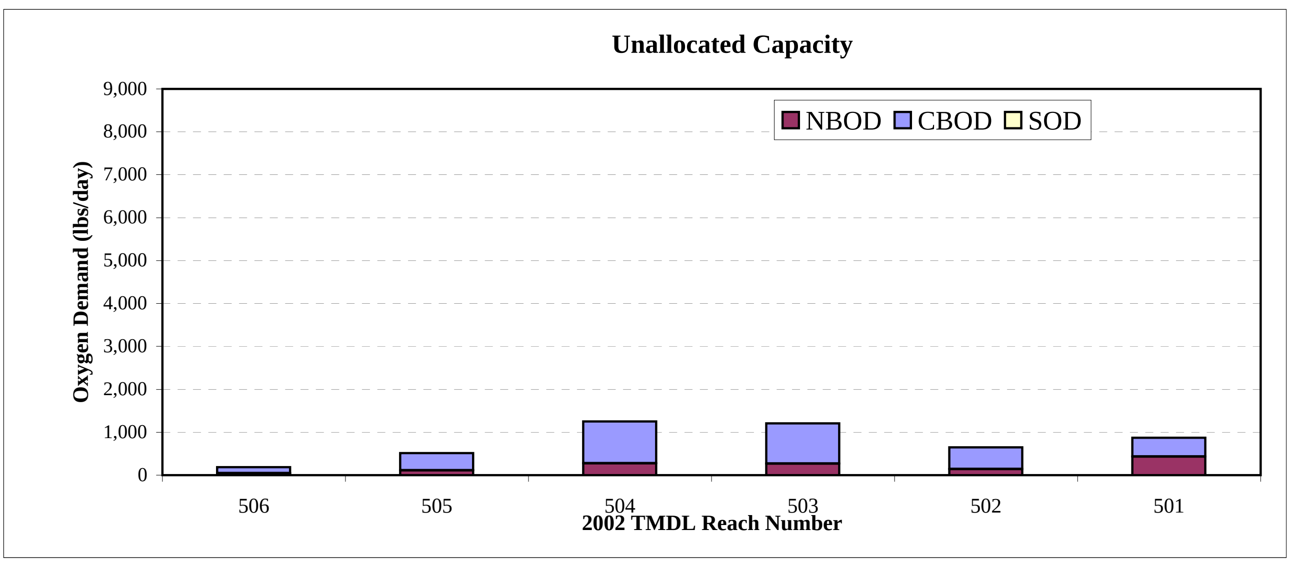


Figure 11-2

MPCA Long Prairie River Watershed TMDL Final Report Project

**Long Prairie River Profiles:
TMDL Demonstration (Modified Spring)**

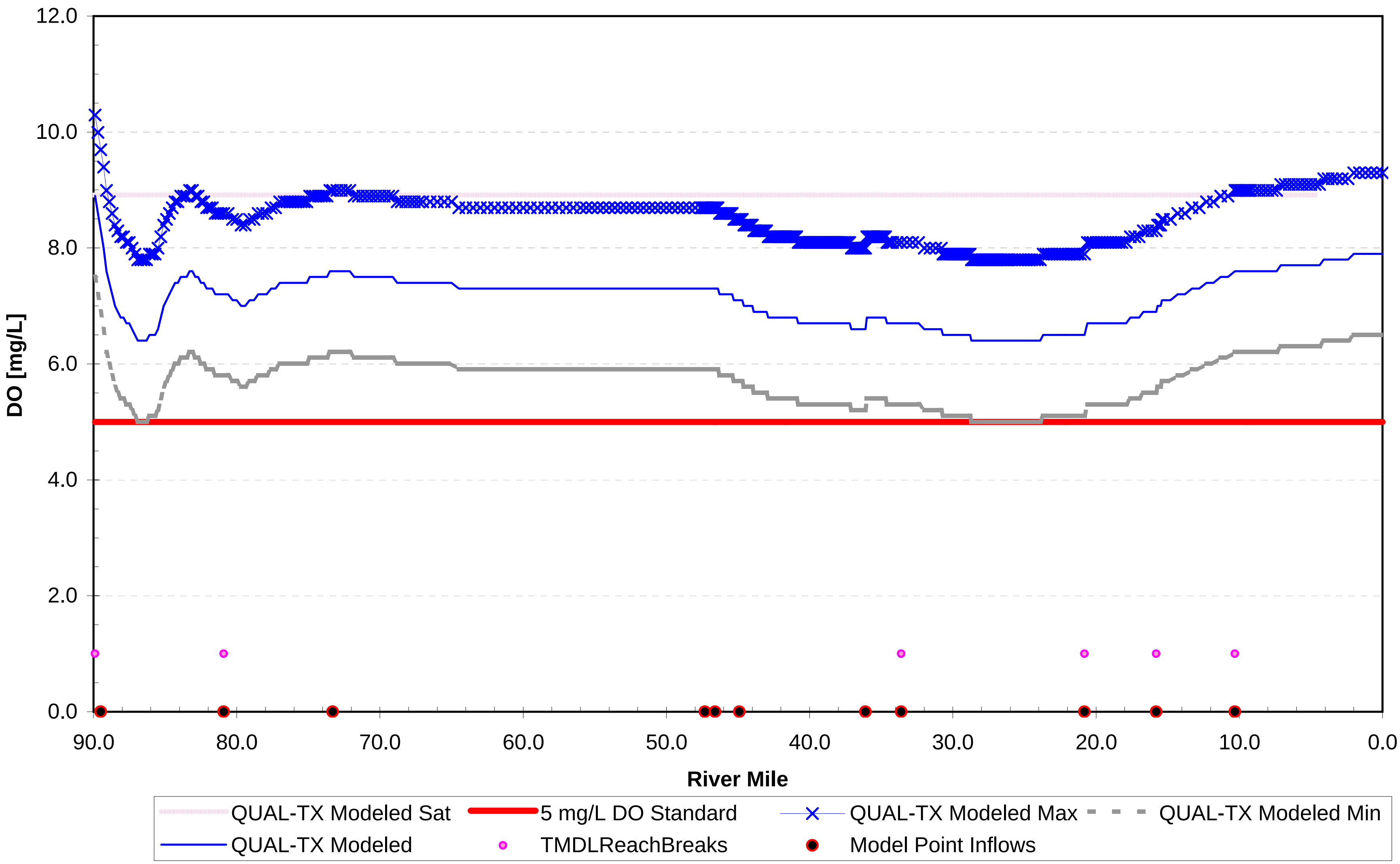


Figure 11-3

MPCA Long Prairie River Watershed TMDL Final Report Project

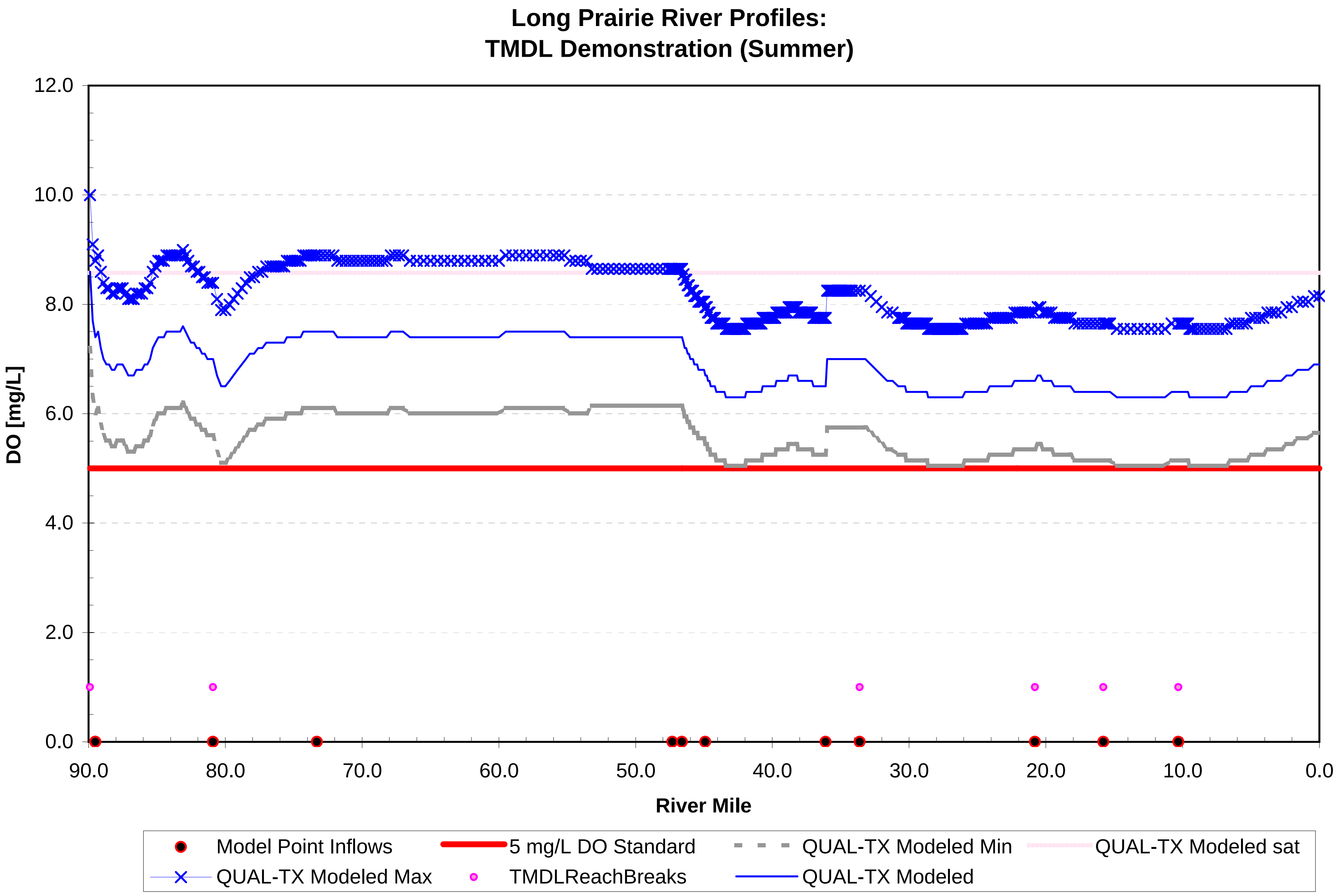
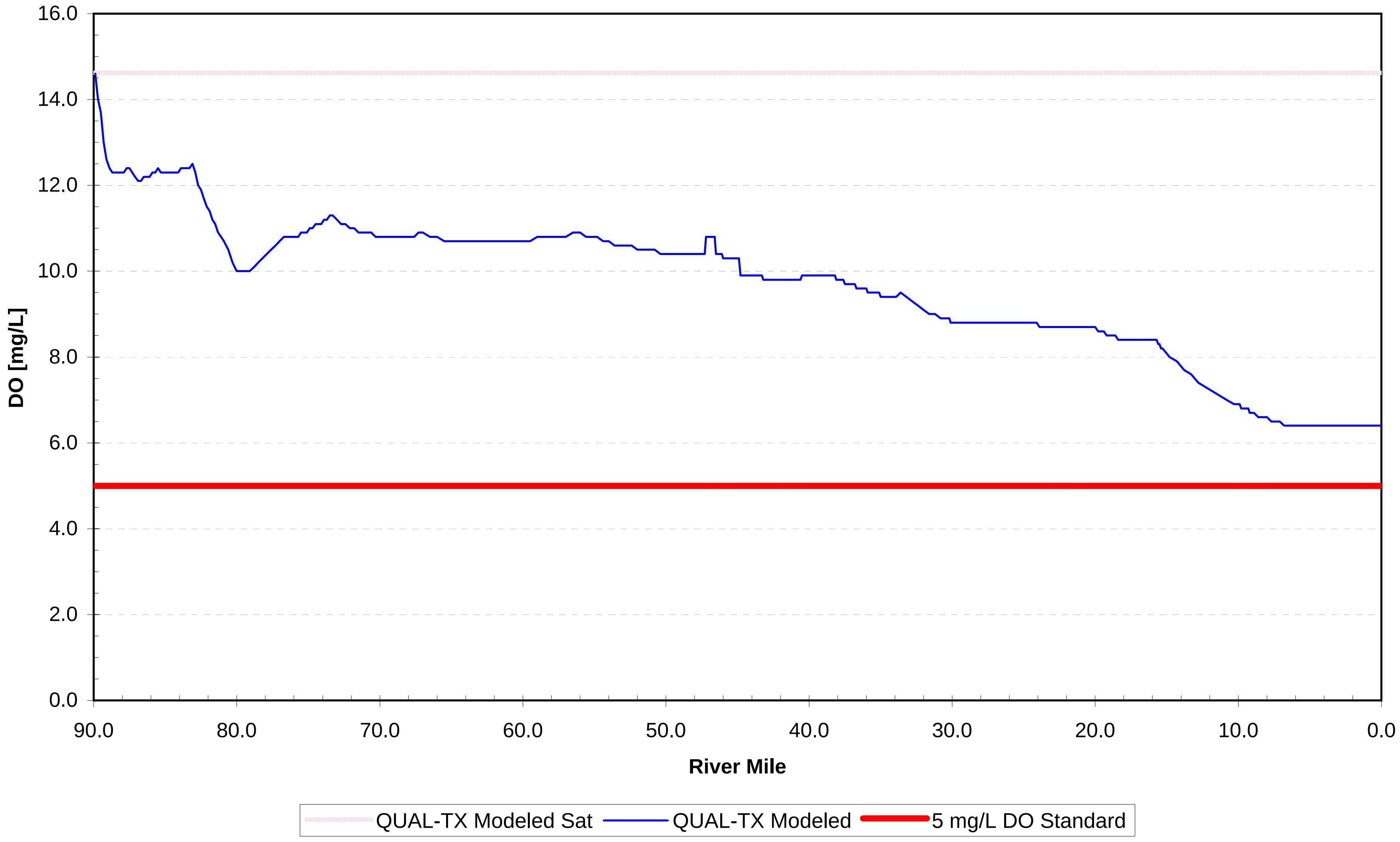


Figure 11-4

MPCA Long Prairie River Watershed TMDL Final Report Project

Long Prairie River Profiles:
TMDL Demonstration (Winter)



Appendix A Table A-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Final Project Report
Land Use Summary
Source: Todd County GIS Department

Land Use	Upper Reach Area		Middle Reach Area		Lower Reach Area		Watershed Total	
	acres	%	acres	%	acres	%	acres	%
Urban & Rural Dev.	8,674	4%	4,992	3%	2,078	2%	15,744	3%
Agriculture	94,231	43%	91,685	48%	34,685	28%	220,601	41%
Grassland	42,085	19%	53,119	28%	31,886	26%	127,090	24%
Forest	35,455	16%	35,281	18%	43,102	35%	113,838	21%
Water & Wetlands	38,349	17%	6,823	4%	10,456	8%	55,628	10%
Other	380	0%	352	0%	833	1%	1,655	0%
Total	**219,173**		**192,252**		**123,040**		**534,556**	
							835	**sq miles**

Notes:

1. Land use is further broken down in Appendix A.
2. Omits portion of watershed in Wadena County and eastern portion of watershed in Morrison County (48 square miles total).

Appendix A Table A- 2

MPCA Long Prairie River Watershed TMDL Final Project Report

Subwatershed Area

Source: Todd SWCD

ID Number	Watershed Major Name	Watershed Minor Name	Watershed Area (acres)
Lower Reach			
14031	LONG PRAIRIE RIVER	Moran Cr	13659
14032	LONG PRAIRIE RIVER	Unknown Watershed Name	5268
14031	LONG PRAIRIE RIVER	Moran Cr	2985
14027	LONG PRAIRIE RIVER	Long Prairie R	6318
14034	LONG PRAIRIE RIVER	Long Prairie R	7460
14033	LONG PRAIRIE RIVER	Stony Bk	9602
14027	LONG PRAIRIE RIVER	Long Prairie R	2438
14035	LONG PRAIRIE RIVER	Unknown Watershed Name	18763
14028	LONG PRAIRIE RIVER	Fish Trap Cr	14266
14036	LONG PRAIRIE RIVER	Moran Cr	3420
14037	LONG PRAIRIE RIVER	Long Prairie R	1254
14029	LONG PRAIRIE RIVER	Unknown Watershed Name	1027
14037	LONG PRAIRIE RIVER	Long Prairie R	7058
14030	LONG PRAIRIE RIVER	Fish Trap Cr	920
14027	LONG PRAIRIE RIVER	Long Prairie R	258
14027	LONG PRAIRIE RIVER	Long Prairie R	6069
14027	LONG PRAIRIE RIVER	Long Prairie R	61
14063	LONG PRAIRIE RIVER		18974
14028	LONG PRAIRIE RIVER	Fish Trap Cr	573
14029	LONG PRAIRIE RIVER	Unknown Watershed Name	10940
14030	LONG PRAIRIE RIVER	Fish Trap Cr	6138
14031	LONG PRAIRIE RIVER	Moran Cr	1609
Middle Reach			
14038	LONG PRAIRIE RIVER	Turtle Cr	25397
14043	LONG PRAIRIE RIVER	Co Ditch #31	3492
14061	LONG PRAIRIE RIVER	Unknown Watershed Name	4915
14044	LONG PRAIRIE RIVER	Eagle Cr	7452
14047	LONG PRAIRIE RIVER	Eagle Cr	5132
14062	LONG PRAIRIE RIVER	Unknown Watershed Name	3441
14037	LONG PRAIRIE RIVER	Long Prairie R	385
14060	LONG PRAIRIE RIVER	Long Prairie R	3003
14060	LONG PRAIRIE RIVER	Long Prairie R	6415
14045	LONG PRAIRIE RIVER	Unknown Watershed Name	7430
14039	LONG PRAIRIE RIVER	Unknown Watershed Name	5678
14046	LONG PRAIRIE RIVER	Eagle Cr	9066
14060	LONG PRAIRIE RIVER	Long Prairie R	2242
14048	LONG PRAIRIE RIVER	Freemans Cr	6417
14015	LONG PRAIRIE RIVER	Eagle Cr	6446
14049	LONG PRAIRIE RIVER	Harris Cr	12044
14050	LONG PRAIRIE RIVER	Drayer Cr	5242
14047	LONG PRAIRIE RIVER	Eagle Cr	16
14041	LONG PRAIRIE RIVER	Unknown Watershed Name	4406
14051	LONG PRAIRIE RIVER	Long Prairie R	11201
14052	LONG PRAIRIE RIVER	Unknown Watershed Name	4558

Appendix A Table A- 2

MPCA Long Prairie River Watershed TMDL Final Project Report

Subwatershed Area

Source: Todd SWCD

ID Number	Watershed Major Name	Watershed Minor Name	Watershed Area (acres)
14040	LONG PRAIRIE RIVER	Dismal Cr	10661
14042	LONG PRAIRIE RIVER	Long Prairie R	11003
14052	LONG PRAIRIE RIVER	Unknown Watershed Name	470
14059	LONG PRAIRIE RIVER	Long Prairie Cr	7551
14054	LONG PRAIRIE RIVER	Turtle Cr	5445
14059	LONG PRAIRIE RIVER	Long Prairie Cr	2495
14053	LONG PRAIRIE RIVER	Unknown Watershed Name	4443
14042	LONG PRAIRIE RIVER	Long Prairie R	2958
14055	LONG PRAIRIE RIVER	Unknown Watershed Name	3428
14058	LONG PRAIRIE RIVER	Unknown Watershed Name	4775
14051	LONG PRAIRIE RIVER	Long Prairie R	743
14056	LONG PRAIRIE RIVER	Turtle Cr	5978
14057	LONG PRAIRIE RIVER	Venewitz Cr	12210
14015	LONG PRAIRIE RIVER	Eagle Cr	400
Upper Reach			
14006	LONG PRAIRIE RIVER	Stormy Cr	833
14014	LONG PRAIRIE RIVER	Unknown Watershed Name	2193
14006	LONG PRAIRIE RIVER	Stormy Cr	170
14016	LONG PRAIRIE RIVER	Long Prairie R	1674
14003	LONG PRAIRIE RIVER	Co Ditch #11	8082
14002	LONG PRAIRIE RIVER	Unknown Watershed Name	4393
14007	LONG PRAIRIE RIVER	From L Irene	7259
14004	LONG PRAIRIE RIVER	Co Ditch #24	1061
14005	LONG PRAIRIE RIVER	Spruce Cr	9543
14006	LONG PRAIRIE RIVER	Stormy Cr	7103
14013	LONG PRAIRIE RIVER	Unknown Watershed Name	4161
14008	LONG PRAIRIE RIVER	From L Miltona	12071
14012	LONG PRAIRIE RIVER	Unknown Watershed Name	3385
14009	LONG PRAIRIE RIVER	L Ida	19154
14014	LONG PRAIRIE RIVER	Unknown Watershed Name	2621
14011	LONG PRAIRIE RIVER	Long Prairie R	8200
14017	LONG PRAIRIE RIVER	Long Prairie R	5358
14005	LONG PRAIRIE RIVER	Spruce Cr	494
14010	LONG PRAIRIE RIVER	L Carlos	11213
14017	LONG PRAIRIE RIVER	Long Prairie R	262
14016	LONG PRAIRIE RIVER	Long Prairie R	3430
14017	LONG PRAIRIE RIVER	Long Prairie R	1487
14018	LONG PRAIRIE RIVER	Unknown Watershed Name	5663
14020	LONG PRAIRIE RIVER	L Cowdry	7696
14019	LONG PRAIRIE RIVER	L Le Homme Dieu	17014
14021	LONG PRAIRIE RIVER	From L Brophy	6673
14022	LONG PRAIRIE RIVER	From Lobster L	7064
14025	LONG PRAIRIE RIVER	L Victoria	8491
14023	LONG PRAIRIE RIVER	From Mill L	7030
14024	LONG PRAIRIE RIVER	Bly Cr	20010

Appendix A Table A- 2

MPCA Long Prairie River Watershed TMDL Final Project Report

Subwatershed Area

Source: Todd SWCD

ID Number	Watershed Major Name	Watershed Minor Name	Watershed Area (acres)
14026	LONG PRAIRIE RIVER	Unknown Watershed Name	7843
14001	LONG PRAIRIE RIVER		4784
14005	LONG PRAIRIE RIVER	Spruce Cr	2264
14004	LONG PRAIRIE RIVER	Co Ditch #24	3698
14005	LONG PRAIRIE RIVER	Spruce Cr	3942
14003	LONG PRAIRIE RIVER	Co Ditch #11	2170
14006	LONG PRAIRIE RIVER	Stormy Cr	393
14007	LONG PRAIRIE RIVER	From L Irene	283
14002	LONG PRAIRIE RIVER	Unknown Watershed Name	71

Lower Reach Area	139,058	acres
Middle Reach Area	206,939	acres
Upper Reach Area	219,236	acres
Total Watershed Area	565,234	acres
	883	square miles

MPCA - LONG PRAIRIE RIVER WATERSHED TMDL FINAL PROJECT REPORT

Land Use & Sub-Watersheds

Wenck
Wenck Associates, Inc.
Environmental Engineers
1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

JULY 2003

Appendix A
Figure A-1

MPCA - LONG PRAIRIE RIVER WATERSHED TMDL FINAL PROJECT REPORT
Soils & Sub-Watersheds

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Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

JULY 2003
Appendix A Figure A-2

Appendix B Table B-1

MPCA Long Prairie River Watershed TMDL Final Project Report

Summary of Monthly Average Long Prairie River Flows at LPR 47.8 October 1971 to February 2002 (all data is in cfs)

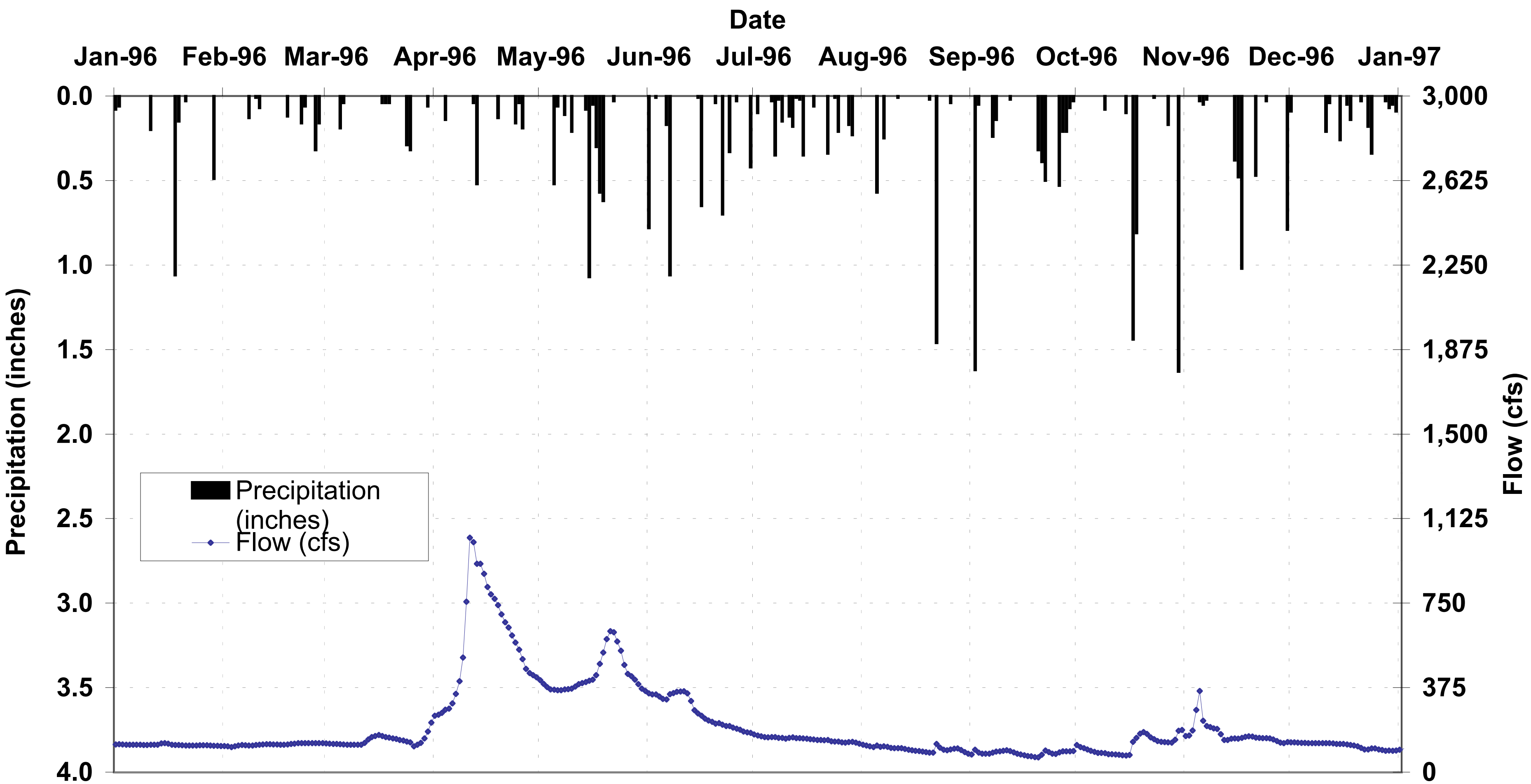
	January	February	March	April	May	June	July	August	September	October	November	December
1971										145.6	425.1	147.8
1972	100.9	85.9	393.3	602.4	409.3	256.5	777.3	715.1	324.8	243.6	226.9	133.5
1973	109.9	81.0	409.2	273.5	226.3	127.9	63.0	75.0	67.5	92.2	78.5	54.3
1974	46.3	46.8	59.7	350.2	255.2	171.7	59.0	51.3	37.2	29.9	38.9	24.7
1975	10.5	8.3	33.6	457.6	359.2	281.0	256.6	85.0	80.7	55.5	44.8	41.1
1976	43.1	48.2	137.3	274.7	85.2	37.3	25.9	10.2	5.3	13.4	8.7	3.2
1977	1.1	1.6	50.6	71.8	45.5	37.5	18.9	17.9	32.2	76.1	88.2	79.9
1978	51.2	40.1	121.9	422.4	148.4	97.5	181.3	99.0	74.5	55.9	40.3	19.0
1979	18.0	22.1	73.6	554.6	316.5	412.7	350.6	156.4	136.8	90.8	172.6	92.7
1980	75.4	64.6	62.1	373.1	126.6	311.7	118.2	172.2	215.5	142.7	85.2	44.1
1981	43.4	60.0	84.7	132.7	148.1	179.7	114.0	98.8	80.4	105.6	67.3	39.0
1982	34.0	40.1	56.0	611.4	353.4	213.1	188.4	85.5	80.1	204.6	123.7	102.4
1983	75.8	73.2	283.2	219.8	147.3	155.8	138.4	90.2	67.7	58.5	71.8	53.3
1984	50.0	80.0	147.3	267.0	260.5	383.5	217.4	145.2	98.9	399.0	279.3	181.9
1985	143.1	136.0	440.6	414.1	467.1	421.6	203.2	197.5	213.0	168.3	93.8	93.0
1986	91.4	87.2	185.6	747.7	652.7	380.9	395.1	362.8	607.1	512.0	373.1	270.2
1987	216.8	207.9	343.1	288.3	274.1	192.6	100.4	66.6	56.6	41.5	40.2	25.7
1988	14.7	14.0	118.7	175.2	71.6	27.5	4.7	20.3	21.9	28.9	26.7	15.0
1989	11.2	11.2	19.8	335.0	165.3	73.1	24.1	10.0	40.6	25.6	37.3	13.0
1990	4.2	3.0	146.7	136.3	125.6	164.4	87.5	49.6	49.1	64.9	39.2	23.2
1991	12.1	23.0	96.4	250.2	253.0	197.6	259.7	147.3	124.4	83.0	81.4	66.9
1992	64.7	71.8	265.1	241.4	187.4	105.3	112.7	52.7	48.4	34.9	42.8	26.9
1993	25.2	26.5	40.9	242.9	261.0	350.6	397.9	275.1	213.4	157.9	104.8	113.9
1994	98.7	94.1	333.1	459.3	403.3	160.1	136.2	89.0	80.7	116.7	85.7	63.4
1995	53.7	51.3	382.0	330.5	346.6	259.5	250.4	255.7	168.2	390.8	243.5	129.7
1996	120.7	122.4	140.2	584.6	431.7	269.8	145.9	103.1	84.8	119.5	170.7	117.1
1997	105.7	137.9	146.8	826.7	321.5	195.0	207.1	172.8	129.2	102.5	78.3	64.7
1998	61.6	123.1	175.2	239.7	183.2	191.5	345.2	129.5	68.3	164.8	177.1	123.4
1999	98.8	102.1	224.6	427.0	597.5	317.4	216.4	191.7	197.9	137.7	94.6	64.5
2000	52.2	76.3	198.8	156.6	223.1	151.5	135.7	91.8	61.8	54.7	142.5	
1971- 2000 Average Flow	63.3	66.9	178.3	360.9	270.6	211.2	190.7	138.5	119.6	130.6	119.1	76.8
2001	49.6	52.5	54.4	1062.4	607.8	773.9	306.2	188.2	159.2	130.7	102.1	143.9
2002	122.3	112.3										

Note: February 2002 average flow is calculated through February 7, 2002.

Appendix B Figure B-1a

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

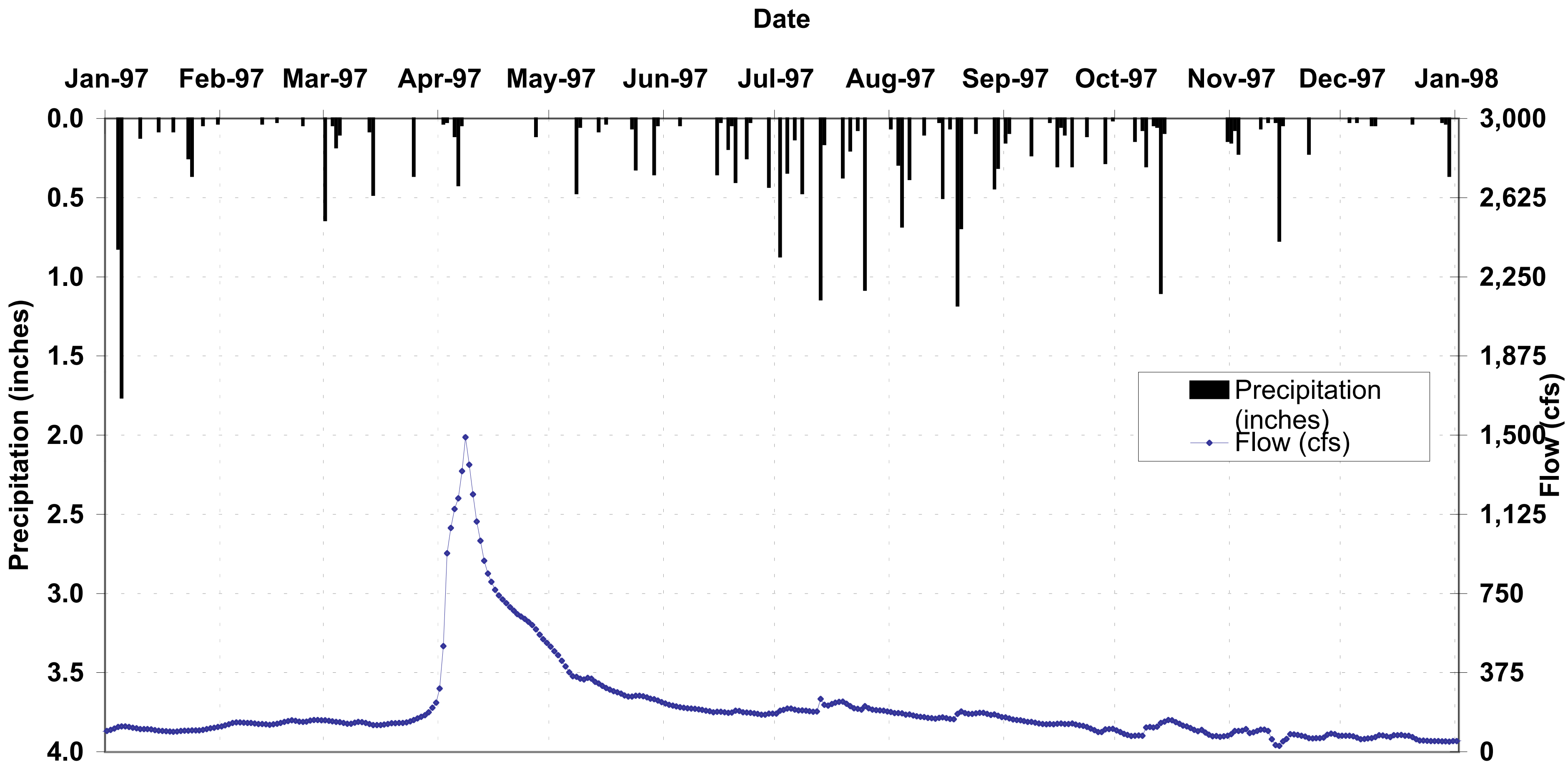
Long Prairie River Average Daily Flow and Precipitation at LPR 47.8
(1996)



Appendix B Figure B-1b

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

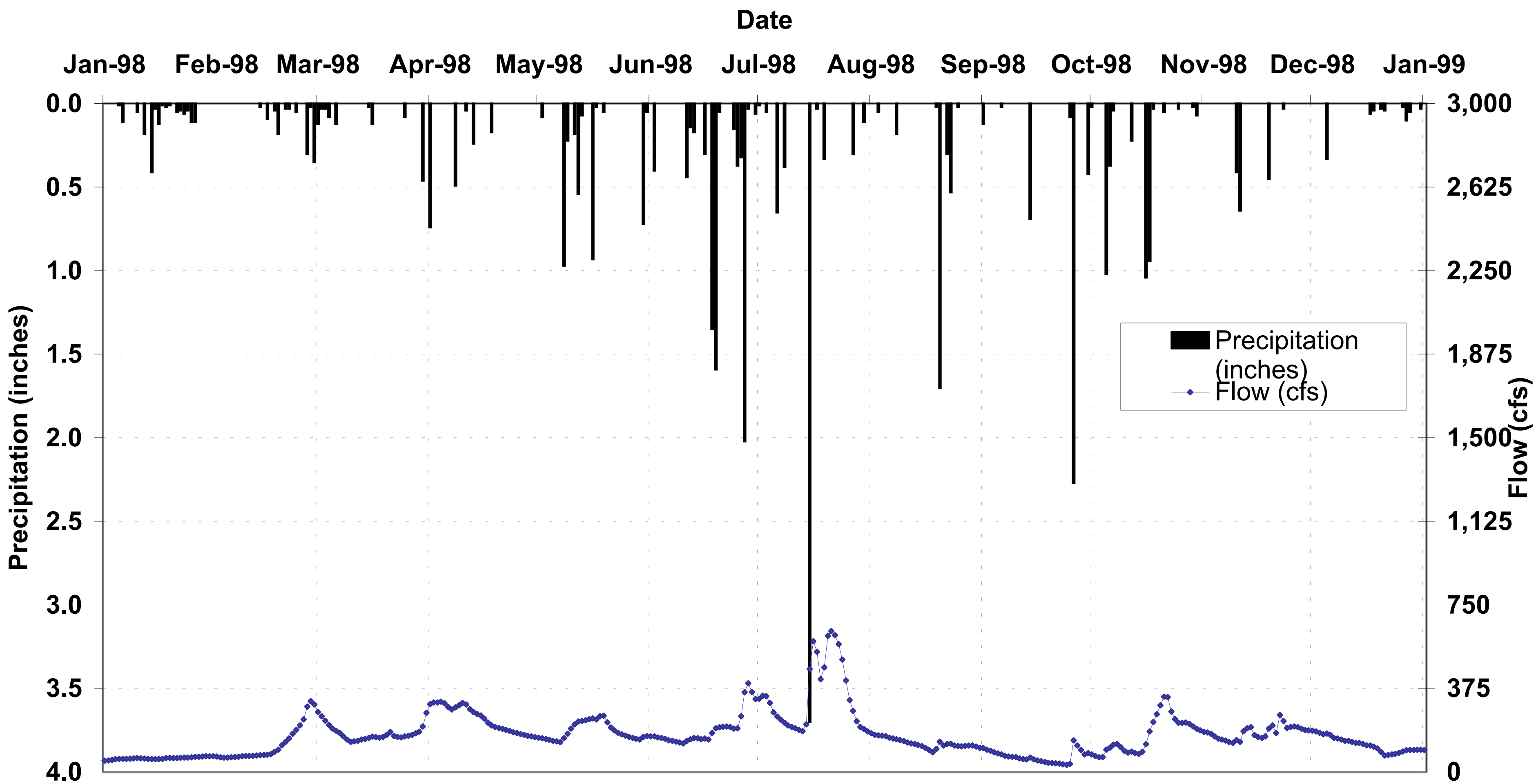
Long Prairie River Average Daily Flow and Precipitation at LPR 47.8 (1997)



Appendix B Figure B-1c

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

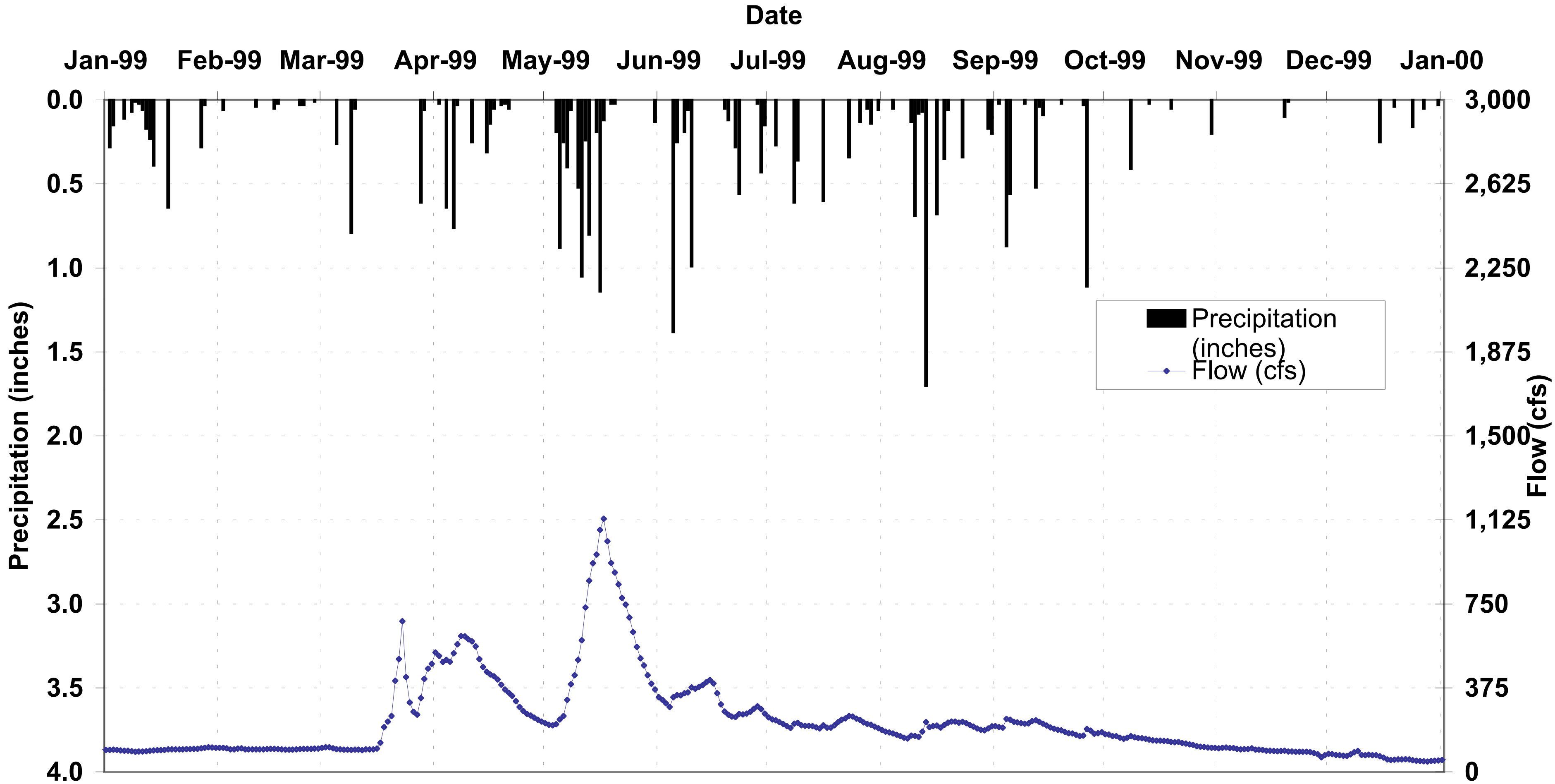
Long Prairie River Average Daily Flow and Precipitation at LPR 47.8
(1998)



Appendix B Figure B-1d

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

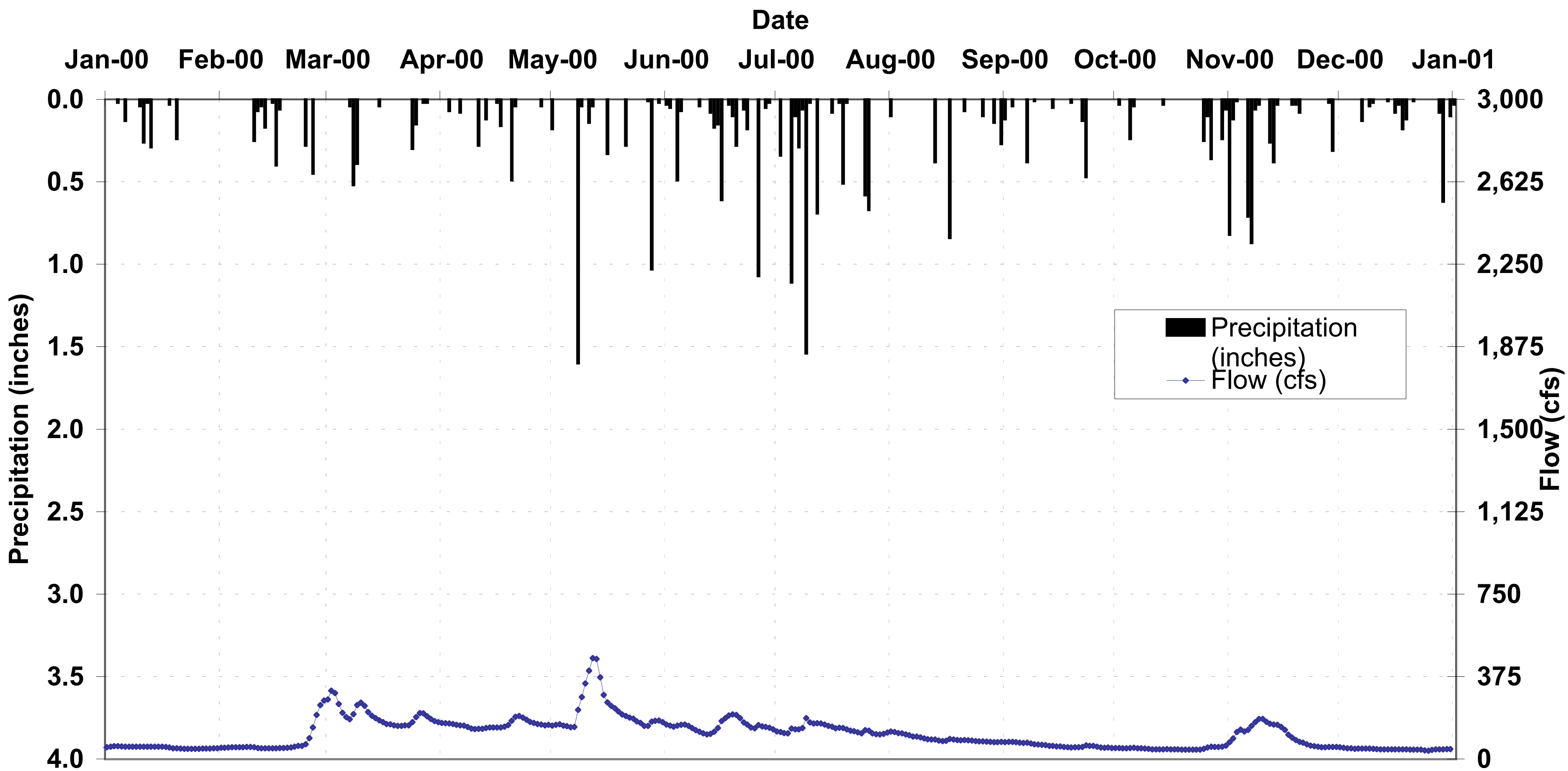
Long Prairie River Average Daily Flow and Precipitation at LPR 47.8
(1999)



Appendix B Figure B-1e

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

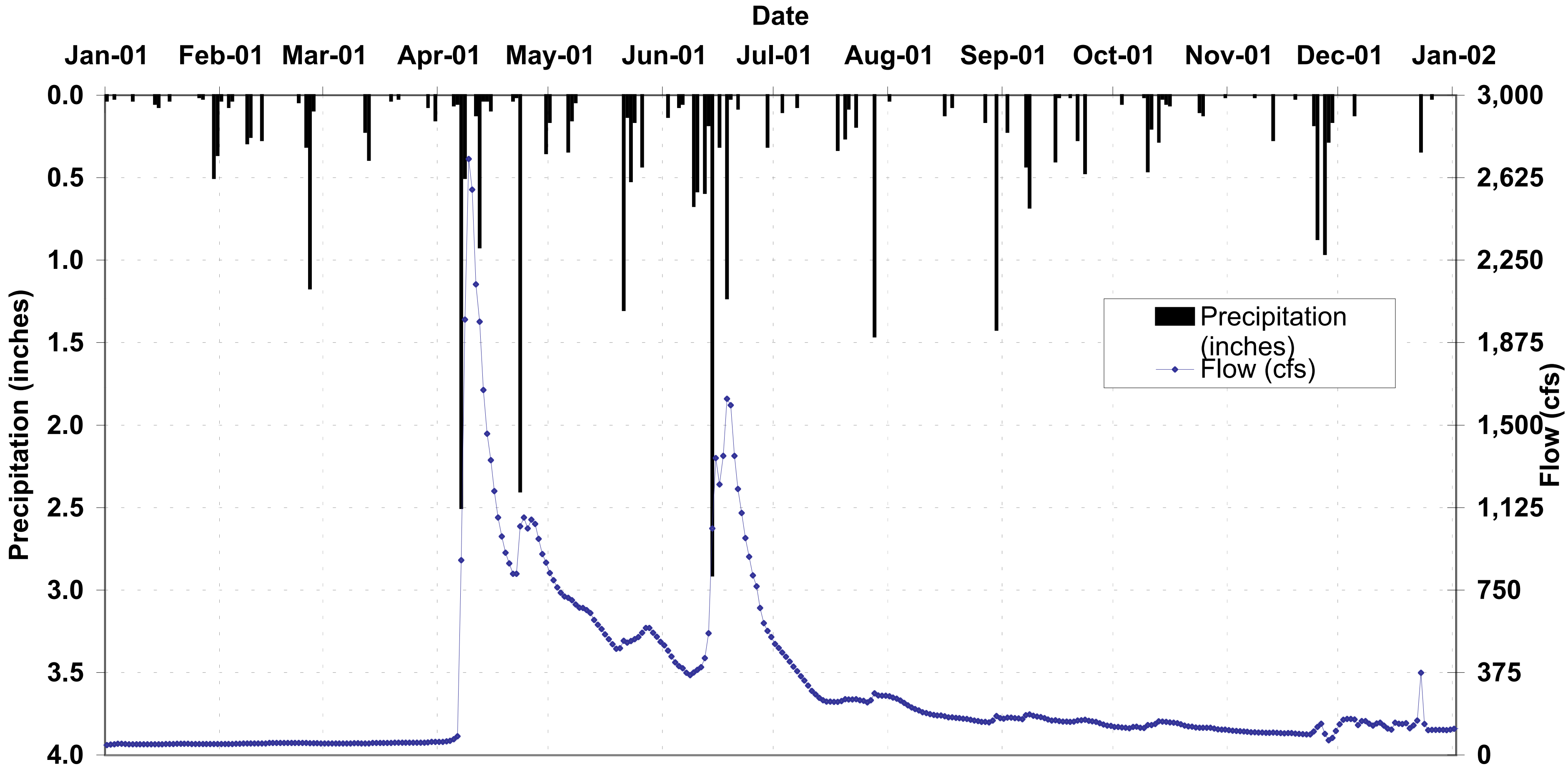
Long Prairie River Average Daily Flow and Precipitation at LPR 47.8
(2000)



Appendix B Figure B-1f

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

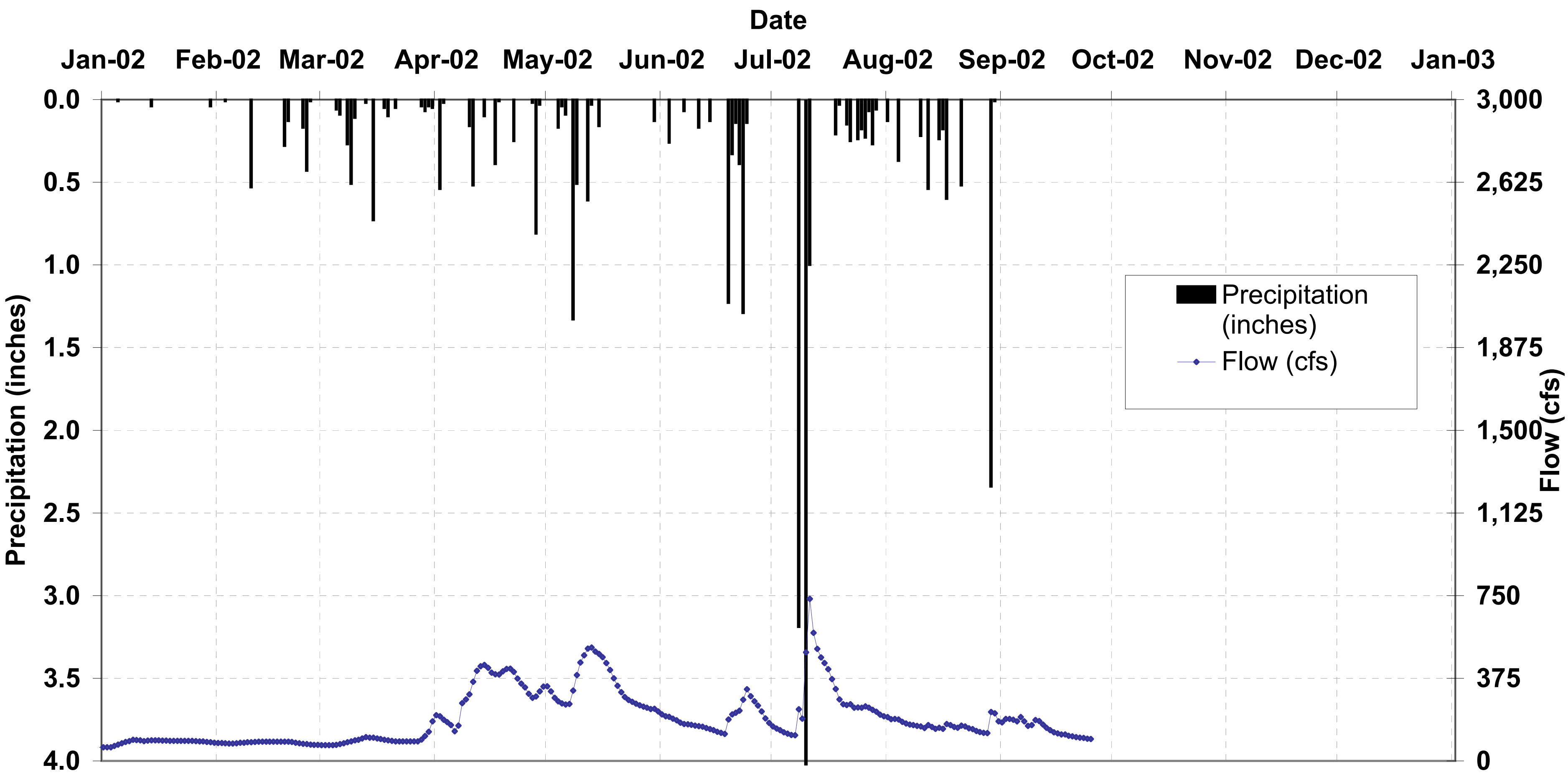
Long Prairie River Average Daily Flow and Precipitation at LPR 47.8 (2001)



Appendix B Figure B-1g

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

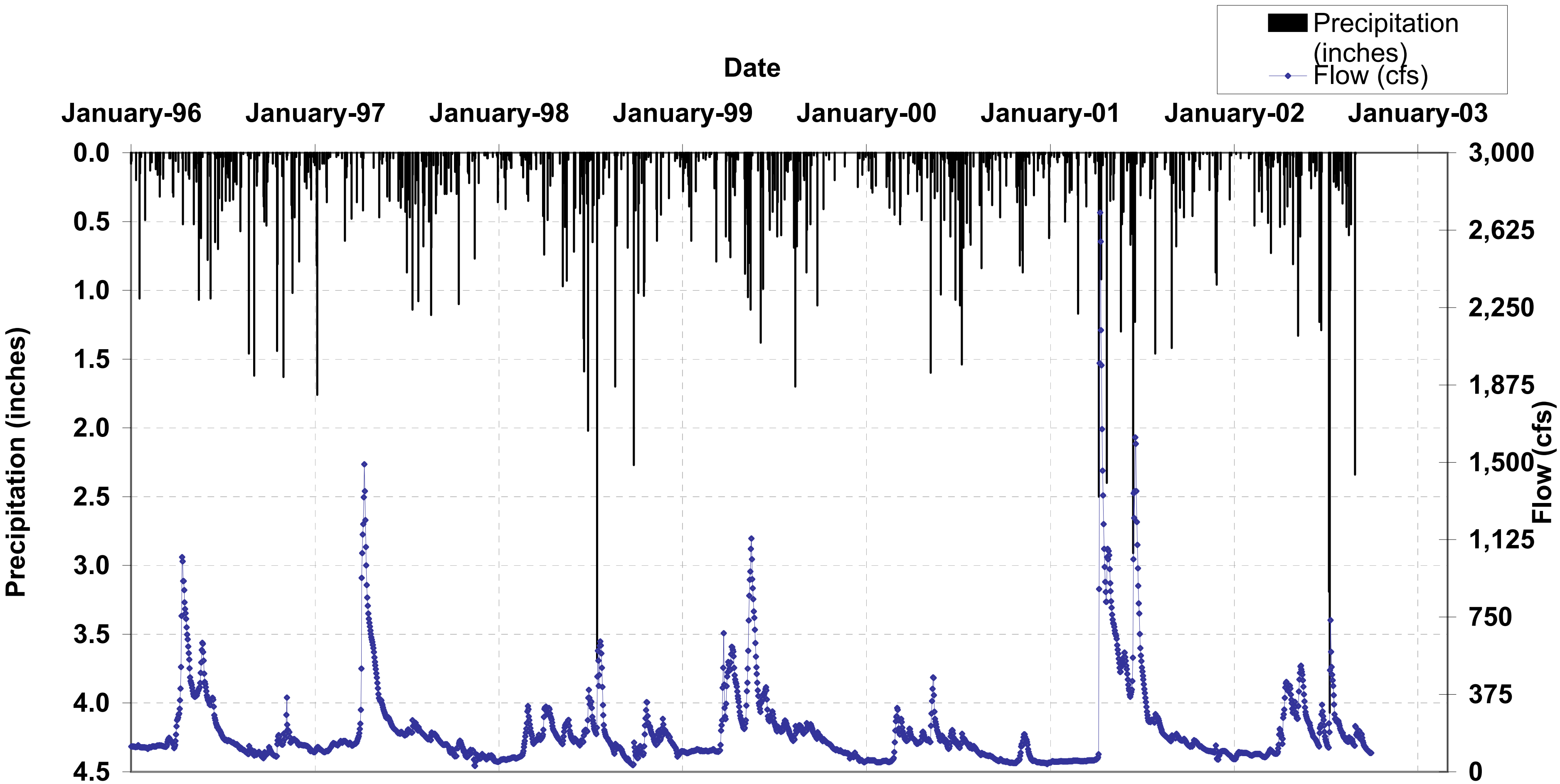
Long Prairie River Average Daily Flow and Precipitation at LPR 47.8
(2002- Through September 30)



Appendix B Figure B-2

MPCA
Long Prairie River Watershed TMDL Project: Final Project Report

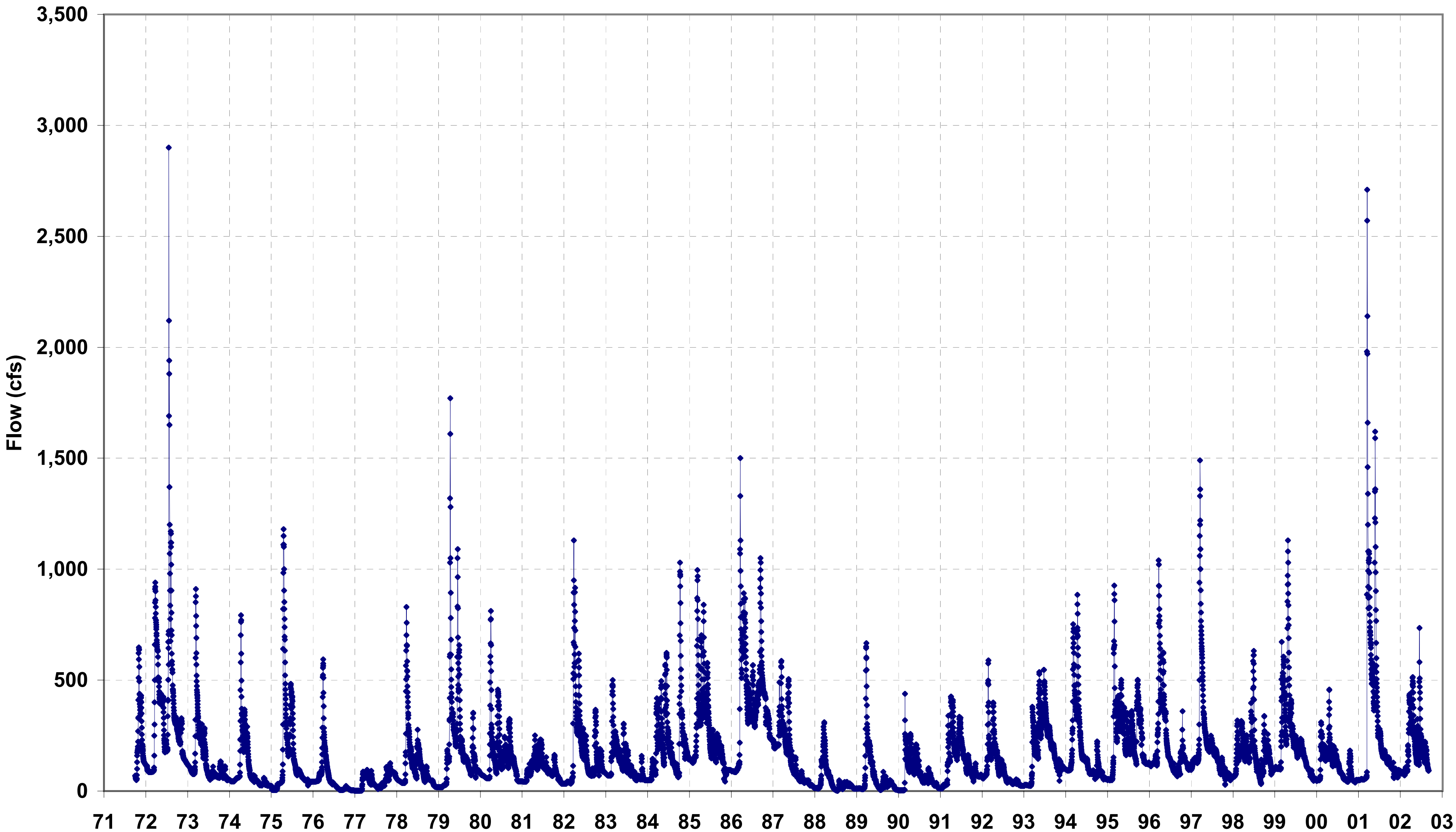
Long Prairie River Average Daily Flow and Precipitation at LPR 47.8
(January 1996-September 2002)



Appendix B Figure B-3

MPCA Long Prairie River Watershed TMDL Final Project Report

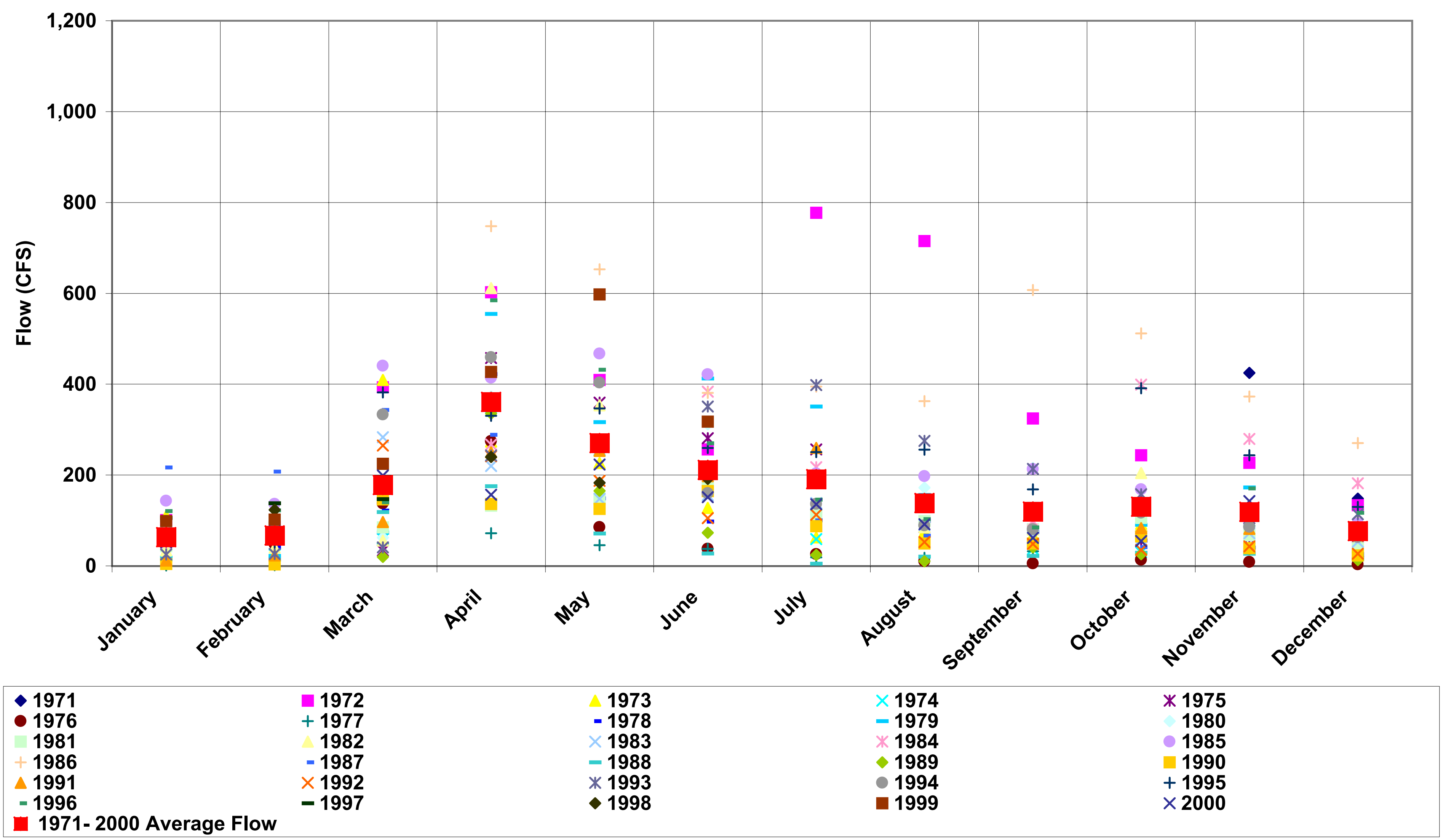
Long Prairie River Average Daily Flow at LPR 47.8
(October 1971- September 2002)



Appendix B Figure B-4

MPCA Long Prairie River Watershed TMDL Final Project Report

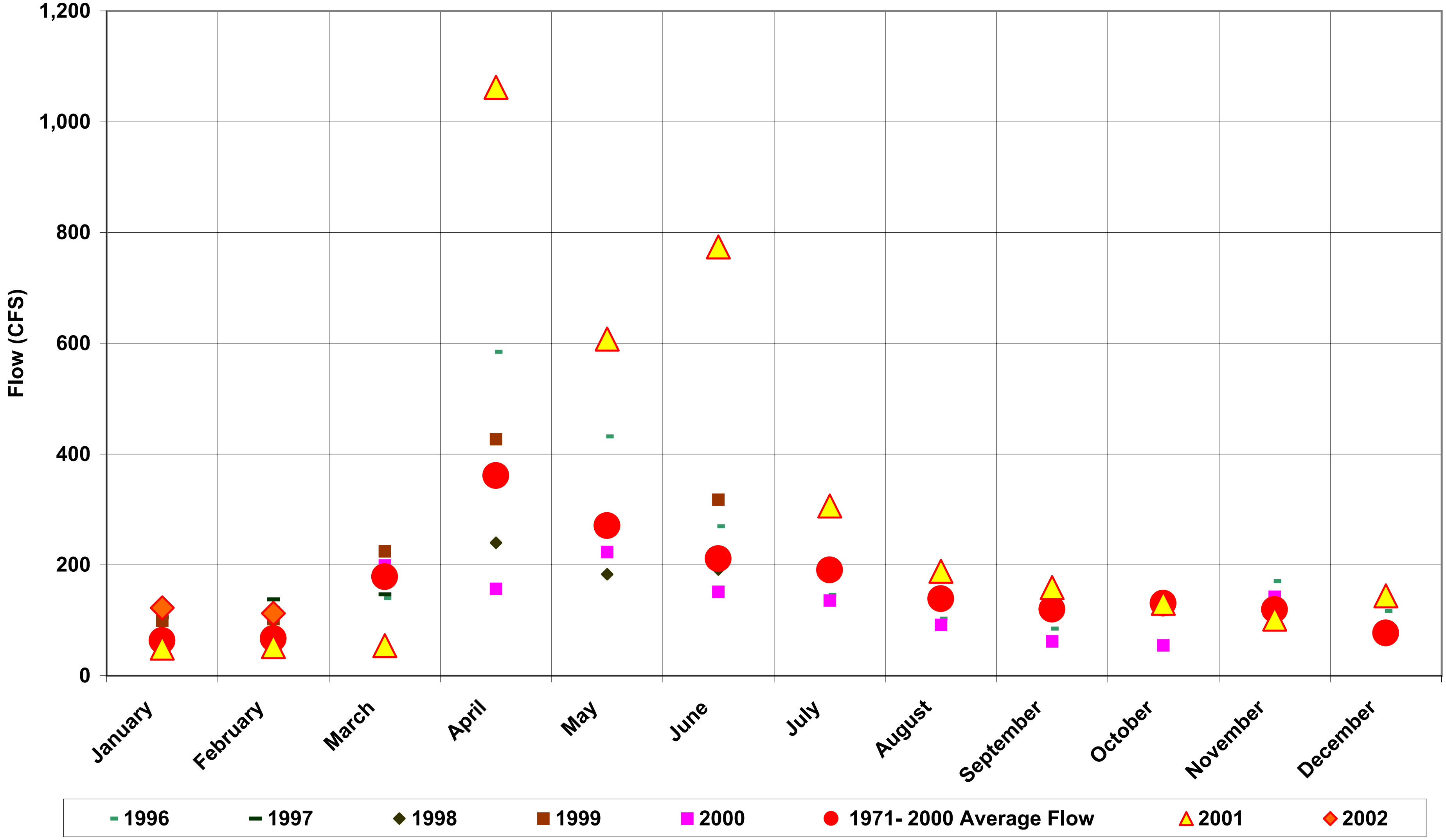
Long Prairie River Average Monthly Flow at LPR47.8 (1971-2000)



Appendix B Figure B-5

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Average Monthly Flow at LPR47.8 (January 1996-February 2002)



Appendix C Table C-1

MPCA Long Prairie River Watershed TMDL Final Project Report

MPCA Calibration Documentation
(Source: MPCA)

LPR 49.3 Date	MPCA Equipment ID	Temperature (degrees C)	DO (mg/L)	pH	Conductivity mS
8/23/00	CR10	23.48	8.08	8.42	0.412
	YSI 63 or 95	23.6	8.02	8.3	0.471
	Quanta	23.25	7.8	8.41	0.412
9/12/00	CR10	16.28	8.44	8.7	0.45
	YSI 63 or 95	16.4	9.25	8.37	0.516
	Quanta	16.21	9.42	8.61	0.408
10/4/00	CR10	8.49	10.75	8.82	0.478
	YSI 63 or 95	---	---	---	---
	Quanta	8.75	11.54	8.44	0.437
11/18/00	CR10	-0.26	13.78	8.69	0.472
	YSI 63 or 95	---	---	---	---
	Quanta	-0.08	11.51	8.22	0.517

LPR 47.2 Date	MPCA Equipment ID	Temperature (degrees C)	DO (mg/L)	pH	Conductivity mS
9/7/00	CR10	19.39	8.29	8.7	0.486
	YSI 63 and 95	19.6	8.05	8.17	0.513
	Quanta	19.35	8.28	8.45	0.397
9/12/00	CR10	13.89	8.28	8.68	0.505
	YSI 63 or 95	14.1	8.06	8.19	0.526
	Quanta	13.83	8.02	8.45	0.415
10/4/00	CR10	8.43	12.74	8.99	0.535
	YSI 63 or 95	---	---	---	---
	Quanta	8.47	10.98	8.38	0.433
11/18/00	CR10	0.1	4.06	8.84	0.525
	YSI 63 or 95	---	---	---	---
	Quanta	0.03	11.98	8.25	0.52

LPR 42.2 Date	MPCA Equipment ID	Temperature (degrees C)	DO (mg/L)	pH	Conductivity mS
9/7/00	CR10	20.2	8.16	8.34	0.628
	YSI 63 or 95	20.2	8.03	8.16	0.673
	Quanta	---	---	---	---
9/12/00	CR10	15.5	8.52	8.48	0.587
	YSI 63 or 95	15.4	8.45	8.22	0.614
	Quanta	15.2	8.46	8.51	0.487
10/4/00	CR10	9.77	4.33	8.8	0.55
	YSI 63 or 95	9.9	11.65	8.25	0.495
	Quanta	9.68	10.24	8.28	0.452
	CR10 after cleaning	9.98	12.65	8.84	0.552
	and calibrating sensors	---	---	---	---
11/18/00	CR10	0.03	15.46	8.81	0.561
	YSI 63 or 95	---	---	---	---
	Quanta	0.04	12.45	8.28	0.561

Appendix C Table C-2

MPCA Long Prairie River Watershed TMDL Final Project Report

Summary of Continuous DO and Temperature Data Recorded at LPR 49.3, LPR 47.2, and LPR 42.2

(Data from September- November 2000)

	Dissolved Oxygen Range (mg/L)	Average Daily Maximum Dissolved Oxygen Concentration (mg/L)	Maximum Dissolved Oxygen Concentrations Generally Occur Between	Average Daily Minimum Dissolved Oxygen Concentration (mg/L)	Minimum Dissolved Oxygen Concentrations Generally Occur Between	Temperature Range (degrees C)	Maximum Temperatures Generally Occur Between	Minimum Temperatures Generally Occur Between
LPR 49.3	4.8 to 15.9	---	---	---	---	-0.3 to 20.1	---	---
LPR 47.2	1.3 to 15.8	10.8	2pm and 6pm	8.5	2am and 8am	-0.2 to 20.3	6pm and 10pm	10am to 2pm
LPR 42.2	8.0 to 16.2	13.5	2pm and 6pm	12.2	2am and 8am	-0.2 to 15.6	6pm and 10pm	10am to 2pm

Source: Raw data collected September to November 2000 by MPCA Brainerd staff.
(1) Four readings per day were collected at LRP 49.3 at 10am, 2pm, 4pm, and 6pm. Readings were collected at LPR 47.2 and LPR 42.2 every two hours. This difference in data collection frequency complicates comparison of summary data between LRP 49.3 versus LPR 42.2 and LPR 47.2.
(2) Data collected at LPR 42.2 prior to October 5 is suspected to be inaccurate.

Appendix C Table C-3

MPCA Long Prairie River Watershed TMDL Final Project Report

Calculation of ∆ DO from Continuous DO Measurements

Date	Daily Max LPR 47.2	Daily Min LPR 47.2	∆ DO	Date	Daily Max LPR 42.2	Daily Min LPR 42.2	∆ DO
9/13/00	8.62	7.39	1.23	9/13/00	9	7.14	1.86
9/14/00	9.05	7.65	1.40	9/14/00	9.61	7.45	2.16
9/15/00	9.63	8.20	1.43	9/15/00	10.67	8.23	2.44
9/16/00	9.24	8.22	1.02	9/16/00	10.6	8.82	1.78
9/17/00	8.91	7.58	1.33	9/17/00	10.43	8.01	2.42
9/18/00	8.01	6.71	1.30	9/18/00	9.78	7.61	2.17
9/19/00	8.36	6.04	2.32	9/19/00	9.51	6.93	2.58
9/20/00	9.75	7.14	2.61	9/20/00	10.78	7.48	3.3
9/21/00	11.07	9.20	1.87	9/21/00	11.7	9.77	1.93
9/22/00	9.99	9.00	0.99	9/22/00	10.92	9.77	1.15
9/23/00	11.53	9.23	2.30	9/23/00	11.49	9.72	1.77
9/24/00	11.95	10.74	1.21	9/24/00	12.39	11.17	1.22
9/25/00	11.56	10.47	1.09	9/25/00	11.47	10.61	0.86
9/26/00	10.88	9.67	1.21	9/26/00	10.45	8.65	1.8
9/27/00	11.03	8.87	2.16	9/27/00	9.58	8.05	1.53
9/28/00	10.72	9.38	1.34	9/28/00	9.27	7.62	1.65
9/29/00	9.76	8.24	1.52	9/29/00	7.44	5.602	1.838
9/30/00	9.77	7.73	2.04	9/30/00	6.421	5.082	1.339
10/1/00	9.40	7.53	1.87	10/1/00	6.422	5.639	0.783
10/2/00	10.02	7.80	2.22	10/2/00	6.125	3.89	2.235
10/3/00	11.38	8.51	2.87	10/3/00	5.225	3.247	1.978
10/4/00	12.80	10.43	2.37	10/4/00	13	3.344	9.656
10/5/00	12.53	10.52	2.01	10/5/00	13.41	11.48	1.93
10/6/00	14.35	12.29	2.06	10/6/00	15.65	13.64	2.01
10/7/00	14.91	13.15	1.76	10/7/00	15.61	15.04	0.57
10/8/00	15.77	13.84	1.93	10/8/00	16.17	15.1	1.07
10/9/00	15.05	13.04	2.01	10/9/00	15.57	14.35	1.22
10/10/00	13.98	12.14	1.84	10/10/00	14.55	13.66	0.89
10/11/00	13.45	11.50	1.95	10/11/00	14.18	13.02	1.16
10/12/00	12.40	10.39	2.01	10/12/00	13.37	11.81	1.56
10/13/00	10.83	8.65	2.18	10/13/00	12.22	10.19	2.03
10/14/00	11.05	7.71	3.34	10/19/00	11.93	10.35	1.58
10/15/00	12.55	9.69	2.86	10/20/00	11.77	9.44	2.33
10/16/00	13.28	11.18	2.10	10/21/00	12.57	10.76	1.81
10/17/00	13.06	10.78	2.28	10/22/00	12.36	10.81	1.55
10/18/00	12.58	10.43	2.15	10/23/00	11.53	9.48	2.05
10/19/00	11.46	9.34	2.12	10/24/00	10.93	9.31	1.62
10/20/00	11.36	8.26	3.10	10/25/00	10.16	8.09	2.07
10/21/00	12.44	9.62	2.82	10/26/00	10.21	7.99	2.22
10/22/00	12.45	10.11	2.34	10/27/00	12.34	8.67	3.67
10/23/00	11.03	8.26	2.77	10/28/00	13	11.33	1.67
10/24/00	10.40	8.03	2.37	10/29/00	12.44	11.71	0.73
10/25/00	8.84	6.70	2.14	10/30/00	12.28	11.4	0.88
10/26/00	8.28	6.21	2.07	10/31/00	12.73	11.28	1.45
10/27/00	10.68	6.79	3.89	11/1/00	11.26	9.51	1.75

Appendix C Table C-3

MPCA Long Prairie River Watershed TMDL Final Project Report

Calculation of Δ DO from Continuous DO Measurements

Date	Daily Max LPR 47.2	Daily Min LPR 47.2	Δ DO
10/28/00	12.77	9.65	3.12
10/29/00	11.71	10.53	1.18
10/30/00	11.66	10.06	1.60
10/31/00	11.64	9.80	1.84
11/1/00	9.22	7.14	2.08
11/2/00	9.84	6.69	3.15
11/3/00	11.83	9.65	2.18
11/4/00	12.34	11.59	0.75
11/5/00	11.78	10.58	1.20
11/6/00	9.92	8.78	1.14
11/7/00	9.27	8.37	0.90
11/8/00	10.01	6.93	3.08
11/9/00	7.94	1.25	6.69
11/10/00	8.76	1.34	7.43
11/11/00	6.79	4.50	2.29
11/12/00	9.04	3.71	5.34
11/13/00	10.56	8.47	2.09
11/14/00	14.11	11.05	3.06
11/15/00	14.40	1.39	13.01
11/16/00	5.76	2.81	2.95
11/17/00	3.90	2.26	1.64

Statistics for LPR 47.2

Δ DO Mean= 2.0
Δ DO Max= 3.89
Δ DO Min= 0.99
Δ DO Standard Deviation= 0.6
Δ DO n= 49

Date	Daily Max LPR 42.2	Daily Min LPR 42.2	Δ DO
11/2/00	11.68	9.17	2.51
11/3/00	12.81	11.6	1.21
11/4/00	14.15	12.61	1.54
11/5/00	13.67	13.12	0.55
11/6/00	12.99	12.11	0.88
11/7/00	12.04	11.74	0.3
11/8/00	13.61	12.13	1.48
11/9/00	14.1	13.58	0.52
11/10/00	14.97	14.13	0.84
11/11/00	15.37	14.72	0.65
11/12/00	15.28	14.92	0.36
11/13/00	15.72	14.93	0.79
11/14/00	15.64	15.1	0.54
11/15/00	15.74	15.46	0.28
11/16/00	15.76	15.6	0.16
11/17/00	15.83	15.59	0.24

Statistics for LPR 42.2

Δ DO Mean= 1.6
Δ DO Max= 9.7
Δ DO Min= 0.2
Δ DO Standard Deviation= 1.3
Δ DO n= 61

Notes:

shaded cells not used to caluculate statistics due to questionable meter functionality

Appendix C, Table C-4

MPCA Long Prairie River Watershed TMDL Final Project Report

DO Violations Observed by Todd SWCD in and Near Reaches -503 and -505

Date	TMDL Study Name	Long Prairie R M	Sampled by	Flow at USGS Gage (cfs)	DO (mg/L)	Reach Number
7/27/2000	LPR 83.1	83.1	Todd SWCD	117	4.84	506
8/8/2000	LPR 83.1	83.1	Todd SWCD	102	4.52	506
6/19/2001	LPR 83.1	83.1	Todd SWCD	1590	4.84	506
7/25/2001	LPR 83.1	83.1	Todd SWCD	246	2.01	506
8/6/2001	LPR 83.1	83.1	Todd SWCD	226	3.06	506
8/15/2001	LPR 83.1	83.1	Todd SWCD	179	3.27	506
8/28/2001	LPR 83.1	83.1	Todd SWCD	148	4.66	506
8/26/2002	LPR 83.1	83.1	Todd SWCD	131	4.70	506
		80.9	**Reach 505 upstream end**			
8/6/2001	LPR 79.4	79.4	Todd SWCD	226	4.55	505
8/6/2001	LPR 76.7	76.7	Todd SWCD	226	3.87	505
7/25/2001	LPR 72.6	72.6	Todd SWCD	246	4.50	505
8/6/2001	LPR 72.6	72.6	Todd SWCD	226	4.70	505
7/1/1998	LPR 67.0	67.0	Todd SWCD	328	2.51	505
8/6/2001	LPR 67.0	67.0	Todd SWCD	226	1.84	505
8/15/2001	LPR 67.0	67.0	Todd SWCD	179	3.89	505
6/19/2001	LPR 64.4	64.4	Todd SWCD	1590	4.07	505
7/25/2001	LPR 64.4	64.4	Todd SWCD	246	3.88	505
8/6/2001	LPR 64.4	64.4	Todd SWCD	226	3.65	505
7/1/1998	LPR 56.0	56.0	Todd SWCD	328	3.76	505
6/12/2001	LPR 56.0	56.0	Todd SWCD	440	4.32	505
6/19/2001	LPR 56.0	56.0	Todd SWCD	1590	4.26	505
7/1/1998	LPR 47.8	47.8	Todd SWCD	328	4.71	505
6/12/2001	LPR 47.8	47.8	Todd SWCD	440	4.98	505
6/19/2001	LPR 47.8	47.8	Todd SWCD	1590	4.19	505
7/1/1998	LPR 38.5	38.5	Todd SWCD	328	2.85	505
7/29/1998	LPR 38.5	38.5	Todd SWCD	202	4.52	505
6/5/2001	LPR 38.5	38.5	Todd SWCD	404	3.85	505

Appendix C, Table C-4

MPCA Long Prairie River Watershed TMDL Final Project Report

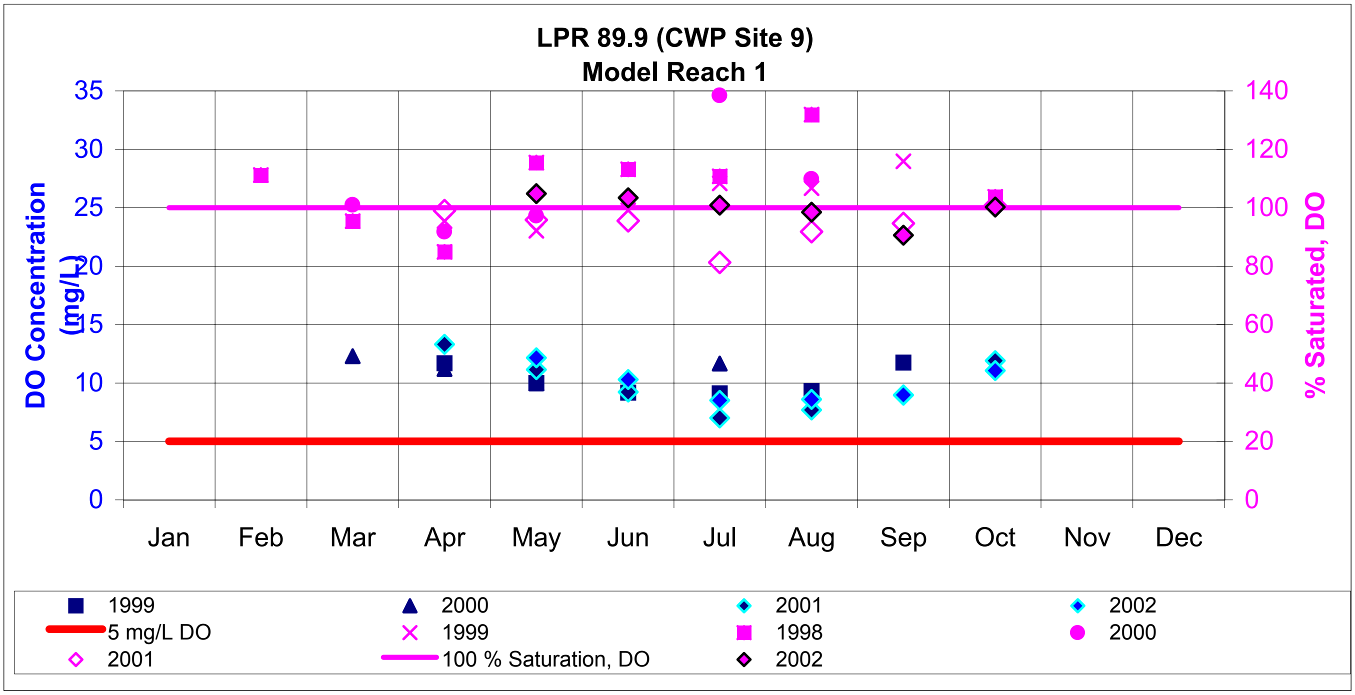
DO Violations Observed by Todd SWCD in and Near Reaches -503 and -505

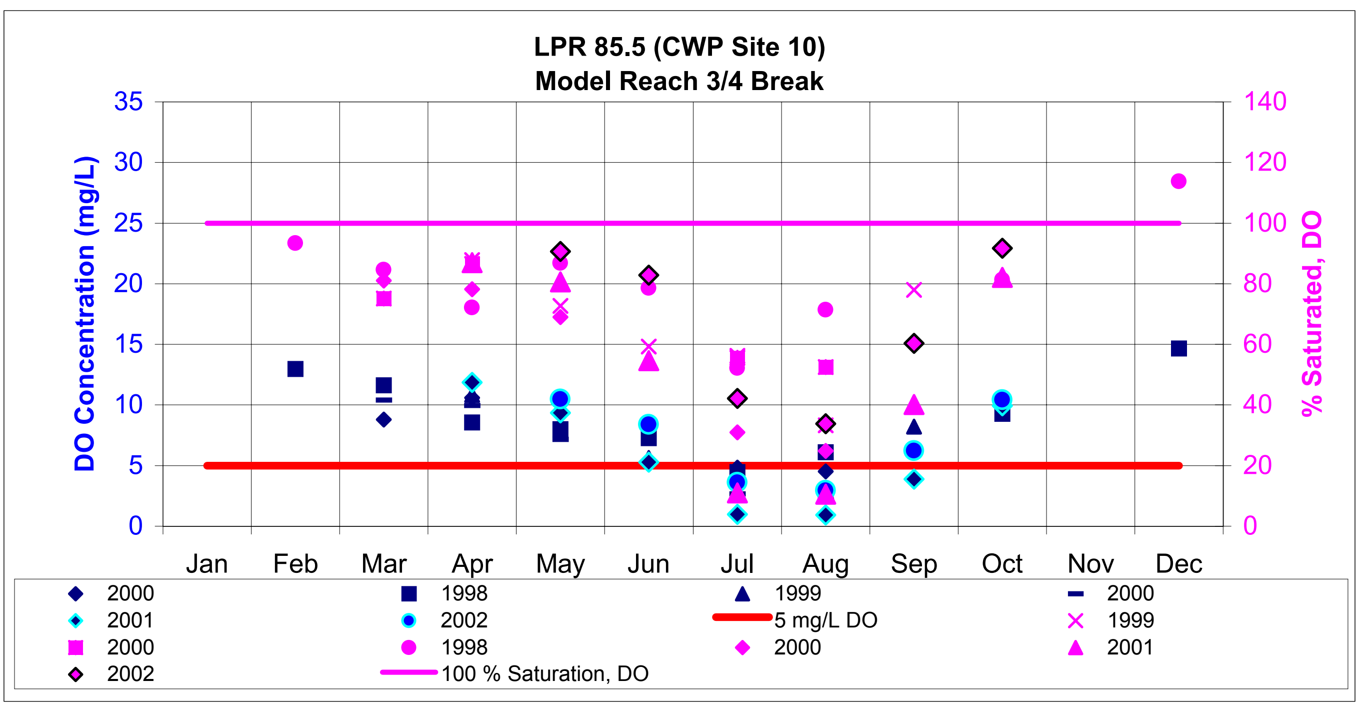
Date	TMDL Study Name	Long Prairie R M	Sampled by	Flow at USGS Gage (cfs)	DO (mg/L)	Reach Number
7/1/1998	LPR 34.2	34.2	Todd SWCD	328	2.35	505
7/7/1998	LPR 34.2	34.2	Todd SWCD	235	3.54	505
7/28/1998	LPR 34.2	34.2	Todd SWCD	227	1.52	505
7/29/1998	LPR 34.2	34.2	Todd SWCD	202	2.61	505
6/15/1999	LPR 34.2	34.2	Todd SWCD	410	4.98	505
6/5/2001	LPR 34.2	34.2	Todd SWCD	404	3.65	505
6/5/2001	LPR 34.2	34.2	Todd SWCD	404	4.33	505
6/12/2001	LPR 34.2	34.2	Todd SWCD	440	3.28	505
6/19/2001	LPR 34.2	34.2	Todd SWCD	1590	3.72	505
7/3/2001	LPR 34.2	34.2	Todd SWCD	466	3.46	505
		33.6	**Reach 505 downstream end**			
7/1/1998	LPR 21.1	21.1	Todd SWCD	328	2.30	504
7/29/1998	LPR 21.1	21.1	Todd SWCD	202	0.94	504
6/24/1999	LPR 21.1	21.1	Todd SWCD	257	4.96	504
8/17/1999	LPR 21.1	21.1	Todd SWCD	197	4.85	504
6/12/2001	LPR 21.1	21.1	Todd SWCD	440	3.62	504
7/3/2001	LPR 21.1	21.1	Todd SWCD	466	3.66	504
6/19/2001	LPR 21.1	21.1	Todd SWCD	1590	3.42	504
7/24/2002	T LPR 20.8	20.8	Todd SWCD	243	1.92	Turtle Ck
7/7/1998	T LPR 20.8	20.8	Todd SWCD	235	2.45	Turtle Ck
7/28/1998	T LPR 20.8	20.8	Todd SWCD	227	2.94	Turtle Ck
8/6/1998	T LPR 20.8	20.8	Todd SWCD	154	4.75	Turtle Ck
6/19/2001	T LPR 20.8	20.8	Todd SWCD	1590	4.64	Turtle Ck
7/3/2001	T LPR 20.8	20.8	Todd SWCD	466	3.63	Turtle Ck
		20.8	**Reach 503 upstream end**			
7/1/1998	LPR 18.2	18.2	Todd SWCD	328	3.19	503
7/29/1998	LPR 18.2	18.2	Todd SWCD	202	1.17	503
8/6/1998	LPR 18.2	18.2	Todd SWCD	154	4.63	503
		15.8	**Reach 503 downstream end**			
7/1/1998	LPR 15.3	15.3	Todd SWCD	328	3.93	502
7/29/1998	LPR 15.3	15.3	Todd SWCD	202	2.25	502
Count				**55**	**55**	
Minimum				**102**	**0.94**	
Maximum				**1590**	**4.98**	
Median				**246**	**3.76**	

Appendix C Figure C-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Phase II

Average* Monthly Dissolved Oxygen and Percent Saturation at CWP Sites
(On-going Monitoring by Todd SWCD)



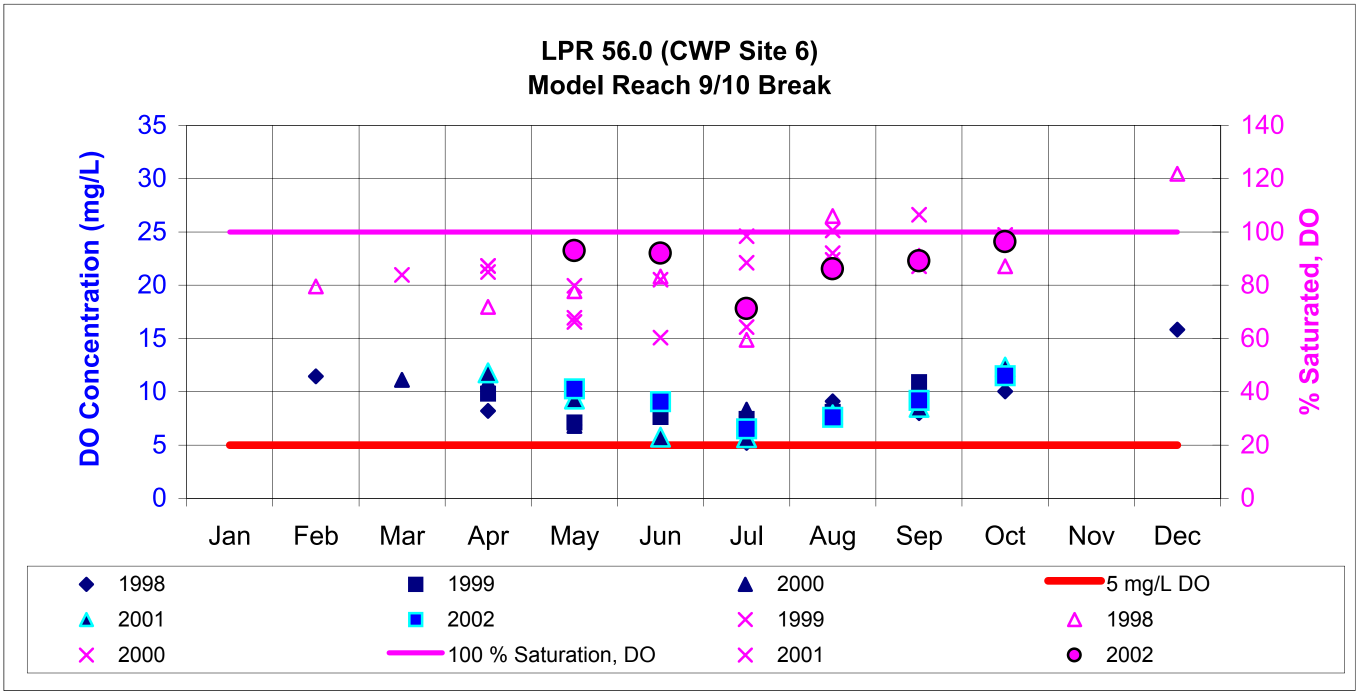


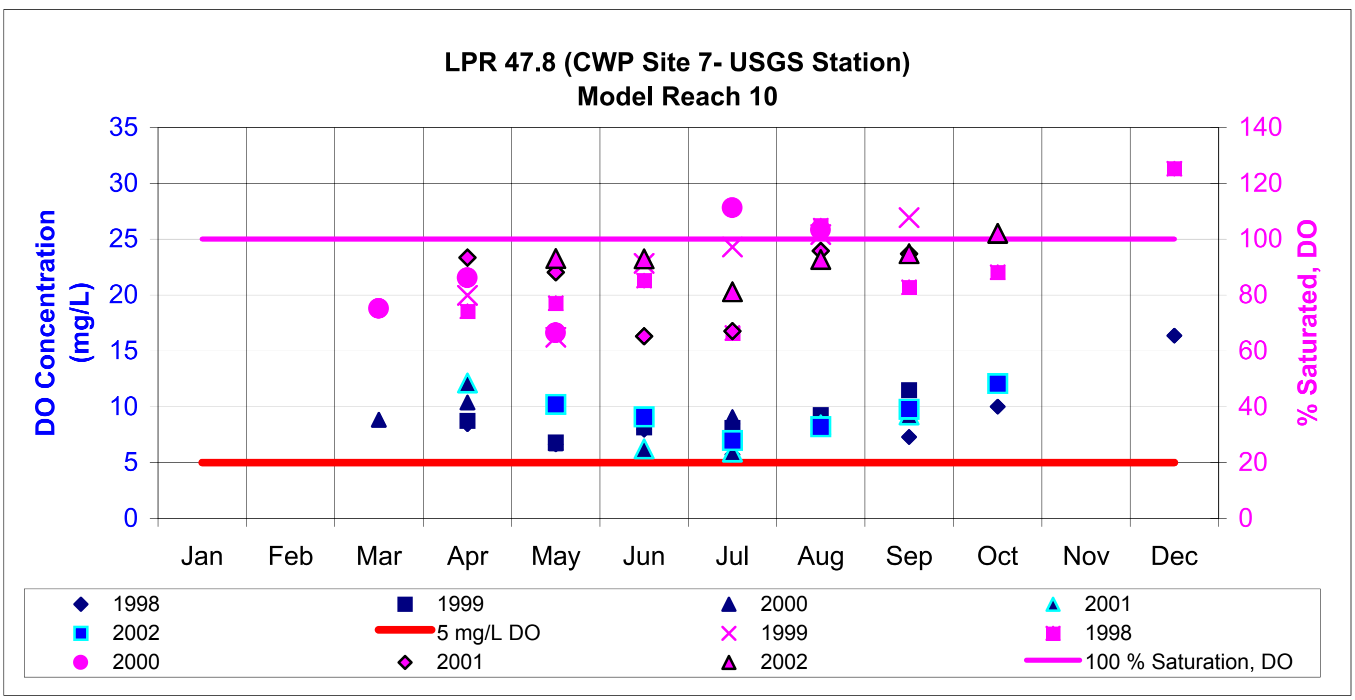
*Averages typically represent between one and four data points.

Appendix C Figure C-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Phase II

Average* Monthly Dissolved Oxygen and Percent Saturation at CWP Sites
(On-going Monitoring by Todd SWCD)



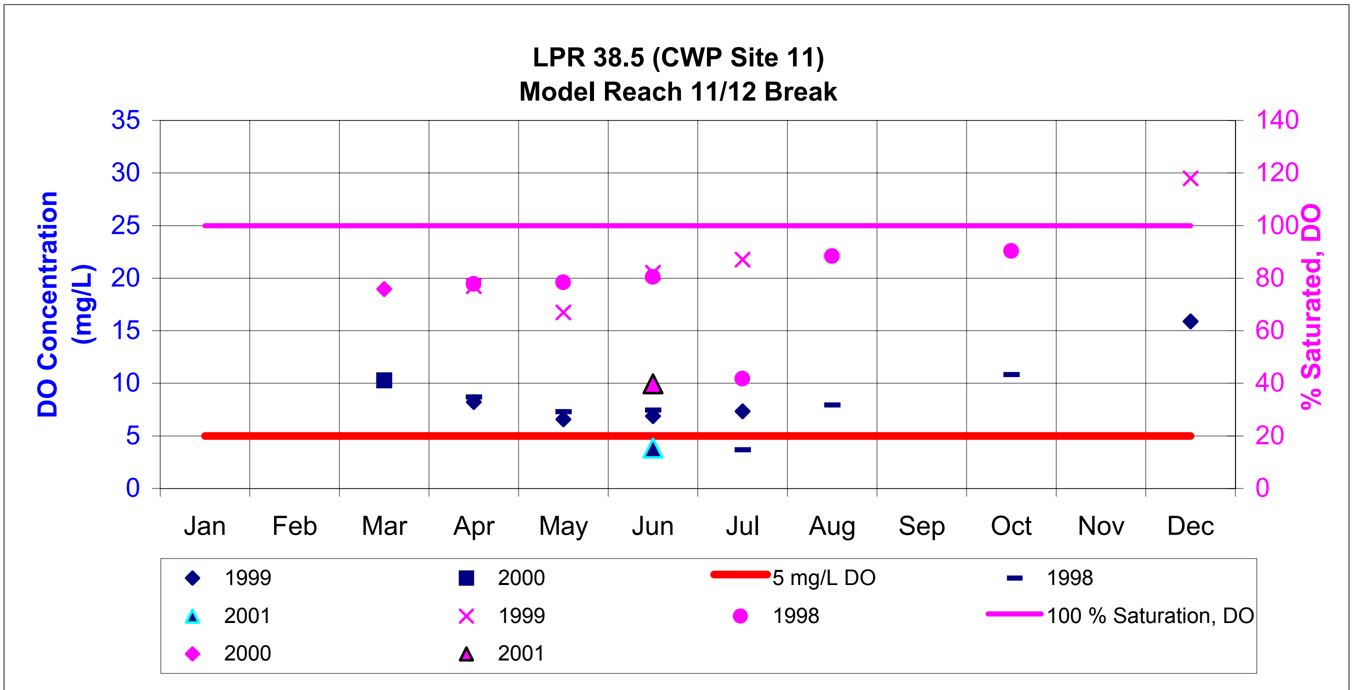


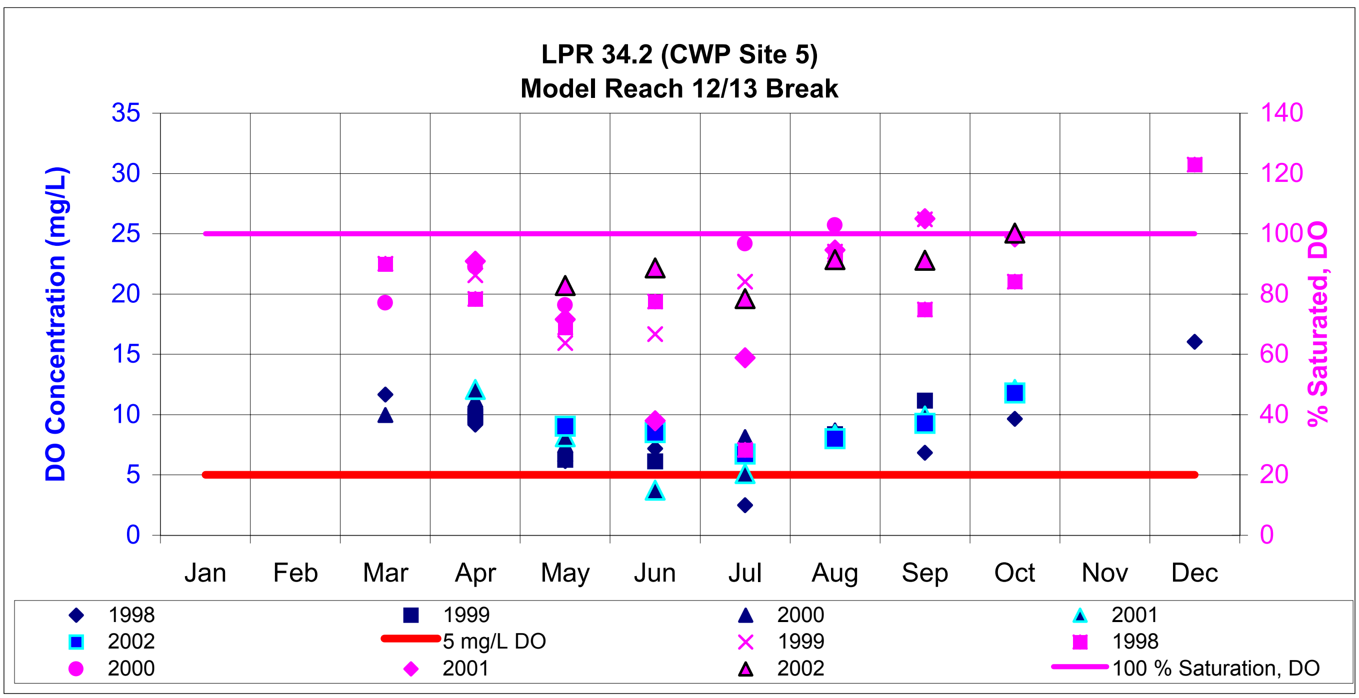
*Averages typically represent between one and four data points.

Appendix C Figure C-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Phase II

Average* Monthly Dissolved Oxygen and Percent Saturation at CWP Sites
(On-going Monitoring by Todd SWCD)



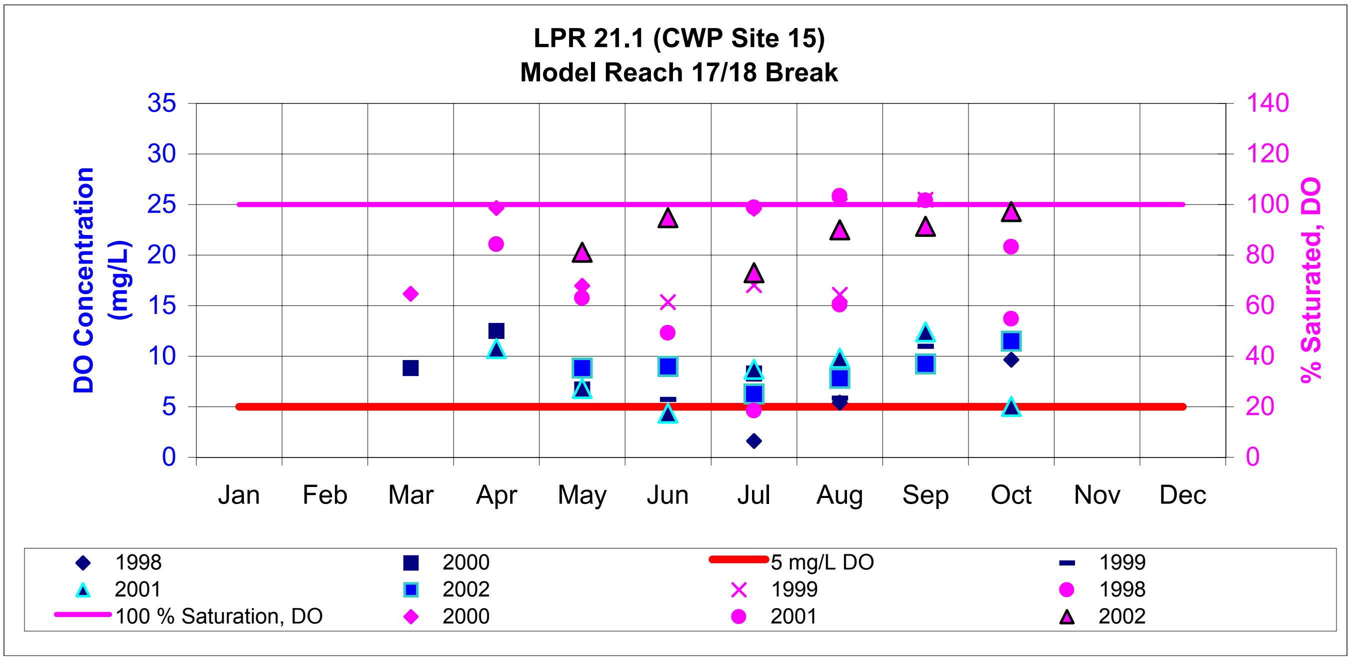


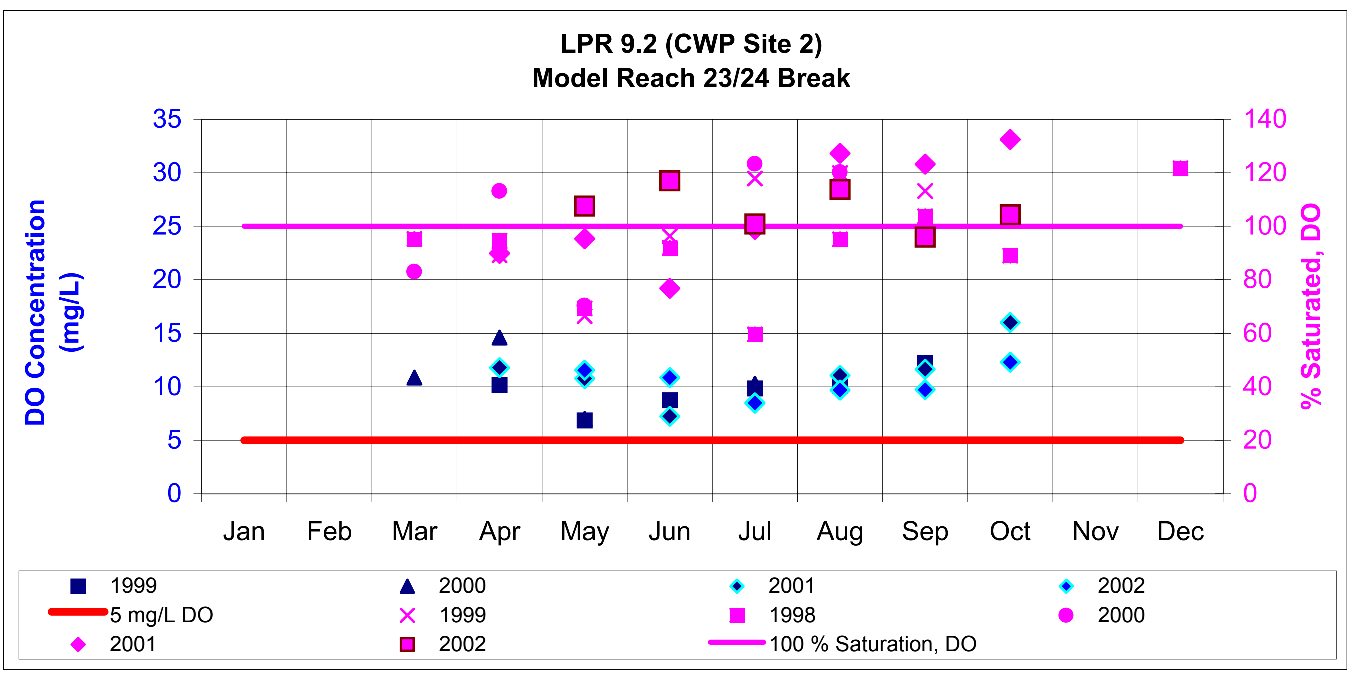
*Averages typically represent between one and four data points.

Appendix C Figure C-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Phase II

Average* Monthly Dissolved Oxygen and Percent Saturation at CWP Sites
(On-going Monitoring by Todd SWCD)



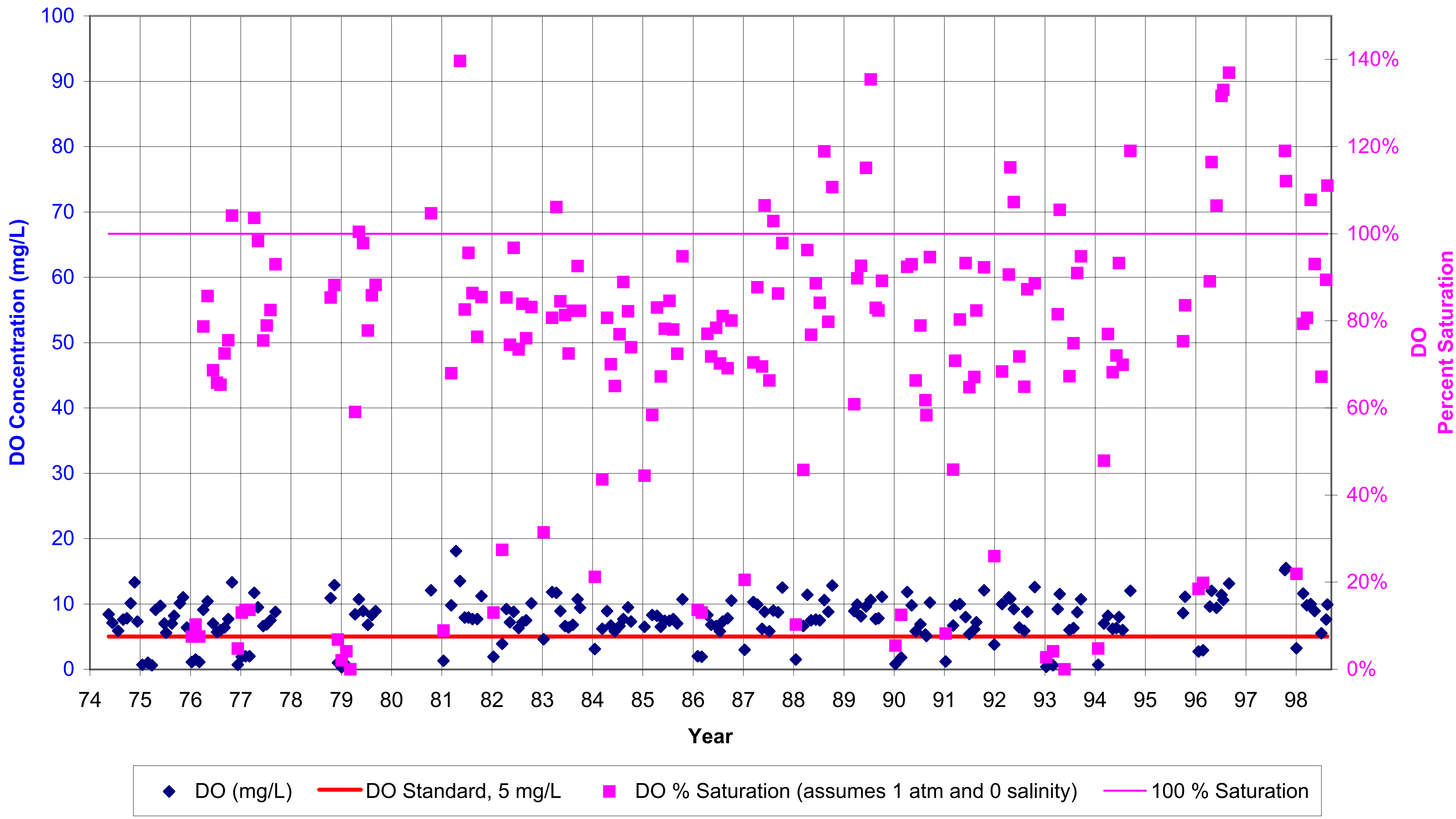


*Averages typically represent between one and four data points.

Appendix C Figure C-2

MPCA Long Prairie River Watershed TMDL Project: Final Project Report

Dissolved Oxygen and Percent Saturation at LPR 3.2 in Motley 1974-1998

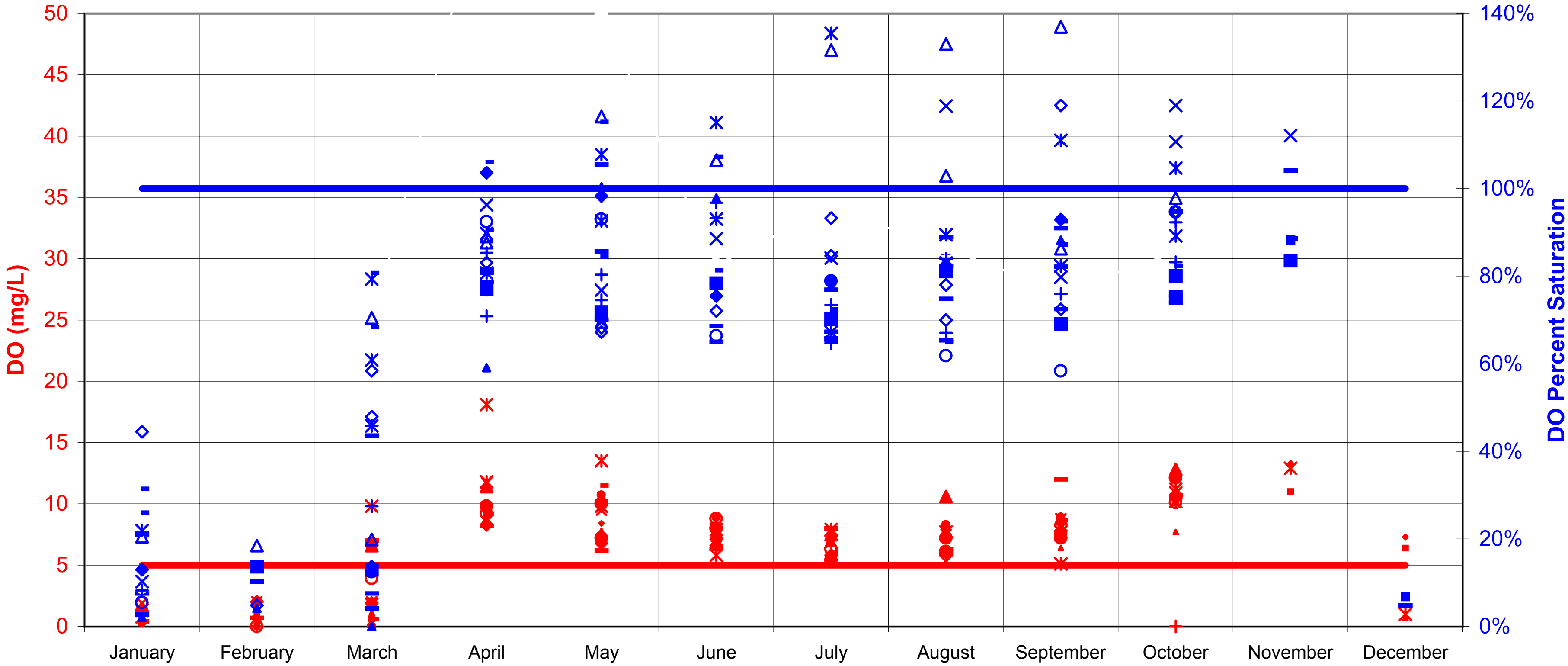


Appendix C Figure C-3

MPCA Long Prairie River Watershed TMDL Project: Final Project Report

Monthly Dissolved Oxygen and Percent Saturation at LPR 3.2 in Motley 1974-1998

Note: DO and percent saturation values were recorded once per month at various times of day at LPR-3 in Motley.
Diurnal fluctuations in DO and percent saturation are not accounted for in this data set.



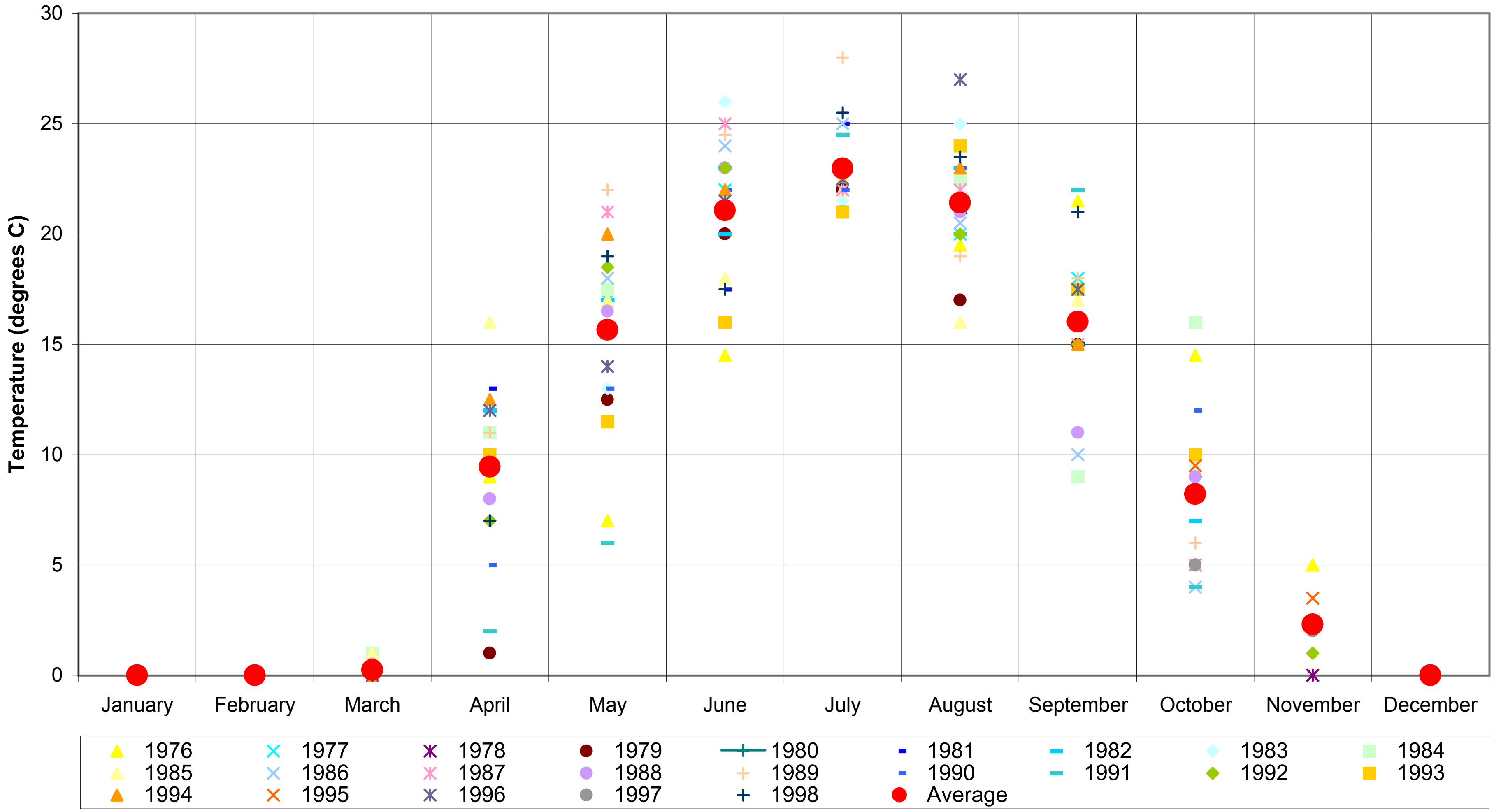
Blue values represent DO saturation, Red values represent DO Concentration in mg/L.

Appendix C Figure C-4

MPCA Long Prairie River Watershed TMDL Project: Final Project Report

Monthly Temperature Summary for LPR 3.2 in Motley 1976-1998

Note: Temperature values were recorded once per month at various times of day at LPR-3 in Motley.
Diurnal fluctuations in temperature are not accounted for in this data set.

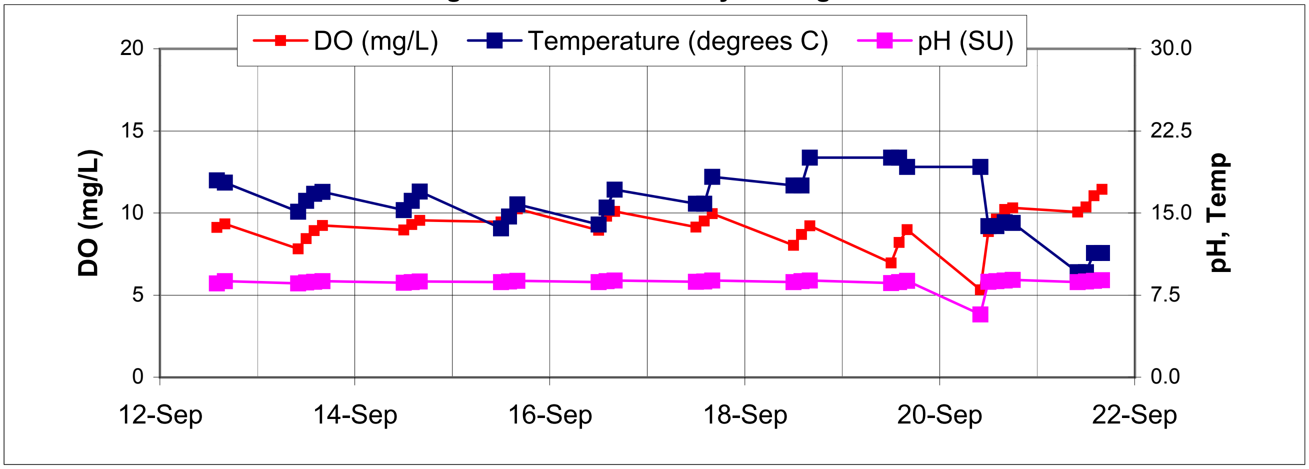


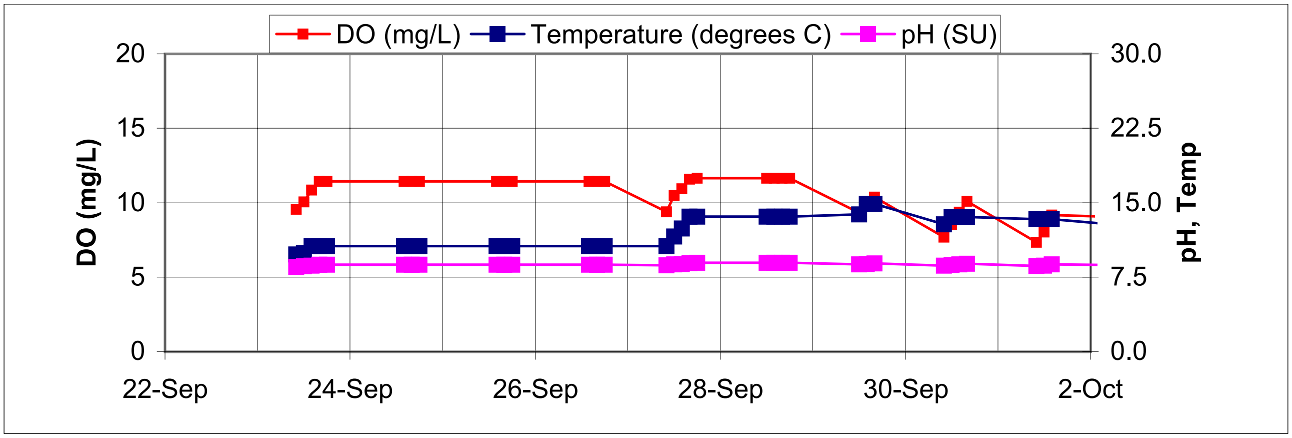
Appendix C Figure C-5a

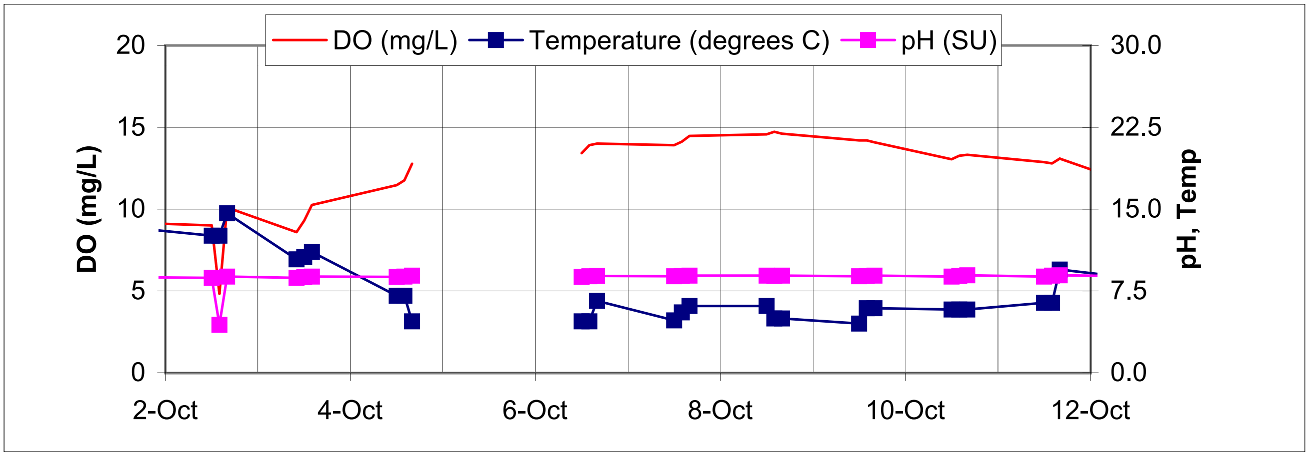
MPCA Long Prairie River Watershed TMDL Final Project Report

Diurnal DO Concentrations, pH, and Temperature at LPR 49.3 by MPCA September to November 2000

Note: Between one and five readings were recorded daily at irregular intervals.





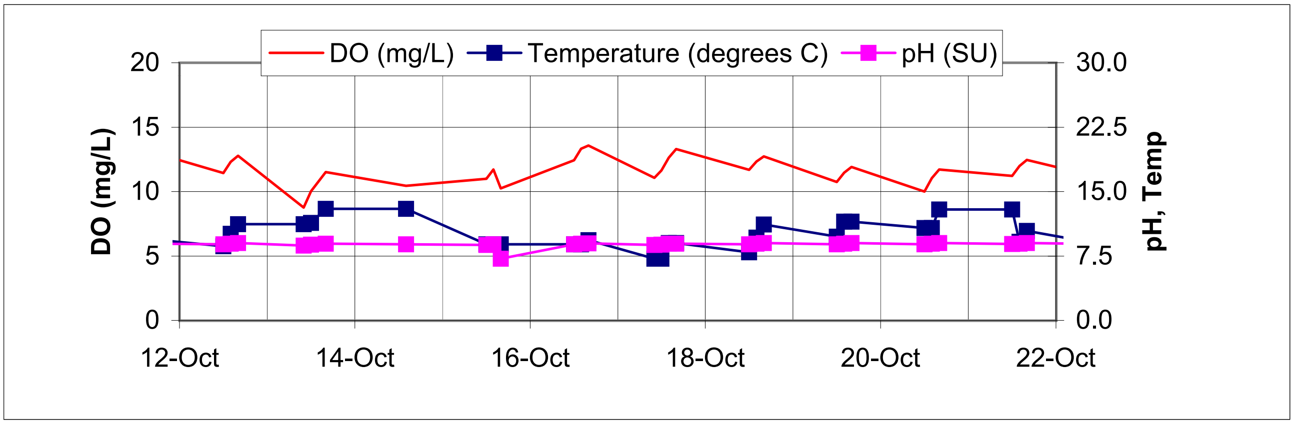


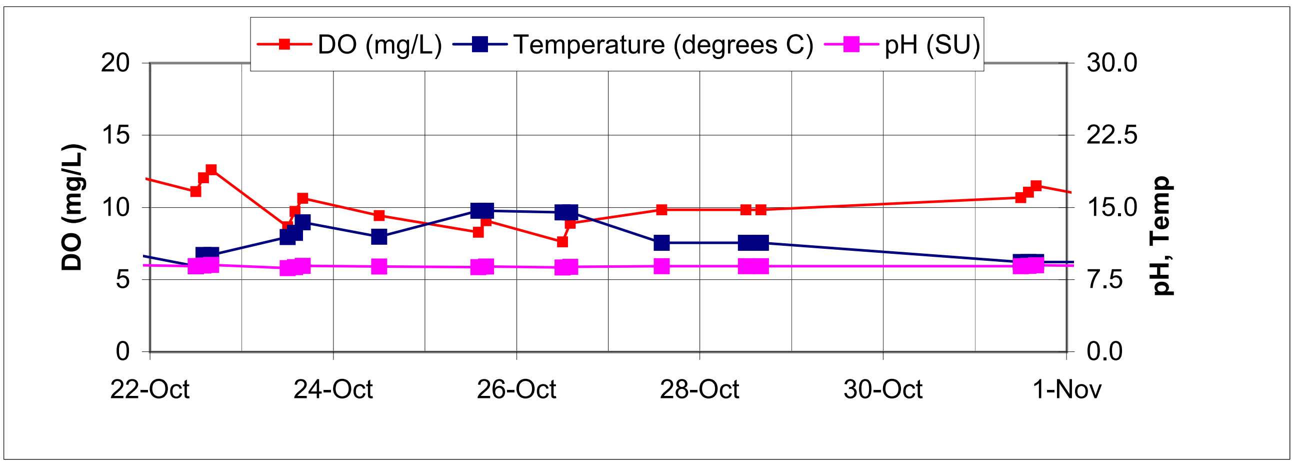
Appendix C Figure C-5a

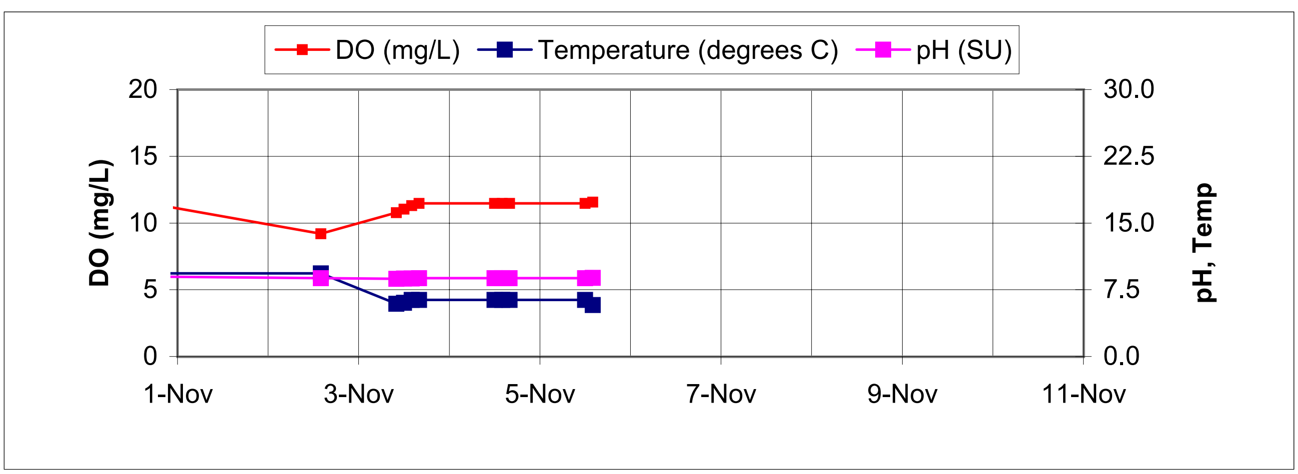
MPCA Long Prairie River Watershed TMDL Final Project Report

Diurnal DO Concentrations, pH, and Temperature at LPR 49.3 by MPCA September to November 2000

Note: Between one and five readings were recorded daily at irregular intervals.





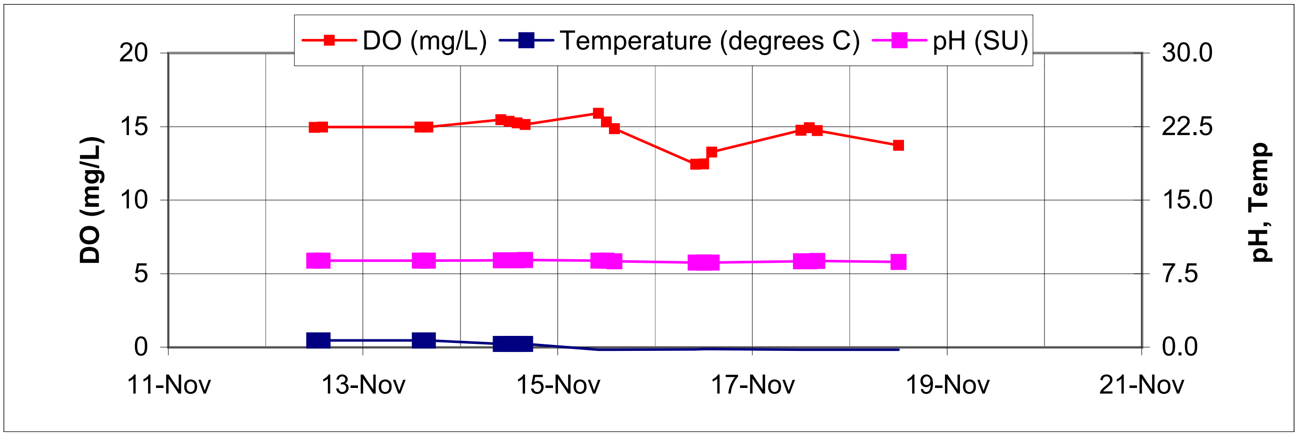


Appendix C Figure C-5a

MPCA Long Prairie River Watershed TMDL Final Project Report

Diurnal DO Concentrations, pH, and Temperature at LPR 49.3 by MPCA September to November 2000

Note: Between one and five readings were recorded daily at irregular intervals.

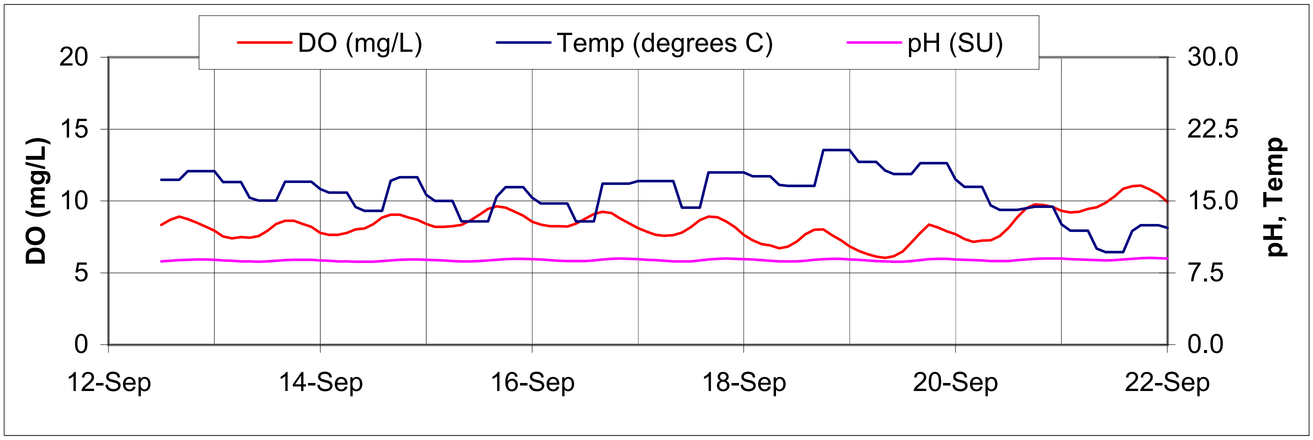


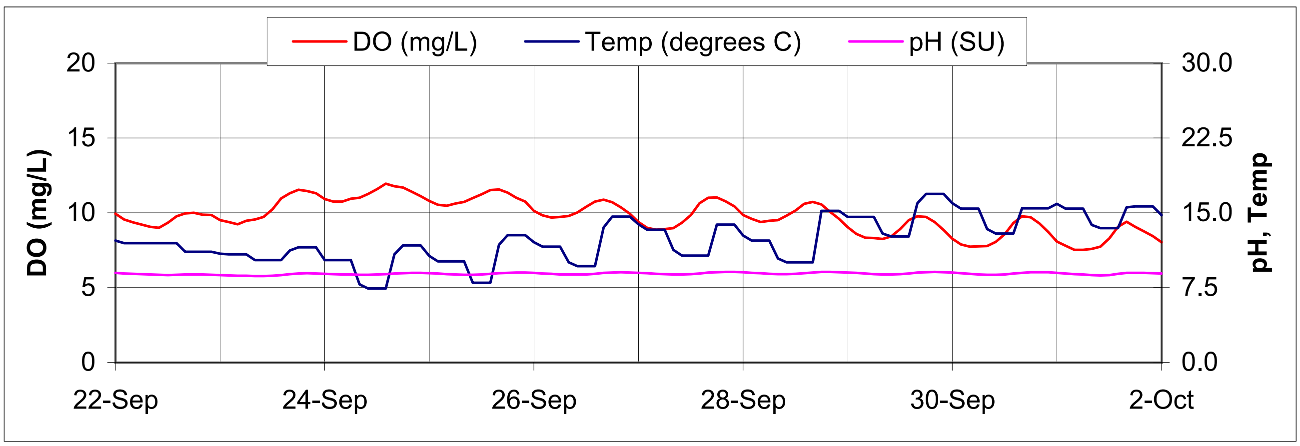
Appendix C Figure C-5b

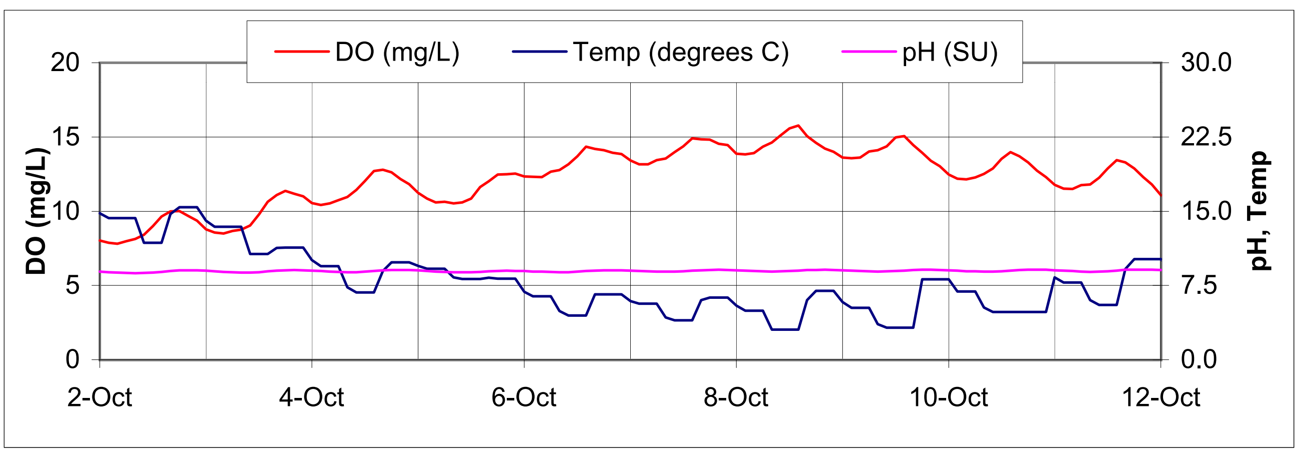
MPCA
Long Prairie River Watershed TMDL Final Project Report

Diurnal DO Concentrations, pH, and Temperature at LPR 47.2
September to November 2000

Note: Readings recorded every two hours.





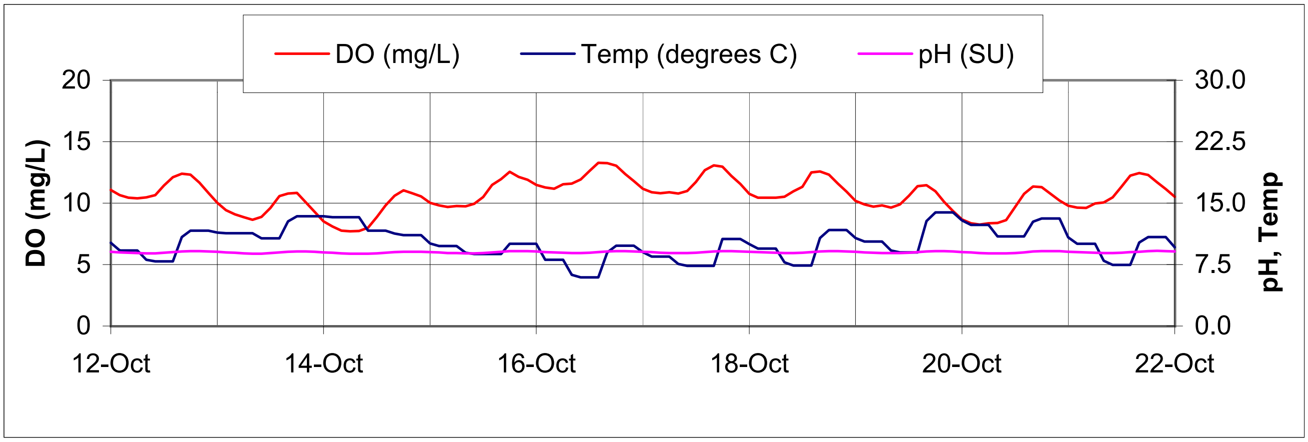


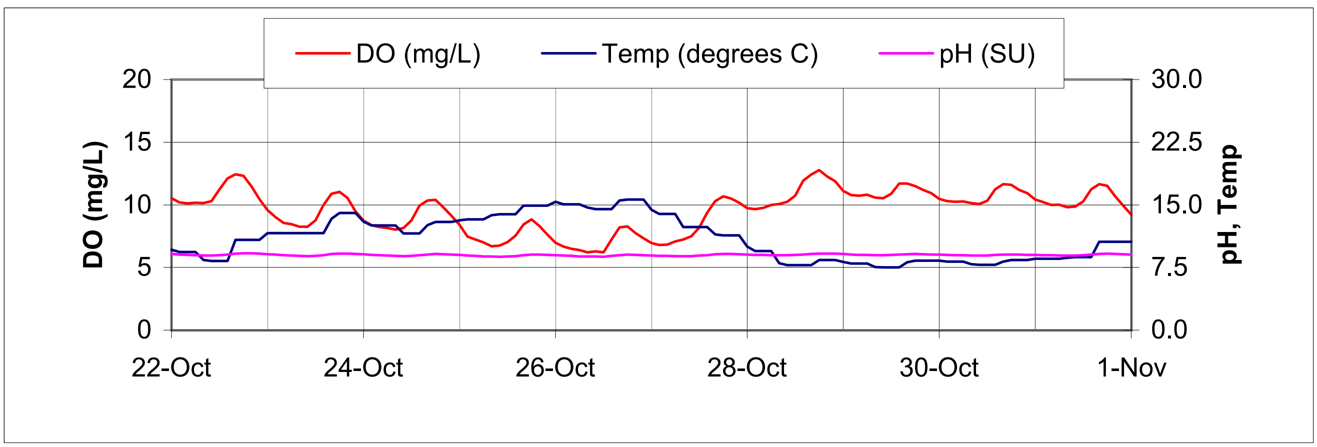
Appendix C Figure C-5b

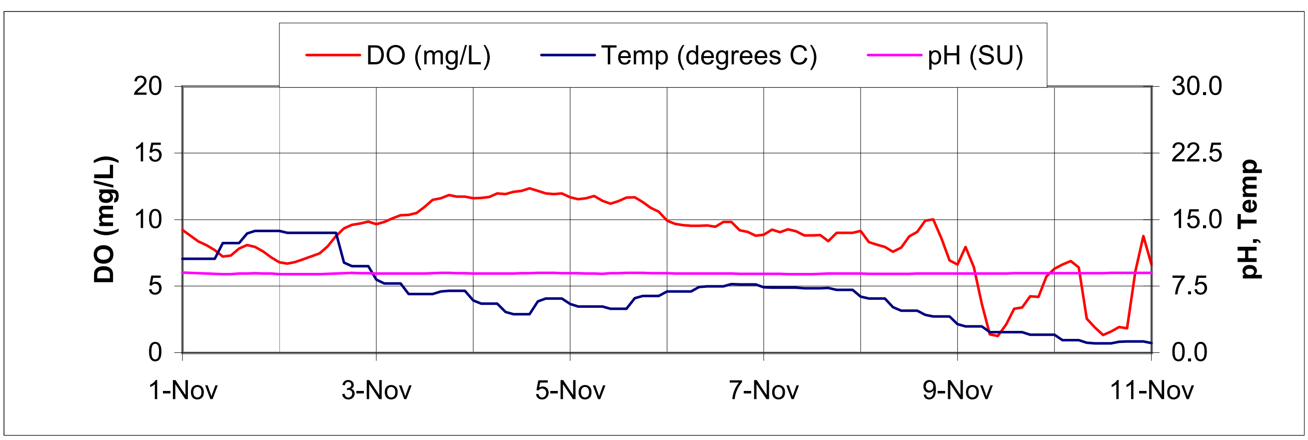
MPCA
Long Prairie River Watershed TMDL Final Project Report

Diurnal DO Concentrations, pH, and Temperature at LPR 47.2
September to November 2000

Note: Readings recorded every two hours.





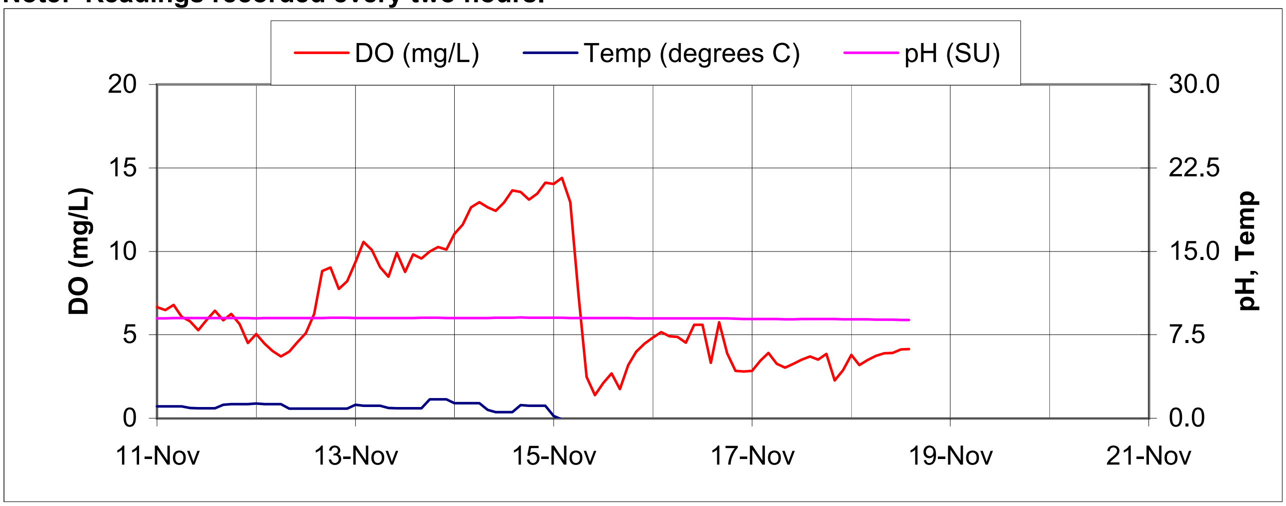


Appendix C Figure C-5b

MPCA
Long Prairie River Watershed TMDL Final Project Report

Diurnal DO Concentrations, pH, and Temperature at LPR 47.2
September to November 2000

Note: Readings recorded every two hours.

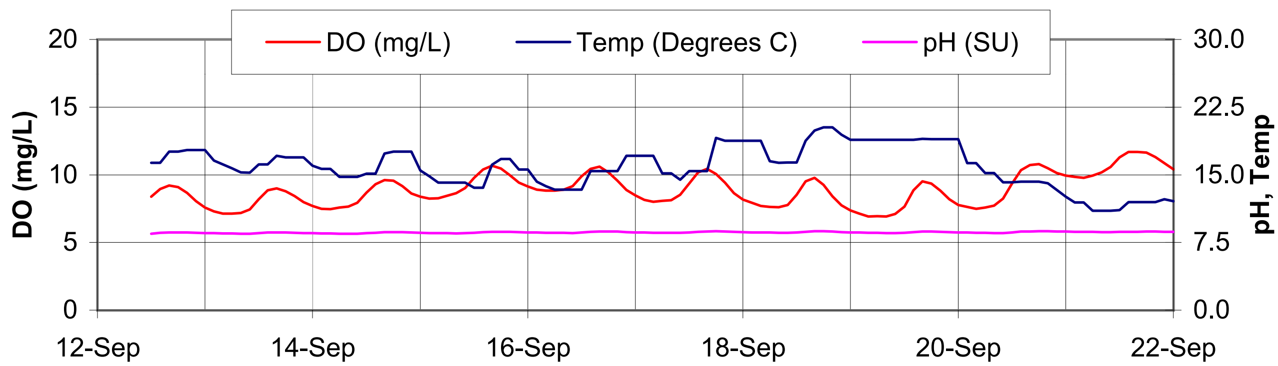


Appendix C Figure C-5c

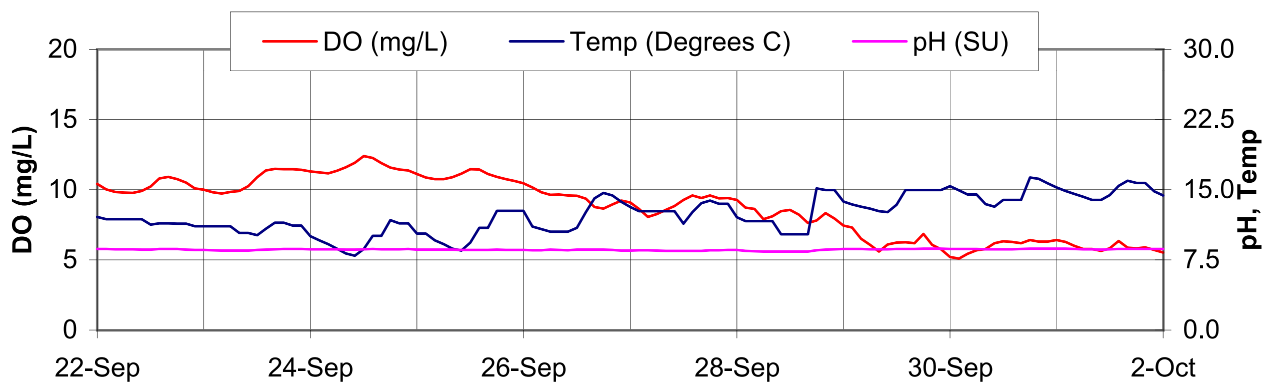
MPCA Long Prairie River Watershed TMDL Final Project Report

Diurnal DO Concentrations, pH, and Temperature
at LPR 42.2

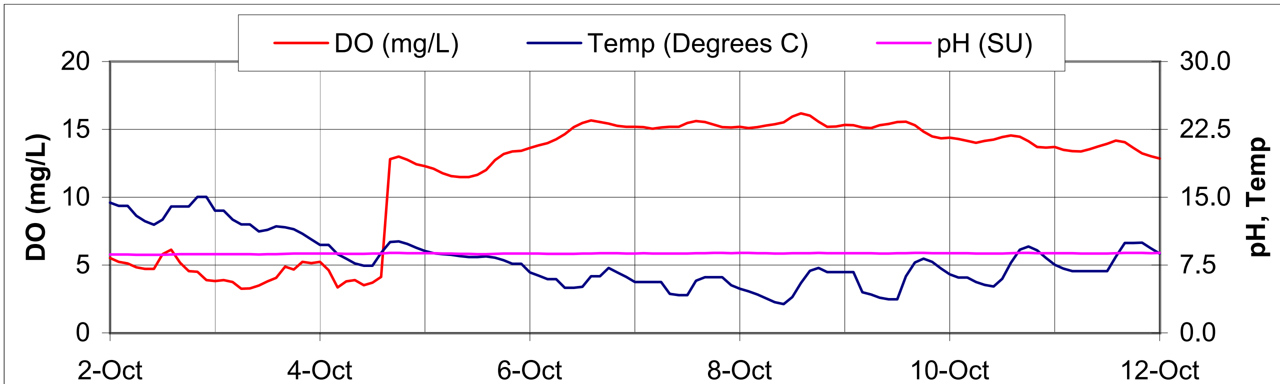
Note: Readings recorded every two hours.



Data prior to 10/4/00 potentially bad.



Data prior to 10/4/00 potentially bad.



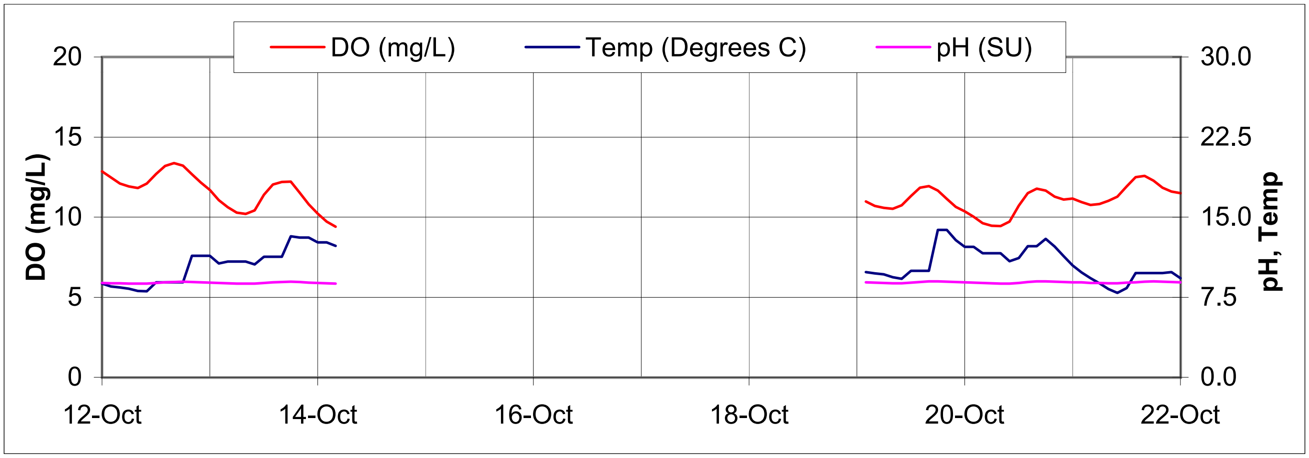
Data prior to 10/4/00 potentially bad.

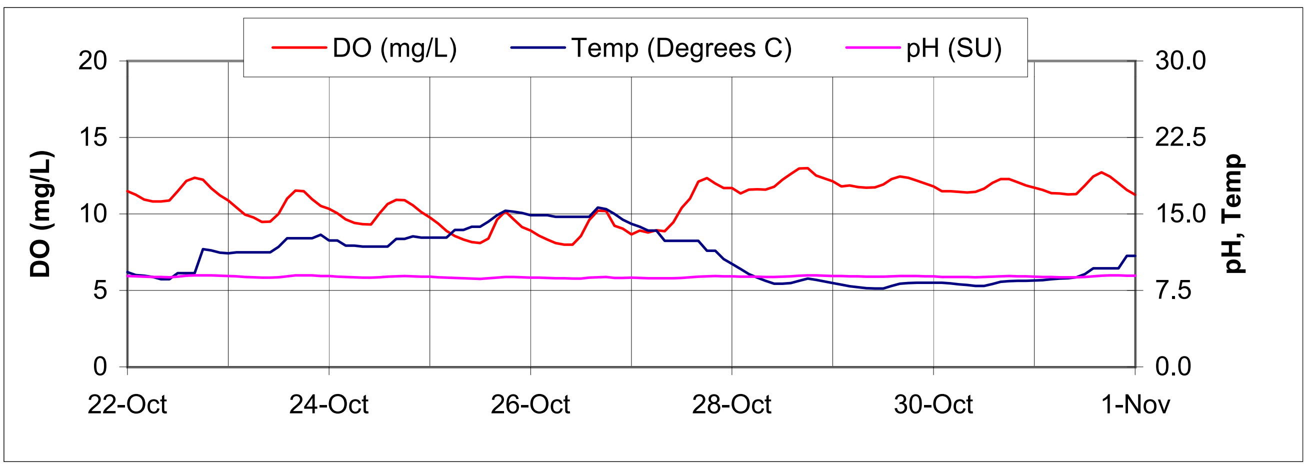
Appendix C Figure C-5c

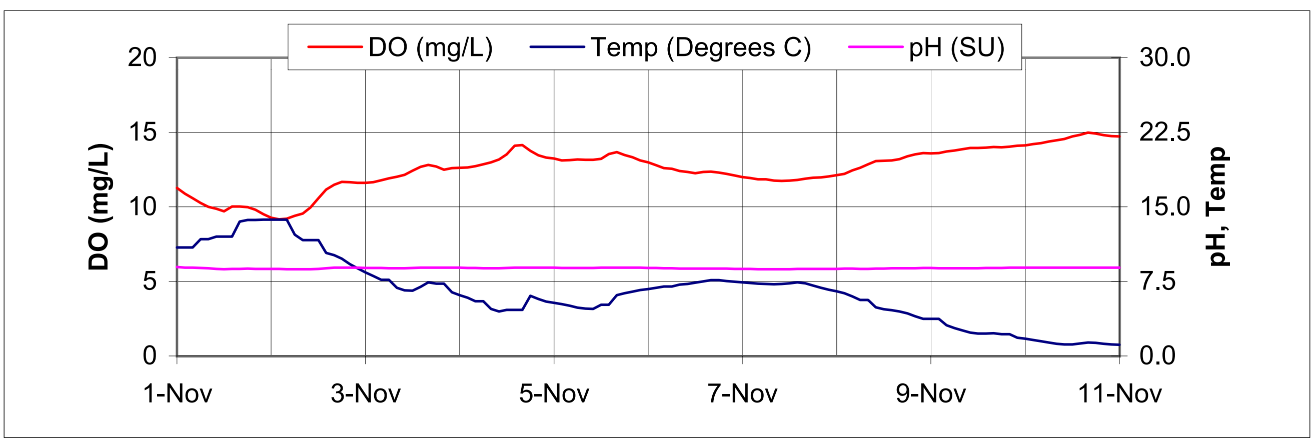
MPCA Long Prairie River Watershed TMDL Final Project Report

Diurnal DO Concentrations, pH, and Temperature at LPR 42.2

Note: Readings recorded every two hours.





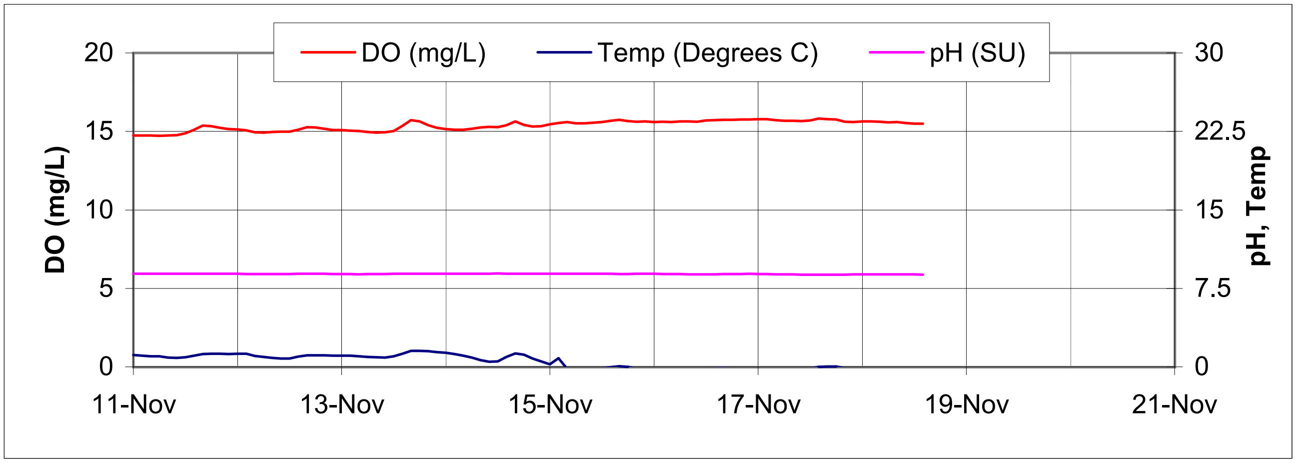


Appendix C Figure C-5c

MPCA Long Prairie River Watershed TMDL Final Project Report

Diurnal DO Concentrations, pH, and Temperature at LPR 42.2

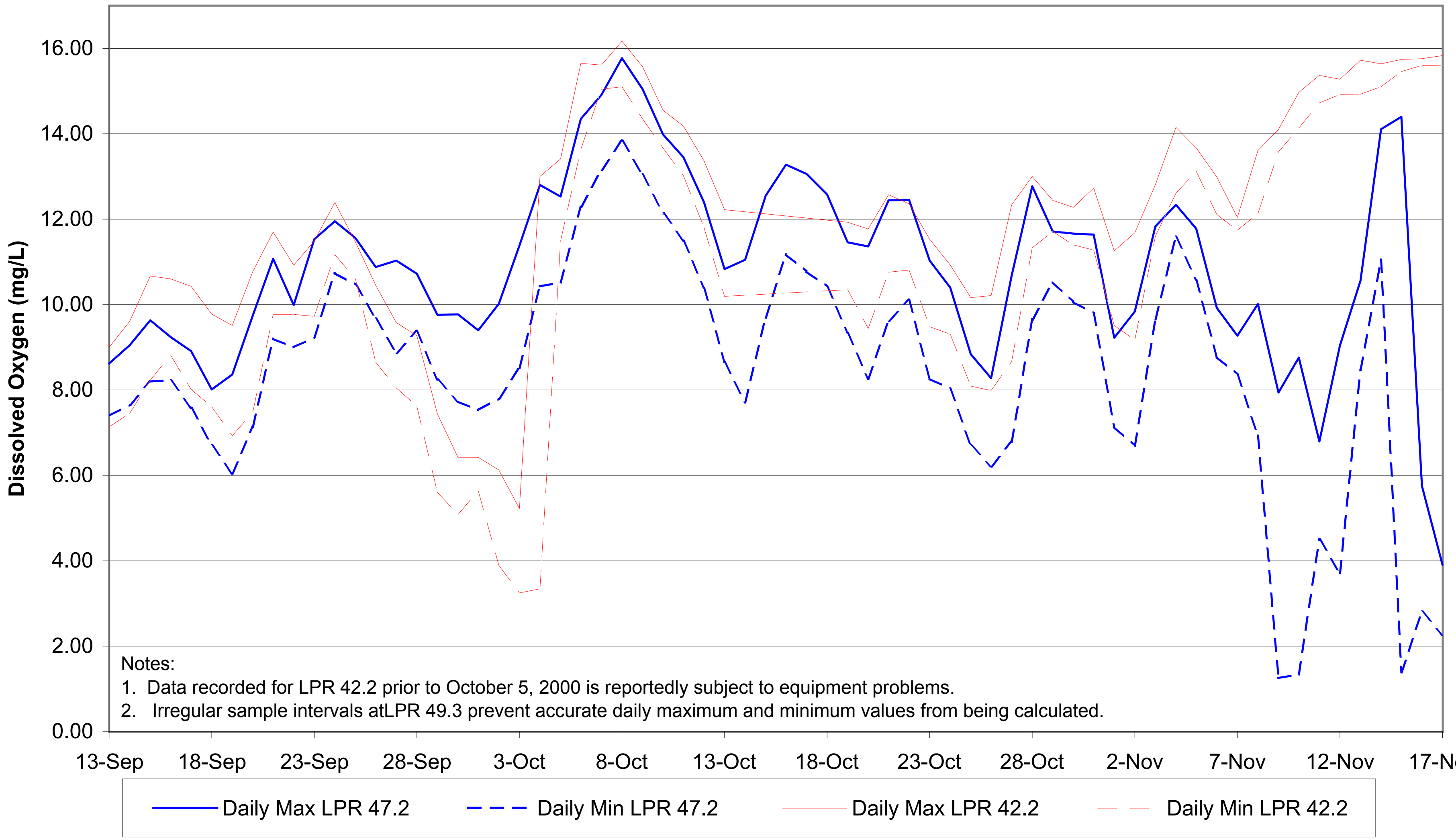
Note: Readings recorded every two hours.



Appendix C Figure C-6

MPCA Long Prairie River Watershed TMDL Final Project Report

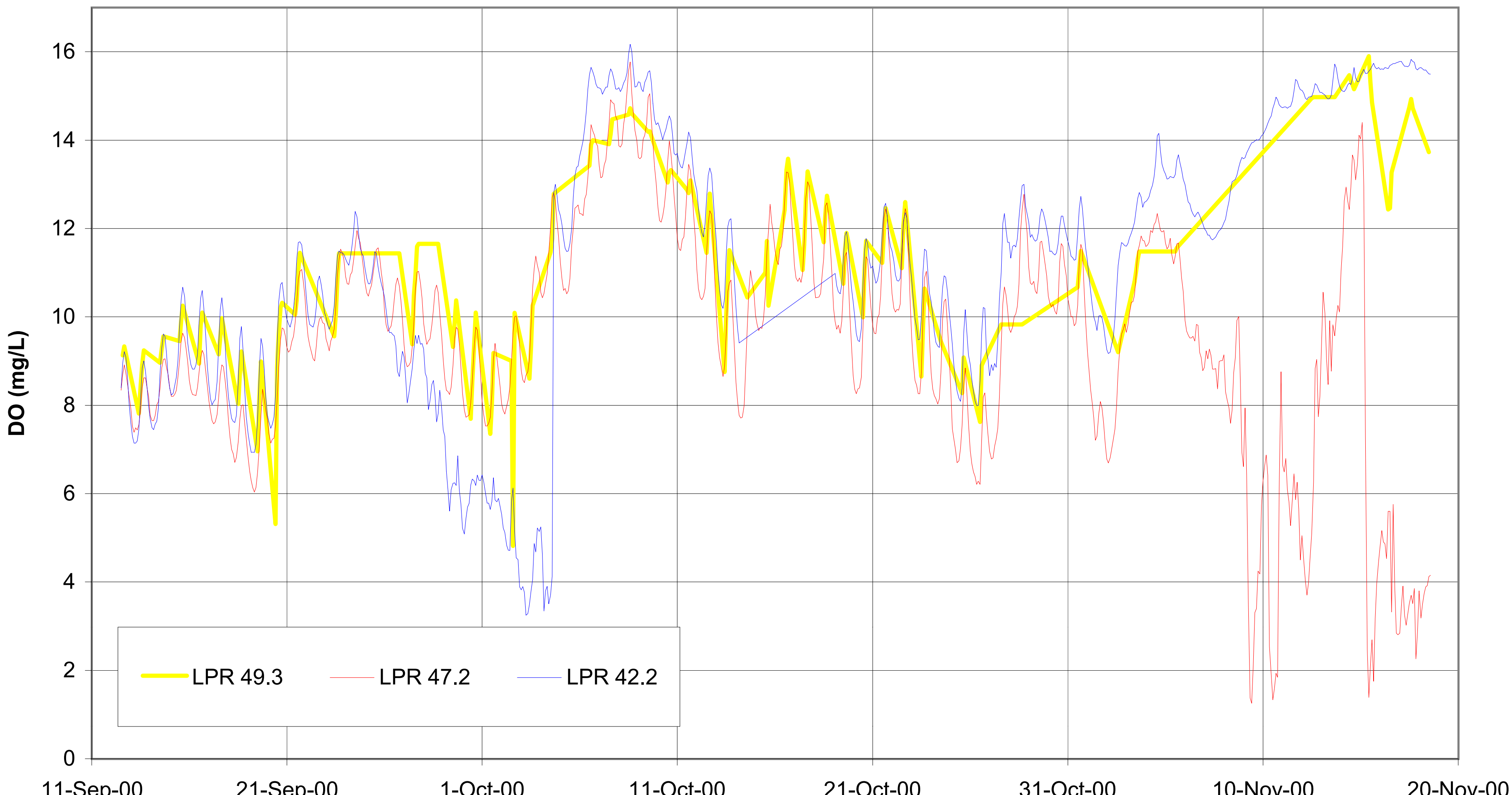
Daily Maximum and Minimum DO Concentrations at LPR 47.2 and LPR 42.2



Appendix C Figure C-7

MPCA Long Prairie River Watershed TMDL Final Project Report

Comparison of Continuous DO Concentrations at LPR 49.3, LPR 47.2, and LPR 42.2



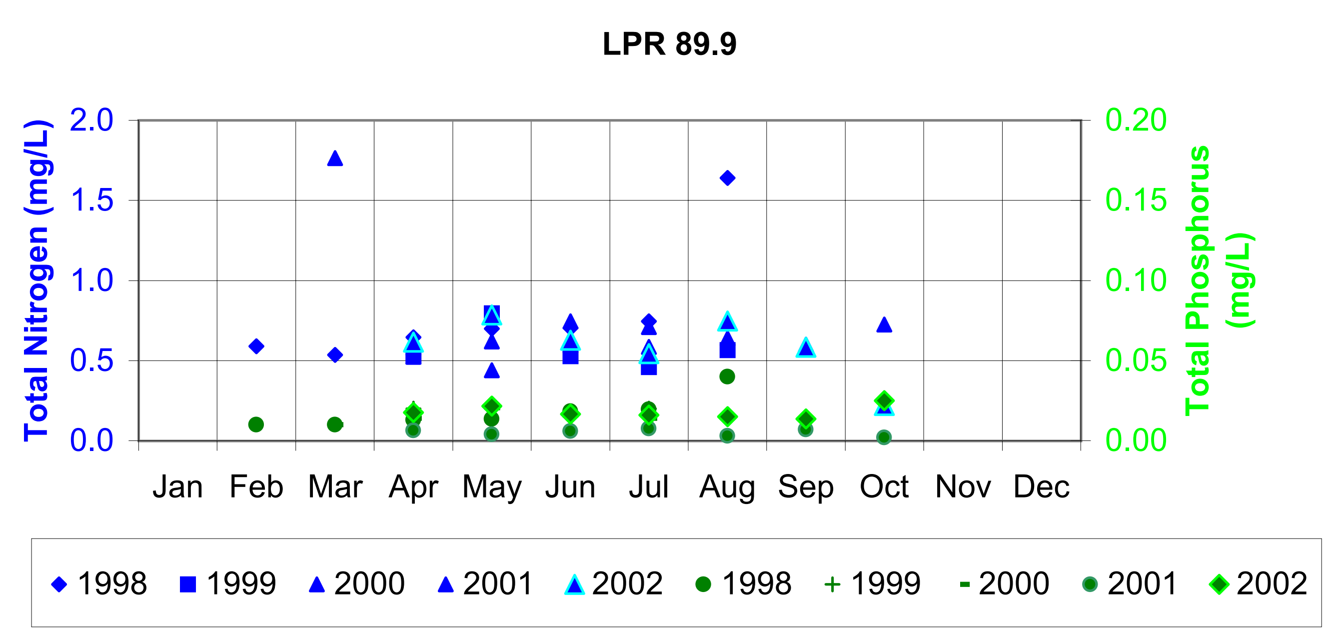
Notes:
1. Equipment difficulties were reported at LPR 42.2 prior to October 5, 2000.
2. Irregular sample interval at LPR 49.3 complicates a comparison of these data.

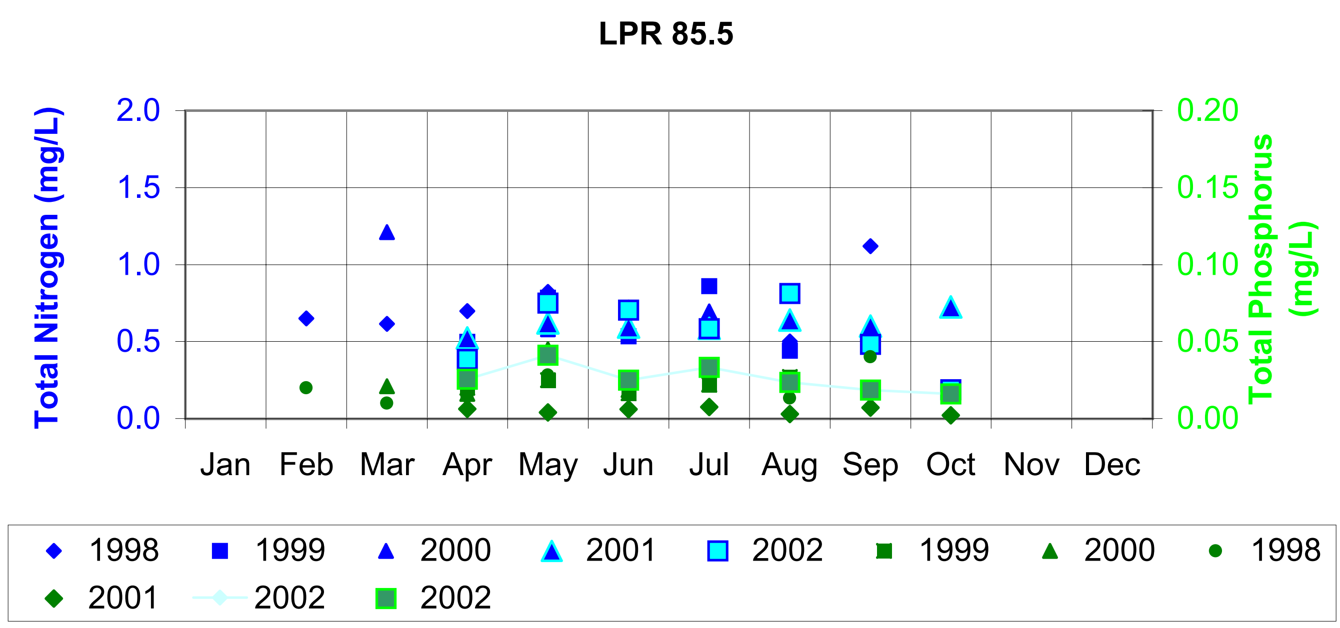
Appendix C Figure C-8

MPCA Long Prairie River Watershed TMDL Final Project Report

Average* Monthly Total Phosphorus and Total Nitrogen Concentrations at CWP Sites (On-going Monitoring by Todd SWCD)

* Averages typically represent one to four data points.





Total phosphorus values are represented in **green**. **Total nitrogen** values are represented in **blue**.

Appendix C Figure C-8

MPCA Long Prairie River Watershed TMDL Final Project Report

Average* Monthly Total Phosphorus and Total Nitrogen Concentrations at CWP Sites (On-going Monitoring by Todd SWCD)

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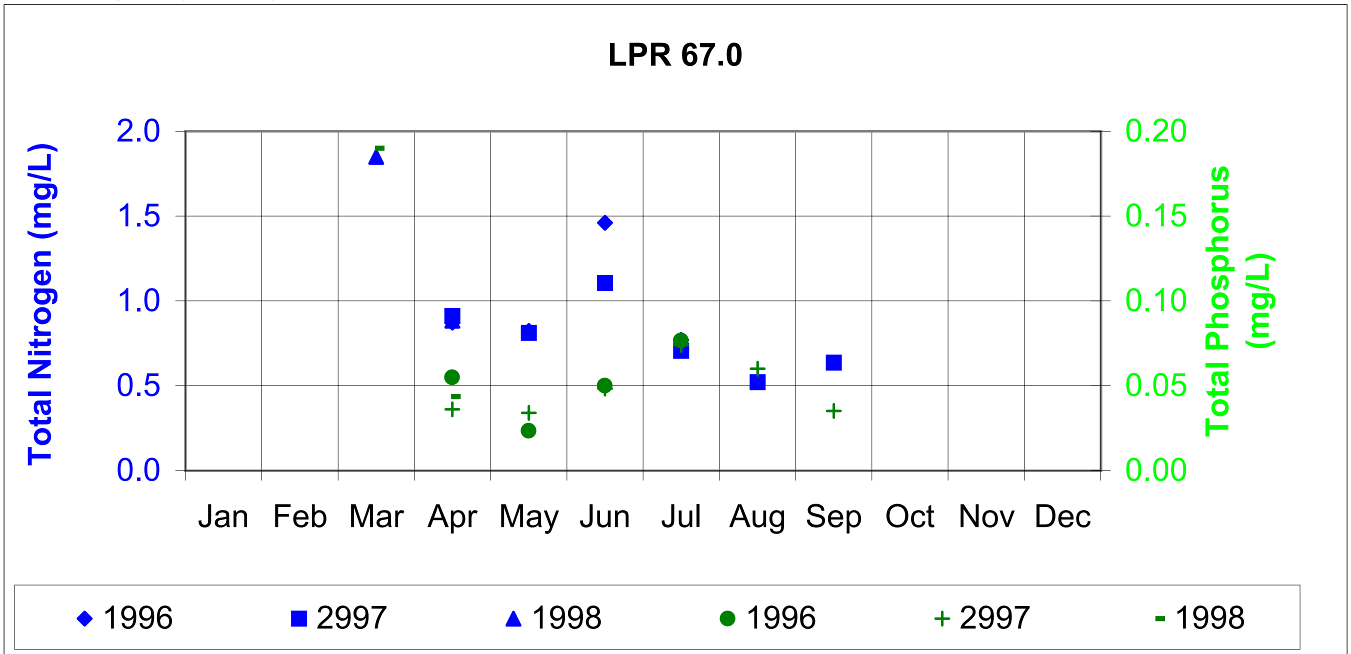

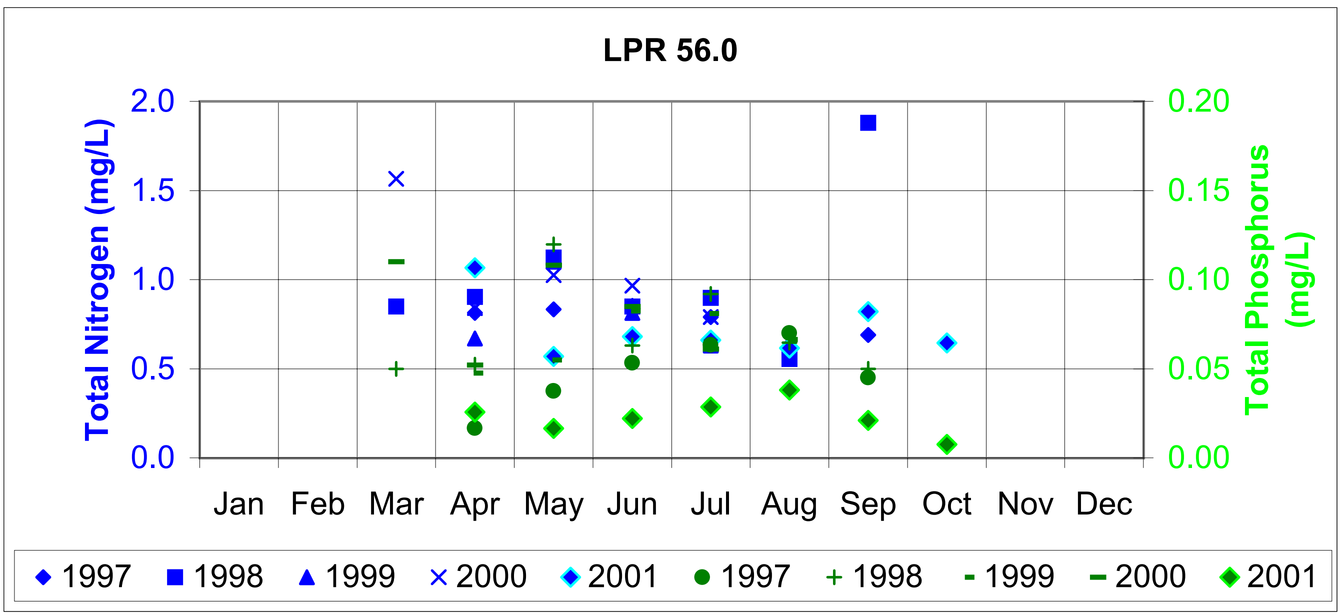

Total phosphorus values are represented in **green**. **Total nitrogen** values are represented in **blue**.

Appendix C Figure C-8

MPCA Long Prairie River Watershed TMDL Final Project Report

Average* Monthly Total Phosphorus and Total Nitrogen Concentrations at CWP Sites (On-going Monitoring by Todd SWCD)

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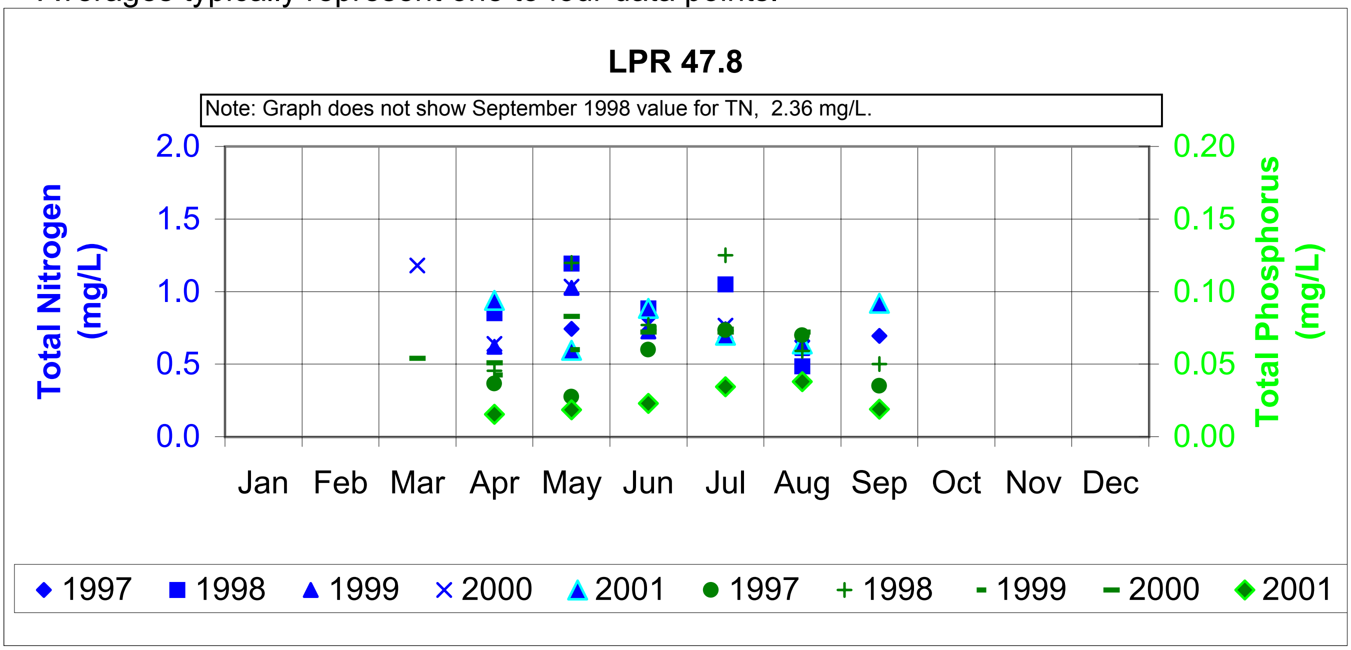

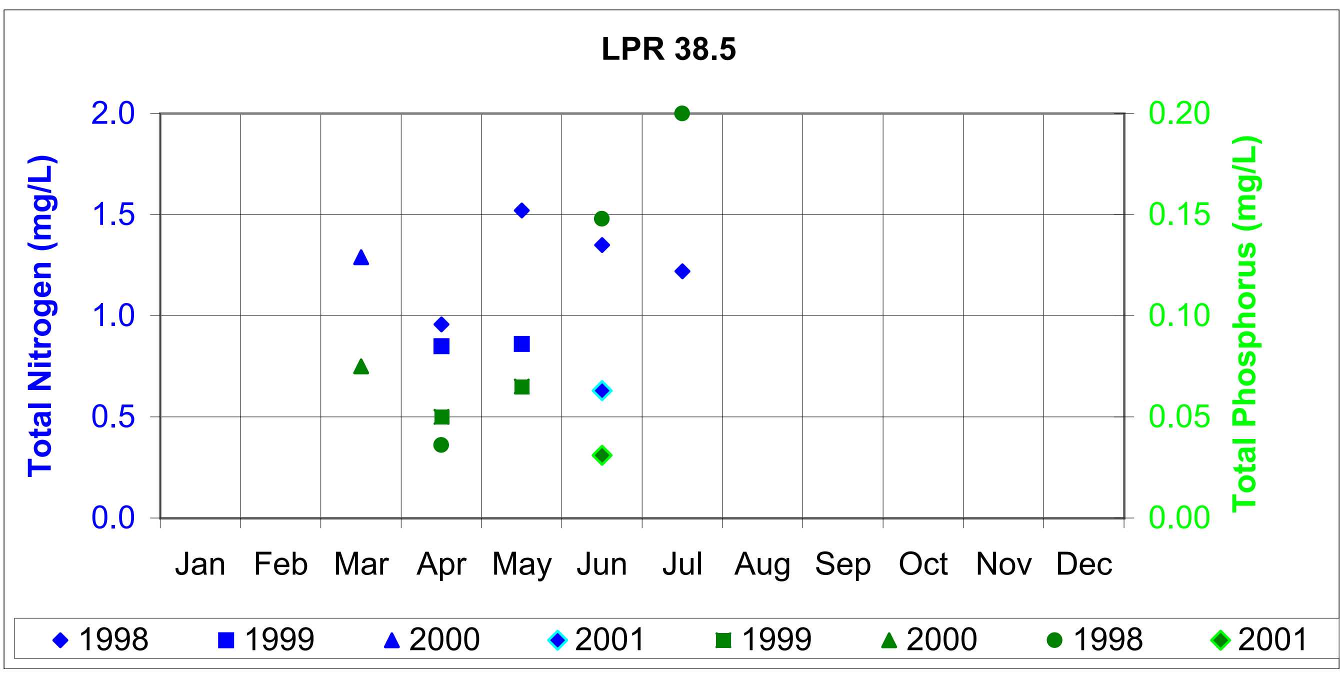

Total phosphorus values are represented in **green**. **Total nitrogen** values are represented in **blue**.

Appendix C Figure C-8

MPCA Long Prairie River Watershed TMDL Final Project Report

Average* Monthly Total Phosphorus and Total Nitrogen Concentrations at CWP Sites (On-going Monitoring by Todd SWCD)

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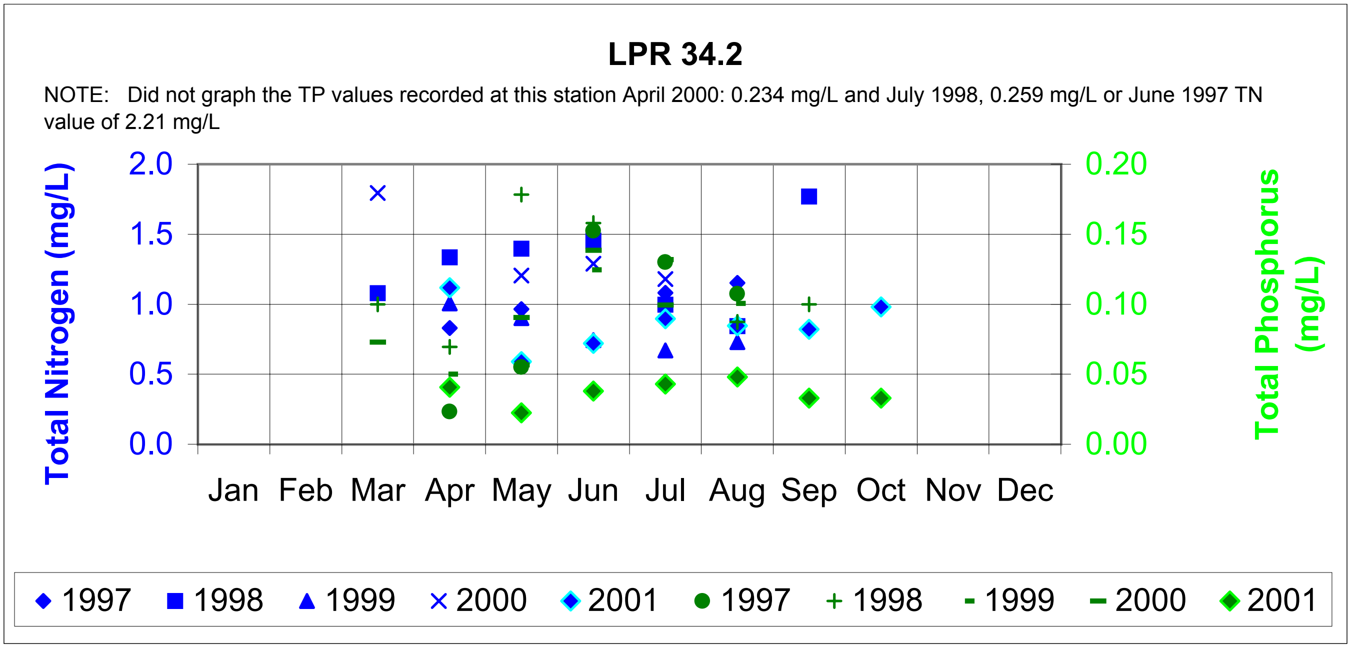
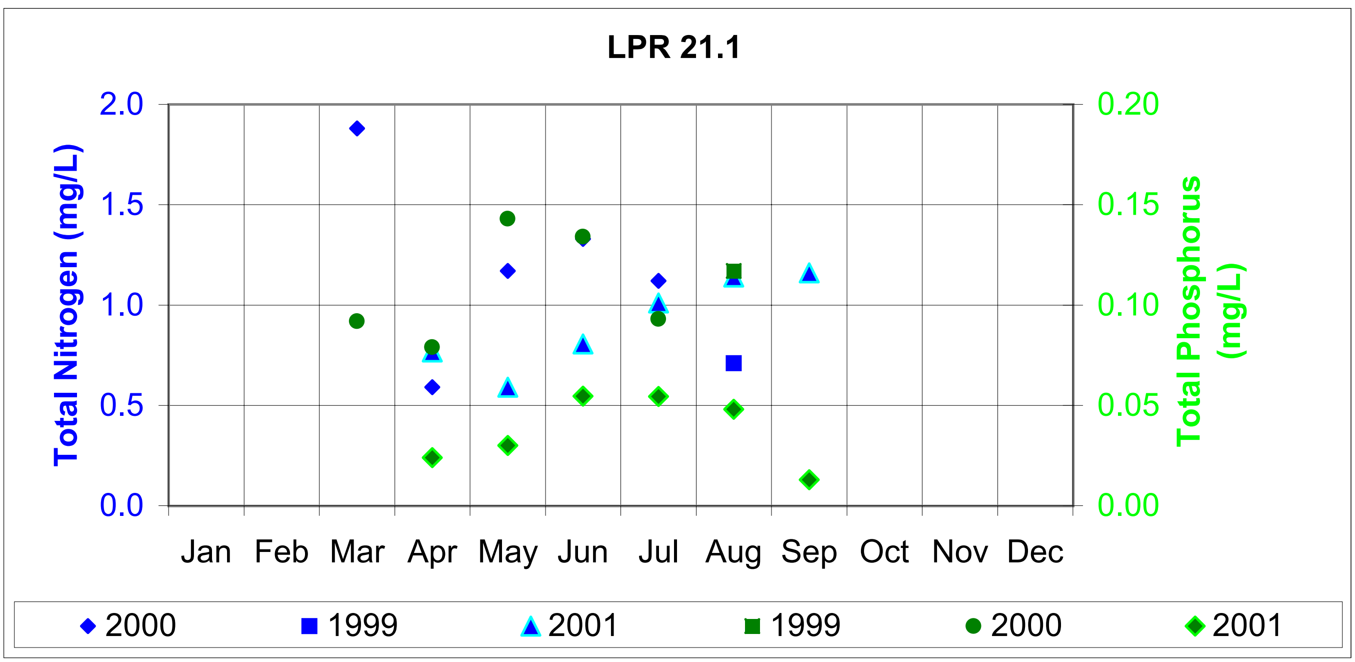




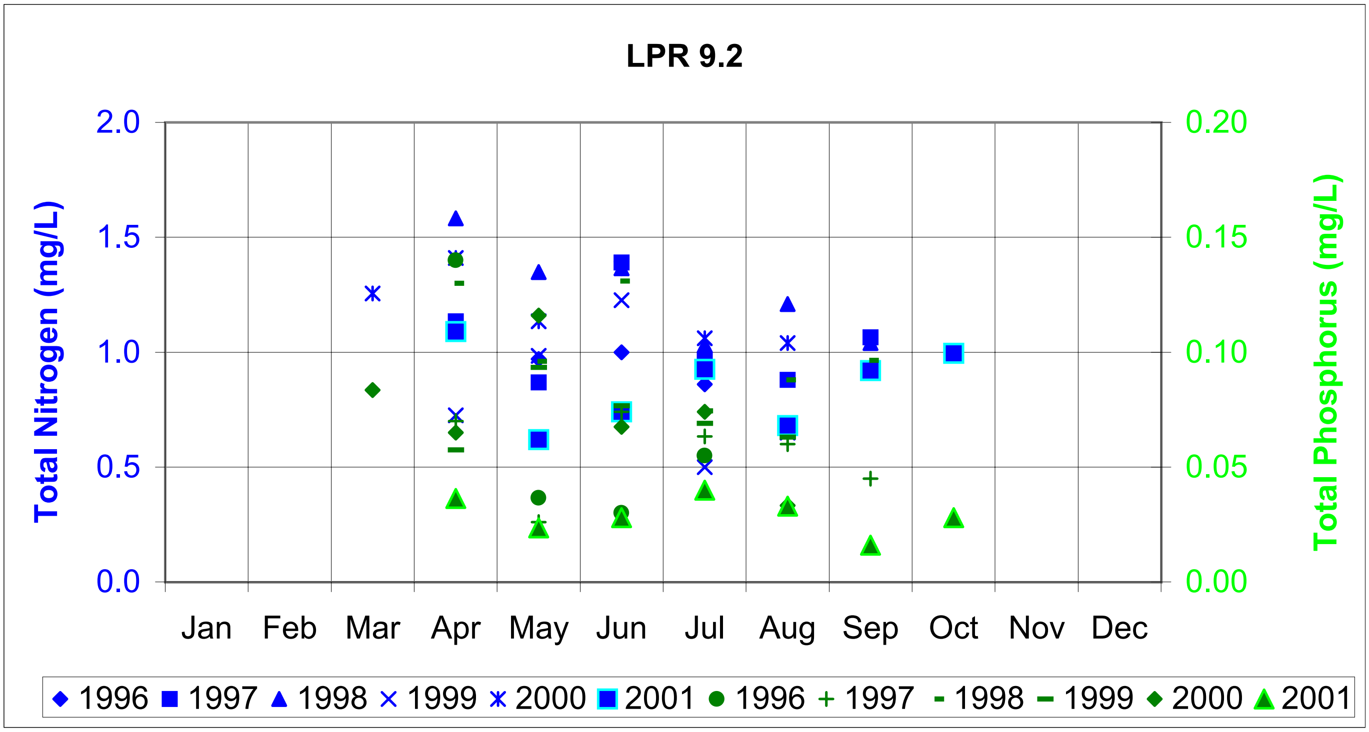
Total phosphorus values are represented in **green**. **Total nitrogen** values are represented in **blue**.

Appendix C Figure C-8

MPCA Long Prairie River Watershed TMDL Final Project Report

Average* Monthly Total Phosphorus and Total Nitrogen Concentrations at CWP Sites (On-going Monitoring by Todd SWCD)

* Averages typically represent one to four data points.

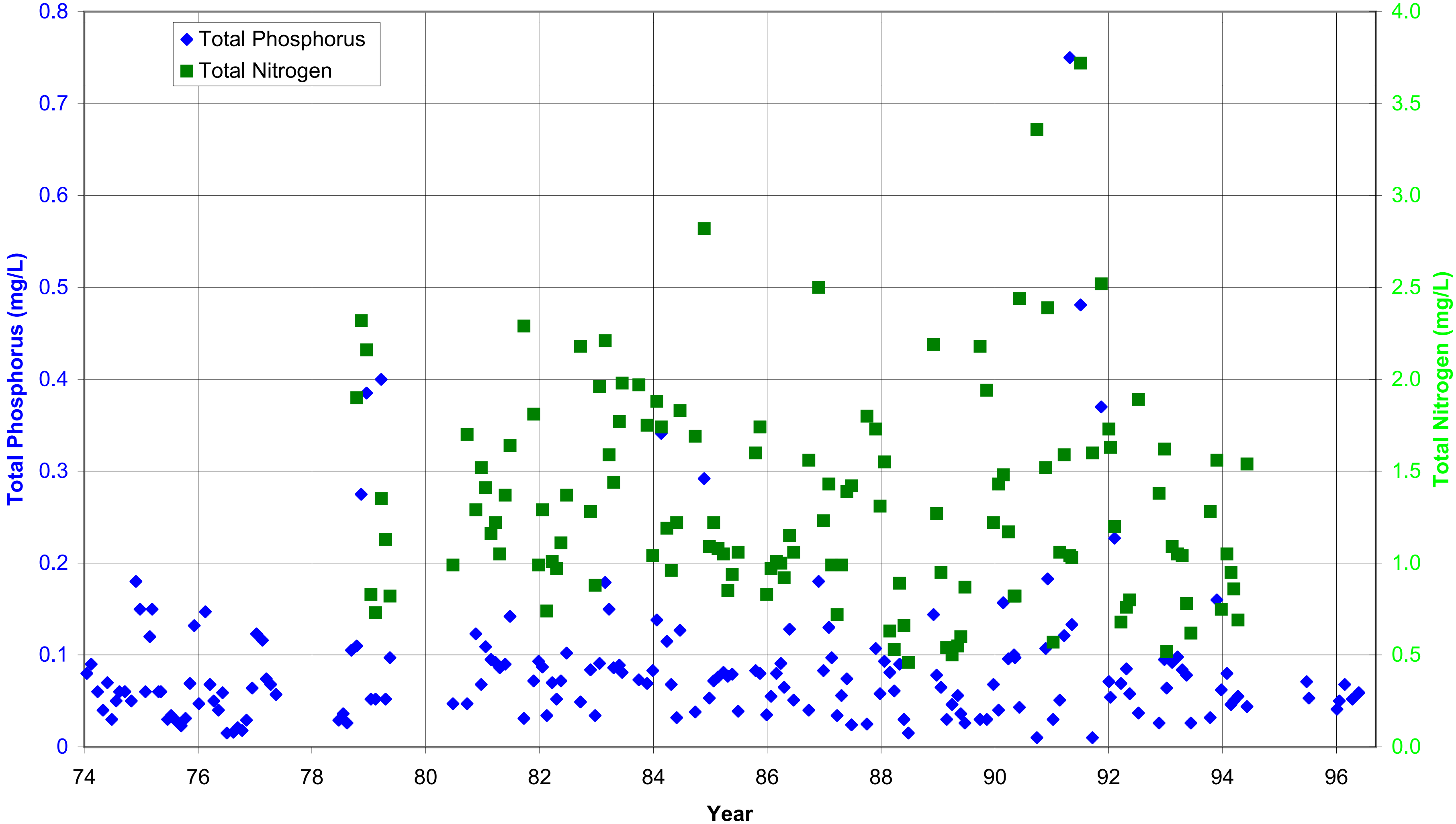


Total phosphorus values are represented in **green**. **Total nitrogen** values are represented in **blue**.

Appendix C Figure C-9

MPCA Long Prairie River Watershed TMDL Final Project Report

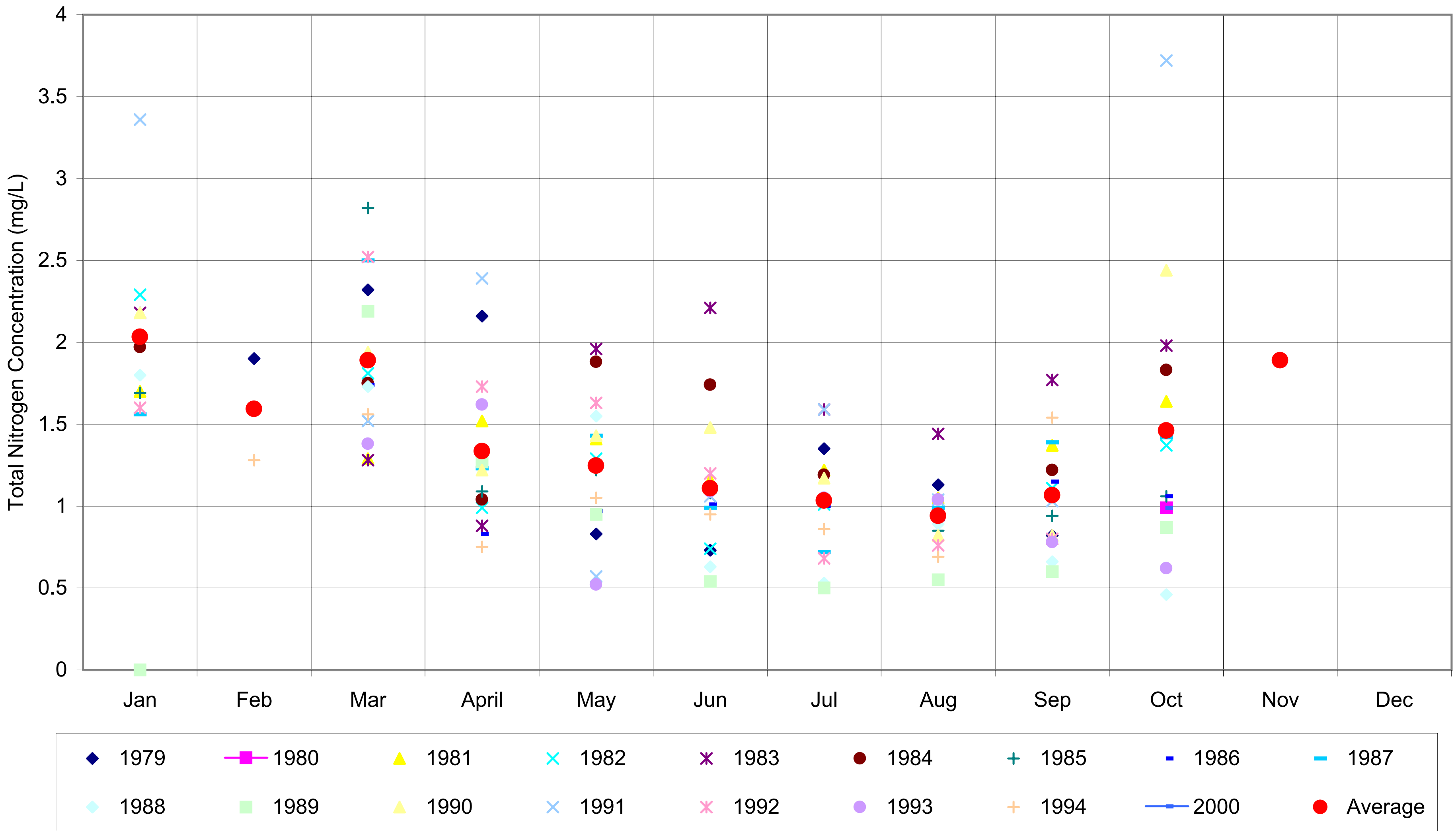
Total Phosphorus and Total Nitrogen Concentrations in the Long Prairie River LPR 3.2



Appendix C Figure C-10a

MPCA Long Prairie River Watershed TMDL Final Project Report

Monthly Total Nitrogen Concentrations in the Long Prairie River LPR 3.2



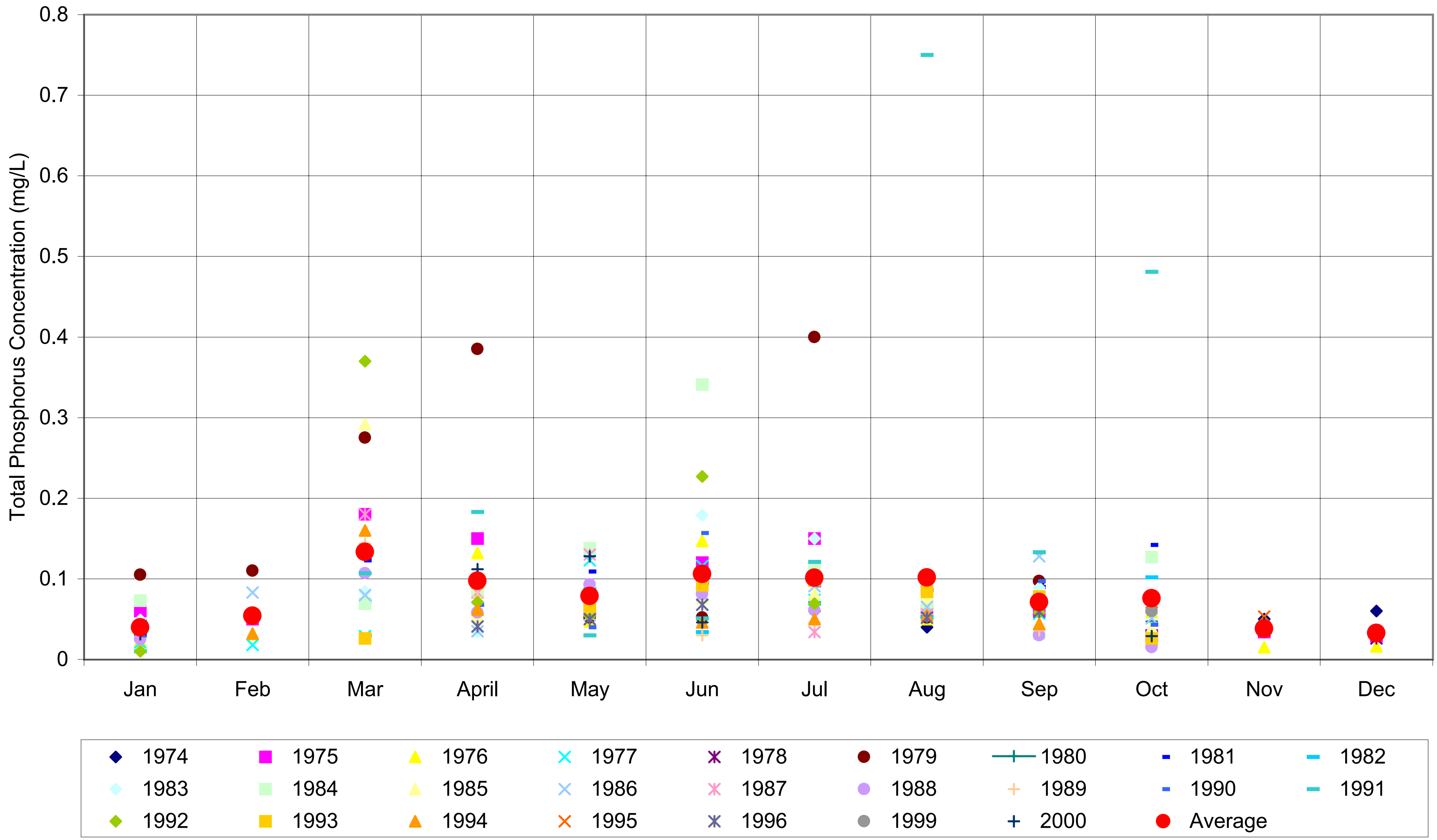
T:/0147/51/Phase III Rpt/Appendices/Appendix C_Figs09_10/Appendix C Fig10a

Wenck Associates, Inc.

Appendix C Figure C-10b

MPCA Long Prairie River Watershed TMDL Final Project Report

Monthly Total Phosphorus Concentrations in the Long Prairie River LPR 3.2

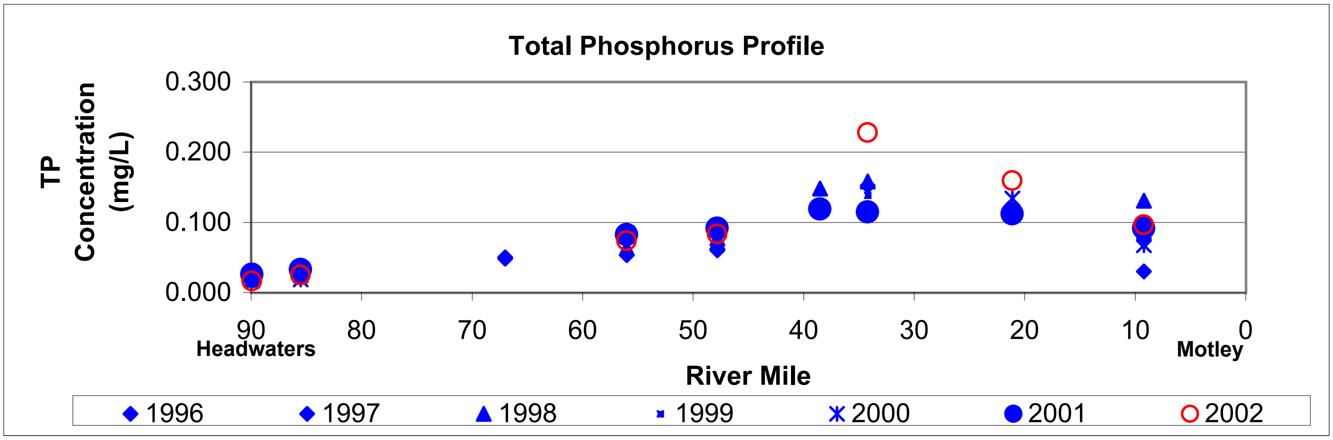


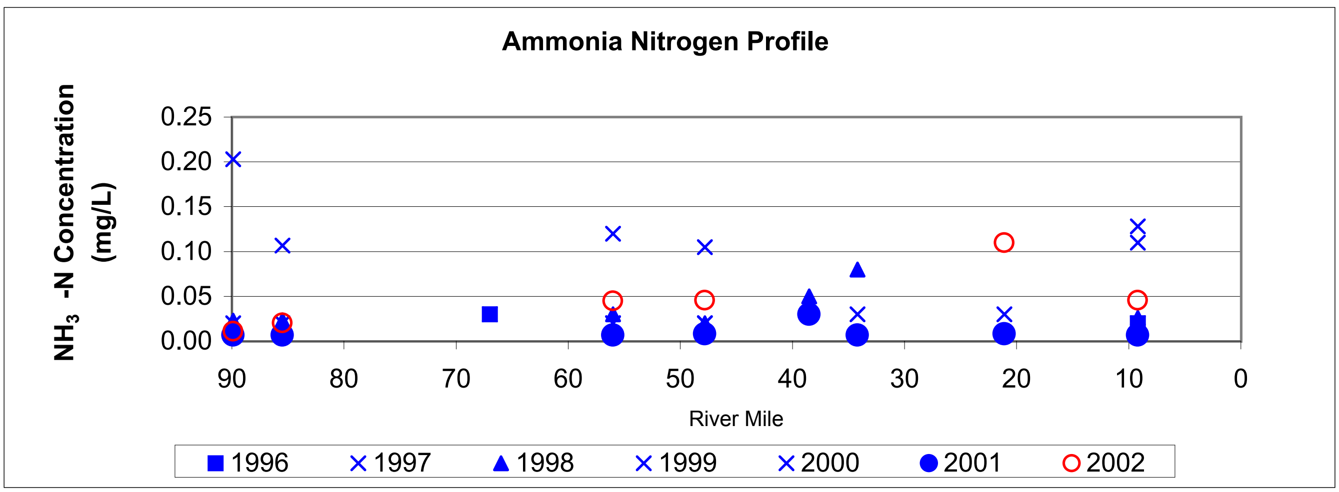
Wenck Associates, Inc.

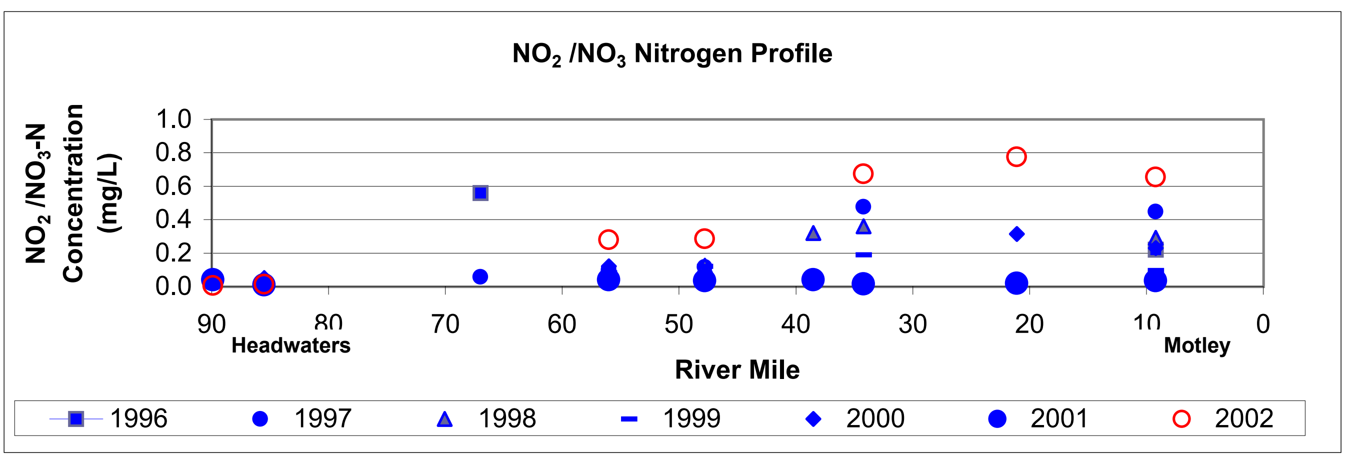
Appendix C Figure C-11a

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs for Selected Water Quality Parameters
June 1996- 2002





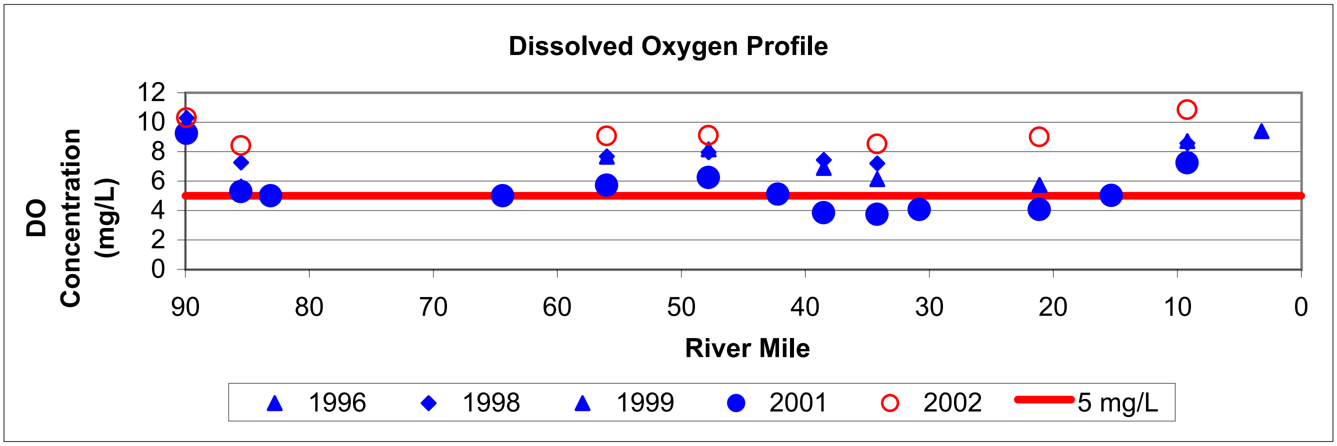


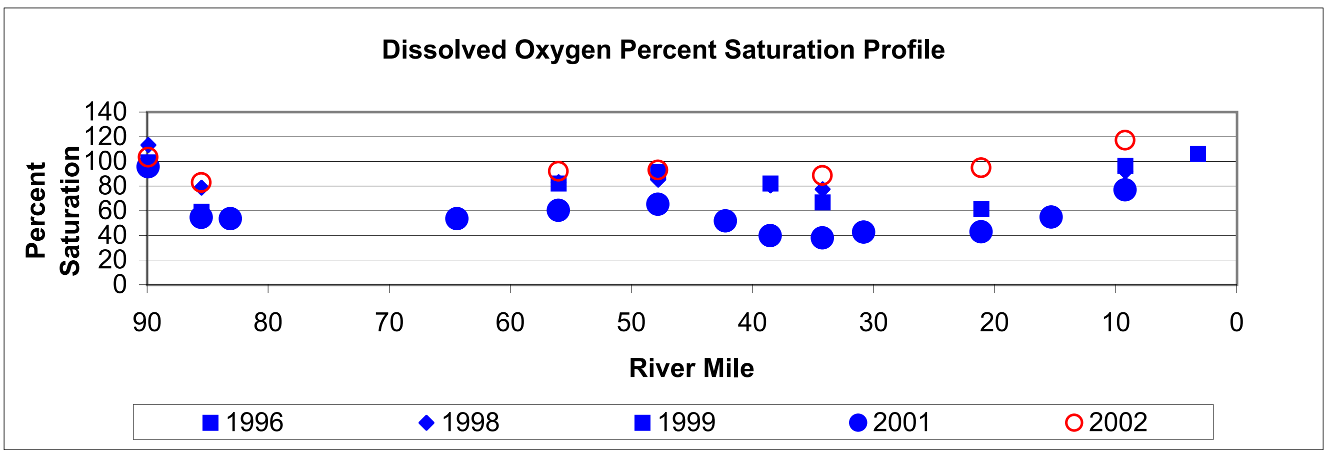
*Averages typically represent one to four data points.

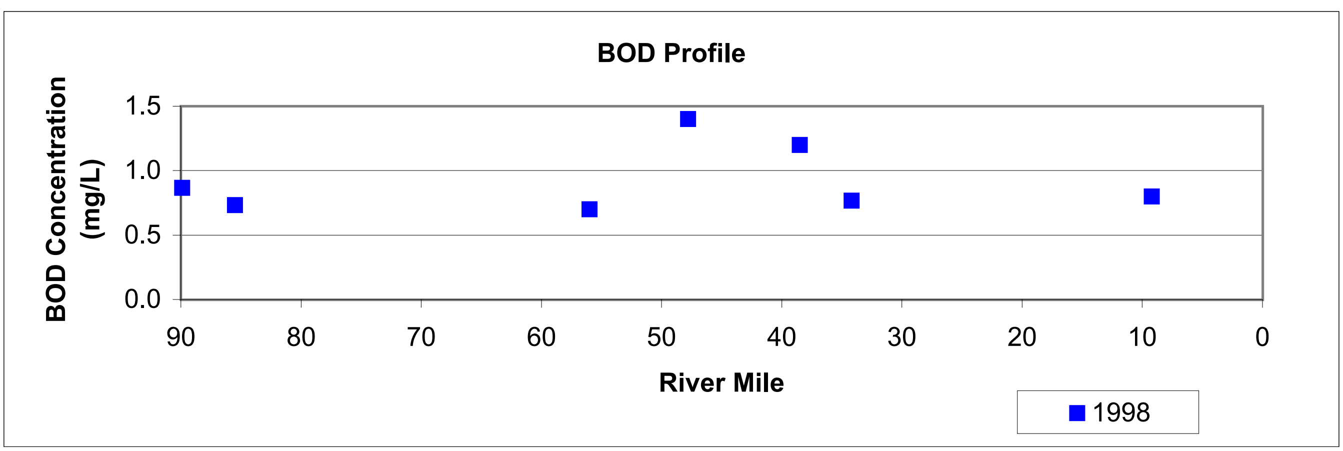
Appendix C Figure C-11a

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs for Selected Water Quality Parameters
June 1996- 2002





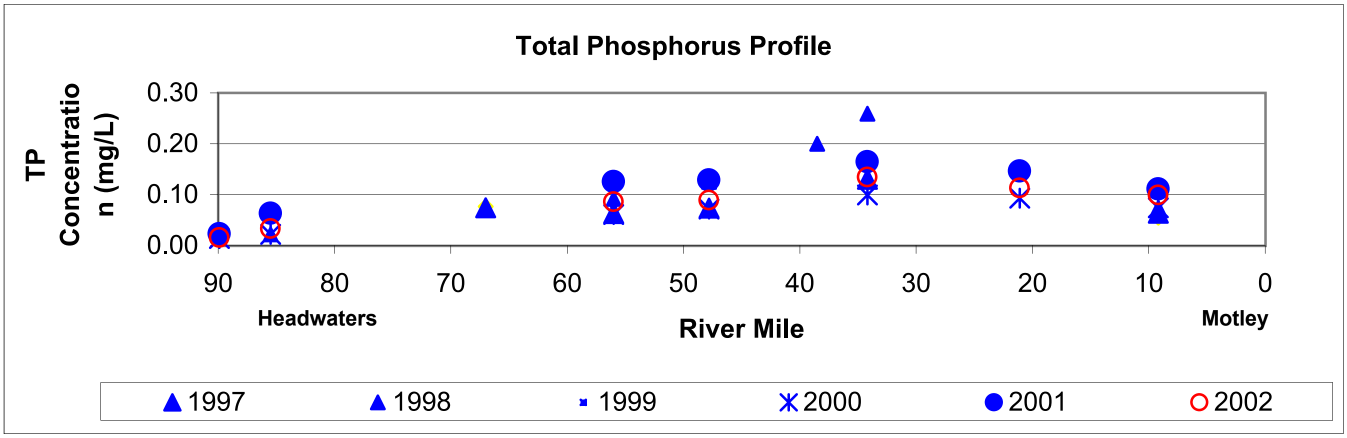


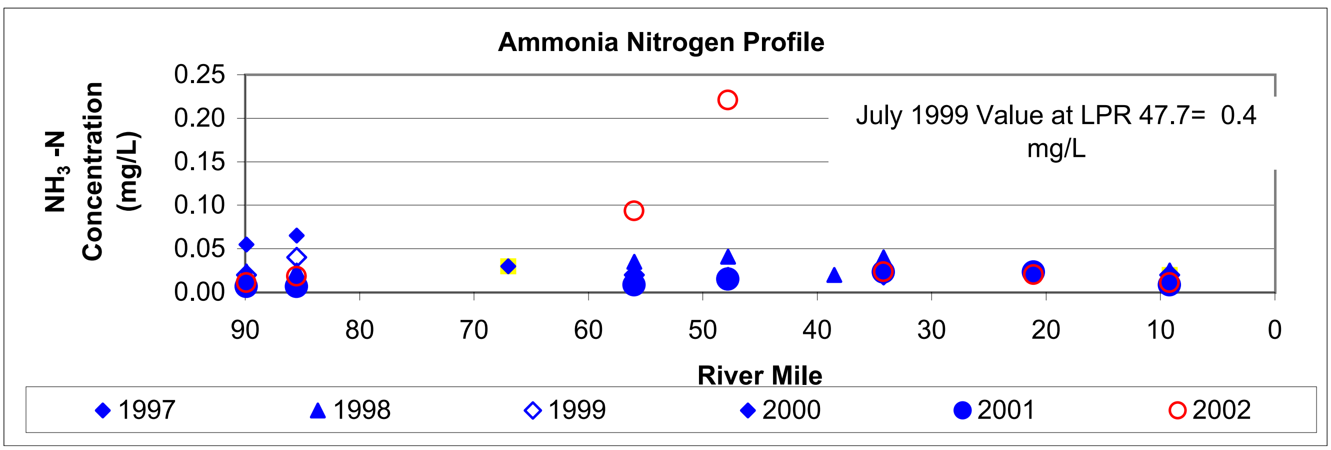
*Averages typically represent one to four data points.

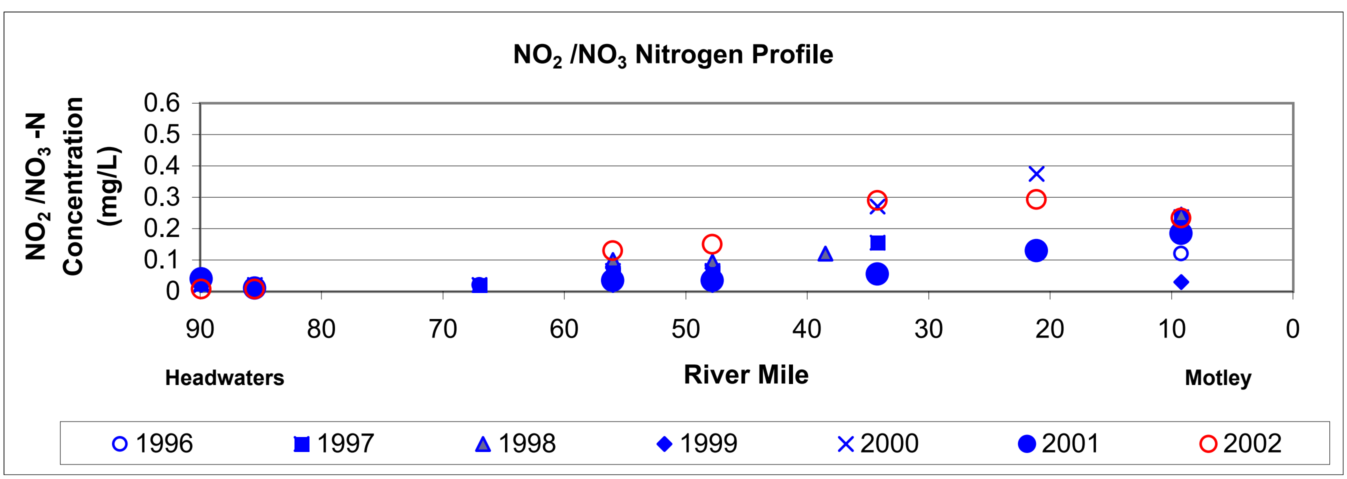
Appendix C Figure C-11b

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs for Selected Water Quality Parameters
July 1996- 2002





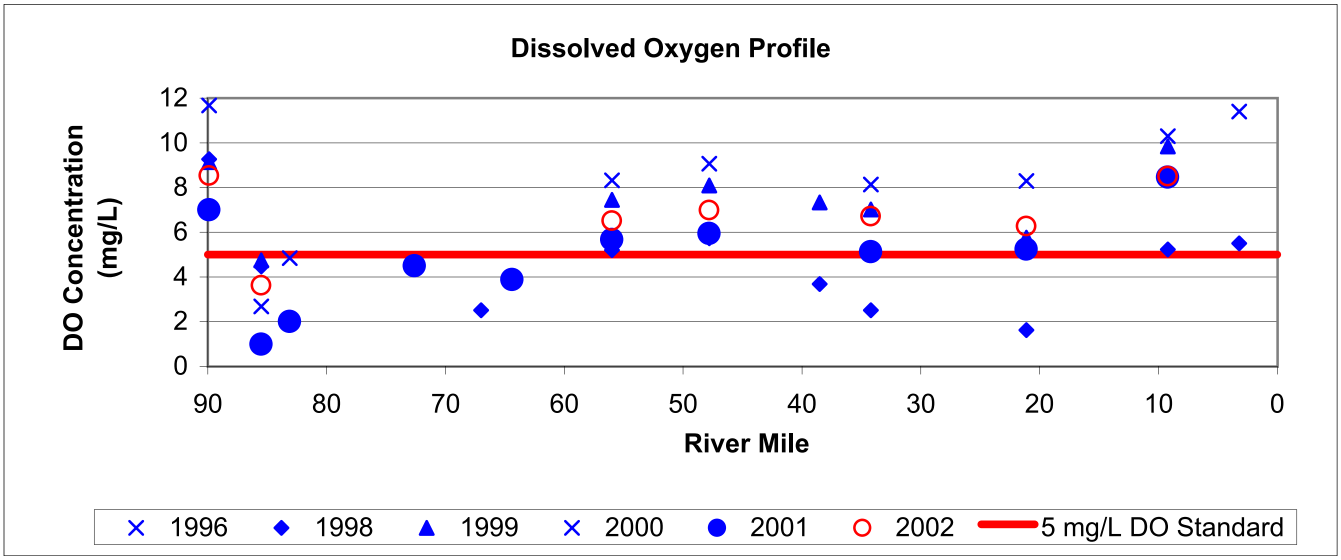


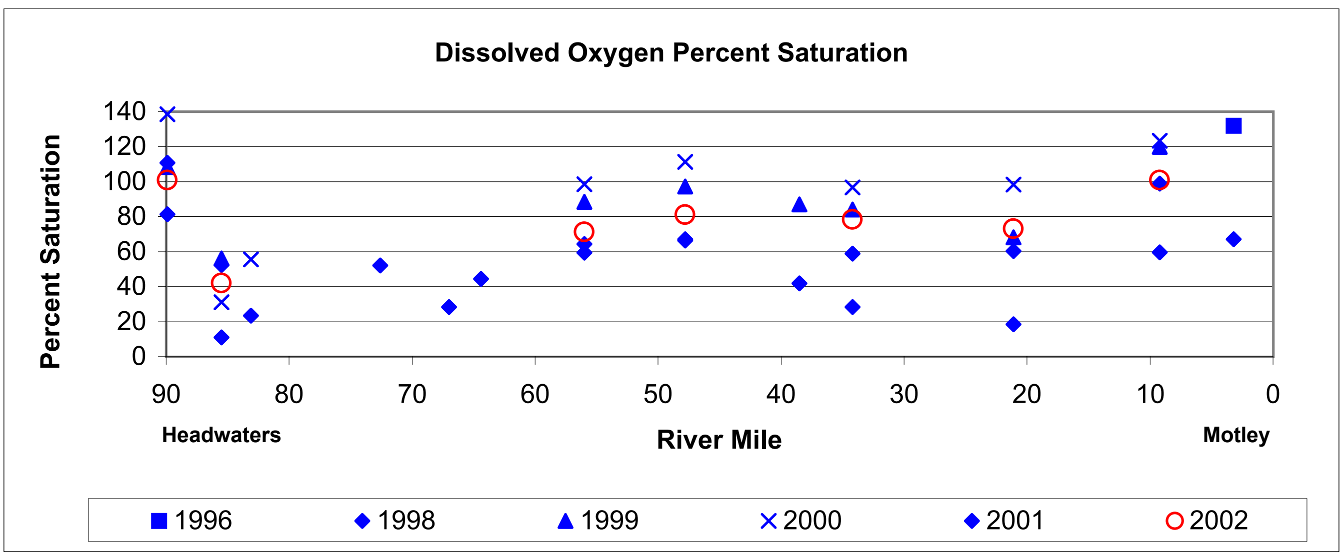
*Averages typically represent one to four data points.

Appendix C Figure C-11b

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs for Selected Water Quality Parameters
July 1996- 2002



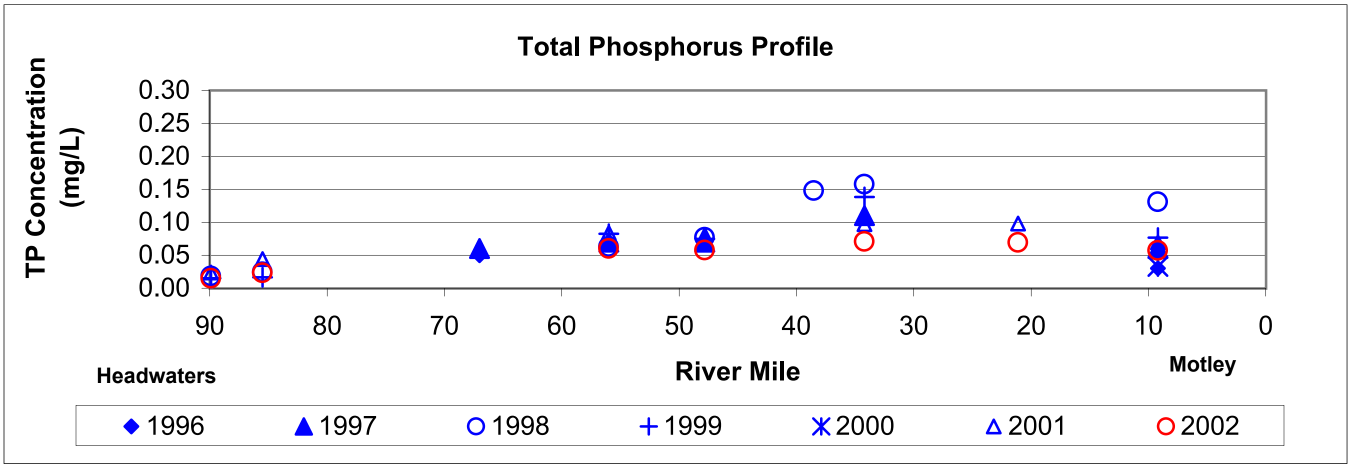


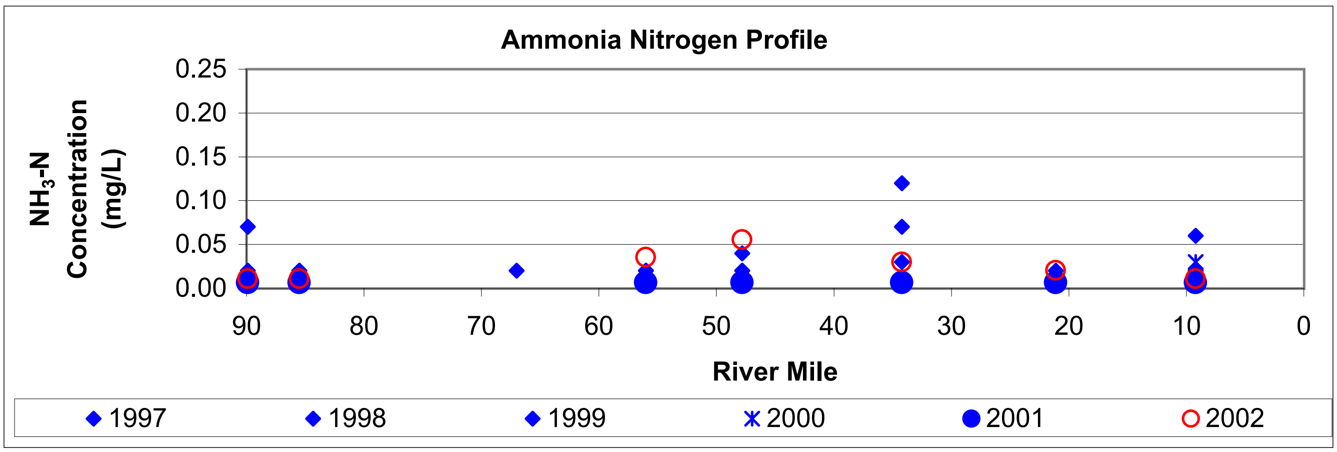
*Averages typically represent one to four data points.

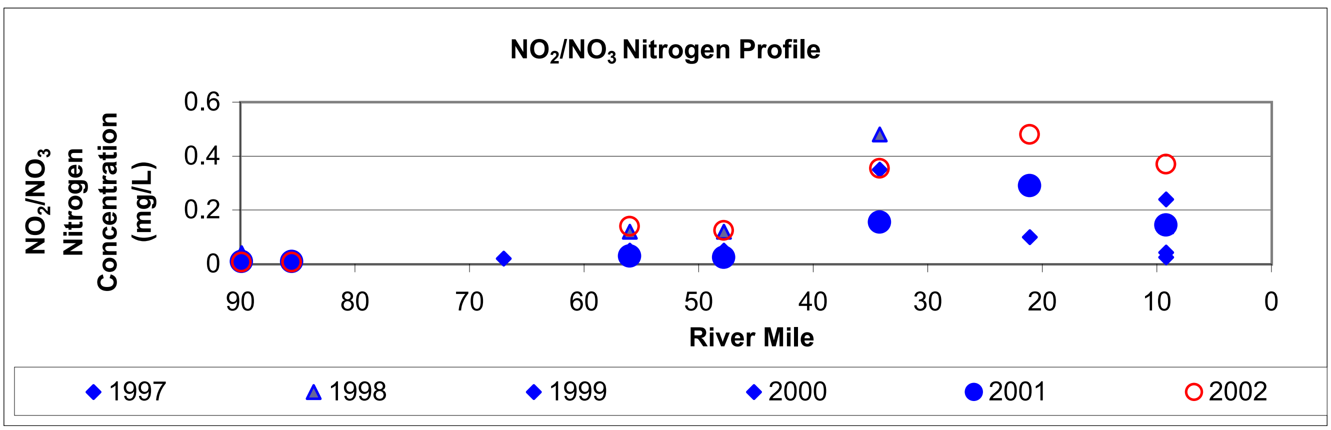
Appendix C Figure C-11c

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs for Selected Water Quality Parameters August 1996- 2002





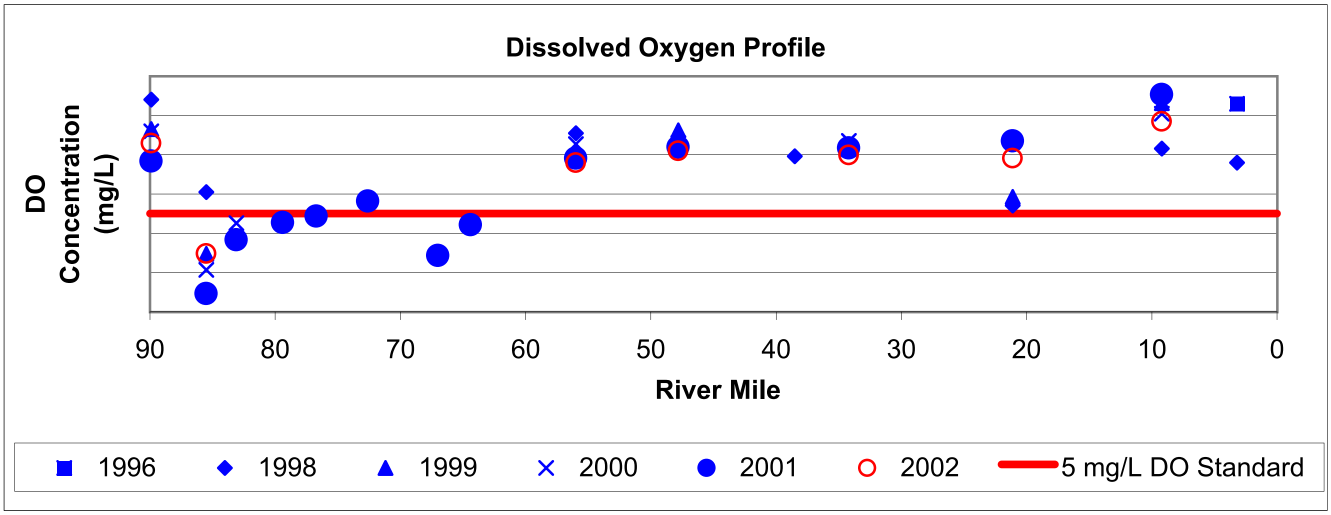


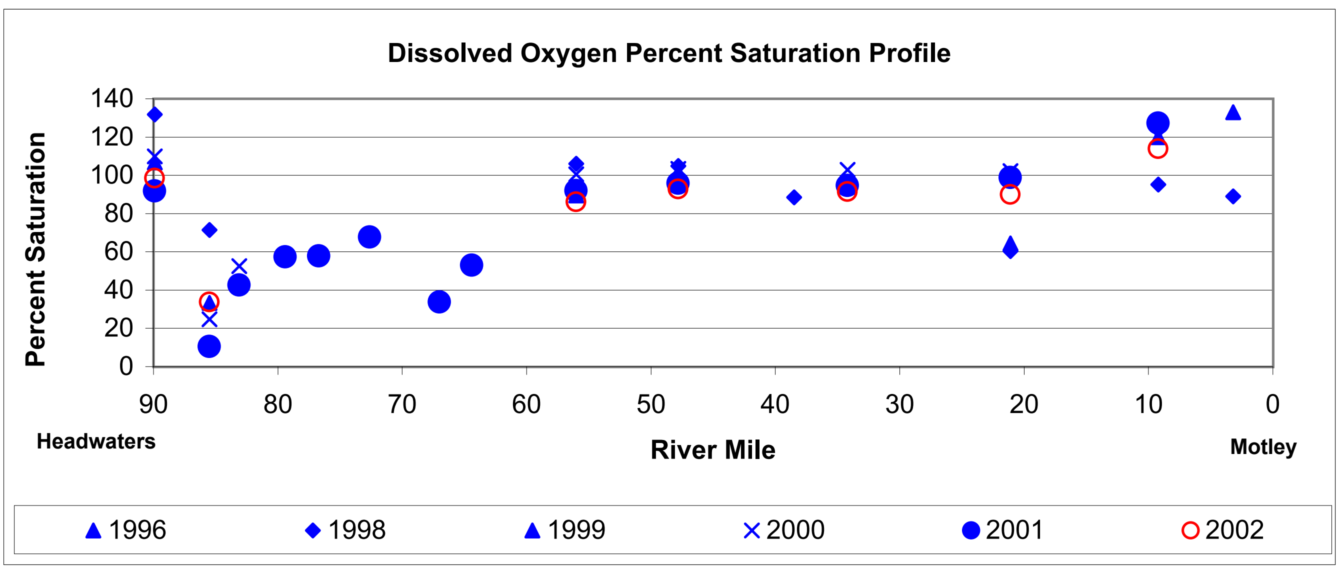
*Averages typically represent one to four data points.

Appendix C Figure C-11c

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs for Selected Water Quality Parameters August 1996- 2002





*Averages typically represent one to four data points.

Appendix D Table D-1

MPCA Long Prairie River Watershed TMDL Final Project Report

Laboratory Sampling Parameters and Methods

Parameter	EPA Analytical Method*	Preservation	Holding Times Recommended /Regulatory Maximum	Detection Limits
Carbonaceous BOD (20 day time series)	405.1	Refrigerate at 4 degrees C	6 hours/48 hours	2 mg/L
Carbonaceous BOD (5 day time series)		Refrigerate at 4 degrees C		2 mg/L
Carbonaceous BOD (Ultimate)		Refrigerate at 4 degrees C		
Ammonia, Nitrogen	350.1	Analyze immediately, or add H2SO4 to pH < 2 and refrigerate at 4 degrees C	7 days/28 days	0.05 mg/L
Total Kjeldahl Nitrogen (TKN)	351.3	Add H2SO4 to pH < 2 and refrigerate at 4 degrees C	7 days/28 days	0.05 mg/L
Nitrite-Nitrate, Nitrogen	353.4	Add H2SO4 to pH < 2 and refrigerate at 4 degrees C	None/28 days	0.05 mg/L
Total Phosphorus (TP)	365.4	Refrigerate	28 days	0.01 mg/L
Orthophosphate, Phosphorus	365.4	Filter as soon as possible. Refrigerate at 4 degrees C	6 hours/48 hours	0.01 mg/L
Chloride	300	Refrigerate	30 days	1 mg/L
Total Suspended Solids (TSS)	160.2	Refrigerate	7 days	1 mg/L
Algae Idendification and Enumeration	---	Lugels Iodine, Refrigerate	---	variable (organisms /L)
Chlorophyll a	AOAC 3.10	Refrigerate	30 days	0.001 mg/L

Appendix D Table D-2

MPCA Long Prairie River Watershed TMDL Final Project Report

Blind Duplicate Water Quality Sample Results

DATE	TMDL STUDY NAME	CWP Site Name	Chloride (mg/L)	TSS (mg/L)	Ammonia- N (mg/L)	Kjeldahl Nitrogen (mg/L)	NO_2- NO_3/N (mg/L)	OP (mg/L)	TP (mg/L)	CBOD 5-Day (mg/L)	CBOD 20-Day (mg/L)	Chloro-A (ug/L)
08/21/01	LPR 47.8	Site 07- Dup	25.3	6	<0.02	0.4	<0.2	0.031	0.047	<2	4	1.1
08/21/01	LPR 47.8	Site 07	24.9	7	<0.02	0.4	<0.2	0.028	0.06	<2	<2	1.6
Relative Percent Difference			2%	15%		0%		10%	24%			37%
08/21/01	LPR 89.9	Site 09- Dup	28.1	9	<0.02	0.7	<0.2	<0.005	<0.005	<2	4	2.1
08/21/01	LPR 89.9	Site 09	27.9	10	<0.02	0.9	<0.2	<0.005	<0.005	<6	7	2.9
Relative Percent Difference			1%	11%		25%					55%	32%
09/25/01	LPR 47.8	Site 07 -Dup	--	4	<0.02	0.9	<0.2	--	0.020	<2	5.00	1.1
09/25/01	LPR 47.8	Site 07	20.8	5	<0.02	0.3	<0.2	0.024	0.028	<2	<2	1.4
Relative Percent Difference				22%		100%			33%			24%
09/25/01	LPR 67.0	Site 01- Dup	21.2	2	<0.02	0.6	<0.2	0.019	0.024	<2	10	<1
09/25/01	LPR 67.0	Site 01	21.0	3	<0.02	0.4	<0.2	0.021	0.024	<2	10	<1
Relative Percent Difference			1%	40%		40%		10%	0%		0%	
										run at 4 degrees C		
02/07/02	LPR 89.9	Site 09- Dup	30.6	2	0.05	0.6	<0.2	<0.005	<0.005	<2	3	--
02/07/02	LPR 89.9		30.2	4	0.03	0.8	<0.2	<0.005	<0.005	<2	3	--
Relative Percent Difference			1%	67%	50%	29%					0%	
										run at 4 degrees C		
02/08/02	T LPR 15.8	Site 08- Moran Creek	8	3	0.24	0.1	0.24	0.008	0.008	<2	<2	--
02/08/02	T LPR 15.8	Site 08- Moran Creek_Dup	7.4	3	0.23	<0.1	0.23	0.008	0.011	<2	<2	--
Relative Percent Difference			8%	0%	4%		4%	0%	32%			

Appendix D Table D-3

MPCA Long Prairie River Watershed TMDL Final Project Report

Data Quality for Measurement Data

PARAMETER	UNITS	METHOD TYPE	METHOD	METHOD DESCRIP.	STORET CODE	Min. Anal. Level	PRECISION of duplicates (RPD)	ACCURACY of matrix spikes % recovery	ACCURACY (Certified Reference Material)	PERCENT COMPLETE
Field Measurements										
PH	std units		EPA 150.1 and MPCA SOP		400	NA	10%	NA	NA	90%
DO	mg/L		EPA 360.1 and MPCA SOP		300	NA	10%	NA	NA	90%
Conductivity	uS/cm		EPA 120.1 and MPCA SOP		94	NA	10%	NA	NA	90%
Temperature	°C		EPA170.1 and MPCA SOP		10	NA	10%	NA	NA	90%
Flow	cfs		USGS* and MPCA SOP		61	NA	NA	NA	NA	90%
Laboratory Analyses										
TSS	mg/L	gravimetric	EPA 160.2		530	2	20%	NA	NA	90%
Chloride	mg/L	titrimetric	EPA 325.2		940	1	20%	80-120%	NA	90%
Ammonia N	mg/L	electrode	EPA 350.3	Total	610	0.05	20%	80-120%	NA	90%
Nitrate + Nitrite N	mg/L		EPA 353.2	Total	630	0.1	20%	80-120%	NA	90%
TKN	mg/L	titrimetric	EPA 351.3	Total	625	0.3	20%	80-120%	NA	90%
Total Phosphorus	mg/L	colorimetric	EPA 365.3	Total	665	0.01	20%	80-120%	NA	90%
Chlorophyll-A	mg/L	colorimetric	Std.Method 10200-H		32211	0.01	20%	NA	NA	90%
Carbonaceous BOD (20 day time series)	mg/L		Std.Method 5210-C		80082 (Reading on day 5)	2	NA	NA	NA	90%

*Note: USGS procedures are found in "Measurement and Computation of Streamflow: Volume 1. Measurement of Stage and Discharge" (1982).

Appendix D Table D-4a

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Calculation of ΔDO from Continuous DO Measurements at LPR 88.3 and LPR 85.5

LPR 88.3					
Date	Daily Max	Time of Daily Max	Daily Min	Time of Daily Min	ΔDO
8/5-6/2002	10.13	5:35 PM	5.23	7:05 AM	4.9

LPR 85.5					
Date	Daily Max	Time of Daily Max	Daily Min	Time of Daily Min	ΔDO
8/23/01	3.56	3:30 PM	0.77	7:30 AM	2.79
9/13/01	5.69	5:01 PM	3.02	10:01 AM	2.67
9/14/01	4.22	5:01 PM	3.04	9:01 AM	1.18
9/15/01	4.33	5:01 PM	2.78	9:01 AM	1.55
9/16/01	4.11	4:01 PM	3.08	9:01 AM	1.03
9/17/01	4.23	6:01 PM	2.87	8:01 AM	1.36
9/18/01	4.28	3:01 PM	2.97	9:01 AM	1.31
9/19/01	5.28	5:01 PM	2.87	9:01 AM	2.41
9/20/01	4.52	6:01 PM	3.4	9:01 AM	1.12
9/21/01	5.79	5:01 PM	3.13	8:01 AM	2.66
9/22/01	5.18	4:01 PM	3.86	8:01 AM	1.32
9/23/01	6.57	6:01 PM	3.89	8:01 AM	2.68
8/5-6/2002	6.38	5:15 PM	2.63	7:15 AM	3.75

Statistics for LPR 85.5	
ΔDO Mean=	1.99
ΔDO Standard Dev.=	0.87
ΔDO n=	13
ΔDO min=	1.03
ΔDO max=	3.75

Appendix D Table D-4b

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

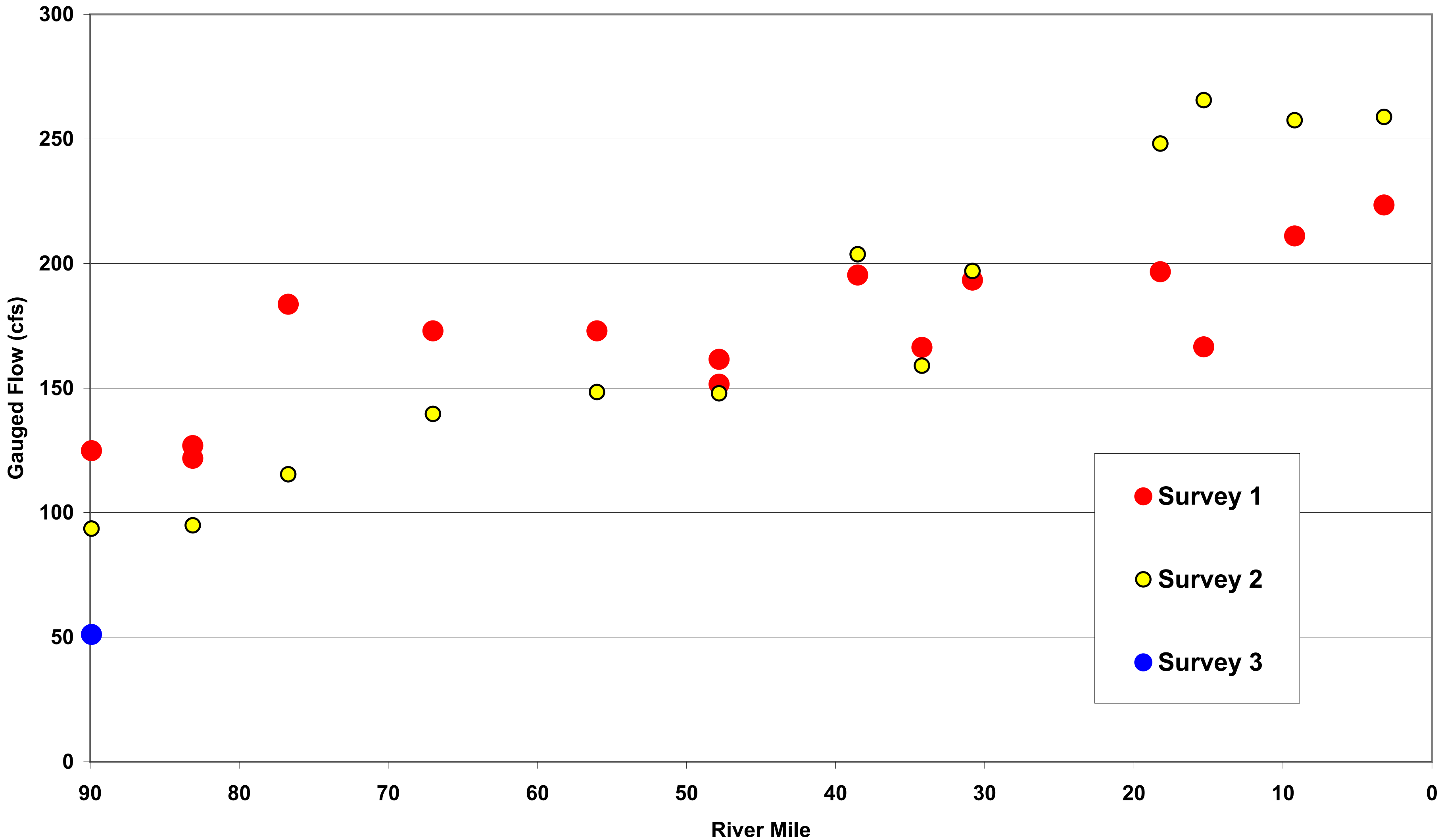
Calculation of ∆DO from Continuous DO Measurements at LPR 21.1 and LPR 18.2

LPR 21.1					
Date	Daily Max	Time of Daily Max	Daily Min	Time of Daily Min	∆DO
8/24/01	7.99	3:00 PM	5.03	8:00 AM	2.96
LPR 18.2					
Date	Daily Max	Time of Daily Max	Daily Min	Time of Daily Min	∆DO
9/12/01	9.95	3:01 PM	7.32	7:01 AM	2.63
9/13/01	10.66	4:01 PM	7.48	7:01 AM	3.18
9/14/01	9.29	5:01 PM	7.68	8:01 AM	1.61
9/15/01	9.87	4:01 PM	7.94	8:01 AM	1.93
9/16/01	9.63	4:01 PM	7.98	8:01 AM	1.65
9/17/01	9.7	5:01 PM	7.95	8:01 AM	1.75
9/18/01	9.48	3:01 PM	7.87	8:01 AM	1.61
9/19/01	10.04	5:01 PM	7.8	8:01 AM	2.24
9/20/01	9.45	5:01 PM	7.76	8:01 AM	1.69
9/21/01	10.36	3:01 PM	7.85	7:01 AM	2.51
9/22/01	9.39	4:01 PM	8.03	7:01 AM	1.36
9/23/01	11.18	4:01 PM	8.43	8:01 AM	2.75
9/24/01	11.62	4:01 PM	9.08	6:01 AM	2.54
Statistics for LPR 18.2					
				∆DO Mean=	**2.1115**
				∆DO Standard Dev.=	**0.56**
				∆DO n=	**13**
				∆DO min=	**1.36**
				∆DO max=	**3.18**

Appendix D Figure D-1

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

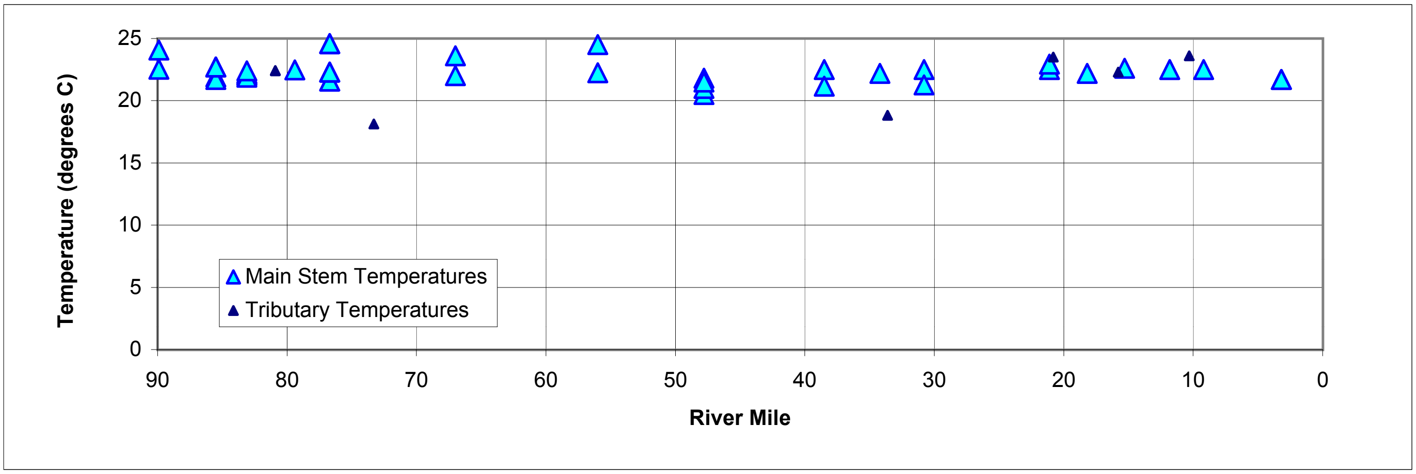
Comparison of Long Prairie River Flow Profiles for Each Synoptic Survey

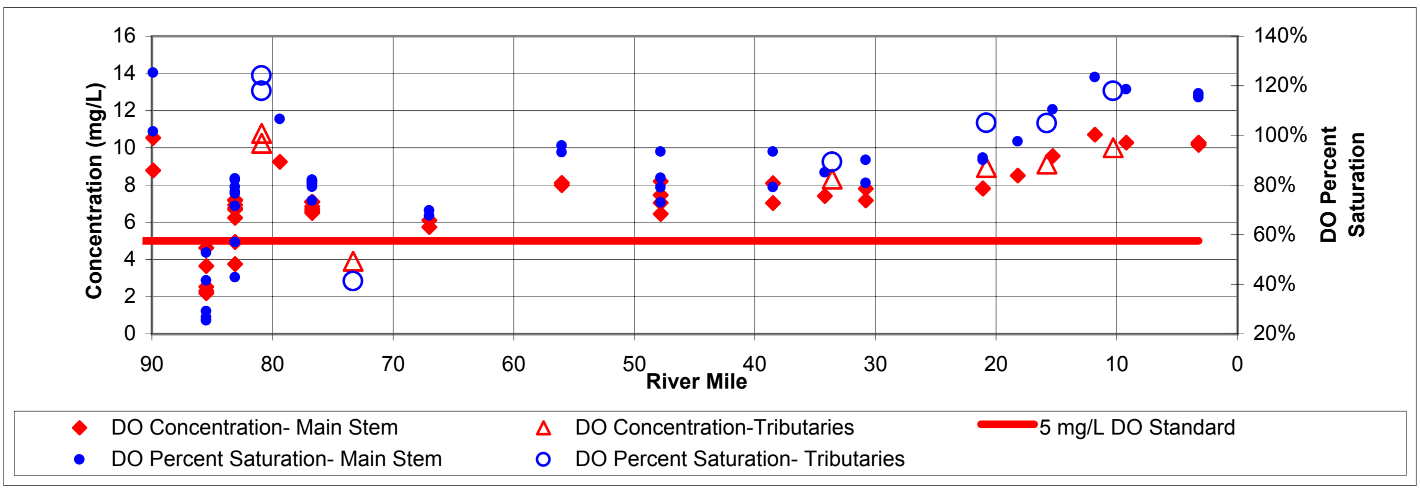


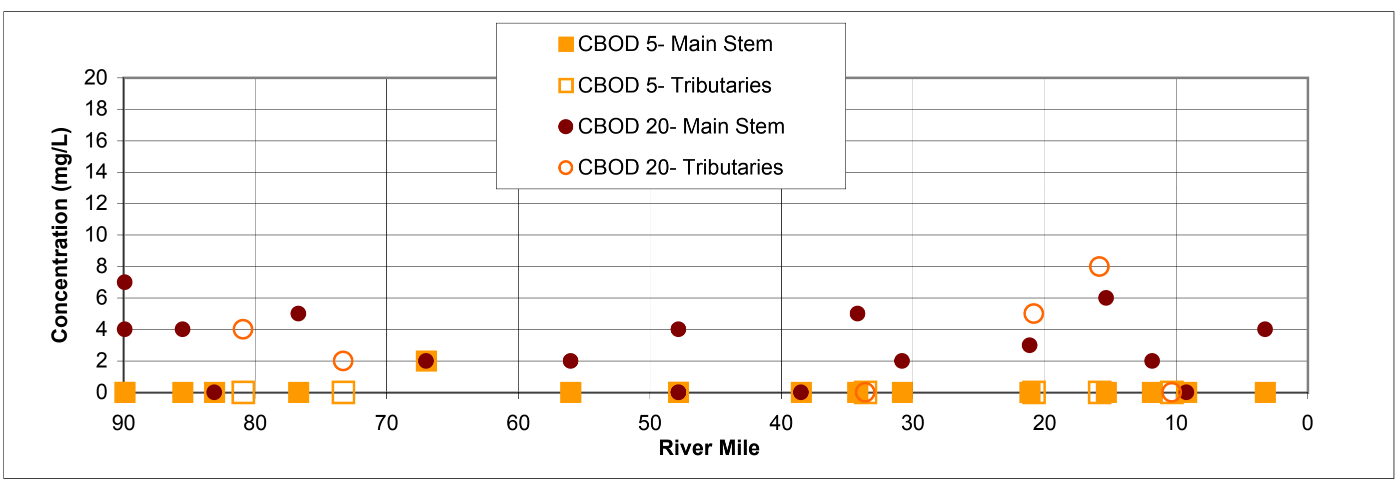
Appendix D Figure D-2a

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Synoptic Survey #1
August 20 to 24, 2001





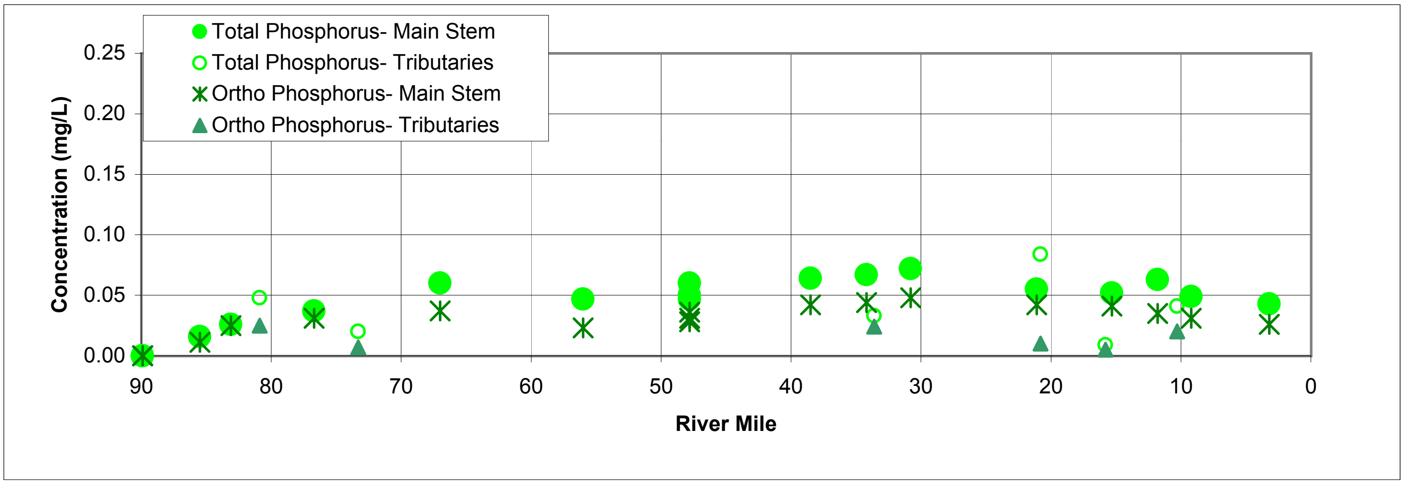


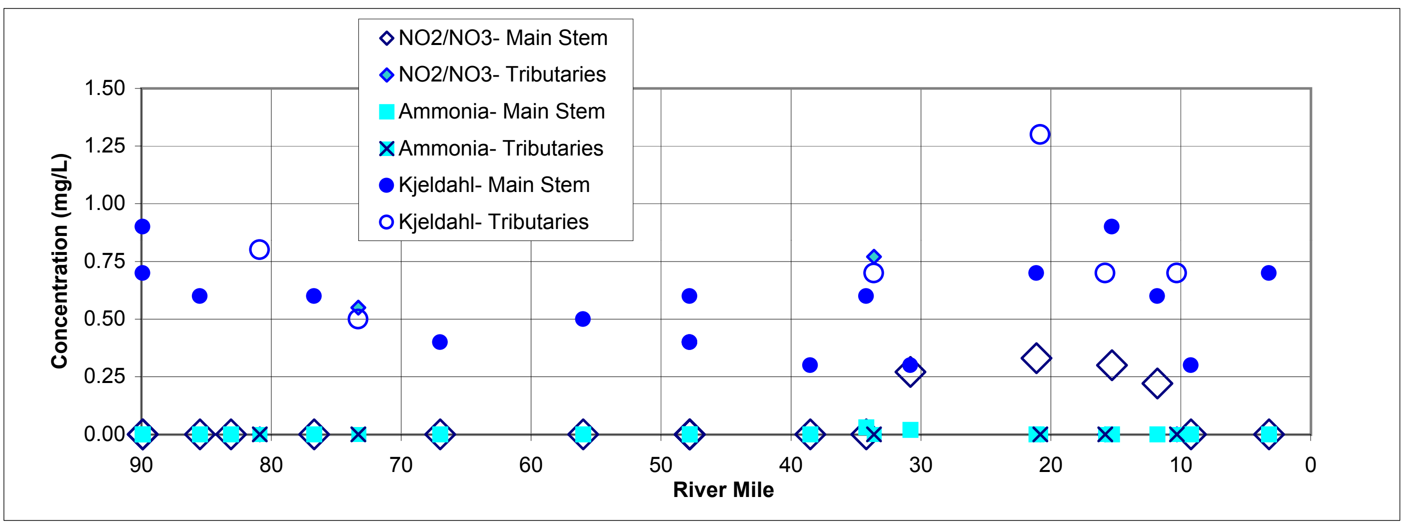
Not all tributaries contributed flow during this survey, see Table 9a for flow & loading data.

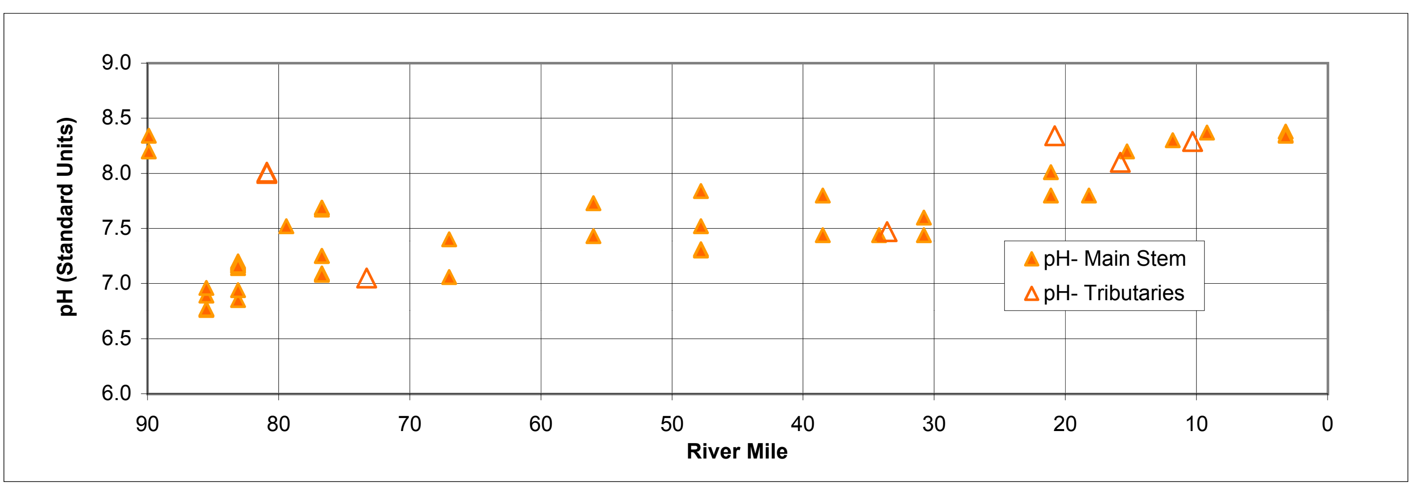
Appendix D Figure D-2a

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Synoptic Survey #1
August 20 to 24, 2001



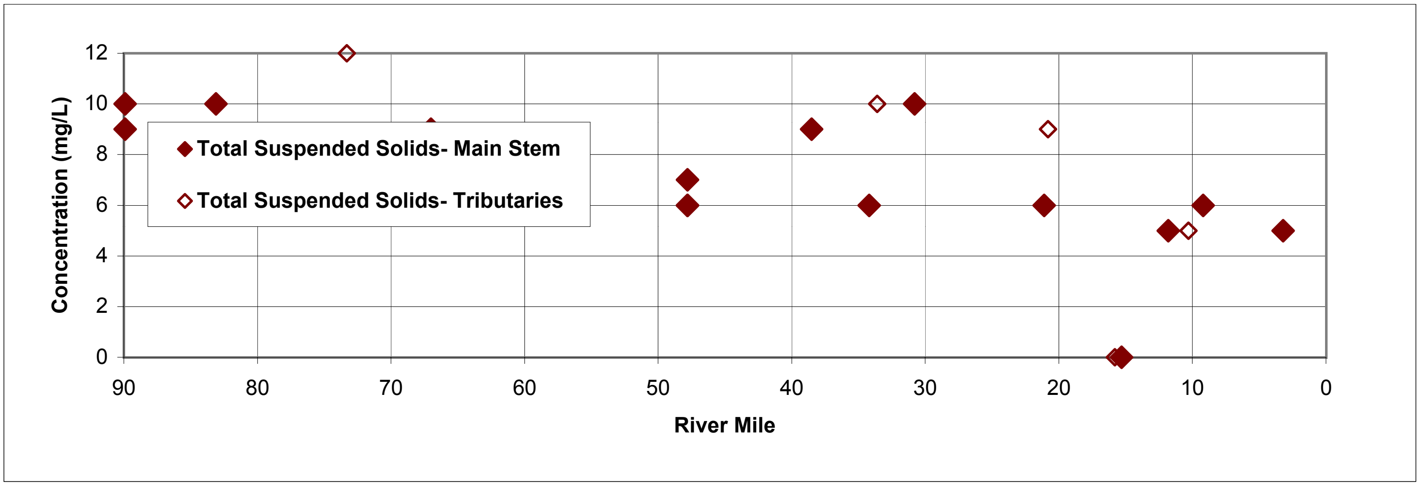


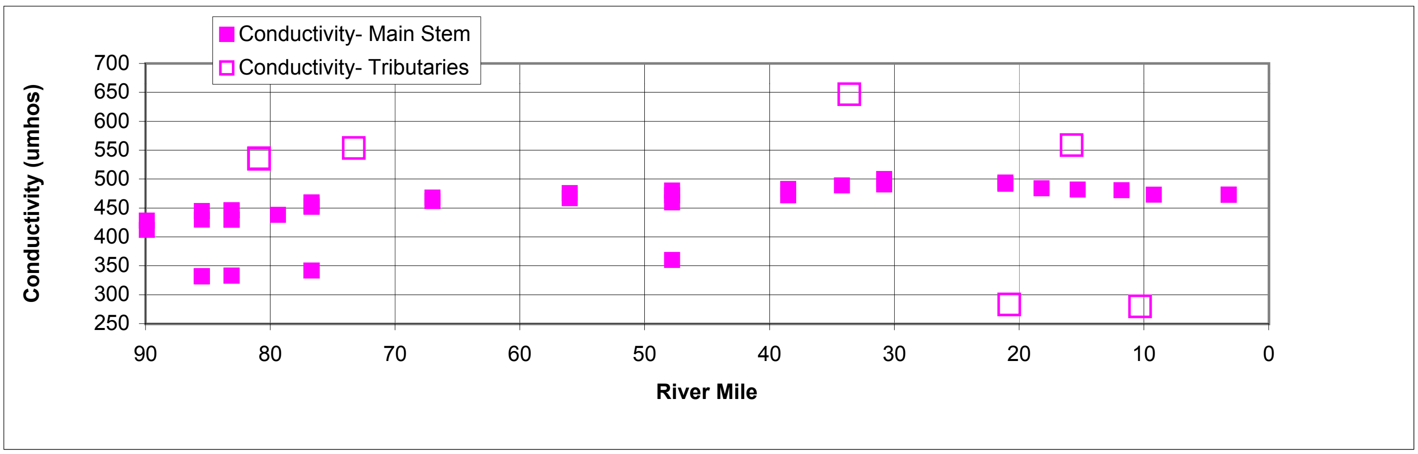


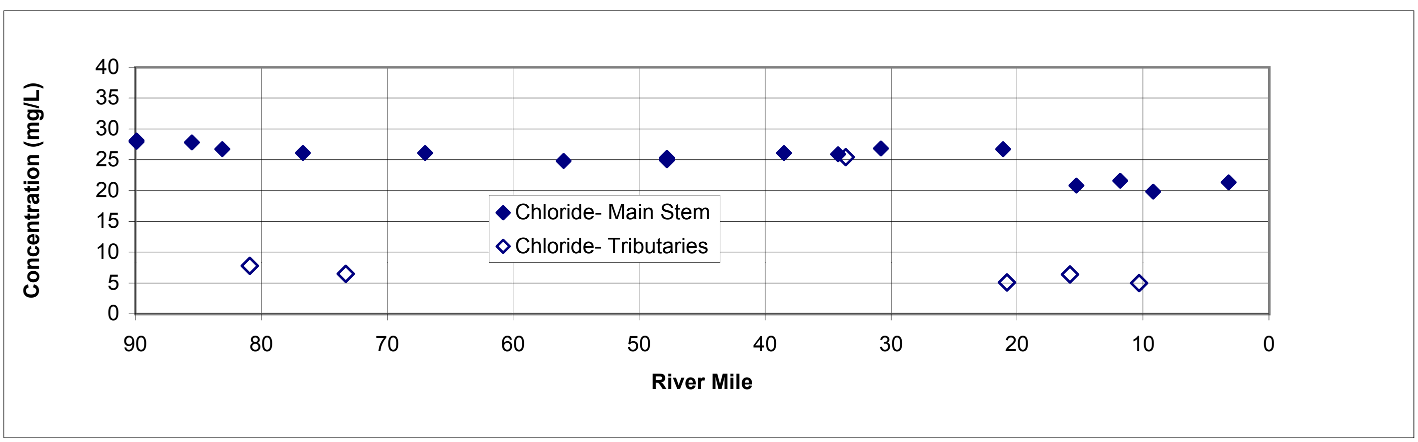
Appendix D Figure D-2a

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Synoptic Survey #1
August 20 to 24, 2001



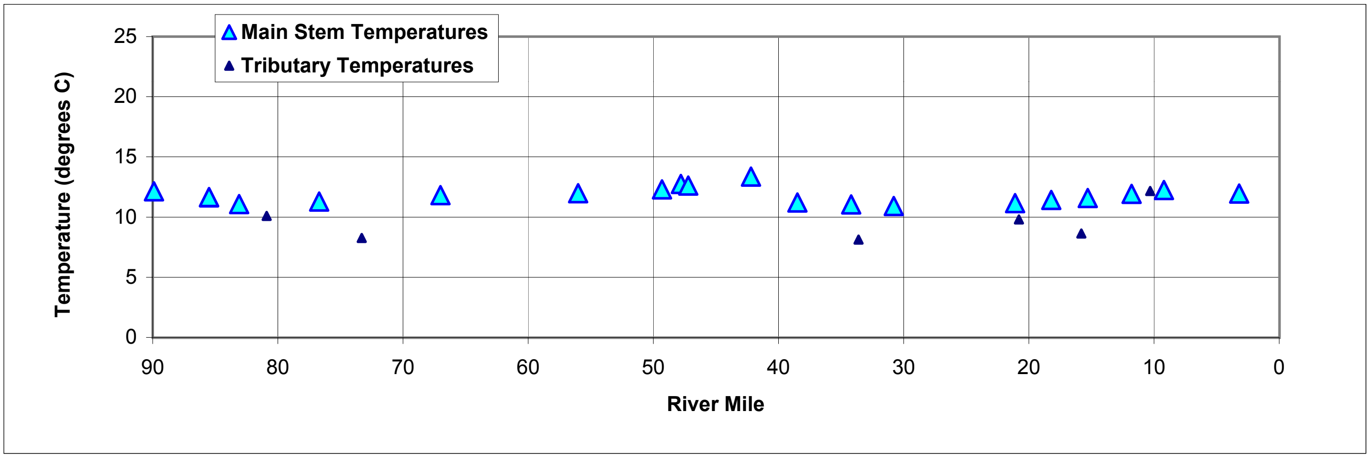


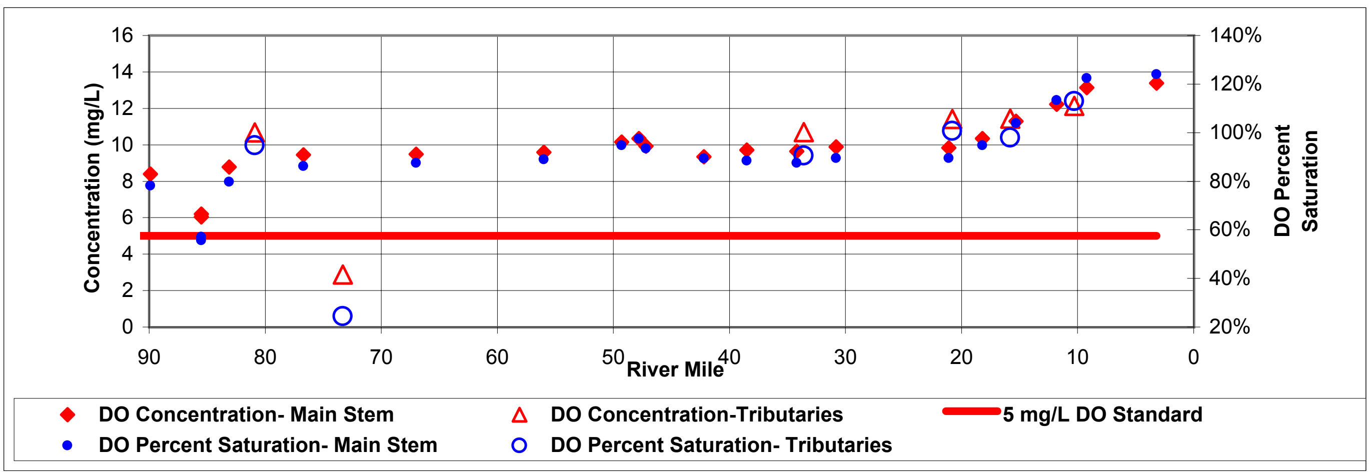


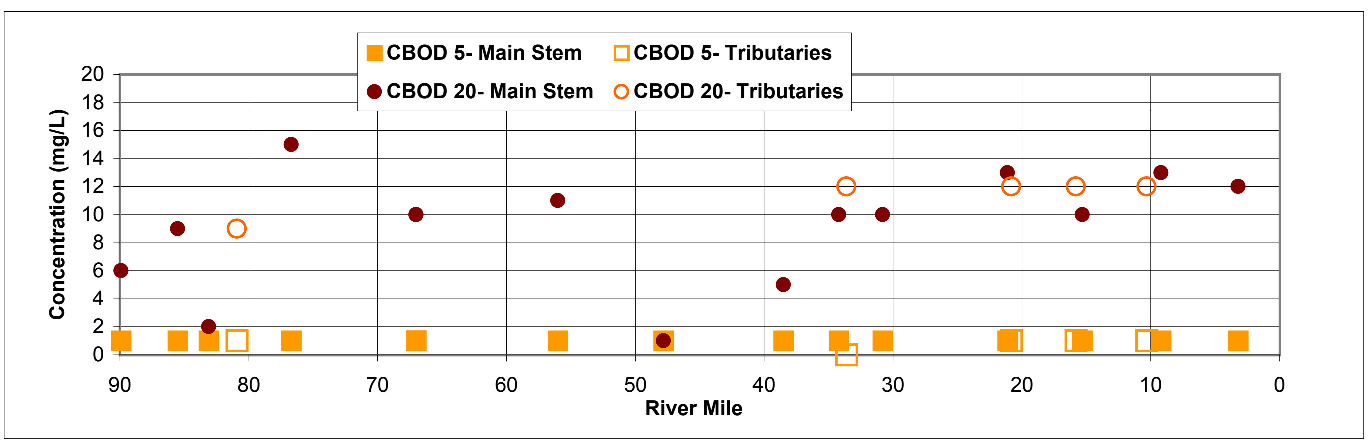
Appendix D Figure D-2b

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Synoptic Survey #2
September 24 and 25, 2001



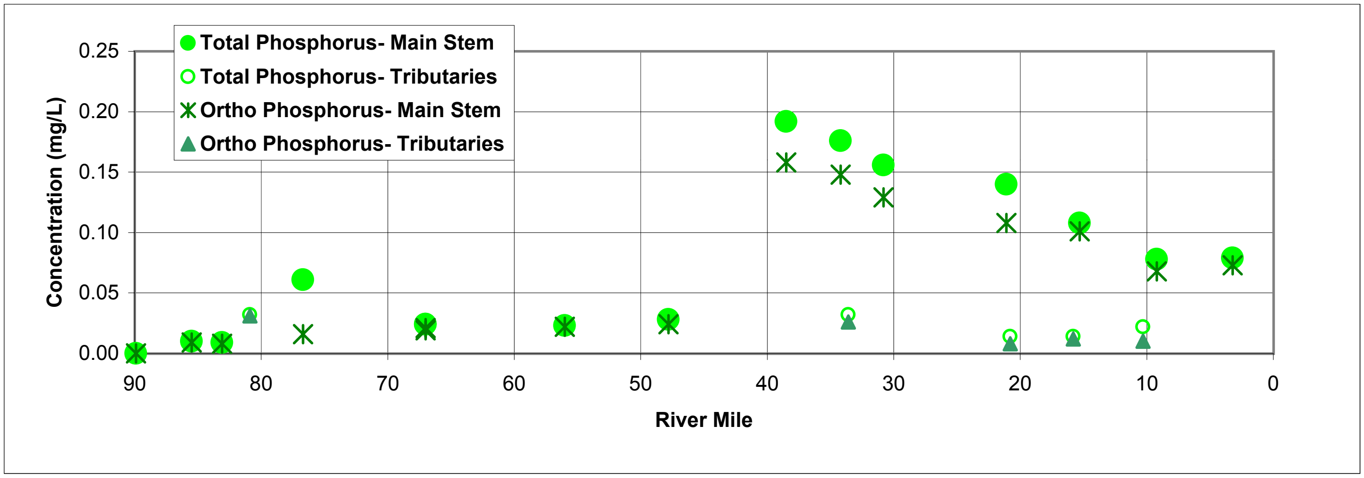


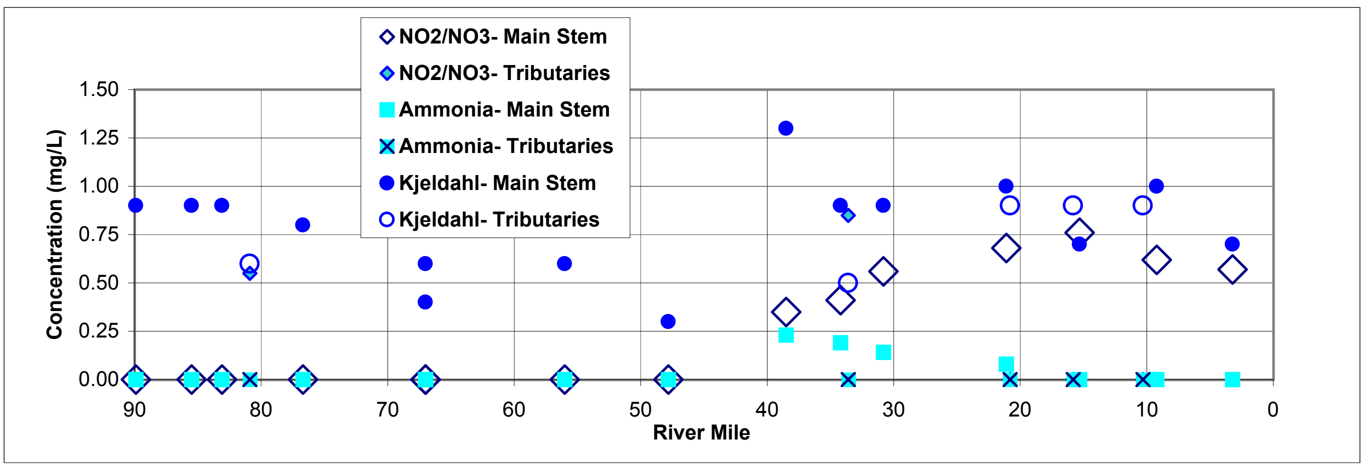


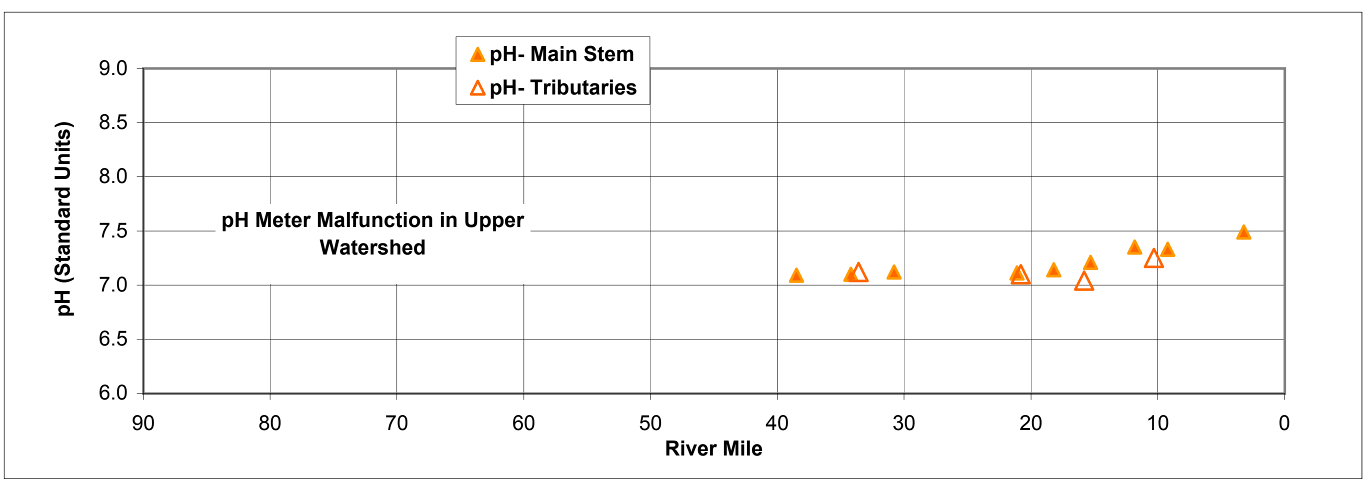
Not all tributaries contributed flow during this survey, see Table 9a for flow & loading data.

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs: Synoptic Survey #2 September 24 and 25, 2001



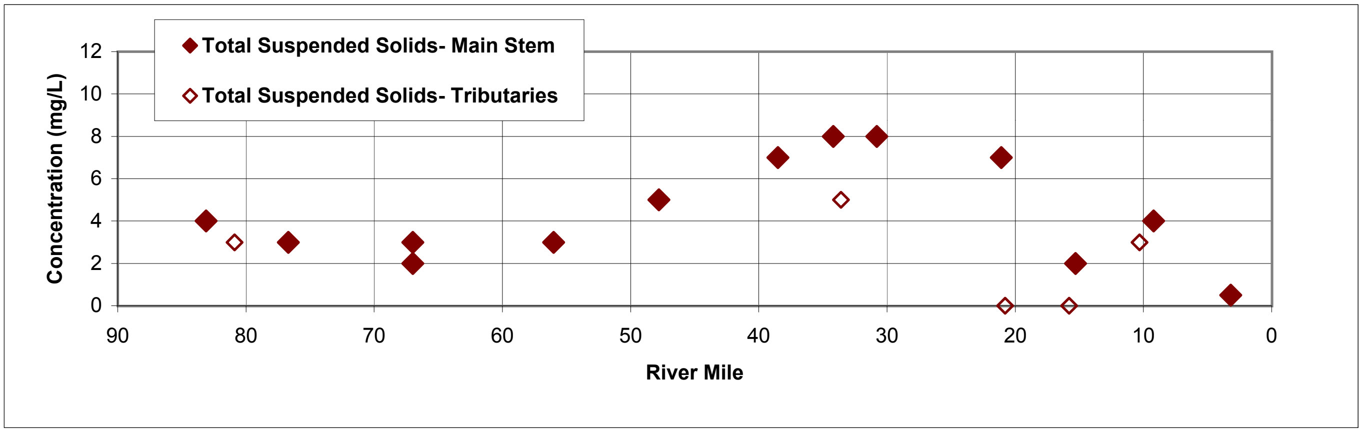


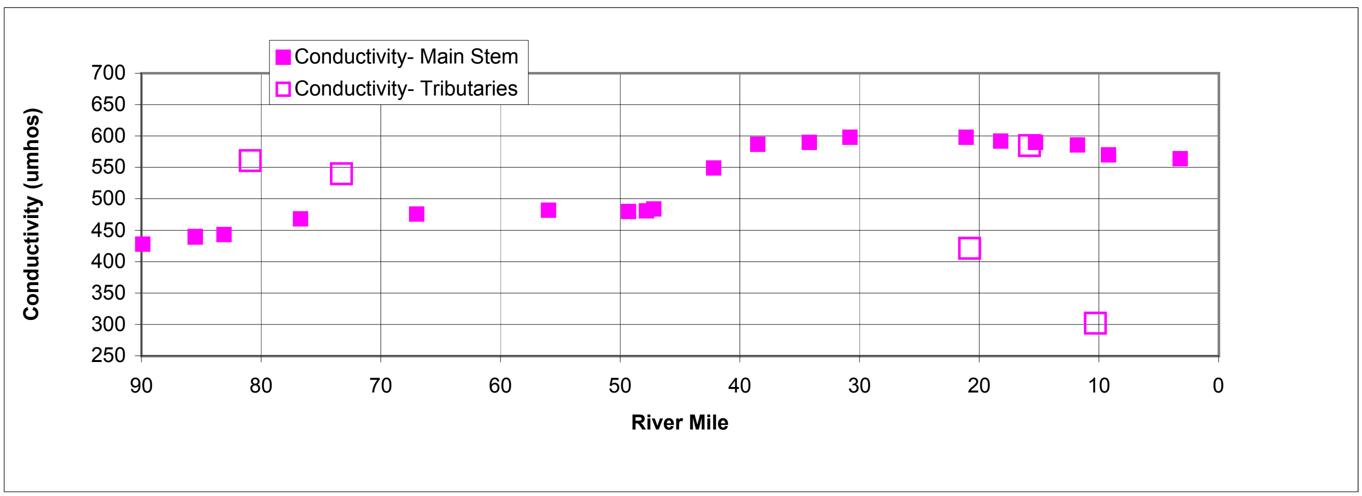


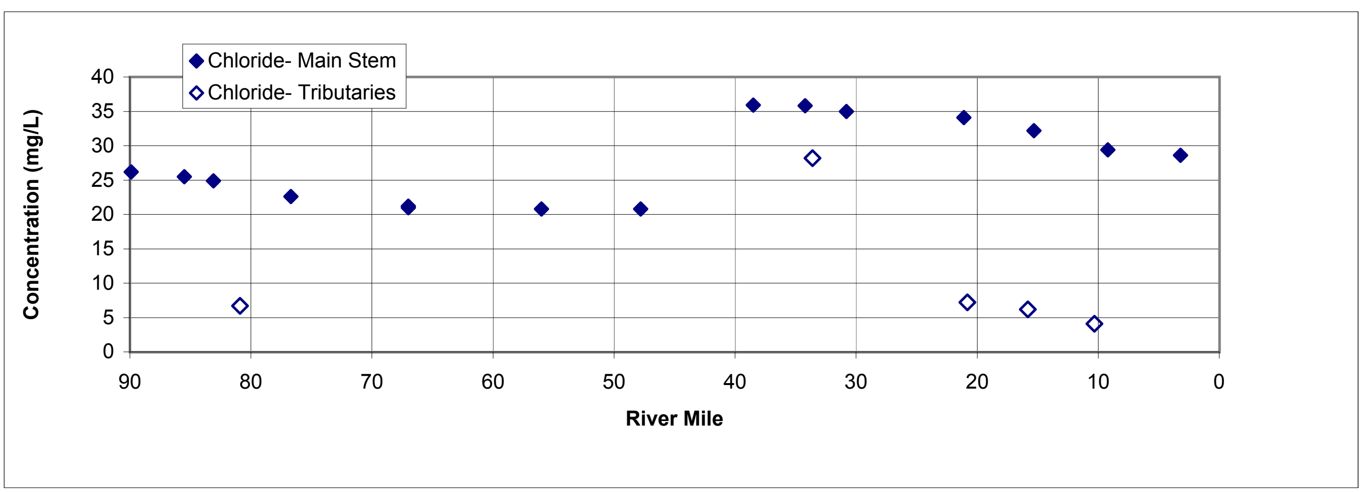
Appendix D Figure D-2b

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Synoptic Survey #2
September 24 and 25, 2001



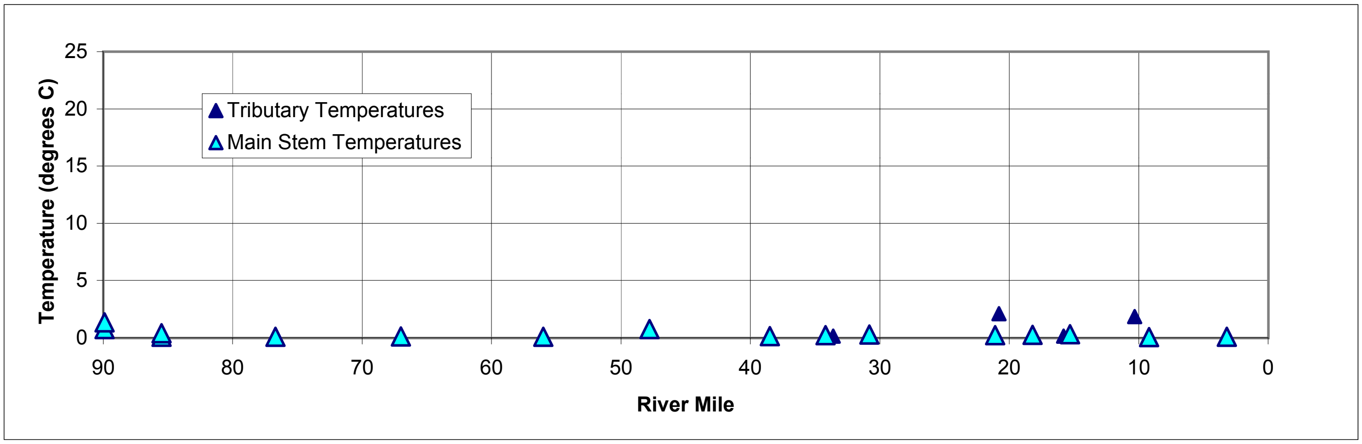


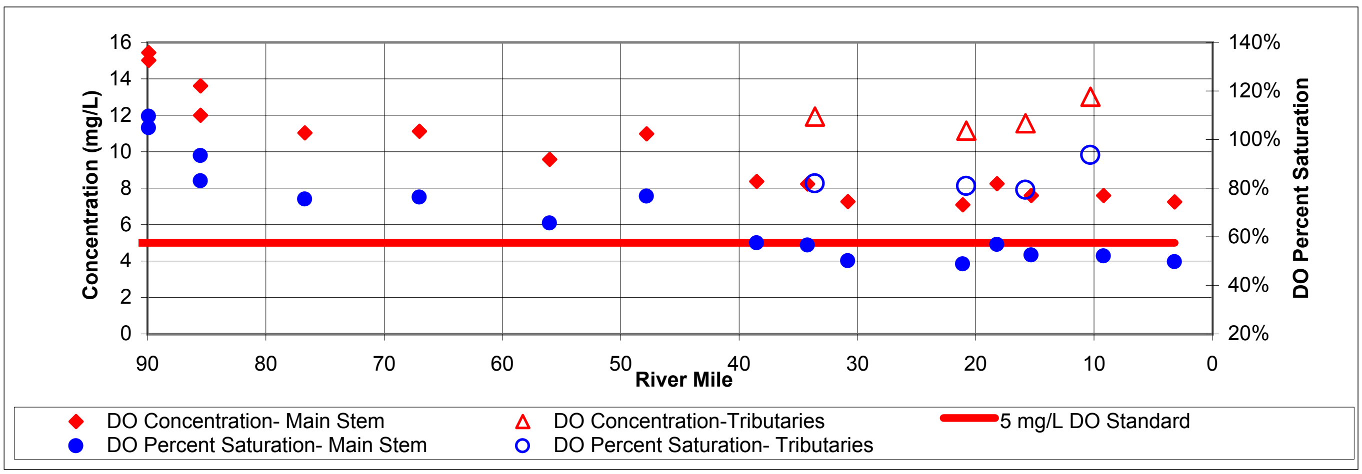


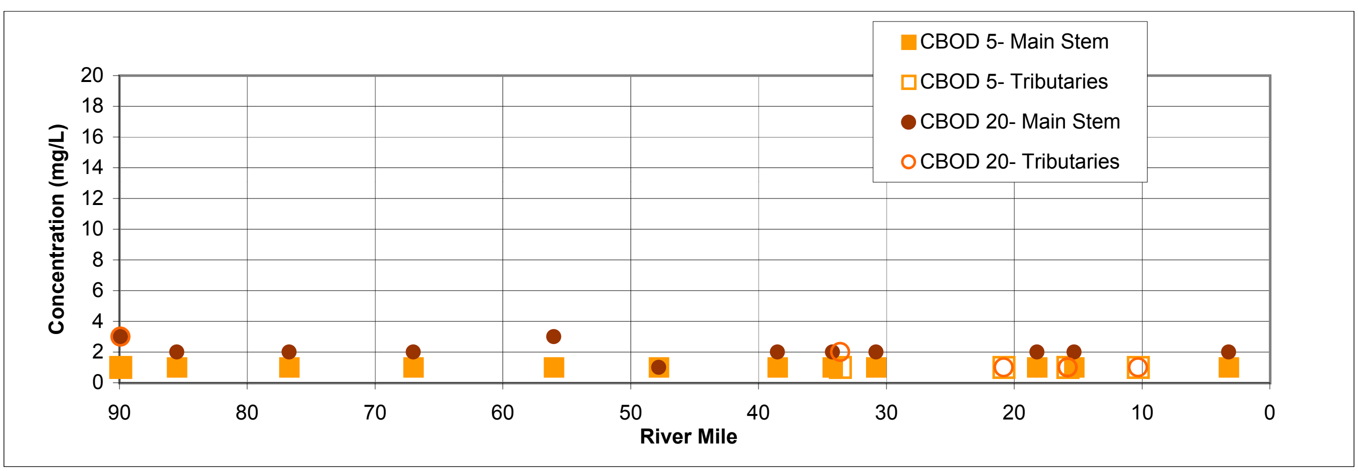
Appendix D Figure D-2c

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Synoptic Survey #3
February 7 and 8, 2002





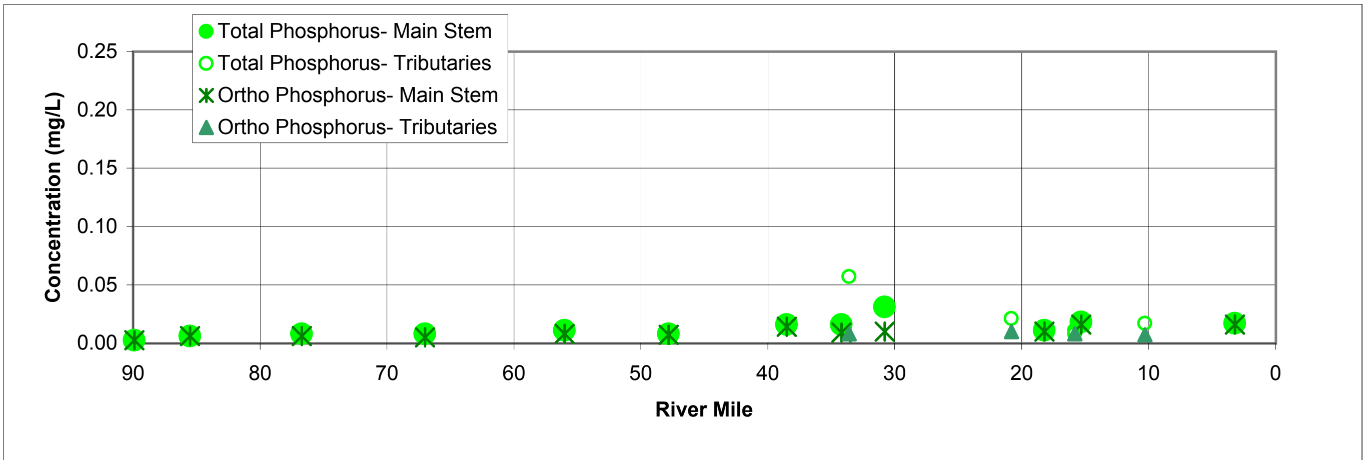


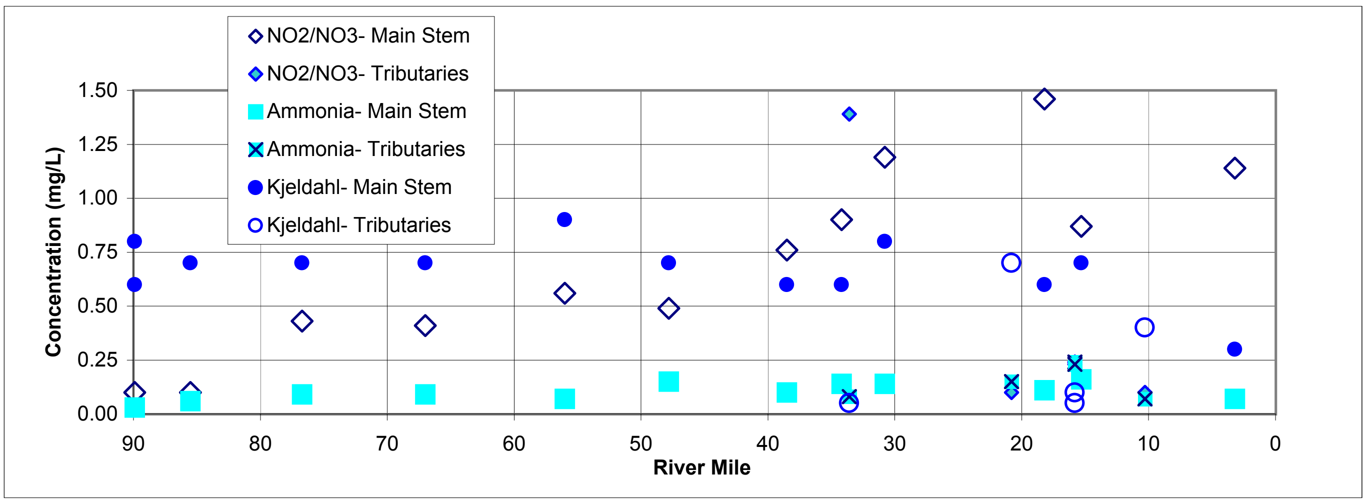
Not all tributaries contributed flow during this survey, see Table 9a for flow & loading data.

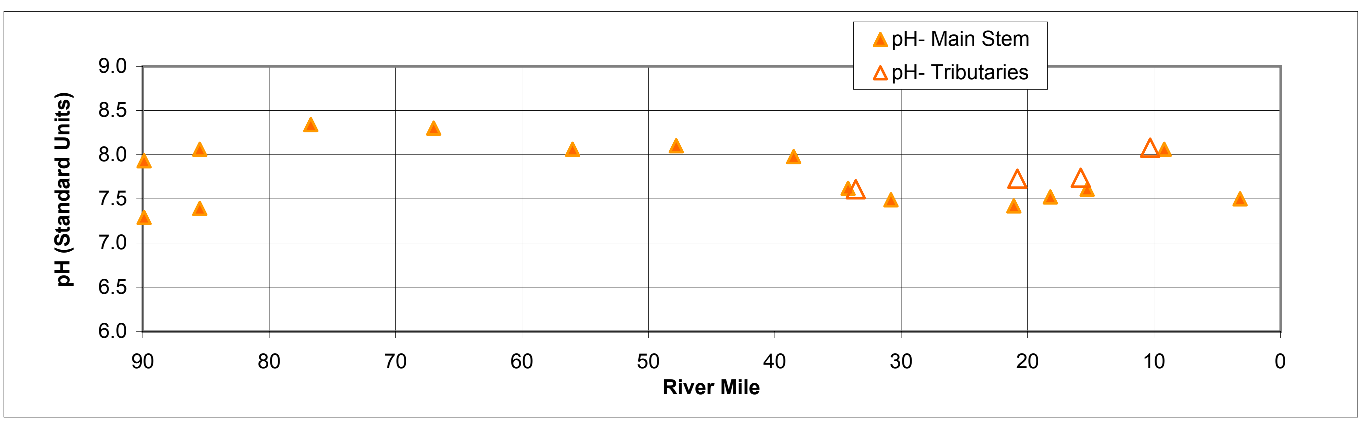
Appendix D Figure D-2c

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Synoptic Survey #3
February 7 and 8, 2002



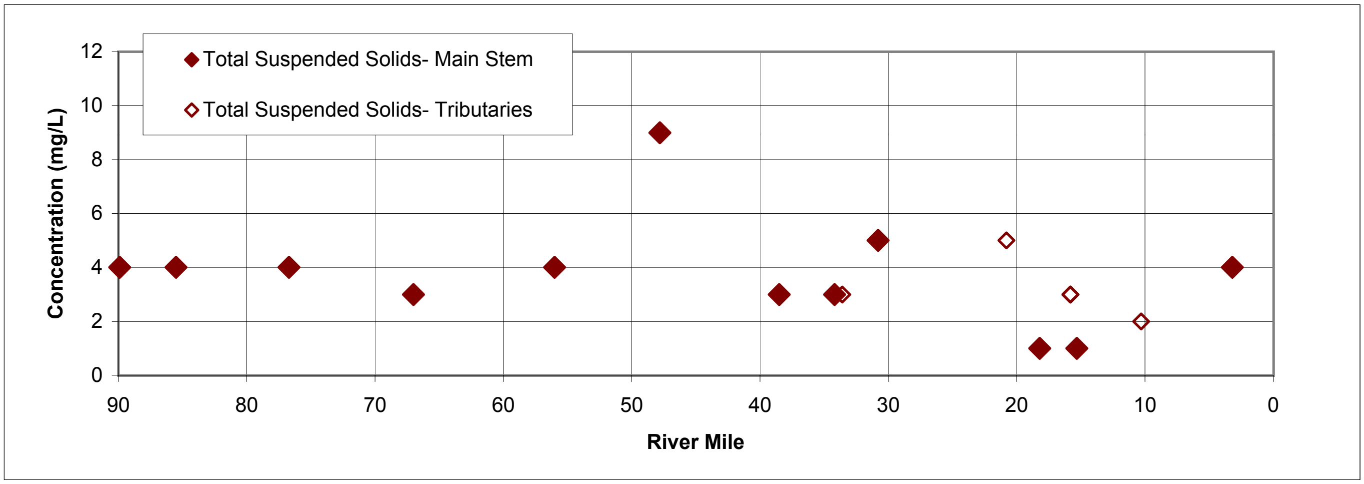


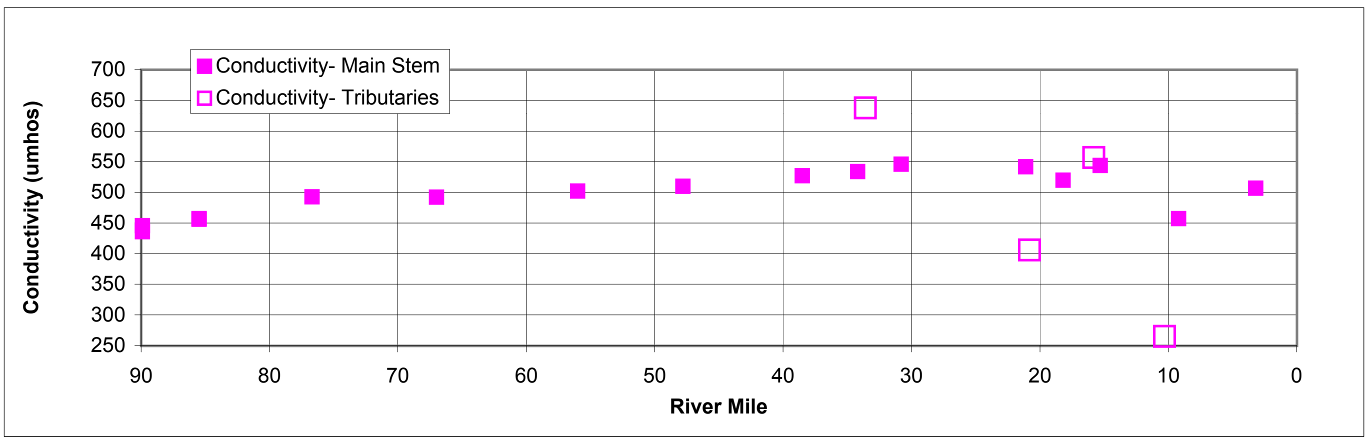


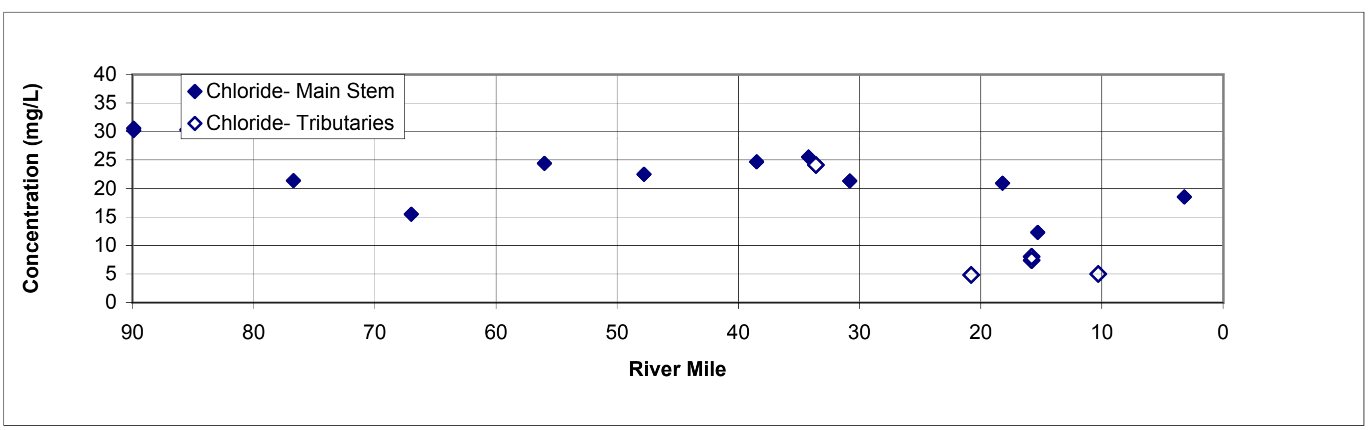
Appendix D Figure D-2c

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Synoptic Survey #3
February 7 and 8, 2002



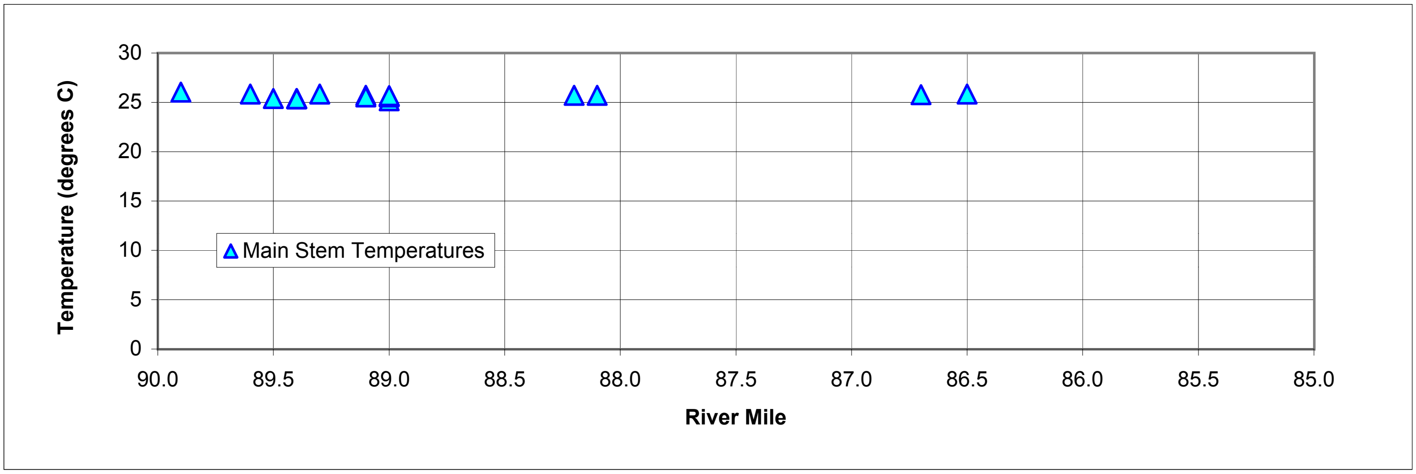


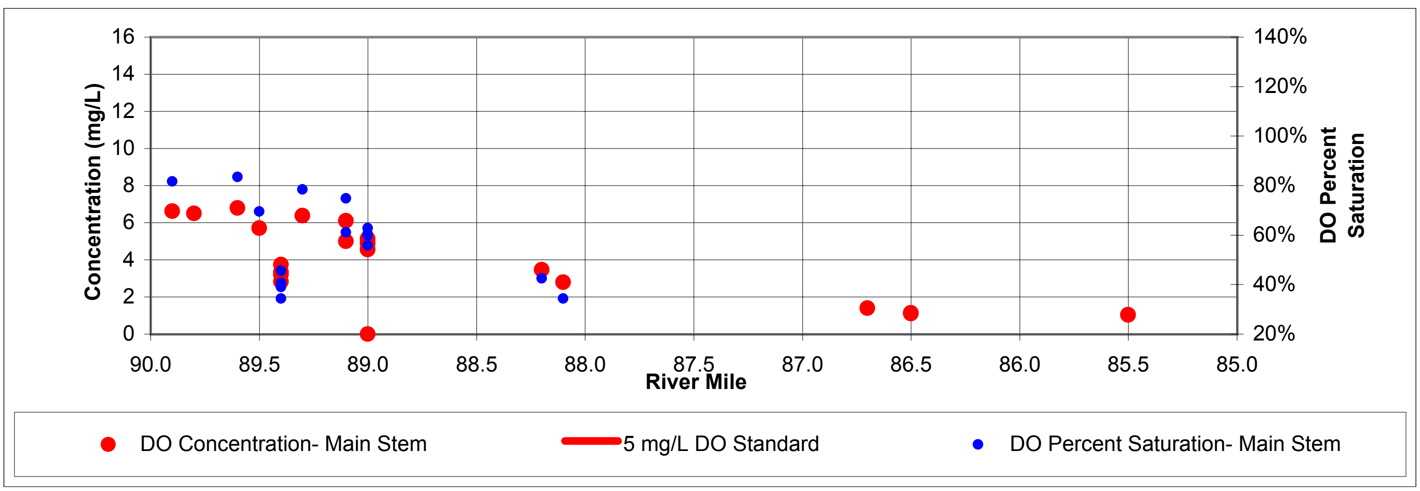


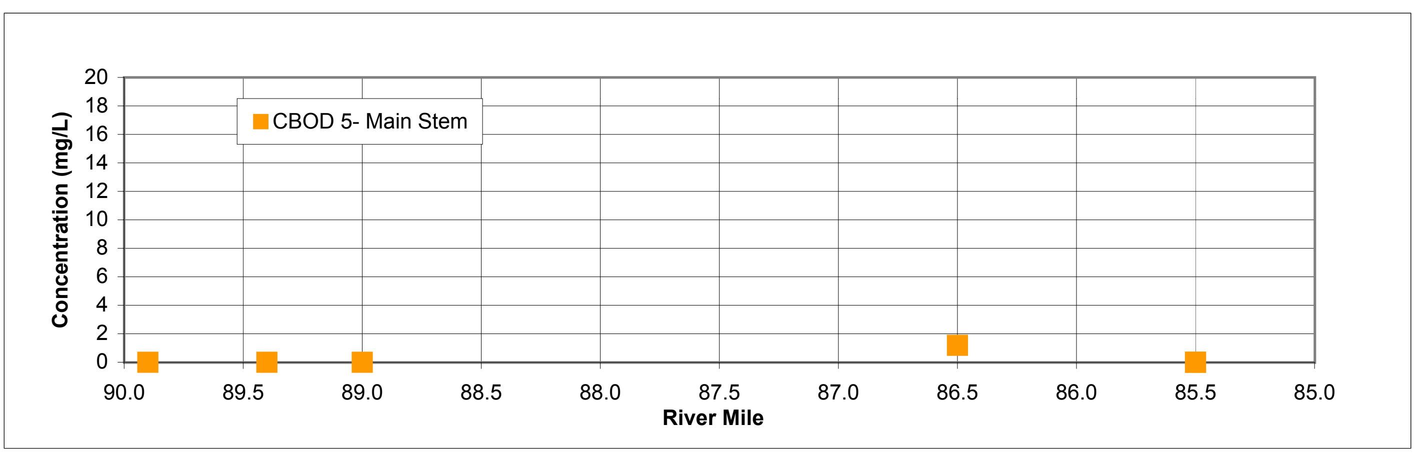
Appendix D Figure D-2d

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Special Survey #1
August 2, 2001



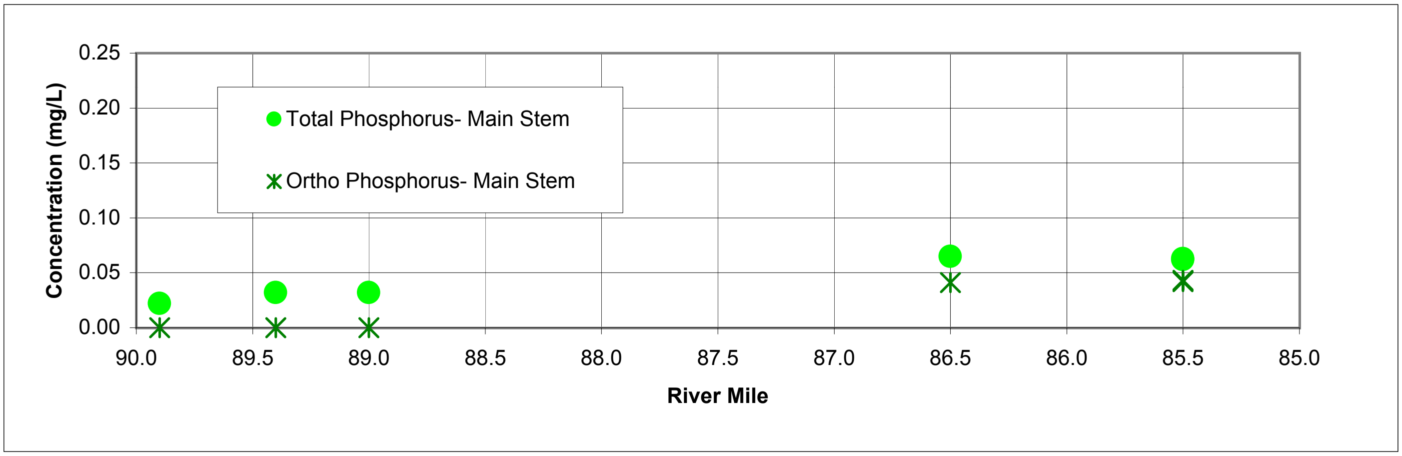


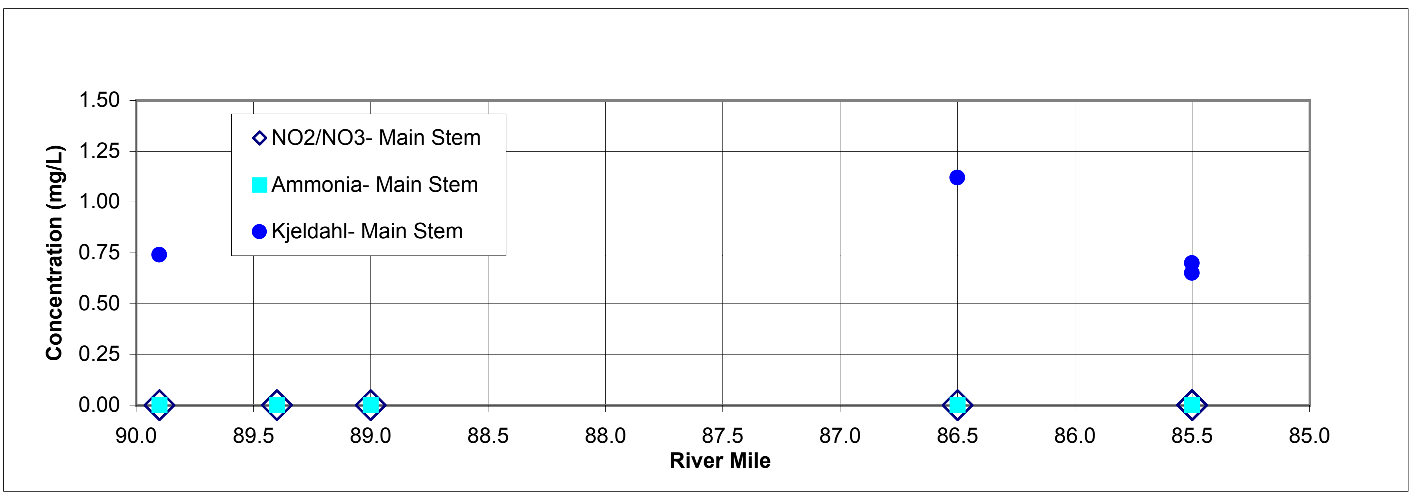


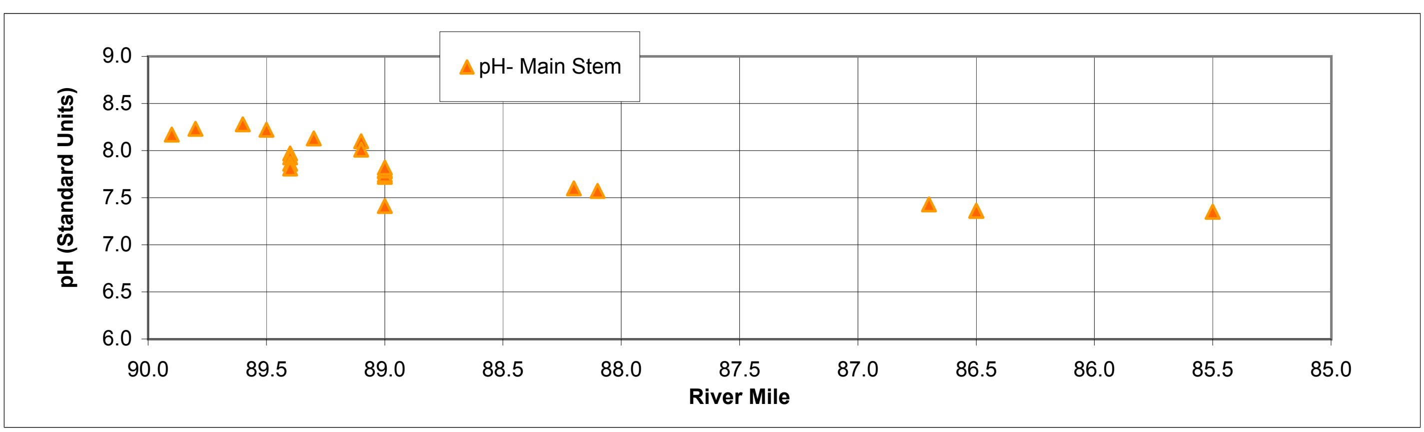
Appendix D Figure D-2d

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Special Survey #1
August 2, 2001



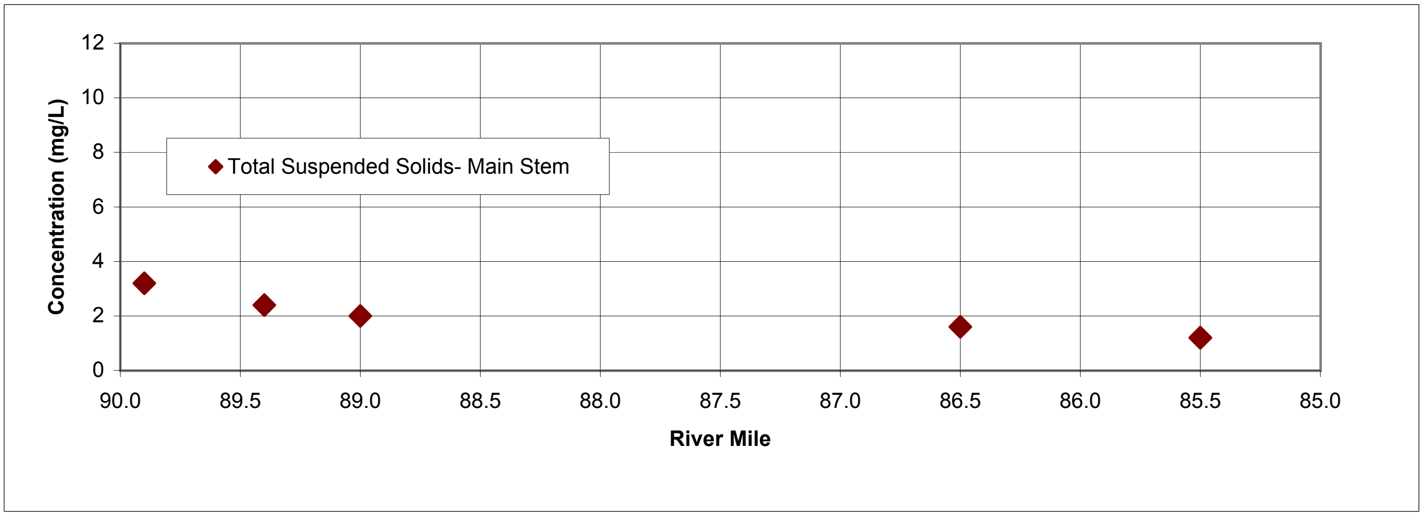


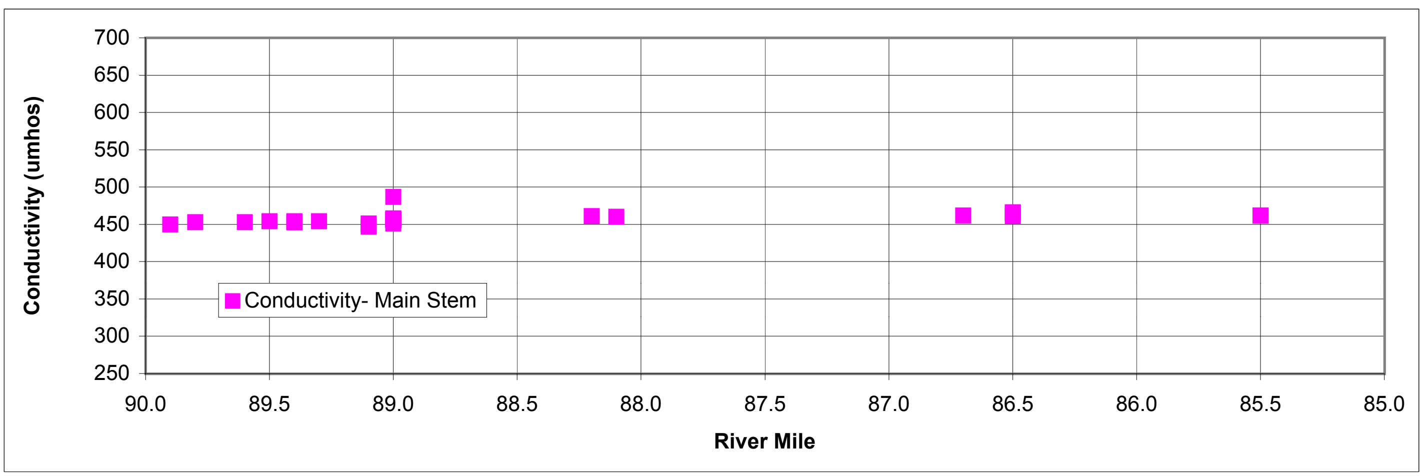


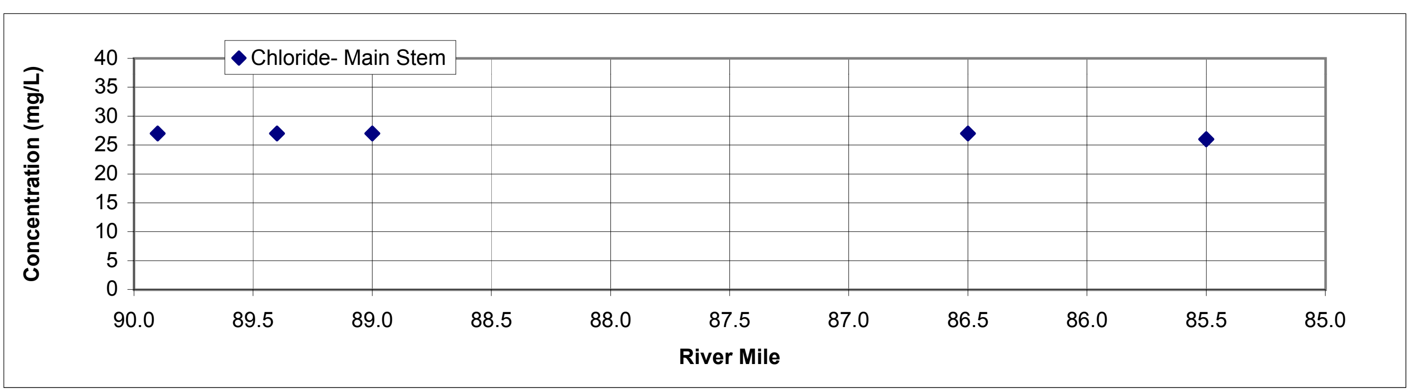
Appendix D Figure D-2d

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Special Survey #1
August 2, 2001



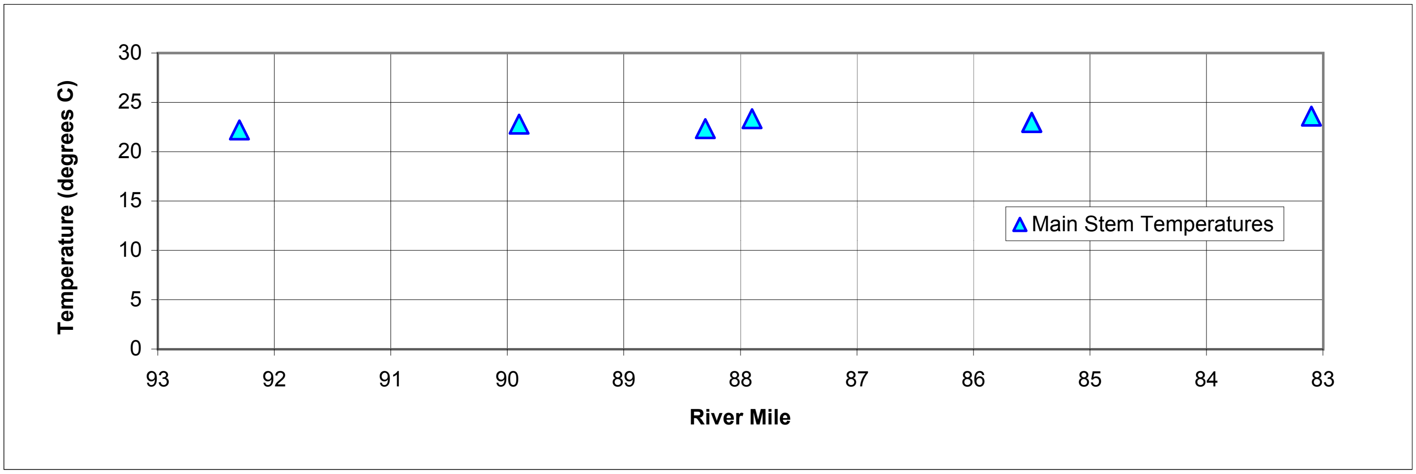


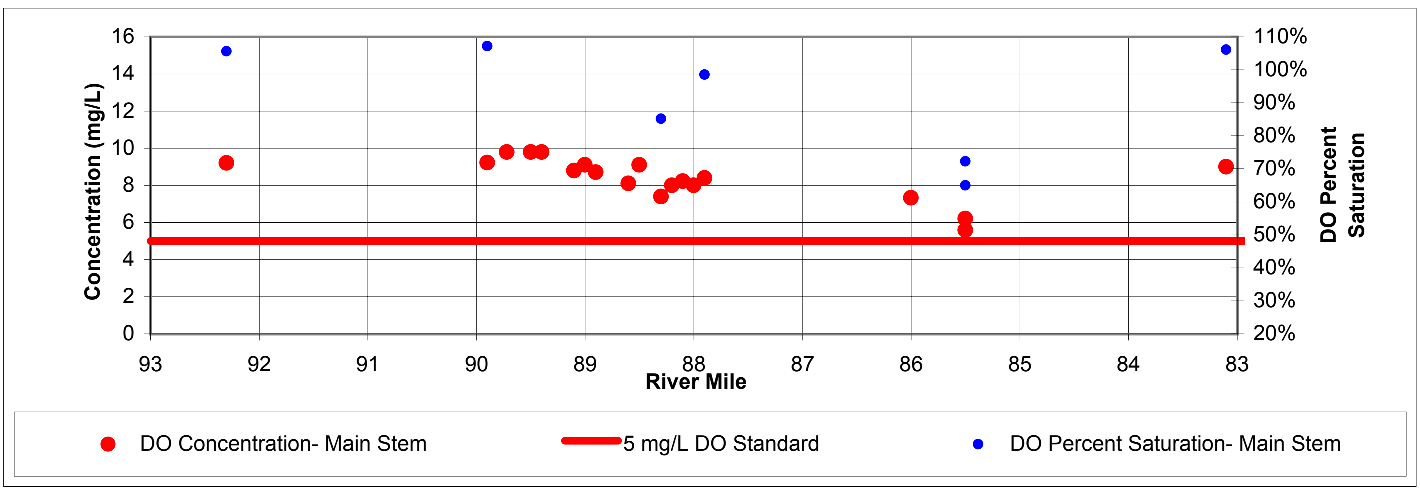


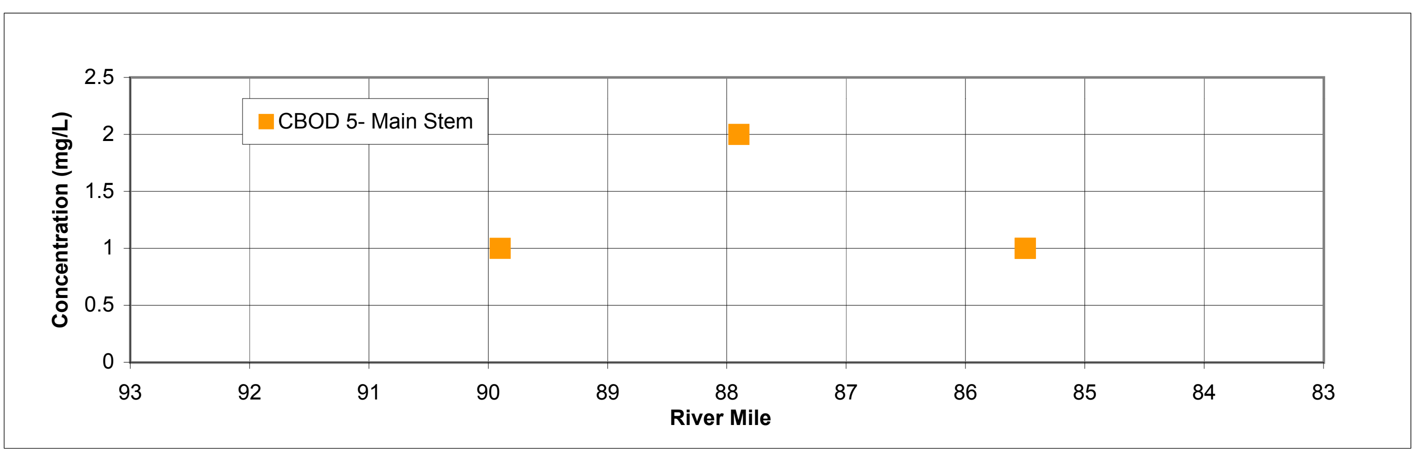
Appendix D Figure D-2e

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Special Survey #2
August 5, 2002



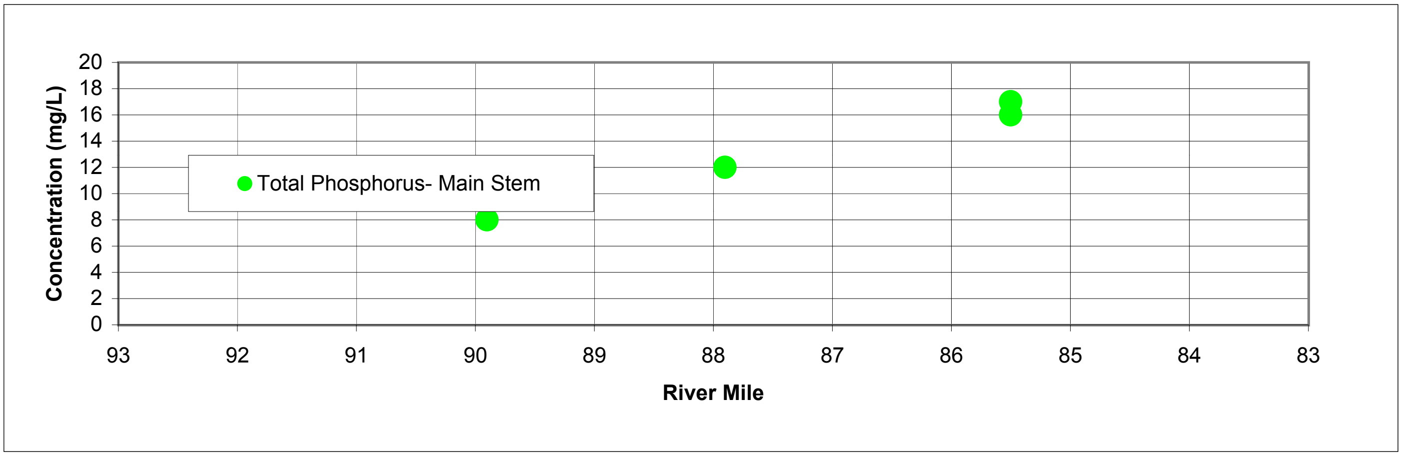


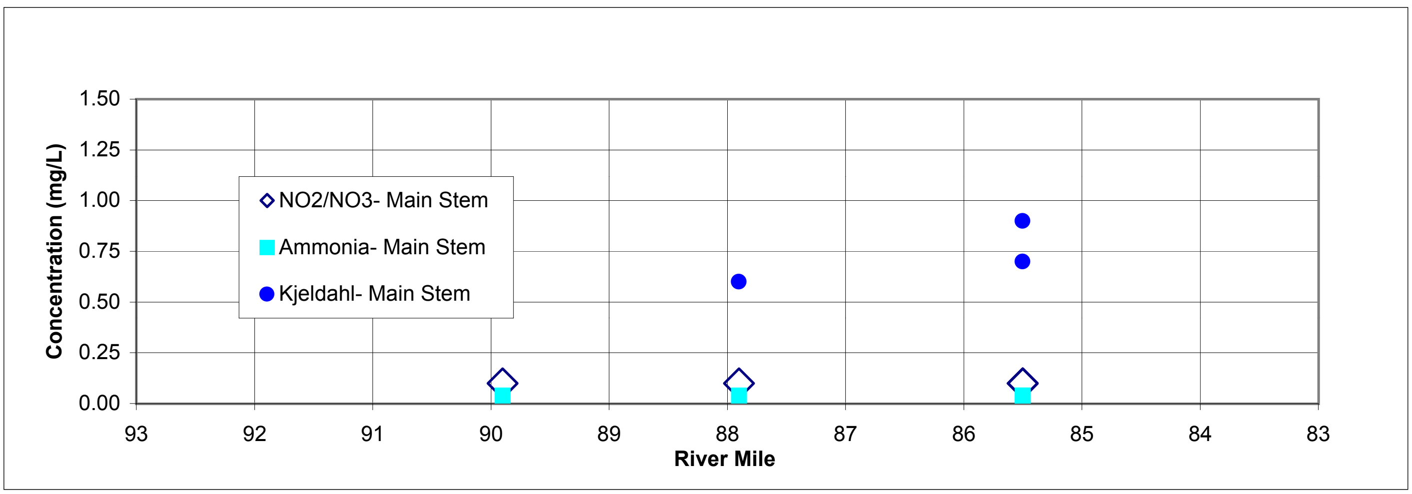


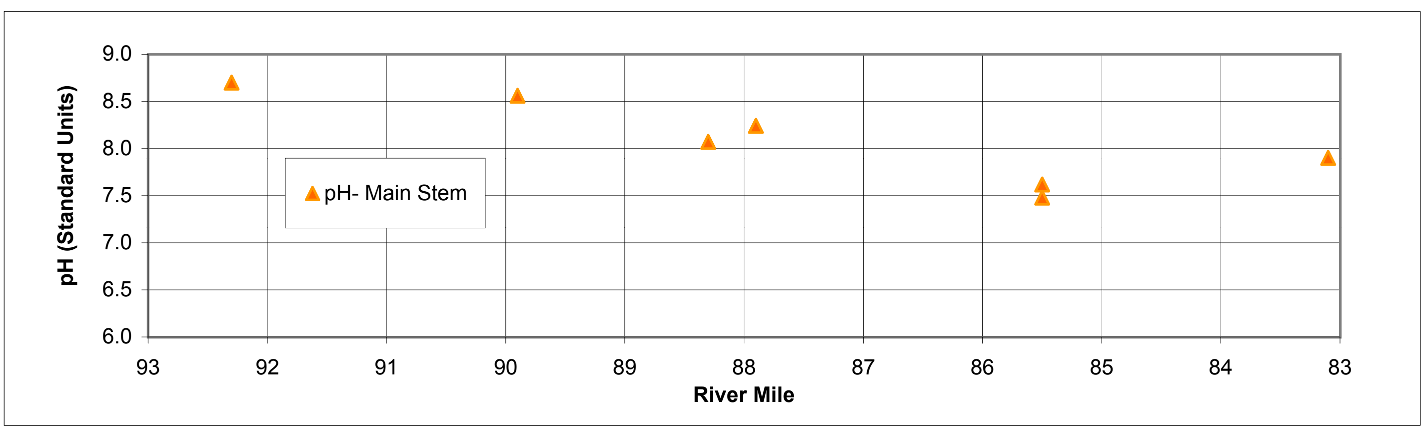
Appendix D Figure D-2e

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Special Survey #2
August 5, 2002



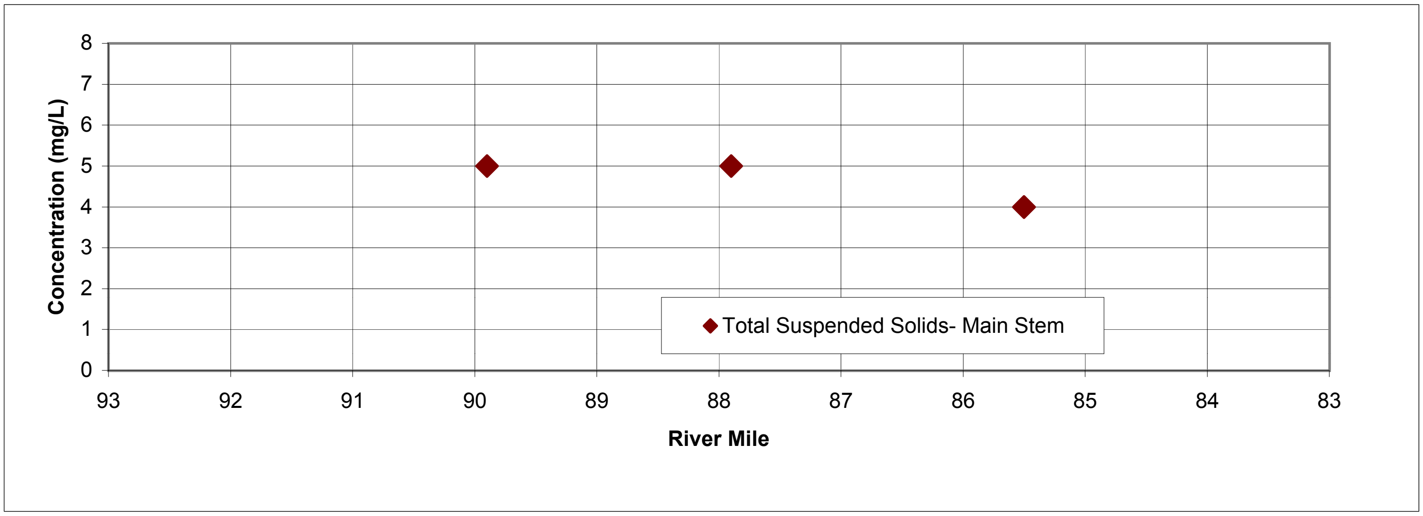


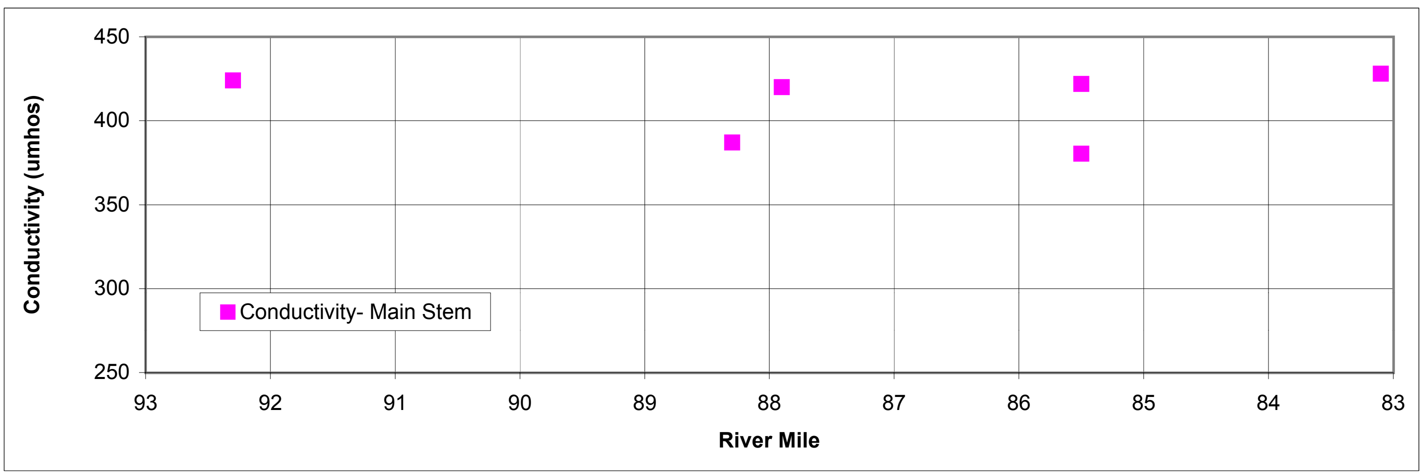


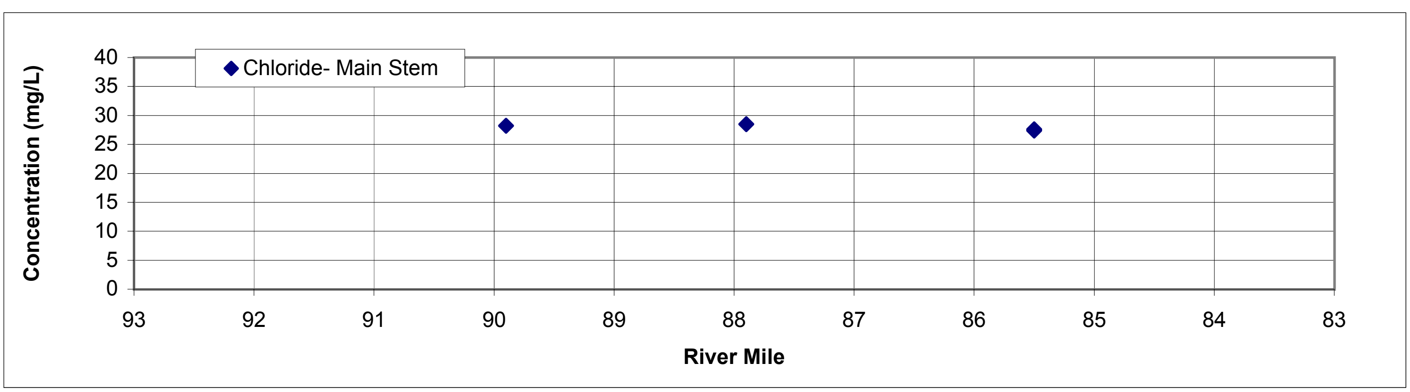
Appendix D Figure D-2e

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
Special Survey #2
August 5, 2002



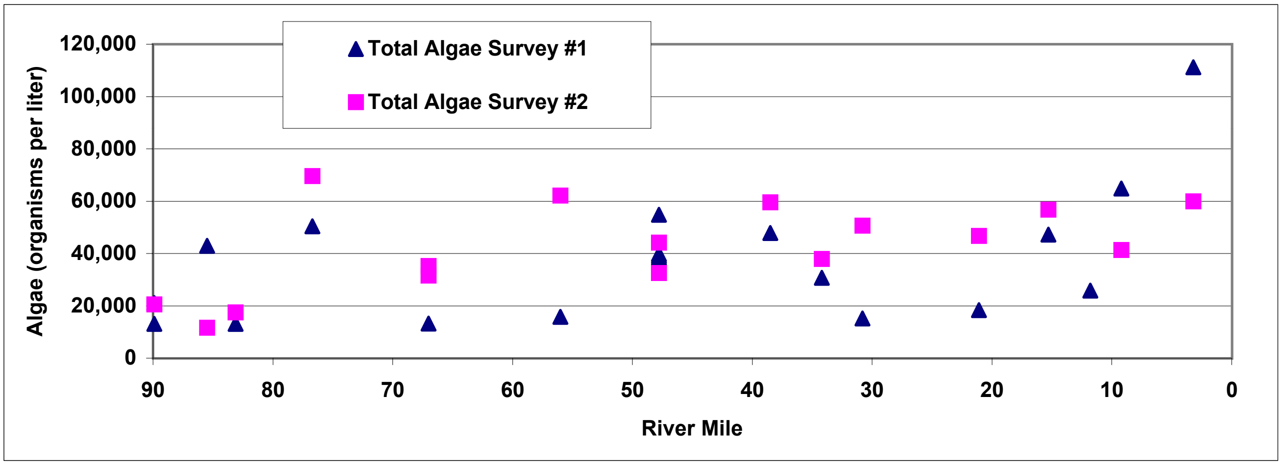


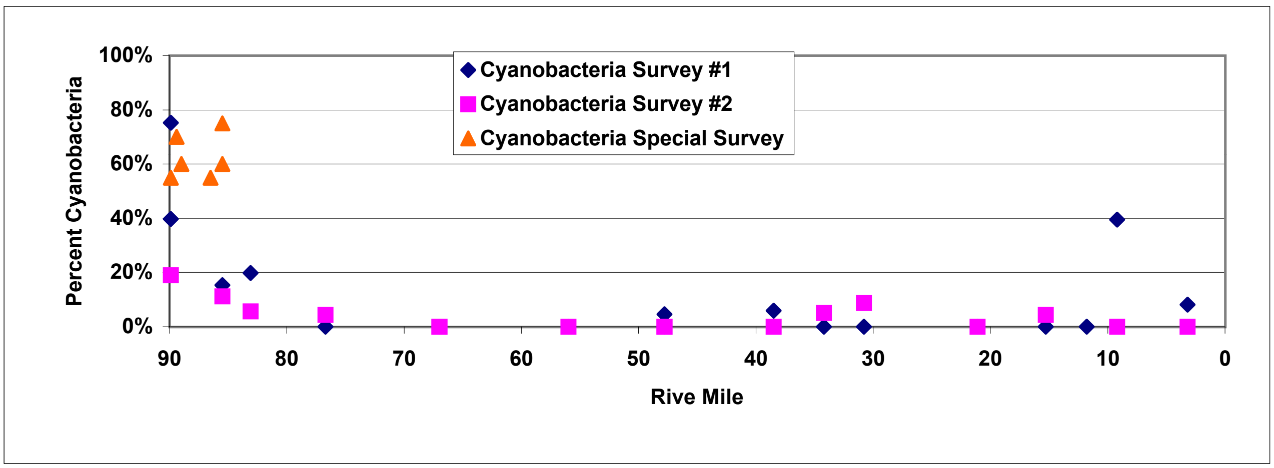


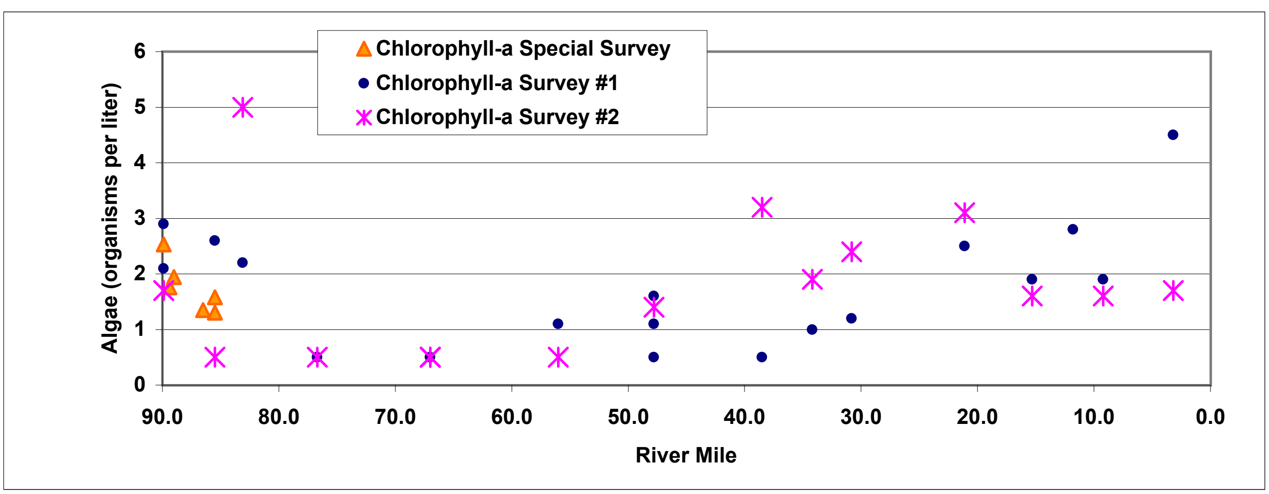
Appendix D Figure D-3

Minnesota Pollution Control Agency
Long Prairie Rive Watershed TMDL Final Project Report

Long Prairie River Profile Graphs: Algae ID, Enumeration Data and Chlorophyll-a (Special Survey 1, Synoptic Surveys 1 and 2)





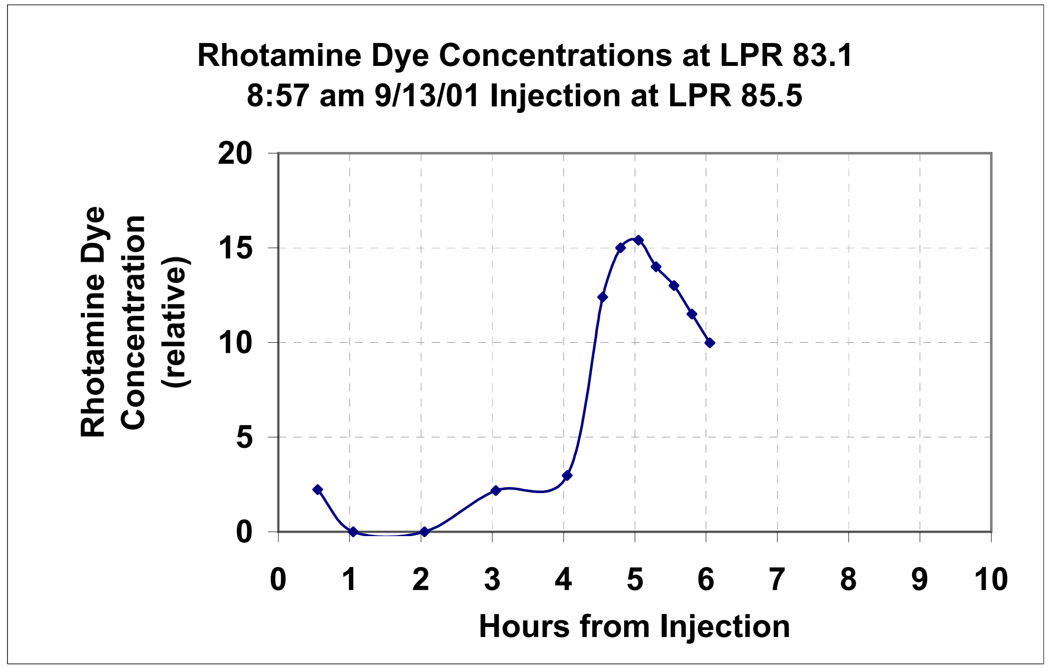


Appendix D Figure D-4a

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Final Project Report

9/12/01 Dye Study Results
LPR 85.5 to 83.1

Injection Date & Time	9/13/2001 8:57
Injection Location (River Mile)	85.5
Sampling Location (River Mile)	83.1
Q (cfs) at LPR 89.9	93.54
Q (cfs) at LPR 83.1	104.22
Gallons of Dye Injected	0.5
Total Travel Dist (miles)	2.4
Total Travel Dist (feet)	12,672



Appendix D Figure D-4b

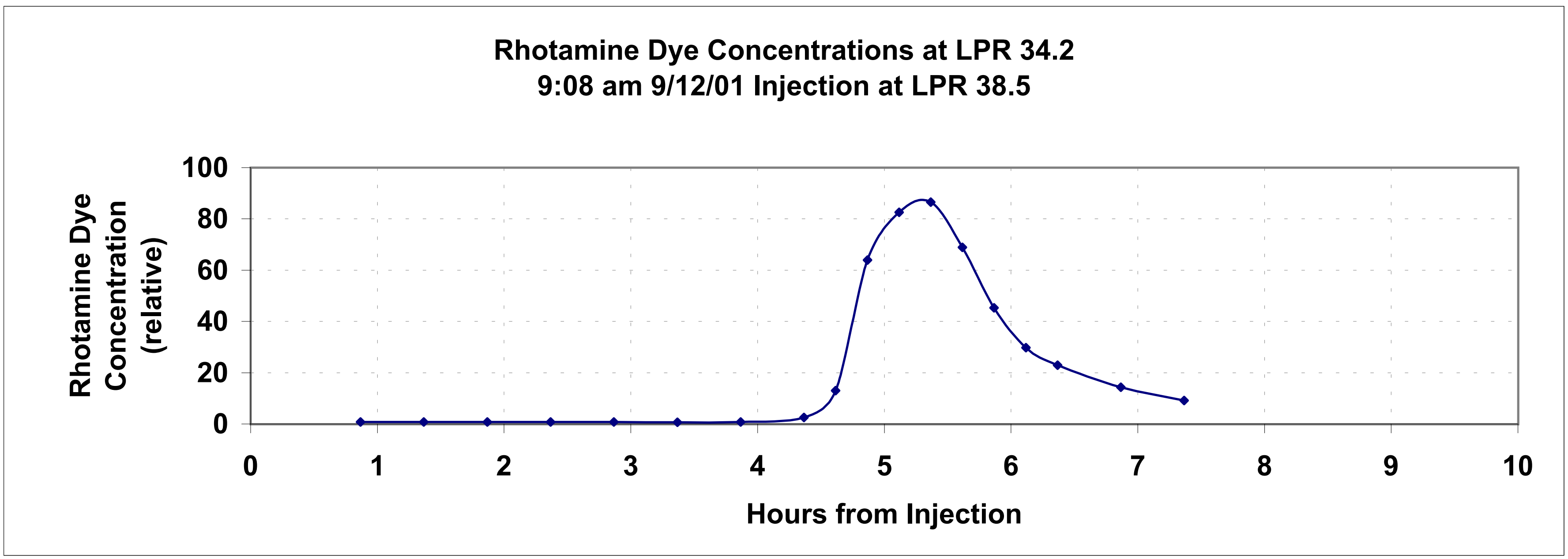
Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Final Project Report

9/12/01 Dye Study
LPR 38.5 to 34.2

9/12/01 Dye Test, LPR 38.5 to LPR 34.2

Injection Date & Time	9/12/01 9:08
Q at Injection (cfs)	170.26
Injection Location (river mile)	38.5

Sampling Location (River Mile)	Total Travel Dist (miles)	Q (cfs)
34.2	4.3	223.38



Appendix D Figure D-4c

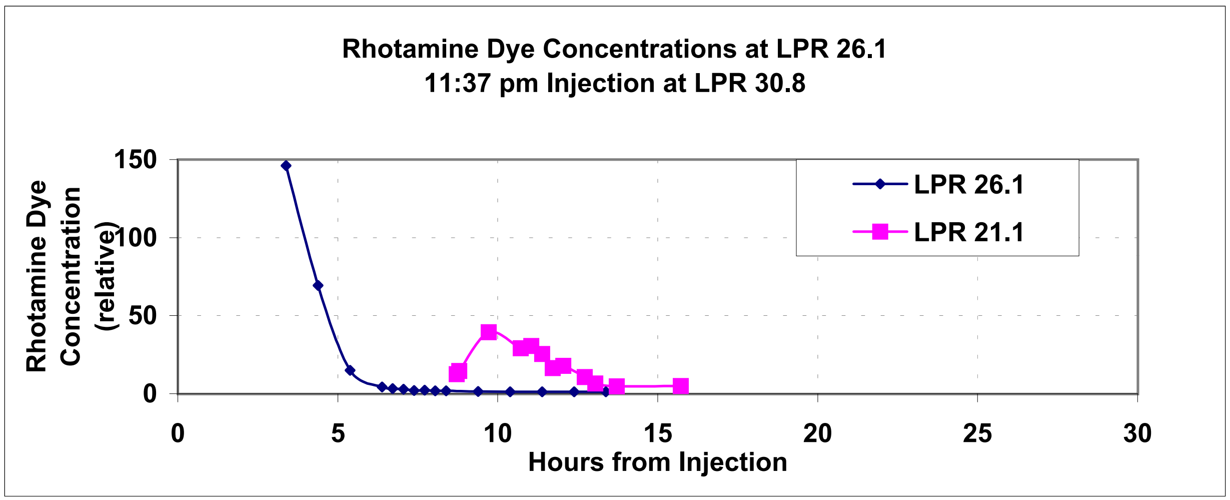
Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Final Project Report

9/12/01 Dye Study
LPR 30.8 to 21.1

9/11/01- 9/12/01 Dye Study LPR 30.8

Injection Date & Time	9/11/01 23:37
Q at Injection (cfs)	220.25
Injection Location (river mile)	30.8

Sampling Locations (River Mile)	Total Travel Dist (miles)	Distance Between Sites (miles)	Q (cfs)
26.1	4.7	4.7	204.30
21.1	9.7	5.0	
18.2	---	---	230.63



Appendix D Figure D-4d

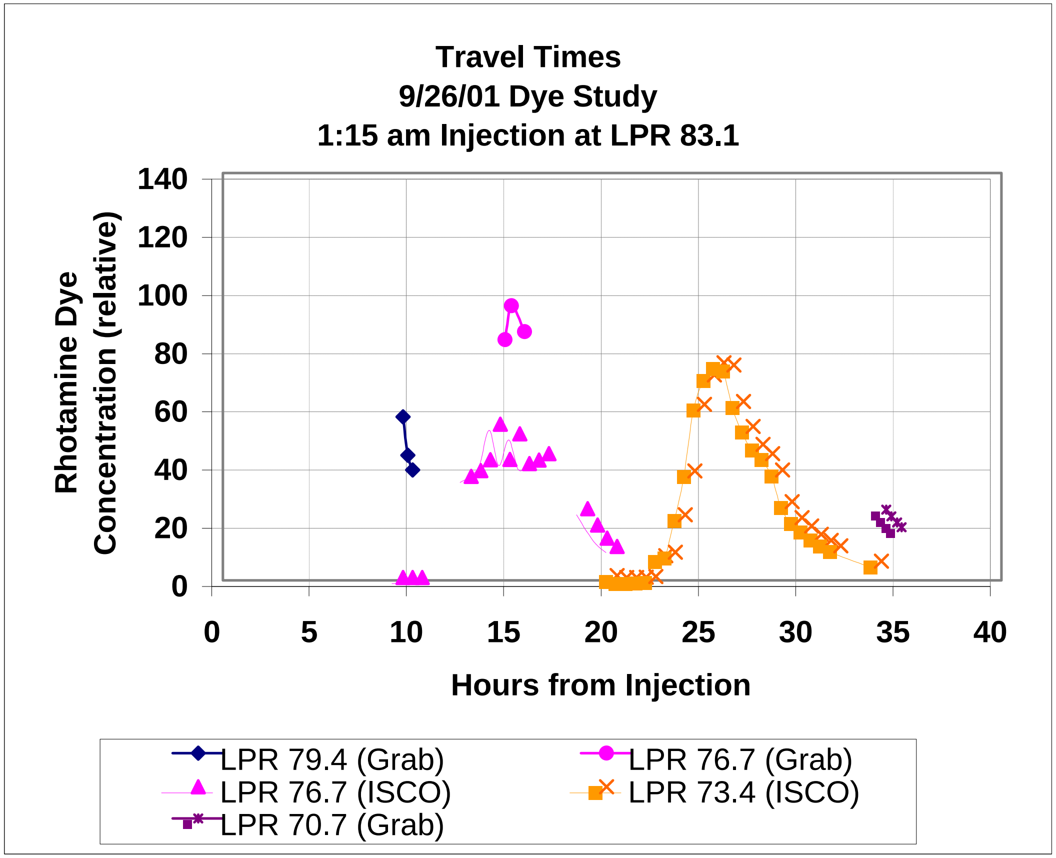
Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Final Project Report

9/26-27/01 Dye Study
LPR 83.1 to 70.7

9/26/01- 9/27/01 Dye Study LPR 83.1

Injection Date & Time	9/26/2001 1:15
Pounds of Dye Injected	25
Q at Injection (cfs)	94.79
Injection Location (river mile)	83.1

Sampling Locations (River Mile)	Total Travel Dist (miles)	Distance Between Sites (miles)	Q (cfs)
79.4	3.7	3.7	
76.7	6.4	2.7	115.36
73.4	9.7	3.3	
70.7	12.4	2.7	
67.0	---	---	139.6



Appendix D Figure D-4e

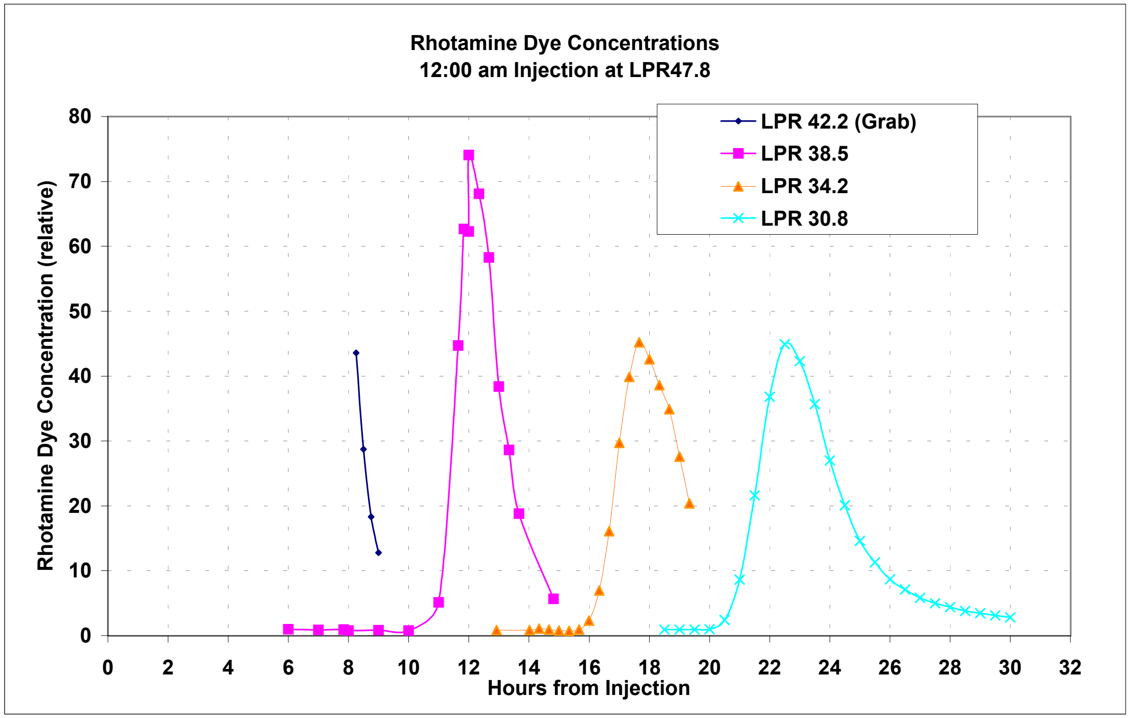
Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Final Project Report

9/26-27/01 Dye Study
LPR 47.8 to 30.8

9/26/01- 9/27/01 Dye Study LPR 47.8

Injection Date & Time	9/26/01 0:00
Pounds of Dye Injected	13
Q at Injection (cfs)	147.86
Injection Location (river mile)	47.8

Sampling Locations (River Mile)	Total Travel Dist (miles)	Distance Between Sites (miles)	Q (cfs)
42.2	5.6	5.6	
38.5	9.3	3.7	203.61
34.2	13.6	4.3	158.92
30.8	17.0	3.4	196.95



Appendix D Figure D-4f

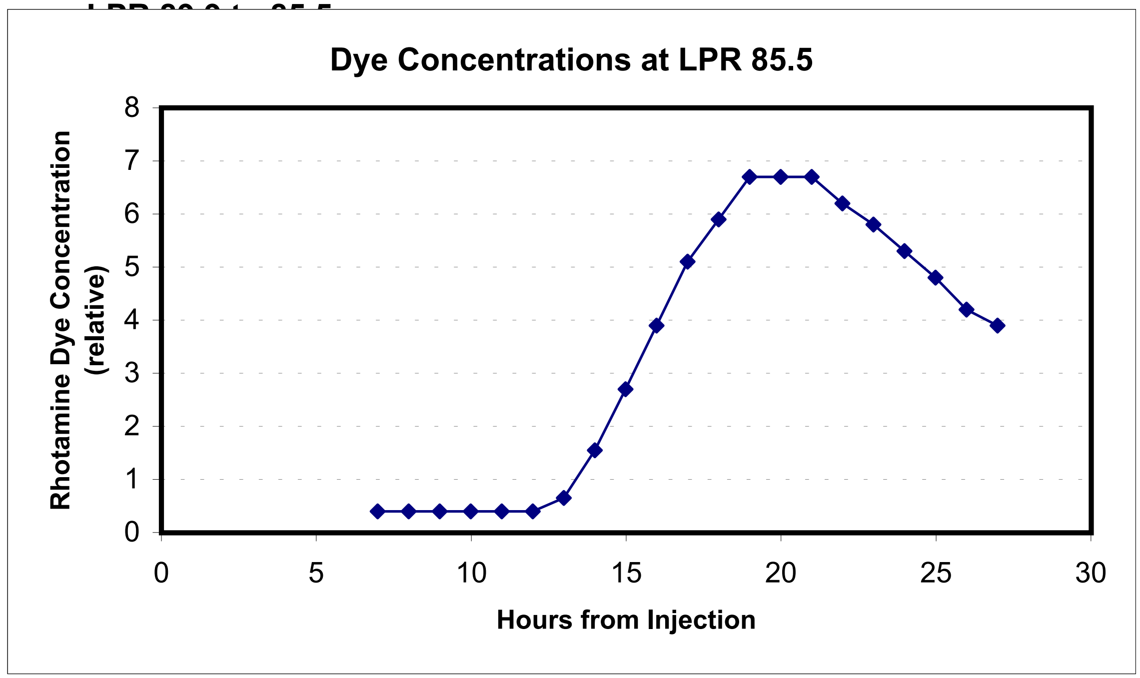
Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Project: Final Project Report

8/5-6/02 Dye Study

8/5-6/2002 Dye Study LPR 85.5

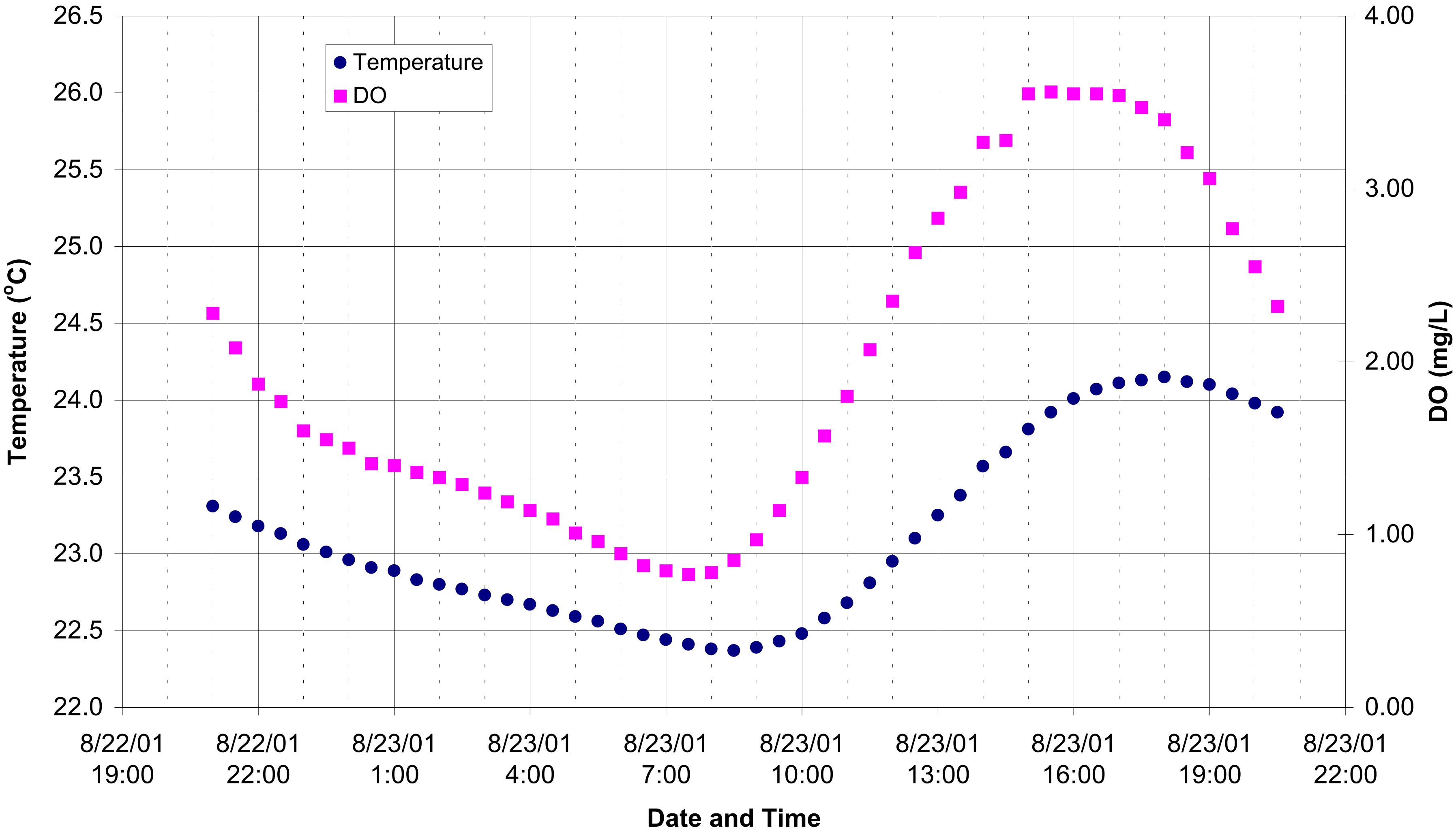
Injection Date & Time	8/5/02 11:46
Q at Injection (cfs)	111.9
Injection Location (river mile)	89.9

Sampling Locations (River Mile)	Total Travel Dist (miles)	Distance Between Sites (miles)	Q (cfs)
85.5	4.4	4.4	
83.1	6.8	2.4	105.3



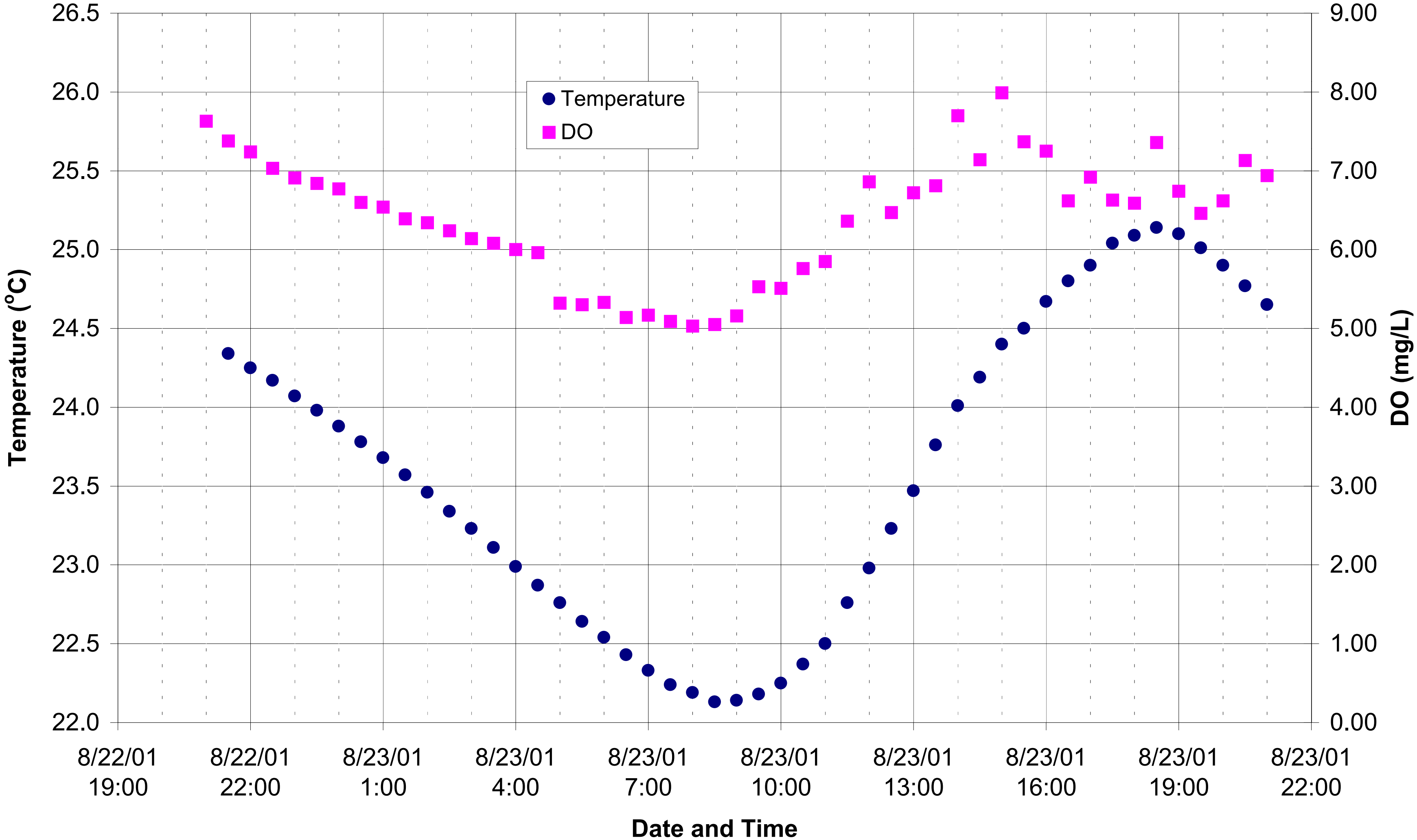
Appendix D Figure D-5
Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Diurnal Temperature and DO Concentrations in Long Prairie River at Mile 85.5
August 22-23, 2001



Appendix D Figure D-6
Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Diurnal Temperature and DO Concentrations in Long Prairie River at Mile 21.1
August 22-23, 2001



T:\0147\51\Phase III Rpt\Appendices/Appendix D_Fig 05_6/Appendix D Figure D-6

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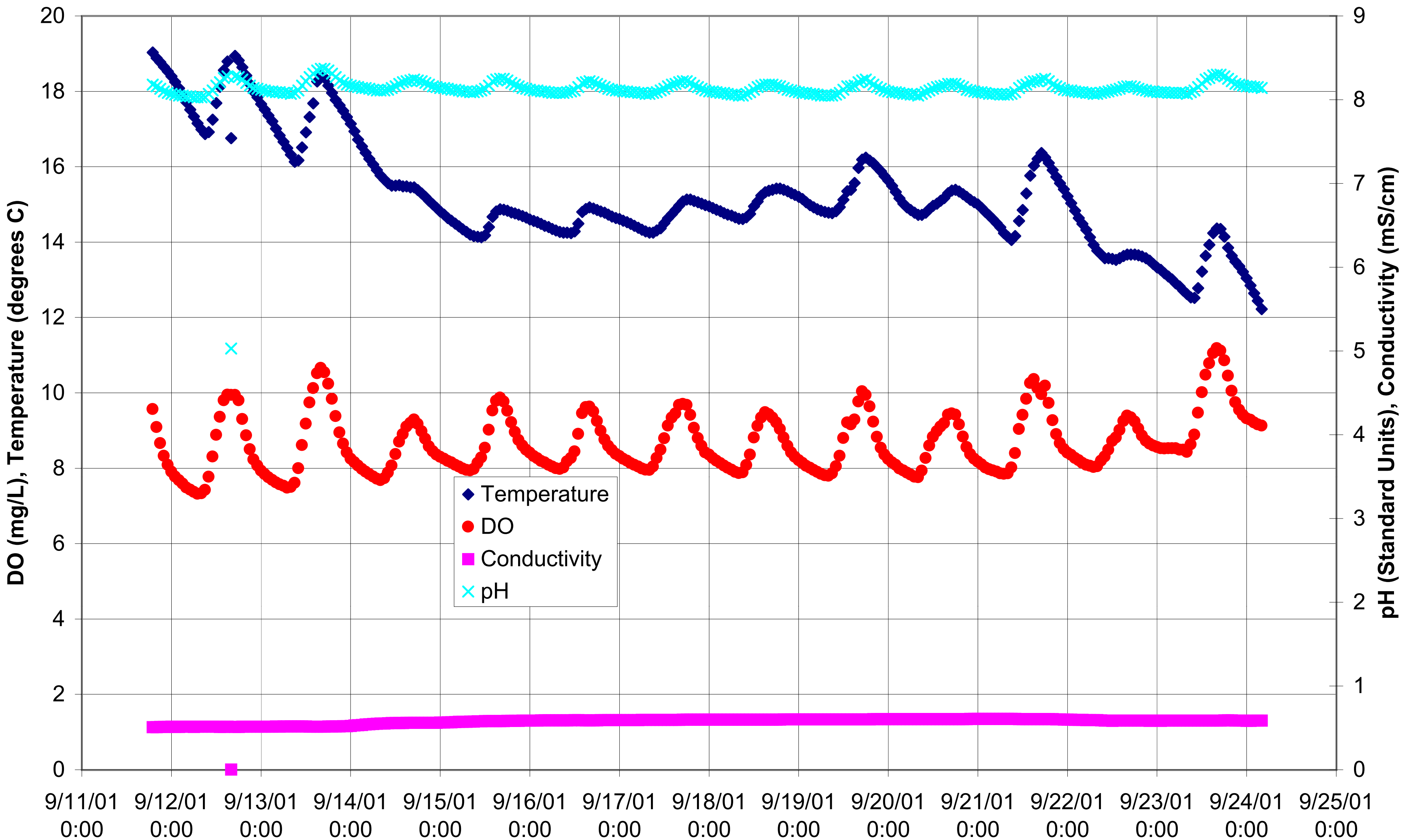
Appendix D Figure D-7

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

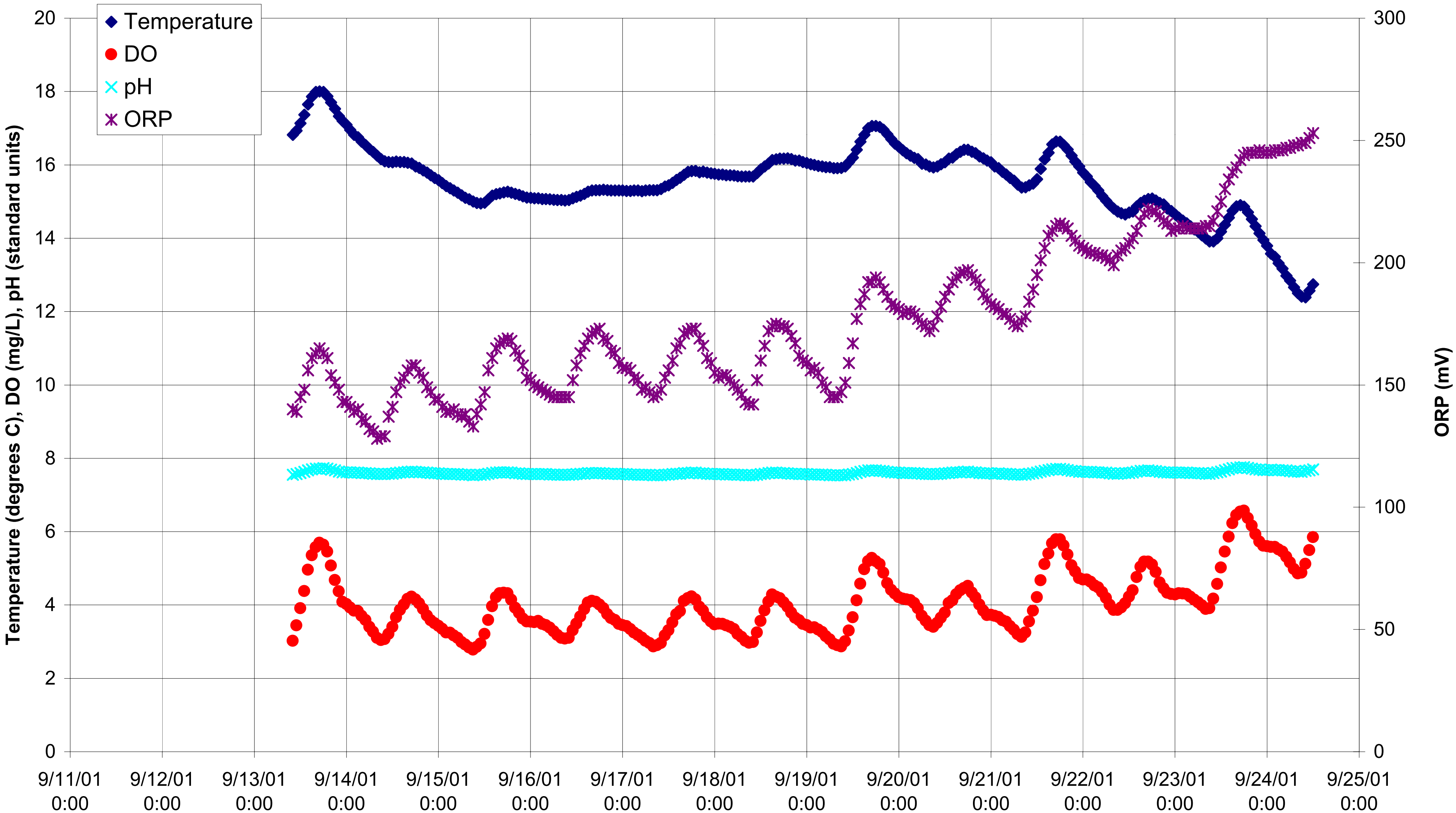
Continuous In-situ Parameters at LPR 18.2 September 12-24, 2001



Appendix D Figure D-8

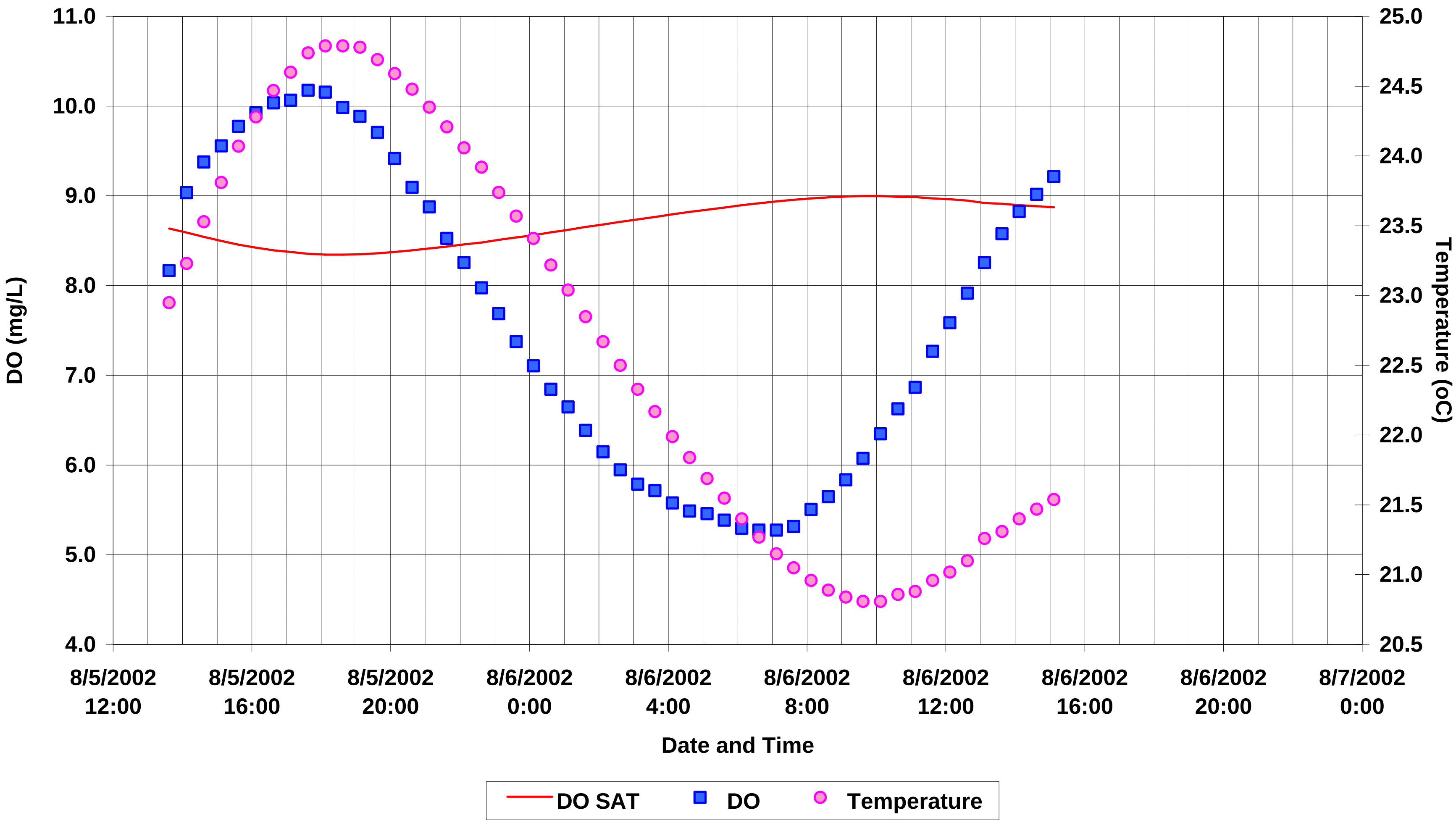
Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Continuous In-situ Parameters Recorded at LPR 85.5 September 12-24, 2001



Appendix D Figure D-9
Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Diurnal Temperature and DO Concentrations in Long Prairie River at Mile 88.3
August 5-6, 2002



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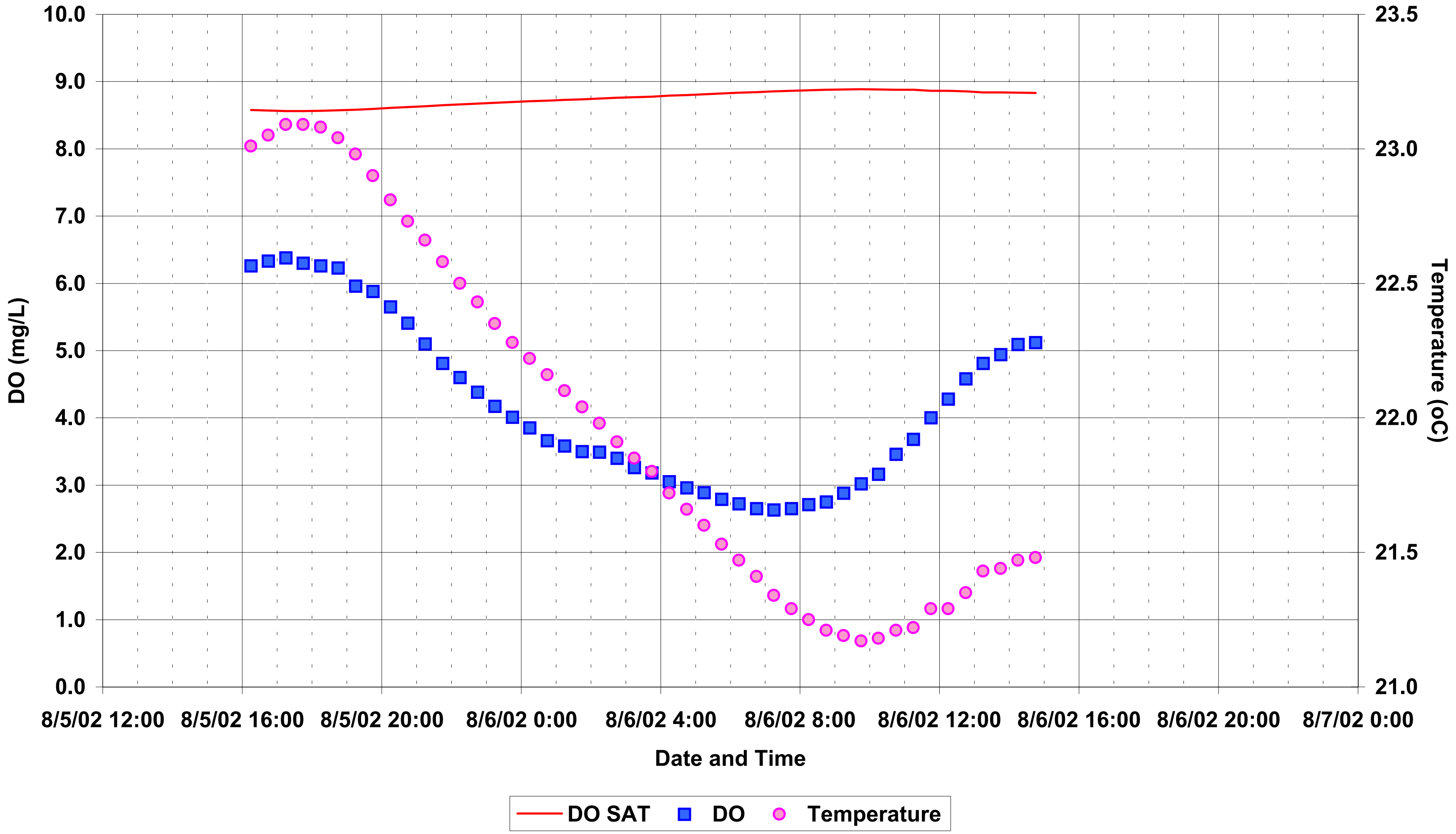
4/29/2003; 3:45 PM

Wenck Associates, Inc.

Appendix D Figure D-10
Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Diurnal Temperature and DO Concentrations in Long Prairie River at Mile 85.5
August 5-6, 2002



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4/23/03; 11:50 AM

Wenck Associates, Inc.

Appendix E

Laboratory Data and QA QC Data, and Field Data Sheets

from Synoptic Surveys

(this appendix is included only in the master copy)

Appendix F, Table F-1

MPCA Long Prairie River Watershed TMDL Final Project Report

QUAL-TX Model Configuration Summary

Model Reach Number	Water Body	Point Source or Tributary Inflow	Reach Start (RM)	Reach End (RM)	Length (mi)	Computational Element Length (mi)	1998 TMDL Reach Number	CWP Reach Divisions	2002 TMDL Reach Number
1	Long Prairie River	---	89.9	89.5	0.4	0.2	07010108-010	Upper Reach	07010108-506
2	Long Prairie River	Carlos WWTP	89.5	87.5	2	0.2	07010108-010	Upper Reach	07010108-506
3	Long Prairie River	---	87.5	85.5	2	0.2	07010108-010	Upper Reach	07010108-506
4	Long Prairie River	---	85.5	83.1	2.4	0.2	07010108-010	Upper Reach	07010108-506
5	Long Prairie River	---	83.1	80.9	2.2	0.2	07010108-010	Upper Reach	07010108-506
6	Long Prairie River	Spruce Creek	80.9	76.7	4.2	0.3	---	Upper Reach	07010108-505
7	Long Prairie River	---	76.7	73.3	3.4	0.2	---	Upper Reach	07010108-505
8	Long Prairie River	Dismal Creek	73.3	67	6.3	0.3	---	Middle Reach	07010108-505
9	Long Prairie River	---	67	56	11	0.5	---	Middle Reach	07010108-505
10	Long Prairie River	---	56	47.6	8.4	0.4	---	Middle Reach	07010108-505
11	Long Prairie River	LP Superfund, WWTP	47.6	38.5	9.1	0.1	---	Middle Reach	07010108-505
12	Long Prairie River	Browerville WWTP	38.5	34.2	4.3	0.1	---	Middle Reach	07010108-505
13	Long Prairie River	---	34.2	33.6	0.6	0.3	---	Middle Reach	07010108-505
14	Eagle Creek	Eagle Bend WWTP & Clarissa WWTP	12.5	0	12.5	0.5	---	Middle Reach	07010108-507
15	Long Prairie River	Eagle Creek	33.6	30.8	2.8	0.4	---	Middle Reach	07010108-504
16	Long Prairie River	---	30.8	26.1	4.7	0.1	07010108-005	Middle Reach	07010108-504
17	Long Prairie River	---	26.1	21.1	5	0.2	07010108-005	Middle Reach	07010108-504
18	Long Prairie River	---	21.1	20.8	0.3	0.3	07010108-005	Middle Reach	07010108-504
19	Long Prairie River	Turtle Creek	20.8	18.2	2.6	0.2	07010108-004	Lower Reach	07010108-503
20	Long Prairie River	---	18.2	15.8	2.4	0.3	07010108-004	Lower Reach	07010108-503
21	Long Prairie River	Moran Creek	15.8	15.3	0.5	0.1	07010108-002	Lower Reach	07010108-502
22	Long Prairie River	---	15.3	10.3	5	0.5	07010108-002	Lower Reach	07010108-502
23	Long Prairie River	Fish Trap Creek	10.3	9.2	1.1	0.1	07010108-001	Lower Reach	07010108-501
24	Long Prairie River	---	9.2	3.2	6	0.3	07010108-001	Lower Reach	07010108-501
25	Long Prairie River	---	3.2	0	3.2	0.4	07010108-001	Lower Reach	07010108-501

Appendix F, Table F-2

MPCA Long Prairie River Watershed TMDL Final Project Report

QUAL-TX Model Point Source and Tributary Configuration Summary

Tributary Name	Inflow at TMDL Site ID	Point Source Inflow Count	Junction
Spruce Creek	LPR 80.9	---	---
Dismal Creek	LPR 73.3	---	---
Eagle Creek	LPR 33.6	2	1
Turtle Creek	LPR 20.8	---	---
Moran Creek	LPR 15.8	---	---
Fish Trap Creek	LPR 10.3	---	---
Long Prairie River	---	6	---

Point Source ID	Inflow at TMDL Site ID	Point Source Name	Tributary Name
EB_SD-002	EC 12.2	City of Eagle Bend WWTP	Eagle Creek
Clarissa_SD-001	EC 7.0	City of Clarissa WWTP	Eagle Creek
Carlos_SD-001	LPR 89.4	City of Carlos WWTP	Long Prairie River
Superfund_Site	LPR 47.3	Long Prairie Superfund Site Discharges Continuously	Long Prairie River
LP_SD-002	LPR 46.6	City of Long Prairie WWTP (SD-002)	Long Prairie River
LP_SD-001	LPR 44.9	City of Long Prairie WWTP (SD-001)	Long Prairie River
LP_SD-003	LPR 44.9	City of Long Prairie WWTP (SD-003)	Long Prairie River
B_SD-001	LPR 36.1	City of Browerville WWTP	Long Prairie River

Appendix F, Table F-3

MPCA Long Prairie River Watershed TMDL Final Project Report

Summary of Data Types used to Estimate Hydraulic Coefficients

TMDL Site ID	Model Reach ID / Hydraulic Coefficients	Stream Gauging	Dye Study
LPR 89.9	R1	w, t*, w, d	i_{w1}
LPR 89.5	R2	d	---
LPR 87.5	R3	d	---
LPR 85.5	R4	t*, w, d	i_{w2}, w1
LPR 83.1	R5	w, w, d	i_{w3}, w2
LPR 76.7	R6-7	w, d	w3
LPR 73.4	R8	d	w3
LPR 70.7	---	d	w3
LPR 67.0	R9	w, d	---
LPR 56.0	R10	w, t, d	---
LPR 47.8	R11	w, t, u, d	i_{w4}
LPR 42.2	---	d	w4
LPR 38.5	R12	w, d	i_{w5}, w4
LPR 34.2	R13	w, t, d	w4, w5, i_{m1}
LPR 30.8	R15-16	w, d	i_{w6}, w4, m1
LPR 26.6	---	w, d	---
LPR 26.1	R17	d	w6
LPR 21.1	---	d	w6, i_{m2}
LPR 18.2	R18-20	w, d	---
LPR 15.3	R21-22	w, d	---
LPR 9.2	R23-24	w, d	m2
LPR 3.2	R25	w, t*, d	---
Eagle Creek	R14	w, d	---

Table Key:

w: data collected by Wenck during synoptic surveys

d: non-stream gauging observational data collected by Wenck

t: data collected by Todd SWCD

u: data collected by USGS

iw: denotes dye injection point for dye study conducted by Wenck (# - relative number to relate dye injection to monitoring locations) (Appendix F, Table F-5)

im: denotes dye injection point for dye study conducted by MPCA (# - relative number to relate dye injection to monitoring locations) (Appendix F, Table F-5)

w: Time of travel deterimined between Wenck dye injection and monitoring location to refine the QUAL-TX hydraulic coefficients (Appendix F, Table F-6).

m: Time of travel deterimined between MPCA dye injection and monitoring location to refine the QUAL-TX hydraulic coefficients (Appendix F, Table F-6).

*****: Data not applicable for the calculation of hydraulic coefficients along Long Prairie River

Appendix F, Table F-4

MPCA Long Prairie River Watershed TMDL Final Project Report

Channel Slopes used by Reaeration Equations

Model Reach	Slope (ft/ft)	Slope *10
1-2	0.00025	0.0025
3	0.00022	0.0022
4	0.00020	0.002
5	0.00036	0.0036
6	0.00033	0.0033
7	0.00031	0.0031
8-9	0.00028	0.0028
10	0.00025	0.0025
11	0.00022	0.0022
12	0.00019	0.0019
13	0.00020	0.002
14-17	0.00026	0.0026
18	0.00032	0.0032
19	0.00033	0.0033
20	0.00045	0.0045
21-25	0.00093	0.0093

Appendix F, Table F-5

MPCA Long Prairie River Watershed TMDL Final Project Report

Dye Studies

Date of Dye Study	River Mile Start	River Mile End	Study Conducted by
August 5-6, 2002	89.9	85.5	Wenck (w1)
September 13, 2001	85.5	83.1	Wenck (w2)
September 26-27, 2001	83.1	70.7	Wenck (w3)
September 26-27, 2001	47.8	30.8	Wenck (w4)
September 12, 2001	38.5	34.2	Wenck (w5)
September 11-12, 2001	30.8	21.1	Wenck (w6)
October 3-5, 2000	34.2	30.8	MPCA (m1)
October 3-5, 2000	21.1	9.2	MPCA (m2)

Appendix F, Table F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Dye Study Comparison using Final Hydraulic Coefficients

TMDL Site ID	Flow (cfs)	Hydraulic Coefficient Calculated Time of Travel from Dye injection (hrs)	Monitored Travel Time of Peak from Dye injection (hrs)	Percent Difference
Wenck (w1) August 5-6, 2002 RM 89.9 to 85.5				
LPR 89.9	110 [a]		**0**	
LPR 89.5	110 [a]	0.59		
LPR 87.5	110 [a]	6.78		
LPR 85.5	110 [a]	17.37	17.4	0%
Wenck (w2) September 13, 2001 RM 85.5 to 83.1				
LPR 85.5	103.78 [c]		**0**	
LPR 83.1	104.22	4.99	5	0%
Wenck (w3) September 26-27, 2001 RM 83.1 to 70.7				
LPR 83.1	94.79		**0**	
LPR 76.7	115.36	14.83	14.83	0%
LPR 73.4	123.51 [c]	25.75	25.75	0%
LPR 70.7	128.61 [c]	31.46	33.00 [b]	
Wenck (w4) September 26-27, 2001 RM 47.8 to 30.8				
LPR 47.8	147.86		**0**	
LPR42.2	175.74	7.53	7.00 [b]	
LPR 38.5	203.61	12	12	0%
LPR 34.2	158.92	17.58	17.67	-1%
LPR 30.8	196.95	22.56	22.5	0%
Wenck (w5) September 12, 2001 RM 38.5 to 34.2				
LPR 38.5	170.26		**0**	
LPR 34.2	223.38	5.45	5.37	2%
Wenck (w6) September 11-12, 2001 RM 30.8 to 21.1				
LPR 30.8	220.25		**0**	
LPR 26.1	204.3	4.56	3.38 [b]	
LPR 21.1	217.05	8.8	9.72	-10%
MPCA (m1) October 3, 2000 RM 34.2 to 30.8				
LPR 34.2	57.5		**0**	
LPR 30.8	62.5	6.89	6.67	3%
MPCA (m2) October 3, 2000 RM 21.1 to 9.2				
LPR 21.1	65.4		**0**	
LPR 18.2	72.1	3.7	na	
LPR 15.3	78.9	8.68	na	
LPR 9.2	87.6	25.67	25.67	0%

a) Average main channel flow rate through the Carlos reach for dye study
b) Estimate of peak arrival, data collection ended before peak was achieved.
c) Flow rate not available for dye study measurement, estimated as distance-weighted average

Appendix F, Table F-7

MPCA Long Prairie River Watershed TMDL Final Project Report

Summary of Final QUAL-TX Hydraulic Coefficients

TMDL Site ID	River Mile	Model Reach Number	a	b	c	d	e
LPR 89.9*	89.9	1	0.2511	0.292	0.1395	0.6061	0
LPR 89.5	89.5	2	0.1202	0.292	0.2651	0.6061	0
LPR 87.5	87.5	3	0.0703	0.292	0.3642	0.6061	0
LPR 85.5	85.5	4	0.0819	0.292	0.1526	0.6061	0
LPR 83.1*	83.1	5	0.3618	0.238	0.3927	0.4019	0
LPR 76.7*	76.7	6-7	0.0452	0.3102	0.2697	0.516	0
LPR 73.4	73.4	8	0.1547	0.3102	0.2457	0.5009	0
LPR 67*	67	9	0.179	0.2854	0.2457	0.5009	0
LPR 56*	56	10	0.4359	0.2004	0.2796	0.3855	0
LPR 47.8*	47.8	11	0.2389	0.2987	0.133	0.55	0
LPR 38.5*	38.5	12	0.2739	0.2943	0.2302	0.5113	0
LPR 34.2*	34.2	13	0.1644	0.3463	0.1154	0.5959	0
LPR 30.8*	30.8	15-16	0.2638	0.262	0.2251	0.5007	0
LPR 26.1*	26.1	17	0.2922	0.3556	0.128	0.5866	0
LPR 21.1	21.1	18	0.4054	0.2465	0.185	0.5042	0
LPR 18.2*	18.2	19-20	0.4054	0.2465	0.185	0.5042	0
LPR 15.3*	15.3	21-22	0.2249	0.2018	0.3039	0.4334	0
LPR 9.2*	9.2	23-24	0.1349	0.2975	0.2183	0.488	0
LPR 3.2*	3.2	25	0.2511	0.1973	0.2388	0.452	0
Eagle Creek*	0.66	14	0.0729	0.3013	0.5537	0.6393	0

* Hydraulic Coefficients plotted in Appendix F, Figure F-1

Appendix F, Table F-8

MPCA Long Prairie River Watershed TMDL Final Project Report

Modeled Percent Ice Cover

Estimated from Synoptic Survey 3

Model Reach Number	Model Reach Start (mi)	Percent Ice Cover (%)
1	89.9	0
2	89.5	80
3	87.5	80
4	85.5	100
5	83.1	100
6	80.9	100
7	76.7	100
8	73.3	100
9	67	100
10	56	100
11	47.6	100
12	38.5	100
13	34.2	100
14	Eagle Creek	90
15	33.6	100
16	30.8	90
17	26.1	100
18	21.1	100
19	20.8	100
20	18.2	90
21	15.8	100
22	15.3	100
23	10.3	100
24	9.2	100
25	3.2	100

Appendix F, Table F-9a

MPCA Long Prairie River Watershed TMDL Final Project Report

Diurnal DO, Average Temperature, and Photoperiod during Synoptic Surveys

Erdmann (1979b) Simplified Diurnal Curve Analysis

Continuous DO Measurments Taken During Survey:	Photoperiod (hrs)	Upstream diurnal DO range (daily max minus minimum DO) (mg/L) ΔC_u	Upstream Average Temperature (C) (average of all readings during 24-hr period) **Tave (C)**	Downstream diurnal DO range (daily max minus minimum DO) (mg/L) ΔC_d	Downstream Average Temperature (C) (average of all readings during 24-hr period) **Tave (C)**
		RM 85.5	**RM 85.5**	**RM 21.1**	**RM 21.1**
22-Aug-01	13.80				
23-Aug-01	13.75				
	13.78	**2.79**	23.13	**2.50** *	23.69
		RM 88.3 rr	**RM 88.3 rr**	**RM 85.5**	**RM 85.5**
5-Aug-02	14.60				
6-Aug-02	14.57				
	14.58	**4.90**	22.69	**3.75**	21.97
		RM 85.5	**RM 85.5**	**RM 18.2**	**RM 18.2**
11-Sep-01	12.75			1.66	18.71
12-Sep-01	12.70			2.63	17.87
13-Sep-01	12.65	2.67	16.81	3.18	17.29
14-Sep-01	12.58	1.18	16.20	1.61	15.72
15-Sep-01	12.53	1.55	15.19	1.93	14.55
16-Sep-01	12.48	1.03	15.17	1.65	14.56
17-Sep-01	12.45	1.36	15.52	1.75	14.68
18-Sep-01	12.38	1.31	15.91	1.61	15.03
19-Sep-01	12.33	2.41	16.38	2.24	15.38
20-Sep-01	12.28	1.12	16.20	1.69	15.10
21-Sep-01	12.23	2.66	15.95	2.51	15.15
22-Sep-01	12.17	1.32	15.01	1.36	13.90
23-Sep-01	**12.12**	**2.68**	14.35	**2.75**	13.33
24-Sep-01	12.07	6.79	14.02	4.21	13.21
25-Sep-01	12.02	2.36	3.41	1.95	5.76

Bold Values used for Delta Method Calculations
Shaded Cells indicate DO range reported is estimated based on less than 24-hours of continuous monitoring
* denotes DO range is best-estimate from suspect data

Appendix F, Table F-9b

MPCA Long Prairie River Watershed TMDL Final Project Report

Summary of Productivity during Synoptic Surveys

Continuous DO Measurments Taken During Survey:	synoptic survey	Pav = Average Plant Production Rate (mg/L - day)			
		Upstream River Mile		Downstream River Mile	
		88.3	85.5	21.1	18.2
August 23, 2001	1	---	5.69	6.25	---
September 25, 2001	2	---	4.87	---	5.39
August 6, 2002	4	10.89	8.15	---	---

DiToro and Chapra (1991) Delta Method Calculation

Appendix F, Table F-10

MPCA Long Prairie River Watershed TMDL Final Project Report

Analysis of Potential DO Depletion from Riparian Wetland SOD in Carlos Reach of Long Prairie River

Reach Description	Upstream River Mile	Downstream River Mile	Channel Length (feet)	Thalweg (feet)	Riparian Wetland Width (feet)	Estimated "Active" Width (feet)	Estimated "Active" Area (sq ft)	Estimated "Active" Area (sq m)
LPR 89.9 to RR bridge	89.9	88.3	8,448	5,000	1,000	500	2,500,000	232,250
RR bridge to cattle Xing	88.3	87.4	4,752	3,500	450	225	787,500	73,159
cattle Xing to LPR 85.5	87.4	85.5	10,032	6,000	700	350	2,100,000	195,090

Reach Description	Estimated "Active" Area (sq m)	Mass Rate O_2 Removal (g O_2/sec) for SOD (g O_2/sq m-day) =				Steady-State Reach DO Change for Q = 100 cfs (2.8 cu m/sec) and SOD (g O_2/sq m-day) =		
		1.0	3.0	5.0		1.0	3.0	5.0
LPR 89.9 to RR bridge	232,250	2.7	8.1	13.4		1.0	2.9	4.8
RR bridge to cattle Xing	73,159	0.8	2.5	4.2		0.3	0.9	1.5
cattle Xing to LPR 85.5	195,090	2.3	6.8	11.3		0.8	2.4	4.0
					Total	**2.1**	**6.2**	**10.3**

Appendix F, Table F-11

MPCA Long Prairie River Watershed TMDL Final Project Report

August 2001 and September 2001 CBODu used in QUAL-TX for Calibration
Ratio of 5-day to 20-day CBOD, Synoptic Surveys of Long Prairie River

August 2001:

Date	Station	R.M.	Note	CBOD 5-Day mg/L	y(20) = CBOD 20-Day mg/L	Detect. Limit mg/L	y(5)* mg/L	y5* / y(20)	tL = Lag Time days	kd = Decay Rate 1/day	Estimated C-BOD ultimate mg/L	Observed C-BOD ultimate
08/21/01	LPR	89.9	a	< 6	7	6	3	0.429	1	0.104	8.12	
08/21/01	LPR	89.9	a	< 2	4	2	1	0.250	1	0.104	4.64	
08/21/01	LPR	85.5		< 2	4	2	1	0.250	1	0.104	4.64	8.73
08/21/01	LPR	76.7		< 2	5	2	1	0.200	1	0.104	5.80	
08/21/01	LPR	67.0		**2**	2	**2**	**2**	**1.000**	1	0.104	2.32	
08/21/01	LPR	56.0		< 2	2	2	1	0.500	1	0.104	2.32	
08/21/01	LPR	47.8	b	< 2	4	2	1	0.250	1	0.104	4.64	
08/22/01	LPR	34.2		< 2	5	2	1	0.200	1	0.104	5.80	
08/22/01	LPR	30.8		< 2	2	2	1	0.500	1	0.104	2.32	
08/21/01	LPR	21.1		< 2	3	2	1	0.333	1	0.104	3.48	4.5
08/21/01	LPR	15.3		< 2	6	2	1	0.167	1	0.104	6.96	
08/21/01	LPR	11.8		< 2	2	2	1	0.500	1	0.104	2.32	
08/21/01	LPR	3.2		< 6	4	6	3	0.750	1	0.104	4.64	
08/21/01	T LPR	73.3		< 2	2	2	1	0.500	1	0.104	2.32	
08/21/01	T LPR	15.8		< 6	8	6	3	0.375	1	0.104	9.28	
08/21/01	T LPR	80.9		< 2	4	2	1	0.250	1	0.104	4.64	
08/21/01	T LPR	20.8		< 2	5	2	1	0.200	1	0.104	5.80	
							Average	**0.391**			**4.71**	
							Standard Deviation	**0.222**			**2.11**	
							Count	**17**			**17**	

September 2001:

Date	Station	R.M.	Note	CBOD 5-Day mg/L	y(20) = CBOD 20-Day mg/L	Detect. Limit mg/L	y(5)* mg/L	y5* / y(20)	tL = Lag Time days	kd = Decay Rate 1/day	Estimated C-BOD ultimate mg/L	Observed C-BOD ultimate
09/25/01	LPR	89.9		< 2	6	2	1	0.167	4	0.104	7.38	
09/25/01	LPR	85.5		< 2	9	2	1	0.111	4	0.104	11.07	4.03
09/25/01	LPR	83.1		< 2	2	2	1	0.500	4	0.104	2.46	
09/25/01	LPR	76.7		< 2	15	2	1	0.067	4	0.104	18.45	
09/25/01	LPR	67.0	c	< 2	10	2	1	0.100	4	0.104	12.30	
09/25/01	LPR	56.0		< 2	11	2	1	0.091	4	0.104	13.53	
09/25/01	LPR	38.5		< 2	5	2	1	0.200	4	0.104	6.15	4.67
09/25/01	LPR	34.2		< 2	10	2	1	0.100	4	0.104	12.30	
09/25/01	LPR	30.8		< 2	10	2	1	0.100	4	0.104	12.30	
09/25/01	LPR	21.1		< 2	13	2	1	0.077	4	0.104	15.99	4.97
09/25/01	LPR	15.3		< 2	10	2	1	0.100	4	0.104	12.30	
09/25/01	LPR	9.2		< 2	13	2	1	0.077	4	0.104	15.99	
09/25/01	LPR	3.2		< 2	12	2	1	0.083	4	0.104	14.76	
09/25/01	T LPR	33.6		< 2	12	2	1	0.083	4	0.104	14.76	
09/25/01	T LPR	15.8		< 2	12	2	1	0.083	4	0.104	14.76	
09/25/01	T LPR	10.3		< 2	12	2	1	0.083	4	0.104	14.76	
09/25/01	T LPR	80.9		< 2	9	2	1	0.111	4	0.104	11.07	
09/25/01	T LPR	20.8		< 2	12	2	1	0.083	4	0.104	14.76	
							Average	**0.123**			**12.51**	
							Standard Deviation	**0.100**			**3.90**	
							Count	**18**			**18**	

February 2002 Main Stem:

Date	Station	R.M.	Note	CBOD 5-Day mg/L	y(20) = CBOD 20-Day mg/L	Detect. Limit mg/L	y(5)* mg/L	y5* / y(20)
02/07/02	LPR	89.9	d	3	12	3	3	0.250

February 2002 Tributaries:

Date	Station	R.M.	Note	CBOD 5-Day mg/L	y(20) = CBOD 20-Day mg/L	Detect. Limit mg/L	y(5)* mg/L	y5* / y(20)
02/08/02	T LPR	20.8	d	< 2	10	2	1	0.100

Key:

LPR 9.2	Long Prairie river mile
T LPR 20.8	Tributary confluence river mile

Notes:

a	Second results are for blind dup
b	Blind dup retained; other results both < 2mg/L
c	Blind dup with identical results omitted
d	Test at 4 degrees C
	Results with detected C-BOD5 are bolded
*	y5* = C-BOD5 if detected, or 0.5*Detection Limit otherwise

Source: filtered from T:\0147\51\Database\Appendix D.xls

Appendix F, Table F-12a

MPCA Long Prairie River Watershed TMDL Final Project Report

Calibration Event Tributary Summary

August 2001 Calibration Event

Tributary Names	Inflow at TMDL Site ID	Inflow Rate (cfs)	Temperature (C)	Chloride (mg/L)	DO (mg/L)	CBODu (mg/L)	ON (mg/L)	NH3-N (mg/L)	NO2/ NO3-N (mg/L)	TP (mg/L)	Chlorophyll-a (ug/L)
Turtle Creek	LPR 20.8	10.09	23.5	5.1	8.93	5.8	1.29	0.01	0.1	0.084	15
Moran Creek	LPR 15.8	4.65	22.3	6.4	9.12	9.28	0.69	0.01	0.1	0.009	1.1
Fish Trap Creek	LPR 10.3	8	23.6	5	10	3.48	0.69	0.01	0.1	0.041	2

September 2001 Calibration Event

Tributary Names	Inflow at TMDL Site ID	Inflow Rate (cfs)	Temperature (C)	Chloride (mg/L)	DO (mg/L)	CBODu (mg/L)	ON (mg/L)	NH3-N (mg/L)	NO2/ NO3-N (mg/L)	TP (mg/L)	Chlorophyll-a (ug/L)
Spruce Creek	LPR 80.9	15.73	10.09	6.7	10.68	11.07	0.59	0.01	0.55	0.032	3.1
Turtle Creek	LPR 20.8	6.18	9.81	7.2	11.42	14.76	0.89	0.01	0.1	0.014	0.5
Moran Creek	LPR 15.8	10.09	8.64	6.2	11.43	14.76	0.89	0.01	0.1	0.014	1.7
Fish Trap Creek	LPR 10.3	8.97	12.18	4.1	12.13	14.76	0.89	0.01	0.1	0.022	2.2

February 2002 Calibration Event

Appendix F, Table F-12b

MPCA Long Prairie River Watershed TMDL Final Project Report

7Q10 Event Tributary Summary

Summer 7Q10 Event*

Tributary Names	Inflow at TMDL Site ID	Inflow Rate (cfs)	Temperature (C)	Chloride (mg/L)	DO (mg/L)	CBODu (mg/L)	ON (mg/L)	NH3-N (mg/L)	NO2/ NO3-N (mg/L)	TP (mg/L)	Chlorophyll-a (ug/L)
Spruce Creek	LPR 80.9	0.67	23	---	8.58	7.86	0.51	0.065	0.107	0.066	---
Dismal Creek	LPR 73.3	0.44	23	---	8.58	2.32	0.923	0.018	0.313	0.046	---
Turtle Creek	LPR 20.8	1.52	23	---	8.58	8.59	1.027	0.029	0.077	0.077	---
Moran Creek	LPR 15.8	0.89	23	---	8.58	5.7	0.792	0.04	0.046	0.046	---
Fish Trap Creek	LPR 10.3	0.9	23	---	8.58	14.76	0.69	0.1	0.041	0.041	---

Spring 7Q10 Event*

Tributary Names	Inflow at TMDL Site ID	Inflow Rate (cfs)	Temperature (C)	Chloride (mg/L)	DO (mg/L)	CBODu (mg/L)	ON (mg/L)	NH3-N (mg/L)	NO2/ NO3-N (mg/L)	TP (mg/L)	Chlorophyll-a (ug/L)
Spruce Creek	LPR 80.9	2.26	21	---	8.91	7.86	0.579	0.024	0.154	0.067	---
Dismal Creek	LPR 73.3	1.49	21	---	8.91	2.32	0.94	0.02	0.09	0.043	---
Turtle Creek	LPR 20.8	5.13	21	---	8.91	8.59	0.905	0.175	0.175	0.058	---
Moran Creek	LPR 15.8	3.02	21	---	8.91	5.7	0.851	0.034	0.034	0.047	---
Fish Trap Creek	LPR 10.3	3.05	21	---	8.91	14.76	0.64	0.03	0.1	0.027	---

Winter 7Q10 Event*

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* CBODu, ON, NH3-N, NO2/NO3-N, and TP values from Appendix F, Table F-22

Appendix F, Table F-13a

MPCA Long Prairie River Watershed TMDL Final Project Report

Calibration Event Point Source Summary

August 2001 Calibration Event

September 2001 Calibration Event

Point Source Sites	Inflow at TMDL Site ID	Inflow Rate (cfs)	Temperature (C)	Chloride (mg/L)	DO (mg/L)	CBODu (mg/L)	ON (mg/L)	NH3-N (mg/L)	NO2/ NO3-N (mg/L)	TP (mg/L)	Chlorophyll-a (ug/L)
LP SUPERFUND SITE	LPR 47.3	0.67	13.52	58.4	8.58	13.38	1.02	0.04	0.88	0.1	0
LPRAIRIE WWTF SD002	LPR 46.6	2.71	15.35	434	8.98	30.28	3.73	9.67	0.1	3.67	0
LPRAIRIE WWTF SD 001 & 003	LPR 44.9	3.47	16.16	251	4.82	31.43	2.6	11.3	0.43	5.86	0
EAGLE BEND WWTF 010	EC 12.0	1.01	15.76	185	6	11.36	1.7	0.6	0.27	4.77	0

February 2002 Calibration Event

Appendix F, Table F-13b

MPCA Long Prairie River Watershed TMDL Final Project Report

7Q10 Event Point Source Summary

Summer 7Q10 Event*

Point Source Sites	Inflow at TMDL Site ID	Inflow Rate (cfs)	Temperature (C)	Chloride (mg/L)	DO (mg/L)	CBODu (mg/L)	ON (mg/L)	NH3-N (mg/L)	NO2/ NO3-N (mg/L)	TP (mg/L)	Chlorophyll-a (ug/L)
CARLOS WWTF 1	LPR 89.4	1.21	23	---	8.58	35.7	4.43	0.07	0.008	2.11	---
LP SUPERFUND SITE	LPR 47.3	0.67	13.52	---	8.58	13.38	1.02	0.04	0.88	0.1	---
LPRAIRIE WWTF SD002	LPR 46.6	2.70	23	---	4.83	30	5.5	14.2	0.1	5.9	---
LPRAIRIE WWTF SD001	LPR 44.9	1.43	23	---	4.54	66	19	60.8	0.43	17.3	---
LPRAIRIE WWTF SD003	LPR 44.9	0.88	23	---	6	31.7	2.4	10.3	0.43	1	---
BROWERVILLE WWTF 010	LPR 36.1	6.16	23	---	8.58	16.3	4.43	0.07	0.008	2.43	---
EAGLE BEND WWTF 010	EC 6.1	1.01	23	---	8.58	16.1	4.43	0.07	0.008	0.79	---
CLARISSA WWTF	EC 6.1	1.42	23	---	8.58	28.6	4.43	0.07	0.008	1.49	---

Spring 7Q10 Event*

Point Source Sites	Inflow at TMDL Site ID	Inflow Rate (cfs)	Temperature (C)	Chloride (mg/L)	DO (mg/L)	CBODu (mg/L)	ON (mg/L)	NH3-N (mg/L)	NO2/ NO3-N (mg/L)	TP (mg/L)	Chlorophyll-a (ug/L)
CARLOS WWTF 1	LPR 89.4	1.21	21	---	8.91	35.7	3.2	5.8	0.05	2.11	---
LP SUPERFUND SITE	LPR 47.3	0.67	13.52	---	8.58	13.38	1.02	0.04	0.88	0.1	---
LPRAIRIE WWTF SD002	LPR 46.6	2.70	21	---	4.83	53	5.5	14.2	0.1	5.9	---
LPRAIRIE WWTF SD001	LPR 44.9	1.43	21	---	4.54	66	77	249.5	0.43	17.3	---
LPRAIRIE WWTF SD003	LPR 44.9	0.88	21	---	6	31.7	3.7	16.0	0.43	1	---
BROWERVILLE WWTF 010	LPR 36.1	6.16	21	---	8.91	16.3	3.2	5.8	0.05	2.43	---
EAGLE BEND WWTF 010	EC 6.1	1.01	21	---	8.91	16.1	3.2	5.8	0.05	2.7	---
CLARISSA WWTF	EC 6.1	1.42	21	---	8.91	28.6	3.2	5.8	0.05	1.49	---

Winter 7Q10 Event*

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* Values from DMR Summary for WWTFs summarized in Appendix F, Table F-19b

Appendix F, Table F-14

MPCA Long Prairie River Watershed TMDL Final Project Report

Data from State Climatology Working Group Web Page

(www.climate.umn.edu)

Preceding Days	Preceding Cumulative Precipitation 21-Aug P (in)	25-Sep P (in)	7-Feb P (in)	Preceding Air Temperature 7-Feb Tmx (F)	7-Feb Tmn (F)
0	**0**	**0**	**0**	**48**	19
1	0	0	0	**49**	20
2	0	0.47	0	**35**	11
3	0.07	0.47	0	27	-8
4	0.07	0.74	0.01	25	9
5	**0.19**	**0.74**	**0.01**	31	12
6	0.19	0.75	0.01	27	5
7	0.19	0.75	0.01	24	5
8	0.19	0.75	0.05	22	-4
9	0.19	0.76	0.05	12	2
10	**0.19**	**1.16**	**0.05**	21	7
11	0.19	1.16	0.05	**39**	21
12	0.19	1.16	0.05	**46**	22
13	0.19	1.16	0.05	**50**	23
14	0.19	1.16	0.05	**33**	1
15	**0.19**	**1.16**	**0.05**	**43**	7
16	0.19	1.16	0.05	**45**	16
17	0.19	1.84	0.05	29	13
18	0.19	2.27	0.05	26	7
19	0.19	2.27	0.05	27	3
20	**0.22**	**2.27**	**0.05**	15	-8

Note: Temperature at or above 32 degrees are bolded

Appendix F, Table F-15

MPCA Long Prairie River Watershed TMDL Final Project Report

Incremental Inflows by Model Run

Model Run:		Flow at Long Prairie River USGS station (cfs)	Total Incremental Inflow (cfs/RM)	Groundwater Inflow (cfs/RM)	Runoff Inflow (cfs/RM)
August 2001 Calibration Event	(AUG)	162	0.64	0.64	0
September 2001 Calibration Event	(SEP)	154	1.18	0.64	0.54
February 2002 Calibration Event	(FEB)	118	1.59	0.64	0.95
Summer 7Q10 Event	(SUM)	11.4	0.23	0.23	0
Spring 7Q10 Event	(SPR)	38.6	0.78	0.23	0.55
Winter 7Q10 Event	(WIN)	6.9	0.16	0.16	0

Published gains in stream flow (cfs/RM)

0.85	Myette (1984)
1.3	Myette (1984)
0.6	McBride (1975)

Appendix F, Table F-16

MPCA Long Prairie River Watershed TMDL Final Project Report

Groundwater Quality Monitoring Data

ID	Agency	Unique Well ID		depth of Well (ft)	Source of Water	Date of Collection	Time of Collection	NO2 + NO3 as Nitrogen (mg/L)	Phosphorus, dissolved (mg/L)
1	SWCD		T129 R37 Sec 1 SE 1/4 NE 1/4	70	Dean Yohnke	08/13/02	10:15		
2	SWCD		T129 R37 Sec 1 SW 1/4 NE 1/4	60	Charles Yohnke	08/13/02	11:05		
3	SWCD		T129 R37 Sec 12 SE 1/4 NW 1/4	30	Martin Tonn	08/13/02	10:45		
4	SWCD		T129 R35 Sec 16 NW 1/4 SW 1/4	104	Tim Bruder	08/13/02	11:30		
5	SWCD		T130 R33 Sec 9 N 1/2 SW 1/4 NW 1/4	150	Joe Myres	08/13/02	01:30		
6	SWCD		T132 R33 Sec 14 SW 1/4 SE 1/4	30	Jim Olson	08/13/02	03:10		
7	MN040	455349095220501	128N37W18ADDC 01			08/27/96	10:00:00 AM		
8	USGS	460041094595101	T129NR34W05CBAB			07/27/94	12:45:00 PM	0.066	
9	USGS	460624094473501	130N33WS02AAA 01			07/27/94	11:15:00 AM	11	
10	USGS	455647094515401	T129NR33W32ABBC			07/26/94	12:15:00 PM	19	
11	USGS	460412094515301	T130NR33WS17DBB			07/26/94	4:00:00 PM	2.3	
12	USGS	454831094462601	T127NR33WS13DBA			07/22/94	12:05:00 PM	13	
13	USGS	455049094503001	T128NR33WS33CCC			05/04/94	8:45:00 AM	3.2	
14	USGS	455951094562501	T129NR34WS10DA			05/04/94	12:00:00 PM	0.05	
15	USGS	455958094395501	T129NR32WS12BCD			05/04/94	1:15:00 PM	12	
16	USGS	454641094584701	127N34W29DAC			05/03/94	10:40:00 AM	0.05	
17	USGS	454744094464701	T127NR33WS24DBB			05/03/94	2:20:00 PM	0.05	
18	USGS	454744094464701	T127NR33WS24DBB			05/03/94	2:25:00 PM	0.05	
19	USGS	454755095003201	T127NR34WS19BDB			05/03/94	12:20:00 PM	0.05	
20	USGS	455321094535701	T128NR34WS24ABB			05/03/94	4:25:00 PM	0.05	
21	USGS	445614093215301	117N21W17DDB02		DES MOINES OUTWASH (112DSMO)	12/16/83	12:00:00 PM	0.1	0.17
22	USGS	455900095162001	129N36W18CBB01	19.4	OUTWASH DEPOSITS (112OTSH)	11/15/83	2:00:00 PM	22	
23	USGS	455926095122901	129N36W15BBB01	18	OUTWASH DEPOSITS (112OTSH)	11/15/83	11:30:00 AM	10	
24	USGS	455900095162001	129N36W18CBB01	19.4	OUTWASH DEPOSITS (112OTSH)	07/27/83	2:30:00 PM	19	
25	USGS	455926095122901	129N36W15BBB01	18	OUTWASH DEPOSITS (112OTSH)	07/26/83	6:00:00 PM	14	
26	USGS	455926095122901	129N36W15BBB01	18	OUTWASH DEPOSITS (112OTSH)	05/19/83	12:15:00 PM	11	
27	USGS	455900095162001	129N36W18CBB01	19.4	OUTWASH DEPOSITS (112OTSH)	05/18/83	12:30:00 PM	17	
28	USGS	455900095162001	129N36W18CBB01	19.4	OUTWASH DEPOSITS (112OTSH)	02/23/83	12:45:00 PM	13	
29	USGS	455926095122901	129N36W15BBB01	18	OUTWASH DEPOSITS (112OTSH)	02/23/83	5:30:00 PM	3.9	
30	USGS	455926095122901	129N36W15BBB01	18	OUTWASH DEPOSITS (112OTSH)	08/24/82	1:00:00 PM	5.7	
31	USGS	445614093215301	117N21W17DDB02	23	DES MOINES OUTWASH (112DSMO)	06/02/80	3:30:00 PM		
32	USGS	445614093215301	117N21W17DDB02		DES MOINES OUTWASH (112DSMO)	06/02/80	3:35:00 PM		
33	**USGS**	**Average of several wells**	**Average of several wells**		**Viking Basin (sand plain area)**	**01/01/89**		**13**	**0.03**
34	USGS	Median of several wells	Median of several wells		Viking Basin (sand plain area)	01/01/89		10	0.02
35			129N33W21bbd	83	Surface outwash aquifer	11/28/79		0.21	0.05
36			130N33W8bdd	60	Surface outwash aquifer	11/28/79		0.03	0.06
37			131N34W27abb	40	Surface outwash aquifer	11/28/79		4.50	0.05
38			128N33W17ccb	62	Surface outwash aquifer	09/18/79		0.09	**0.005**
39			129N33W5ccb	27	Surface outwash aquifer	09/18/79		0.24	0.01
40			130N33W4dbd	46	Surface outwash aquifer	09/18/79		0.09	**0.005**

Appendix F, Table F-16

MPCA Long Prairie River Watershed TMDL Final Project Report

Groundwater Quality Monitoring Data

ID	Water Temperature (C)	Chloride (mg/L)	Organic carbon, dissolved (mg/L)	Theoretical BOD ultimate (mg/L) based on stoichiometry [A]	Theoretical BOD ultimate (mg/L) based on stoichiometry [B]	SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C)	OXYGEN DISSOLVED (MG/L)	NITROGEN ORGANIC DISSOLVED (MG/L AS N)	NITROGEN AMMONIA DISSOLVED (MG/L AS N)	Source of Data
1	11.81					439	2.14			Todd SWCD
2	10.19					325	2.05			Todd SWCD
3	12.97					520	1.9			Todd SWCD
4	9.17					447	1.64			Todd SWCD
5	12.35					425	0.78			Todd SWCD
6	10.88					413	1.04			Todd SWCD
7	10.9	92				868	0.7			USGS (web site)
8	9.9	0.5				563	0.1		1.5	USGS (web site)
9	10.7	14				375	2.7		0.03	USGS (web site)
10	10.5	13				384	6.6		0.01	USGS (web site)
11	12.4	28				669	5.4		0.2	USGS (web site)
12	10.9	26				641	2.2		0.12	USGS (web site)
13	9.4	14				634	0.1		0.04	USGS (web site)
14	9	1.1				738	0.1		1.4	USGS (web site)
15	9.1	7.5				414	3.7		0.02	USGS (web site)
16	8.8	1.3				694	0.1		0.48	USGS (web site)
17	8.9	2.4				519	0.1		0.06	USGS (web site)
18		2.3							0.07	USGS (web site)
19	7.2	1.1				964	0.2		0.72	USGS (web site)
20	8.7	1.8				510	0.1		0.44	USGS (web site)
21	12	39	**10**	**26.70**	**34.70**	1080	0		1.1	USGS (web site)
22	9.5					660				USGS (web site)
23	10.5					480				USGS (web site)
24	9					620				USGS (web site)
25	8.5					530				USGS (web site)
26	7					520				USGS (web site)
27	8					650				USGS (web site)
28	9					560				USGS (web site)
29	7.5					550				USGS (web site)
30	9.5	4.1	1.7	**4.54**	**5.90**	515		0.180	0.02	USGS (web site)
31	9.5		9	**24.03**	**31.23**	1020				USGS (web site)
32		61								USGS (web site)
33		**9.3**	**2**	**5.34**	**6.94**	**633**		**0.3**	**0.15**	**(Anderson, 1989)**
34		9	1.9	**5.07**	**6.59**	575		0.18	0.08	(Anderson, 1989)
35	8.0	15								(Myette, 1984)
36	8.0	12								(Myette, 1984)
37	8.0	92								(Myette, 1984)
38	10.0	9.6								(Myette, 1984)
39	11.5	9.4								(Myette, 1984)
40	10.0	9.6								(Myette, 1984)

Appendix F, Table F-16

MPCA Long Prairie River Watershed TMDL Final Project Report

Groundwater Quality Monitoring Data

ID	Agency	Unique Well ID		depth of Well (ft)	Source of Water	Date of Collection	Time of Collection	NO2 + NO3 as Nitrogen (mg/L)	Phosphorus, dissolved (mg/L)
41			130N33W17dbb	27	Surface outwash aquifer	09/18/79		5.30	**0.005**
42			132N33W26dcc	31	Surface outwash aquifer	09/18/79		0.01	0.01
43			133N32W14ccd	24	Surface outwash aquifer	09/18/79		0.01	0.20
44	USGS	455337094521001	128N33W17CCB01		WADENA OUTWASH (112WDNO)	09/18/79	8:30:00 AM	4	0.01
45			131N32W18bcc	27	Surface outwash aquifer	09/11/79		0.01	**0.005**
46			131N32W18bcc	27	Surface outwash aquifer	05/01/79		0.03	0.01
47			132N33W26dcc	31	Surface outwash aquifer	05/01/79		0.02	0.01
48			133N32W14ccd	24	Surface outwash aquifer	05/01/79		0.01	0.18
49			128N33W17ccb	62	Surface outwash aquifer	04/30/79		6.40	0.01
50			129N33W5ccb	27	Surface outwash aquifer	04/30/79		**0.005**	0.01
51			130N33W4dbd	46	Surface outwash aquifer	04/30/79		0.01	0.01
52			130N33W17dbb	27	Surface outwash aquifer	04/30/79		4.50	0.03
53	USGS	455337094521001	128N33W17CCB01		WADENA OUTWASH (112WDNO)	04/30/79	2:42:00 PM	6.4	0.01
54	USGS	445614093215301	117N21W17DDB02	23	DES MOINES OUTWASH (112DSMO)	04/03/79	11:30:00 AM		
55	USGS	445614093215301	117N21W17DDB02		DES MOINES OUTWASH (112DSMO)	04/03/79	11:35:00 AM	0.01	
56			128N33W5cac	58	Surface outwash aquifer	03/08/79		**0.005**	0.04
57			131N32W18bbc	27	Surface outwash aquifer	03/07/79		**0.005**	0.09
58			133N32W14ccd	24	Surface outwash aquifer	03/06/79		**0.005**	0.19
59			129N36W15bbb		Surface outwash aquifer	11/13/73		0.1	
60			129N36W18cbb	29	Surface outwash aquifer	11/13/73		8.6	
61	USGS	455900095162001	129N36W18CBB01		OUTWASH DEPOSITS (112OTSH)	11/13/73	3:00:00 PM		
62			129N37W13aac		Surface outwash aquifer	10/26/72		27	
63			129N33W21bbd	83	Surface outwash aquifer	03/08/67			
64			131N34W27abb	40	Surface outwash aquifer	03/08/67			
65	USGS	460427095380301	130N39W18ACB			08/28/65	(blank)		
66	USGS	454716095383801	127N40W25ABB	178		08/27/65	(blank)		
67			130N33W8bdd	60	Surface outwash aquifer	06/22/64			
			min	18				0.005	0.0050
			max	178				27.0	0.200
			average	44				5.238	**0.049**
			Count	42				51	25

Appendix F, Table F-16

MPCA Long Prairie River Watershed TMDL Final Project Report

Groundwater Quality Monitoring Data

ID	Water Temperature (C)	Chloride (mg/L)	Organic carbon, dissolved (mg/L)	Theoretical BOD ultimate (mg/L) based on stoichiometry [A]	Theoretical BOD ultimate (mg/L) based on stoichiometry [B]	SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C)	OXYGEN DISSOLVED (MG/L)	NITROGEN ORGANIC DISSOLVED (MG/L AS N)	NITROGEN AMMONIA DISSOLVED (MG/L AS N)	Source of Data
41	9.0	7.7								(Myette, 1984)
42	9.0	5.8								(Myette, 1984)
43	7.0	2.1								(Myette, 1984)
44	11	2.8				420				USGS (web site)
45	10.0	1								(Myette, 1984)
46	9.0	1.5	4.6	**12.28**	**15.96**					(Myette, 1984)
47	7.5	32	**1.4**	**3.74**	**4.86**					(Myette, 1984)
48	6.0	1.2	8.4	**22.43**	**29.15**					(Myette, 1984)
49	7.2	2.1	1.6	**4.27**	**5.55**					(Myette, 1984)
50	7.2	22	6.4	**17.09**	**22.21**					(Myette, 1984)
51	8.2	23	6.9	**18.42**	**23.94**					(Myette, 1984)
52	8.0	8.7	2.7	**7.21**	**9.37**					(Myette, 1984)
53	7.2	2.1				510				USGS (web site)
54	9		8	**21.36**	**27.76**	890				USGS (web site)
55		81	9.2	**24.56**	**31.92**					USGS (web site)
56	6.5	1.7	2.9	**7.74**	**10.06**					(Myette, 1984)
57	6.0	1.1	4.7	**12.55**	**16.31**					(Myette, 1984)
58	6.0	1.3	7.1	**18.96**	**24.64**					(Myette, 1984)
59	11	4.4								
60	10	12								
61	10	12				603				USGS (web site)
62	7.5	52								
63		5.8								(Myette, 1984)
64		9.4								(Myette, 1984)
65		13								USGS (web site)
66		7.5				1580				USGS (web site)
67	9.4	2								(Myette, 1984)
	6.0	0.5	1.4	3.74	4.86	325	0.0	0.1800	0.0100	
	13.0	92.0	10	26.70	34.70	1580	6.6	0.3000	1.5000	
	9.15	**15.49**	5.21	13.90	18.06	620	1.583	**0.220**	**0.379**	
	58	51	17	17	17	37	20	3	17	

Theoretical BOD ultimate notes:

A) Assumes complete stabilization of the organic carbon requires 2.67 mg of oxygen for every mg of carbon that is oxidized.

B) Assumes complete stabilization of the organic carbon (for Algae) requires 3.47 mg of oxygen for every mg of carbon that is oxidized

Appendix F, Table F-17

MPCA Long Prairie River Watershed TMDL Final Project Report

Incremental Inflow Water Quality Parameters

	Groundwater					Runoff				
Model Event	$CBOD_u$ (mg/L)	ON (mg/L)	NH_3-N (mg/L)	NO_2/ NO_3-N (mg/L)	TP (mg/L)	$CBOD_u$ (mg/L)	ON (mg/L)	NH_3-N (mg/L)	NO_2/ NO_3-N (mg/L)	TP (mg/L)
August, 2001	17	0.3[(a)], 1.2[(b)]	0.19	0.8[(c)], 1.8[(d)]	0.08	---	---	---	---	---
September, 2001	17	0.3[(a)], 1.2[(b)]	0.19	0.8[(c)], 1.8[(d)]	0.08	246.4[(e)], 34.5[(f)]	0.3[(a)], 1.64[(b)]	0.19	0.8[(c)], 1.8[(d)]	0.08
February, 2002	17	0.3	0.19	0.8[(c)], 1.8[(d)]	0.08	7.8	0.3	0.19	0.8[(c)], 3.0[(d)]	0
Summer 7Q10	17	0.3[(a)], 1.2[(b)]	0.19	0.8[(c)], 1.8[(d)]	0.08	---	---	---	---	---
Winter 7Q10	17	0.3[(a)], 1.2[(b)]	0.19	0.8[(c)], 1.8[(d)]	0.08	---	---	---	---	---
Spring 7Q10	17	0.3[(a)], 1.2[(b)]	0.19	0.8[(c)], 1.8[(d)]	0.08	34.5	0.3[(a)], 1.64[(b)]	0.19	0.8[(c)], 1.8[(d)]	0.08

Multiple values in cells denote reach variable parameters.

[(a)] Value used in Model Reaches 1-11; 14

[(b)] Value used in Model Reaches 12-13; 15-25 (Browerville (LPR 38.5) downstream (LPR 0.0))

[(c)] Value used in Model Reaches 1-10; 20-25

[(d)] Value used in Model Reaches 11-19 (between LPR 47.6 (upstream of superfund discharge) to LPR 18.2 (Bridge downstream of turtle creek inflow, after 15, 400th Street))

[(e)] Value used in Model Reaches 1-3 (Carlos Reach)

[(f)] Value used in Model Reaches 4-25

August, Summer, and Winter model runs do not have a runoff flow component.

Appendix F, Table F-18

MPCA Long Prairie River Watershed TMDL Final Project Report

Modeled vs Monitored Water Quality Calibration Summary

DO Calibration

	August 20, 22-24 2001			September 24-25 2001			February 7-8 2002		
River Mile	Monitored Average DO (mg/L)	Modeled DO (mg/L)	Percent Difference	Monitored Average DO (mg/L)	Modeled DO (mg/L)	Percent Difference	Monitored Average DO (mg/L)	Modeled DO (mg/L)	Percent Difference
89.9	9.66	9.7	**0%**	8.40	8.4	**0%**	15.23	15.2	**0%**
85.5	3.06	2.8	**-8%**	6.13	6.1	**0%**	12.81	14.1	**10%**
83.1	6.21	4.5	-28%	8.79	7.5	**-15%**	---	13	---
79.4	9.24	7	**-24%**	---	8.9	---	---	12.3	---
76.7	6.88	7.1	**3%**	9.45	9.5	**1%**	11.03	11.7	**6%**
67	5.92	6.8	**15%**	9.48	9.4	**-1%**	11.13	10.8	**-3%**
56	8.06	6.8	**-16%**	9.59	9	**-6%**	9.58	9.9	**3%**
49.3	---	7.3	---	10.15	9.2	**-9%**	---	9.8	---
47.8	7.29	7.4	**2%**	10.34	9.2	**-11%**	10.98	9	**-18%**
47.2	---	7.4	---	9.93	9.2	**-7%**	---	8	---
42.2	---	7.6	---	9.35	9	**-4%**	---	7.8	---
38.5	7.57	7.7	**2%**	9.71	9	**-7%**	8.37	7.7	**-8%**
34.2	7.41	7.8	**5%**	9.64	9	**-7%**	8.22	7.6	**-8%**
30.8	7.49	7.9	**6%**	9.89	9.1	**-8%**	7.27	7.4	**2%**
21.1	7.81	8.1	**4%**	9.83	9.5	**-3%**	7.09	6.7	**-6%**
18.2	8.50	8.2	**-4%**	10.35	9.6	**-7%**	8.24	7.4	**-10%**
15.3	9.55	8.4	**-12%**	11.30	9.9	**-12%**	7.60	7.3	**-4%**
11.8	10.70	8.6	**-20%**	12.23	10.2	**-17%**	---	7.3	---
9.2	10.27	8.7	**-15%**	13.13	10.3	**-22%**	7.60	7.2	**-5%**
3.2	10.21	8.8	**-14%**	13.38	10.4	**-22%**	7.25	7.2	**-1%**
Average Percent Difference			-6%			-8%			-3%

$CBOD_u$ Calibration

	August 20, 22-24 2001			September 24-25 2001			February 7-8 2002		
River Mile	Monitored Average CBOD 20-day(mg/L)	Modeled BOD (mg/L)	Percent Difference	Monitored Average CBOD 20-day(mg/L)	Modeled BOD (mg/L)	Percent Difference	Monitored Average CBOD 20-day(mg/L)	Modeled BOD (mg/L)	Percent Difference
89.9	6.4	6.38	**0%**	7.4	7.66	**4%**	12.0	11.99	**0%**
85.5	4.6	6.11	32%	11.1	12.84	**16%**	---	11.52	---
83.1	2.3	5.94	---	2.5	12.77	---	---	11.27	---
79.4	---	5.75	---	---	12.51	---	---	10.98	---
76.7	5.8	5.38	**-7%**	18.5	12.15	-34%	---	10.58	---
67	2.3	4.98	---	12.3	12.02	**-2%**	---	10.05	---
56	2.3	5.01	---	13.5	12.38	**-8%**	---	9.9	---
49.3	---	5.14	---	---	12.72	---	---	9.9	---
47.8	4.6	5.17	**11%**	2.5	12.78	---	---	9.9	---
47.2	---	5.18	---	---	12.8	---	---	9.9	---
42.2	---	5.26	---	---	13.6	---	---	9.87	---
38.5	2.3	5.31	---	6.2	13.69	123%	---	9.86	---
34.2	5.8	5.37	**-7%**	12.3	13.81	**12%**	---	9.85	---
30.8	2.3	5.42	---	12.3	14.29	**16%**	---	9.82	---
21.1	3.5	5.56	60%	16.0	14.46	**-10%**	---	9.8	---
18.2	---	5.61	---	---	14.51	---	---	9.8	---
15.3	7.0	5.71	**-18%**	12.3	14.54	**18%**	---	9.78	---
11.8	2.3	5.62	---	---	14.4	---	---	9.7	---
9.2	2.3	5.48	---	16.0	14.31	**-11%**	---	9.64	---
3.2	4.6	5.35	**15%**	14.8	14.07	**-5%**	---	9.51	---

NOTE: gray shaded cells are non detect shown as half the detection limit.
"< DL" in the Percent Difference Column denotes when the Model is predicting below the Detection Limit.

Average Percent Difference			11%			10%			0%

Appendix F, Table F-18

MPCA Long Prairie River Watershed TMDL Final Project Report

Modeled vs Monitored Water Quality Calibration Summary

TP Calibration

	August 20, 22-24 2001			**September 24-25 2001**			**February 7-8 2002**		
River Mile	Monitored Average TP (mg/L)	Modeled TP (mg/L)	Percent Difference	Monitored Average TP (mg/L)	Modeled TP (mg/L)	Percent Difference	Monitored Average TP (mg/L)	Modeled TP (mg/L)	Percent Difference
89.9	0.003	0	-100%	0.003	0	-100%	0.003	0.000	-100%
85.5	0.016	0.01	-38%	0.010	0.01	**0%**	0.006	0.010	67%
83.1	0.026	0.02	**-23%**	0.009	0.02	122%	---	0.010	---
79.4	---	0.03	---	---	0.03	---	---	0.010	---
76.7	0.037	0.04	**8%**	0.061	0.04	-34%	0.008	0.010	**25%**
67	0.060	0.06	**0%**	0.024	0.06	150%	0.008	0.010	**25%**
56	0.047	0.06	28%	0.023	0.06	161%	0.011	0.020	82%
49.3	---	0.06	---	---	0.06	---	---	0.020	---
47.8	0.052	0.05	**-4%**	0.028	0.06	114%	0.008	0.020	150%
47.2	---	0.05	---	---	0.06	---	---	0.020	---
42.2	---	0.05	---	---	0.23	---	---	0.020	---
38.5	0.064	0.05	**-22%**	0.192	0.22	**15%**	0.016	0.020	**25%**
34.2	0.067	0.05	**-25%**	0.176	0.22	**25%**	0.016	0.020	**25%**
30.8	0.072	0.05	-31%	0.156	0.23	47%	0.031	0.020	-35%
21.1	0.055	0.05	**-9%**	0.140	0.22	57%	---	0.020	---
18.2	---	0.05	---	---	0.21	---	0.011	0.020	82%
15.3	0.052	0.05	**-4%**	0.108	0.2	85%	0.018	0.020	**11%**
11.8	0.063	0.04	-37%	---	0.19	---	---	0.020	---
9.2	0.049	0.04	**-18%**	0.078	0.18	131%	---	0.020	---
3.2	0.043	0.04	**-7%**	0.079	0.18	128%	0.017	0.020	**18%**
Average Percent Difference			-19%			64%			31%

NH_3-N Calibration

	August 20, 22-24 2001			**September 24-25 2001**			**February 7-8 2002**		
River Mile	Monitored Average Ammonia (mg/L)	Modeled Ammonia (mg/L)	Percent Difference	Monitored Average Ammonia (mg/L)	Modeled Ammonia (mg/L)	Percent Difference	Monitored Average Ammonia (mg/L)	Modeled Ammonia (mg/L)	Percent Difference
89.9	0.01	0.01	**< DL**	0.01	0.01	**< DL**	0.04	0.04	**0%**
85.5	0.01	0.01	**< DL**	0.01	0.02	**< DL**	0.06	0.06	**0%**
83.1	0.01	0.02	**< DL**	0.01	0.02	**< DL**	---	0.06	---
79.4	---	0.02	---	---	0.03	---	---	0.07	---
76.7	0.01	0.02	**< DL**	0.01	0.03	---	0.09	0.07	-22%
67	0.01	0.02	**< DL**	0.01	0.03	---	0.09	0.08	**-11%**
56	0.01	0.02	**< DL**	0.01	0.03	---	0.07	0.09	29%
49.3	---	0.02	---	---	0.04	---	---	0.1	---
47.8	0.01	0.02	**< DL**	0.01	0.04	---	0.15	0.1	-33%
47.2	---	0.02	---	---	0.04	---	---	0.1	---
42.2	---	0.01	---	---	0.38	---	---	0.11	---
38.5	0.01	0.01	**< DL**	0.23	0.34	48%	0.10	0.12	**20%**
34.2	0.03	0.01	-67%	0.19	0.3	58%	0.14	0.12	**-14%**
30.8	0.02	0.01	-50%	0.14	0.25	79%	0.14	0.13	**-7%**
21.1	0.01	0.01	**< DL**	0.08	0.2	150%	---	0.14	---
18.2	---	0.01	---	---	0.19	---	0.11	0.14	27%
15.3	0.01	0.01	**< DL**	0.01	0.17	---	0.16	0.14	**-13%**
11.8	0.01	0.01	**< DL**	---	0.14	---	---	0.13	---
9.2	0.01	0.01	**< DL**	0.01	0.12	---	---	0.13	---
3.2	0.01	0	**< DL**	0.01	0.09	---	0.07	0.12	71%

NOTE: gray shaded cells are non detect shown as half the detection limit.
"< DL" in the Percent Difference Column denotes when the Model is predicting below the Detection Limit.

Average Percent Difference			-58%			84%			4%

Appendix F, Table F-18

MPCA Long Prairie River Watershed TMDL Final Project Report

Modeled vs Monitored Water Quality Calibration Summary

NO_2/ NO_3-N Calibration

	August 20, 22-24 2001			**September 24-25 2001**			**February 7-8 2002**		
River Mile	Monitored Average NO2+NO3 (mg/L)	Modeled NO2+NO3 (mg/L)	Percent Difference	Monitored Average NO2+NO3 (mg/L)	Modeled NO2+NO3 (mg/L)	Percent Difference	Monitored Average NO2+NO3 (mg/L)	Modeled NO2+NO3 (mg/L)	Percent Difference
89.9	0.10	0.10	**< DL**	0.10	0.10	**< DL**	0.10	0.10	**< DL**
85.5	0.10	0.09	**< DL**	0.10	0.11	**< DL**	0.10	0.19	**< DL**
83.1	0.10	0.09	**< DL**	0.10	0.12	**< DL**	---	0.23	**---**
79.4	---	0.09	---	---	0.19	---	---	0.29	**---**
76.7	0.10	0.08	**< DL**	0.10	0.18	**< DL**	0.43	0.33	**-23%**
67	0.10	0.08	**< DL**	0.10	0.21	**---**	0.41	0.44	**7%**
56	0.10	0.10	**< DL**	0.10	0.24	**---**	0.56	0.51	**-9%**
49.3	---	0.11	---	---	0.26	---	---	0.54	**---**
47.8	0.10	0.11	**< DL**	0.10	0.27	**---**	0.49	0.55	**12%**
47.2	---	0.12	---	---	0.27	---	---	0.56	**---**
42.2	---	0.14	---	---	0.36	---	---	0.72	**---**
38.5	0.10	0.16	**< DL**	0.35	0.43	**23%**	0.76	0.83	**9%**
34.2	0.10	0.19	**< DL**	0.41	0.49	**20%**	0.90	0.94	**4%**
30.8	0.27	0.21	**-22%**	0.56	0.62	**11%**	1.19	1.02	**-14%**
21.1	0.33	0.25	**-24%**	0.68	0.72	**6%**	---	1.22	---
18.2	---	0.26	**---**	---	0.73	---	1.46	1.28	**-12%**
15.3	0.30	0.25	**-17%**	0.76	0.71	**-7%**	0.87	1.27	**46%**
11.8	0.22	0.24	**9%**	---	0.72	---	---	1.26	---
9.2	0.10	0.23	**---**	0.62	0.71	**15%**	---	1.26	---
3.2	0.10	0.21	**---**	0.57	0.72	**26%**	1.14	1.25	**10%**

NOTE: gray shaded cells are non detect shown as half the detection limit.
"< DL" in the Percent Difference Column denotes when the Model is predicting below the Detection Limit.

Average Percent Difference			-4%			7%			3%

Chlorophyll-a Calibration

	August 20, 22-24 2001			**September 24-25 2001**			**February 7-8 2002**		
River Mile	Monitored Average Chlorophyll-a (mg/L)	Modeled Chlorophyll-a (mg/L)	Percent Difference	Monitored Average Chlorophyll-a (mg/L)	Modeled Chlorophyll-a (mg/L)	Percent Difference	Monitored Average Chlorophyll-a (mg/L)	Modeled Chlorophyll-a (mg/L)	Percent Difference
89.9	2.50	2.5	**0%**	1.70	1.6	**-6%**	**---**	0	**---**
85.5	2.60	2.6	**0%**	0.50	0.5	**< DL**	**---**	0	**---**
83.1	2.20	2.2	**0%**	5.00	5	**0%**	**---**	0	**---**
79.4	**---**	0.9	**---**	---	2.2	---	**---**	0	**---**
76.7	0.50	0.5	**< DL**	0.50	0.5	**< DL**	**---**	0	**---**
67	0.50	0.5	**< DL**	0.50	0.5	**< DL**	**---**	0	**---**
56	1.10	1.1	**0%**	0.50	0.5	**< DL**	**---**	0	**---**
49.3	**---**	1.1	**---**	---	1.2	---	**---**	0	**---**
47.8	1.07	1.1	**3%**	1.40	1.4	**0%**	**---**	0	**---**
47.2	**---**	1	**---**	---	1.5	---	**---**	0	**---**
42.2	**---**	0.7	**---**	---	2.5	---	**---**	0	**---**
38.5	0.50	0.5	**< DL**	3.20	3.2	**0%**	**---**	0	**---**
34.2	1.00	1	**0%**	1.90	1.9	**0%**	**---**	0	**---**
30.8	1.20	1.2	**0%**	2.40	2.4	**0%**	**---**	0	**---**
21.1	2.50	2.5	**0%**	3.10	3.1	**0%**	**---**	0	**---**
18.2	**---**	1.9	**---**	---	1.6	---	**---**	0	**---**
15.3	1.90	1.9	**0%**	1.60	1.6	**0%**	**---**	0	**---**
11.8	2.80	2.8	**0%**	---	1.6	---	**---**	0	**---**
9.2	1.90	1.9	**0%**	1.60	1.6	**0%**	**---**	0	**---**
3.2	4.50	4.5	**0%**	1.70	1.7	**0%**	**---**	0	**---**

NOTE: gray shaded cells are non detect shown as half the detection limit.
"< DL" in the Percent Difference Column denotes when the Model is predicting below the Detection Limit.

Average Percent Difference			0%			0%

Appendix F Table F-19a

MPCA Long Prairie River Watershed TMDL Final Project Report

Discharge Monitoring Report Summaries for WWTFs Discharging within the Long Prairie River Watershed

		Browerville SD-001						Eagle Bend (SD-010)						Eagle Bend (SD002)					
	Discharge Period	Average Daily Flow (mgd)	Days	$CBOD_5$ (mg/L)	TSS (mg/L)	TP (mg/L)	DO (mg/L)	Total Flow (MG)	Days	$CBOD_5$ (mg/L)	TSS (mg/L)	TP (mg/L)	DO (mg/L)	Average Daily Flow (mgd)	Days	$CBOD_5$ (mg/L)	TSS (mg/L)	TP (mg/L)	DO (mg/L)
Jul-98	---																		
Aug-98	---																		
Oct-98	fall discharge													0.624	8	5	5	---	12
Nov-98	fall discharge							0.04	---	---	---	---	---						
Dec-98	fall discharge																		
Jan-99	---																		
Feb-99	---																		
Mar-99	---																		
Apr-99	spring discharge							0.06	---	10	16	---	---	0.624	8	8	22	---	13
May-99	spring discharge							0.062	---	108	302	---	---	0.86	10	7.5	15.12	---	7
Jun-99	spring discharge							0.07	---	24	46	---	---	1.608	7	4	9.5	---	6
Jul-99	---							0.062	---	13	17	---	---						
Aug-99	---							0.018	---	13	17	---	---						
Sep-99	fall discharge													0.651	7	20.9	43.06	---	9
Oct-99	fall discharge													1.035	14	3.8	15.8	---	8
Nov-99	fall discharge	4.18	2	9	25	1.7	11												
Dec-99	fall discharge	3.73	5	10	29	---	12.5												
Jan-00	---																		
Feb-00	---																		
Mar-00	---																		
Apr-00	spring discharge													0.614	8	9	18	---	11
May-00	spring discharge																		
Jun-00	spring discharge																		
Jul-00	---																		
Aug-00	---																		
Sep-00	fall discharge													0.623	8	1.5	12.5	---	8
Oct-00	fall discharge													0.62	7	2	5.5	---	12
Nov-00	fall discharge																		
Dec-00	fall discharge																		
Jan-01	---																		
Feb-01	---																		
Mar-01	---																		
Apr-01	spring discharge							1.28	15	11	---	---	---	1.602	7	10.8	---	---	8
May-01	spring discharge													0.911	11	3.34	---	---	8
Jun-01	spring discharge							0.308	5	14.7	---	---	---	1.127	5	7.405	---	---	7.67
Jul-01	---													1.006	6	**1.25**	---	---	9
Aug-01	---																		
Sep-01	fall discharge													0.651	7	4	---	---	6
Oct-01	fall discharge	3.76	7	2	---	2.8	11.93							0.651	9	1.325	---	---	12.5
Nov-01	fall discharge	2.06	3	2	---	2.8	11.93							0.651	2	1	---	---	13.5
Dec-01	fall discharge																		
Sep-02	fall discharge													0.624	8	4.33	5.7	---	---

Notes:
Shaded cells indicate days determined by Total Discharge (MG) divided by Average Daily Discharge (mgd)
Bolded numbers indicate sample below detections limit, reported as half the detection limit
DMRs requested for July-August 1998 and September 2001 to better understand Validataion Data Set

Appendix F Table F-19a

MPCA Long Prairie River Watershed TMDL Final Project Report

Discharge Monitoring Report Summaries for WWTFs Discharging within the Long Prairie River Watershed

		Carlos (SD001)						Clarissa (SD001)					
	Discharge Period	Average Daily Flow (mgd)	Days	$CBOD_5$ (mg/L)	TSS (mg/L)	TP (mg/L)	DO (mg/L)	Average Daily Flow (mgd)	Days	$CBOD_5$ (mg/L)	TSS (mg/L)	TP (mg/L)	DO (mg/L)
Jul-98	---												
Aug-98	---												
Oct-98	fall discharge	0.044	31	5	5	---	9.8						
Nov-98	fall discharge							0.61	4	7.30	22	0.410	9.00
Dec-98	fall discharge												
Jan-99	---												
Feb-99	---												
Mar-99	---												
Apr-99	spring discharge	0.76	7	17	---	2.26	12.2	0.57	7	8.75	29.5	0.91	13.00
May-99	spring discharge	0.68	6	13	18	0.97	10.6	0.70	11	16.33	37.66	0.75	11.67
Jun-99	spring discharge												
Jul-99	---												
Aug-99	---												
Sep-99	fall discharge							0.87	9	3.00	10	1.94	8.00
Oct-99	fall discharge	0.61	7	3	4.33	2.125	9.7	0.92	8	3.50	10	0.66	9.00
Nov-99	fall discharge							0.61	4	7.30	10	0.41	9.00
Dec-99	fall discharge												
Jan-00	---												
Feb-00	---												
Mar-00	---												
Apr-00	spring discharge	0.68	7	5.66	---	1.22	12.33	0.09	2	2.60	3.5	0.21	9.00
May-00	spring discharge							0.10	8	4.00	12	2.60	9.00
Jun-00	spring discharge												
Jul-00	---												
Aug-00	---												
Sep-00	fall discharge												
Oct-00	fall discharge	0.68	7	2	5.3	1.745	9	0.92	4	3.94	---	0.50	7.96
Nov-00	fall discharge												
Dec-00	fall discharge												
Jan-01	---												
Feb-01	---												
Mar-01	---												
Apr-01	spring discharge	0.655	9	14		3.26	13	0.92	6	11.30	---	0.85	10.00
May-01	spring discharge	0.605	6	13.5	---	1.26	10.3	0.91	14	10.63	---	1.90	8.20
Jun-01	spring discharge							0.91	5	13.90	---	1.55	9.00
Jul-01	---							0.91	6	42.85	---	3.08	6.00
Aug-01	---												
Sep-01	fall discharge												
Oct-01	fall discharge	0.928	7	40	---	4	9.8	0.91	9	7.33	---	2.94	11.00
Nov-01	fall discharge							0.91	2	8.50	---	3.62	12.00
Dec-01	fall discharge												
Sep-02	fall discharge							0.92	10	3.60	6.5	3.25	---
		Notes:											
		Shaded cells indicate days determined by Total Discharge (MG) divided by Average Daily Discharge (mgd)											
		Bolded numbers indicate sample below detections limit, reported as half the detection limit											

Appendix F Table F-19a

MPCA Long Prairie River Watershed TMDL Final Project Report

Discharge Monitoring Report Summaries for WWTFs Discharging within the Long Prairie River Watershed

		Long Prairie (SD001)							Long Prairie (SD002)							Long Prairie (SD003)						
	Discharge Period	Average Daily Flow (mgd)	Days	$CBOD_5$ (mg/L)	TSS (mg/L)	TP ave (mg/L)	NH_3-N Ave (mg/L)	DO (mg/L)	Average Daily Flow (mgd)	Days	$CBOD_5$ (mg/L)	TSS (mg/L)	TP ave (mg/L)	NH_3-N Ave (mg/L)	DO (mg/L)	Average Daily Flow (mgd)	Days	$CBOD_5$ (mg/L)	TSS (mg/L)	TP ave (mg/L)	NH_3-N Ave (mg/L)	DO (mg/L)
Jul-98	---																					
Aug-98	---																					
Oct-98	fall discharge																					
Nov-98	fall discharge																					
Dec-98	fall discharge																					
Jan-99	---																					
Feb-99	---																					
Mar-99	---																					
Apr-99	spring discharge	1.22	16	7.00	237	13.89	---	14.69	2.04	12	10.29	183	5.05	---	16.36							
May-99	spring discharge								1.75	7	8.00	61	4.60	---	10.24	2.63	12	13.67	203	12.2	---	15.37
Jun-99	spring discharge								1.75	19	16.44	406	3.86	---	4.19	2.24	10	12.00	---	10.7	---	4.95
Jul-99	---																					
Aug-99	---																					
Sep-99	fall discharge								2.00	14	3.00	41	4.00	1.0	3.24							
Oct-99	fall discharge	0.75	11	7.00	14.5	18.33	68.3	3.52	1.75	8	8.75	33	10.78	0.50	11.91	2.43	14	7.00	22.4	30.1	10.30	5.77
Nov-99	fall discharge	0.83	14	1.60	3.71	4.01	7.83	4.83	1.15	13	2.20	7.4	3.14	3.10	5.66							
Dec-99	fall discharge								1.79	6	10.00	40.5	4.60	0.85	10.76							
Jan-00	---																					
Feb-00	---																					
Mar-00	---																					
Apr-00	spring discharge	1.12	14	7.50	45.75	12.03	244.0	6.69	2.21	7	9.50	23	27.75	26.4	7.09							
May-00	spring discharge								1.68	14	3.29	8.3	1.49	2.88	1.66	2.13	14	10.14	21	7.43	21.0	1.72
Jun-00	spring discharge								1.84	15	5.60	18	4.64	9.73	0.90	1.79	7	12.00	41	14.9	30.1	0.39
Jul-00	---																					
Aug-00	---																					
Sep-00	fall discharge	0.93	10	14.00	43.5	20.40	66.8	0.55	1.63	21	2.60	11.3	3.16	4.50	0.55	1.53	21	6.50	34.4	5.73	12.0	0.47
Oct-00	fall discharge								1.47	17	1.70	4.3	2.11	0.14	0.38	2.24	9	14.00	41.7	5.30	6.00	0.46
Nov-00	fall discharge								1.61	9	6.75	25.3	5.90	0.59	0.42							
Dec-00	fall discharge	0.80	10	5.40	30.2	53.22	14.6	0.62														
Jan-01	---																					
Feb-01	---																					
Mar-01	---																					
Apr-01	spring discharge	0.93	6	5.33	---	15.77	270.7	2.92	1.75	29	9.63	---	6.04	44.9	3.19	2.24	8	18.30	---	10.10	30.1	0.87
May-01	spring discharge	0.93	9	11.20	---	14.57	233.7	1.61	1.75	11	7.00	---	3.27	13.2	2.21	2.24	9	6.50	---	6.55	21.58	2.48
Jun-01	spring discharge								1.75	17	8.25	---	8.37	25.2	0.81	1.79	26	9.82	---	19.4	29.7	1.50
Jul-01	---																					
Aug-01	---																					
Sep-01	fall discharge	0.86	7	15.25	---	13.25	117.8	5.35	1.75	19	1.58	---	4.97	89.8	2.24	2.24	19	5.67	---	2.95	8.15	3.51
Oct-01	fall discharge								1.41	6	4.00	---	4.03	4.05	5.72							
Nov-01	fall discharge	1.25	10	4.75	---	7.50	89.8	4.67	1.19	11	9.25	---	4.43	0.25	4.23	1.46	12	18.50	---	3.55	14.8	3.30
Dec-01	fall discharge																					
Sep-02	fall discharge	0.093	14	13.50	33.25	14.58	48.880	---	1.750	19	2.80	7.5	4.10	4.700	---	2.24	19	5.80	17.8	56.800	11.300	---

Notes:

Shaded cells indicate days determined by Total Discharge (MG) divided by Average Daily Discharge (mgd)

Bolded numbers indicate sample below detections limit, reported as half the detection limit

Appendix F Table F-19b

MPCA Long Prairie River Watershed TMDL Final Project Report

Discharge Monitoring Report Summary Statistics for Municipal Discharges within the Long Prairie River Watershed between October 1998 and December 2001

Statistics for DMR Summary Data from Oct-98 through Dec-01		Browerville SD-001				Eagle Bend (SD-010)				Eagle Bend (SD002)			
		Flow (mgd)	$CBOD_5$ (mg/L)	TP (mg/L)	DO (mg/L)	Flow (MG)	$CBOD_5$ (mg/L)	TP (mg/L)	DO (mg/L)	Flow (mgd)	$CBOD_5$ (mg/L)	TP (mg/L)	DO (mg/L)
	Average	3.43	5.75	2.43	11.84	0.24	27.67	no data	no data	0.87	5.68	no data	9.42
	count	4	4	3	4	8	7	0	0	16	16	0	16
By Discharge Period:													
spring discharge	Average	no data	no data	no data	no data	0.36	33.54	no data	no data	1.05	7.15	no data	8.67
	count	0	0	0	0	5	5	0	0	7	7	0	7
fall discharge	Average	3.43	5.75	2.43	11.84	0.04	no data	no data	no data	0.69	4.94	no data	10.13
	count	4	4	3	4	1	0	0	0	8	8	0	8
	t'	---	---	---	---	---	---	---	---	2.18	0.87	---	1.09
	t(0.05)	---	---	---	---	---	---	---	---	2.365	2.262	---	2.179
	Signif. Diff.	---	---	---	---	---	---	---	---	no	no	---	no

Statistics for DMR Summary Data from Oct-98 through Dec-01		Carlos (SD001)				Clarissa (SD001)			
		Flow (mgd)	$CBOD_5$ (mg/L)	TP (mg/L)	DO (mg/L)	Flow (mgd)	$CBOD_5$ (mg/L)	TP (mg/L)	DO (mg/L)
	Average	0.63	12.57	2.11	10.75	0.72	10.08	1.49	9.46
	count	9	9	8	9	15	15	15	15
By Discharge Period:									
spring discharge	Average	0.68	12.63	1.79	11.69	0.60	9.64	1.25	9.98
	count	5	5	5	5	7	7	7	7
fall discharge	Average	0.56	12.50	2.62	9.58	0.82	5.84	1.50	9.42
	count	4	4	3	4	7	7	7	7
	t'	0.59	0.01	1.01	3.78	1.48	1.84	0.41	0.64
	t(0.05)	3.182	3.182	3.182	2.571	2.365	2.306	2.262	2.201
	Signif. Diff.	no	no	no	**yes**	no	no	no	no

Statistics for DMR Summary Data from Oct-98 through Dec-01		Long Prairie (SD001)					Long Prairie (SD002)					Long Prairie (SD003)				
		Flow (mgd)	$CBOD_5$ (mg/L)	TP ave (mg/L)	Ammonia Ave (mg/L)	DO (mg/L)	Flow (mgd)	$CBOD_5$ (mg/L)	TP ave (mg/L)	Ammonia Ave (mg/L)	DO (mg/L)	Flow (mgd)	$CBOD_5$ (mg/L)	TP ave (mg/L)	Ammonia Ave (mg/L)	DO (mg/L)
	Average	0.96	7.90	17.30	123.71	4.54	1.70	6.73	5.90	14.19	4.83	2.08	11.17	10.74	18.37	3.40
	count	10	10	10	9	10	19	19	19	16	19	12	12	12	10	12
By Discharge Period:																
spring discharge	Average	1.05	7.76	14.06	249.45	6.48	1.84	8.67	7.23	20.38	5.18	2.15	11.78	11.61	26.50	3.90
	count	4	4	4	3	4	9	9	9	6	9	7	7	7	5	7
fall discharge	Average	0.90	8.00	19.45	60.84	3.26	1.58	4.98	4.71	10.48	4.51	1.98	10.33	9.53	10.25	2.70
	count	6	6	6	6	6	10	10	10	10	10	5	5	5	5	5
	t'	1.43	0.10	0.74	9.14	1.05	2.52	2.28	0.92	0.92	0.31	0.74	0.50	0.38	6.22	0.54
	t(0.05)	2.365	2.365	2.571	2.447	3.182	2.131	2.120	2.262	2.160	2.131	2.447	2.447	2.776	2.365	2.306
	Signif. Diff.	no	no	no	**yes**	no	yes	**yes**	no	no	no	no	no	no	**yes**	no

Appendix F, Table F-20

MPCA Long Prairie River Watershed TMDL Final Project Report

Detailed Summary of Model Senstivity

QUAL-TX CODE Word Description	QUAL-TX CODE Word	DO [mg/L] 0%	DO -25%	DO 25%	CBODu [mg/L] 0%	CBODu -25%	CBODu 25%	Organic Nitrogen [mg/L] 0%	Organic Nitrogen -25%	Organic Nitrogen 25%
Stream Velocity	VELOCITY	7.31	7.39	7.25	5.41	4.79	5.85	0.56	0.53	0.58
Stream Depth	DEPTH		7.02	7.48		5.41	5.41		0.56	0.56
Stream Reaeration	REAERATI		6.87	7.58		5.41	5.41		0.56	0.56
BOD Aerobic Decay Rate	BOD DECA		7.39	7.24		5.96	4.93		0.56	0.56
Ammonia Decay Rate	NH3 DECA		7.31	7.31		5.41	5.41		0.56	0.56
Background Ammonia Benthos Source Rate	NH3 SRCE		7.32	7.31		5.41	5.41		0.56	0.56
Organic Nitrogen Decay Rate	ORGN DEC		7.32	7.30		5.41	5.41		0.58	0.54
Background Sediment Oxygen Demand	BENTHAL		7.52	7.10		5.41	5.41		0.56	0.56
Initial Chloryphyll a	CHLOR A		7.30	7.32		5.41	5.41		0.56	0.56
Initial Macrophytes	MACRO		7.09	7.53		5.41	5.41		0.56	0.56
Incremental Inflow	INC INFL		7.37	7.25		5.03	5.76		0.56	0.55
Incremental BOD	INC BOD		7.35	7.27		4.82	6.00		0.56	0.56
Incremental Ammonia	INC NH3		7.32	7.30		5.41	5.41		0.56	0.56
Incremental Nitrate + Nitrite	INC NO3		7.31	7.31		5.41	5.41		0.56	0.56
Incremental Organic Nitrogen	INC ORGN		7.31	7.31		5.41	5.41		0.54	0.58

QUAL-TX CODE Word	Change [%] in DO when CODE Word is changed by -25%	Change [%] in DO when CODE Word is changed by +25%	Average Percent Change	Change [%] in CBODu when CODE Word is changed by -25%	Change [%] in CBODu when CODE Word is changed by +25%	Average Percent Change	Change [%] in ON when CODE Word is changed by -25%	Change [%] in ON when CODE Word is changed by +25%	Average Percent Change
VELOCITY	1%	-1%	-1%	-12%	8%	10%	-5%	3%	4%
DEPTH	-4%	2%	3%	0%	0%	0%	0%	0%	0%
REAERATI	-6%	4%	5%	0%	0%	0%	0%	0%	0%
BOD DECA	1%	-1%	-1%	10%	-9%	-10%	0%	0%	0%
NH3 DECA	0%	0%	0%	0%	0%	0%	0%	0%	0%
NH3 SRCE	0%	0%	0%	0%	0%	0%	0%	0%	0%
ORGN DEC	0%	0%	0%	0%	0%	0%	4%	-3%	-4%
BENTHAL	3%	-3%	-3%	0%	0%	0%	0%	0%	0%
CHLOR A	0%	0%	0%	0%	0%	0%	0%	0%	0%
MACRO	-3%	3%	3%	0%	0%	0%	0%	0%	0%
INC INFL	1%	-1%	-1%	-7%	6%	7%	1%	-1%	-1%
INC BOD	1%	-1%	-1%	-11%	11%	11%	0%	0%	0%
INC NH3	0%	0%	0%	0%	0%	0%	0%	0%	0%
INC NO3	0%	0%	0%	0%	0%	0%	0%	0%	0%
INC ORGN	0%	0%	0%	0%	0%	0%	-3%	3%	3%

Appendix F, Table F-20

MPCA Long Prairie River Watershed TMDL Final Project Report

Detailed Summary of Model Senstivity

QUAL-TX CODE Word	Ammonia Nitrogen [mg/L] 0%	-25%	25%	NO2 / NO3 - Nitrogen [mg/L] 0%	-25%	25%	Total Phosphorus [mg/L] 0%	-25%	25%
VELOCITY	0.013	0.01	0.02	0.159	0.115	0.184	0.045	0.06	0.04
DEPTH		0.01	0.01		0.169	0.152		0.07	0.03
REAERATI		0.01	0.01		0.158	0.159		0.04	0.04
BOD DECA		0.01	0.01		0.159	0.159		0.04	0.04
NH3 DECA		0.02	0.01		0.154	0.161		0.03	0.06
NH3 SRCE		0.01	0.01		0.151	0.167		0.04	0.04
ORGN DEC		0.01	0.02		0.142	0.175		0.04	0.04
BENTHAL		0.01	0.01		0.159	0.158		0.04	0.04
CHLOR A		0.01	0.01		0.162	0.155		0.04	0.04
MACRO		0.02	0.01		0.216	0.102		0.05	0.04
INC INFL		0.01	0.02		0.116	0.196		0.04	0.05
INC BOD		0.01	0.01		0.159	0.159		0.04	0.04
INC NH3		0.01	0.02		0.152	0.165		0.04	0.04
INC NO3		0.01	0.01		0.114	0.204		0.04	0.04
INC ORGN		0.01	0.01		0.158	0.159		0.04	0.04

QUAL-TX CODE Word	Change [%] in NH3-N when CODE Word is changed by -25%	Change [%] in NH3-N when CODE Word is changed by +25%	Average Percent Change	Change [%] in ON when CODE Word is changed by -25%	Change [%] in ON when CODE Word is changed by +25%	Average Percent Change	Change [%] in NH3-N when CODE Word is changed by -25%	Change [%] in NH3-N when CODE Word is changed by +25%	Average Percent Change
VELOCITY	-17%	36%	27%	-28%	16%	22%	23%	-11%	-17%
DEPTH	11%	-9%	-10%	7%	-4%	-5%	48%	-25%	-37%
REAERATI	2%	-1%	-2%	0%	0%	0%	0%	0%	0%
BOD DECA	0%	0%	0%	0%	0%	0%	0%	0%	0%
NH3 DECA	48%	-18%	-33%	-3%	2%	2%	-35%	36%	36%
NH3 SRCE	-10%	7%	8%	-5%	5%	5%	0%	0%	0%
ORGN DEC	-20%	43%	31%	-11%	10%	11%	0%	0%	0%
BENTHAL	-1%	1%	1%	0%	0%	0%	0%	0%	0%
CHLOR A	2%	-2%	-2%	2%	-2%	-2%	0%	0%	0%
MACRO	42%	-19%	-30%	36%	-36%	-36%	19%	-18%	-19%
INC INFL	-15%	19%	17%	-27%	24%	25%	-1%	2%	1%
INC BOD	0%	0%	0%	0%	0%	0%	0%	0%	0%
INC NH3	-16%	32%	24%	-4%	4%	4%	0%	0%	0%
INC NO3	0%	0%	0%	-28%	28%	28%	0%	0%	0%
INC ORGN	-3%	4%	3%	0%	0%	0%	0%	0%	0%

Appendix F, Table F-21

MPCA Long Prairie River Watershed TMDL Final Project Report

Distribution of 7Q10 Flows to the Tributaries by Acreages

	Summer 7Q10 Event (SUM)	Spring 7Q10 Event (SPR)	Winter 7Q10 Event (WIN)
Groundwater Inflow (cfs/RM)	0.23	0.23	0.16
Flow @ USGS (cfs)	11.4	38.6	6.9

	Inflow at TMDL Site Name	Tributary Acreage	Incremental Inflow (cfs) per acreage		
			SUM	SPR	WIN
US of USGS	LPR 47.8	276,928	4.1E-05	1.4E-04	2.5E-05

Tributary Name	Inflow at TMDL Site Name	Tributary Acreage	Flow entering Long Prairie River at TMDL Site		
			SUM	SPR	WIN*
Spruce Creek	LPR 80.9	16243	0.67	2.26	0.00
Dismal Creek	LPR 73.3	10661	0.44	1.49	0.00
Eagle Creek	LPR 33.6	35942	1.48	5.01	0.00
Turtle Creek	LPR 20.8	36820	1.52	5.13	0.00
Moran Creek	LPR 15.8	21673	0.89	3.02	0.00
Fish Trap Creek	LPR 10.3	21897	0.90	3.05	0.00

* Assume that Tributarys are frozen under Winter 7Q10 Event

Appendix F, Table F-22

MPCA Long Prairie River Watershed TMDL Final Project Report

Tributary Water Quality Monitoring Data Collected During Phase II by Wenck and Todd SWCD

						All Data					Summer Data				Spring Data			
DATE	**Year**	**Day**	**Month**	**Trib ID**	**Sampled by**	**Ammonia**	**NO2+3**	**ON**	**TP**	**CBODu**	ON	Ammonia	NO2+3	TP	ON	Ammonia	NO2+3	TP
						(mg/L)	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
4/21/99	1999	21	4	spruce Creek	Todd SWCD	0.02	0.25	0.29	0.04						0.29	0.02	0.25	0.04
4/27/99	1999	27	4	spruce Creek	Todd SWCD	0.02	0.21	0.36	0.05						0.36	0.02	0.21	0.05
5/11/99	1999	11	5	spruce Creek	Todd SWCD	0.02	0.18	1.28	0.09						1.28	0.02	0.18	0.09
5/26/99	1999	26	5	spruce Creek	Todd SWCD	0.03	0.14	0.43	0.06						0.43	0.03	0.14	0.06
6/2/99	1999	2	6	spruce Creek	Todd SWCD	0.02	0.18	0.41	0.07		0.41	0.02	0.18	0.07	0.41	0.02	0.18	0.07
6/15/99	1999	15	6	spruce Creek	Todd SWCD	0.03	0.04	0.73	0.09		0.73	0.03	0.04	0.09	0.73	0.03	0.04	0.09
6/29/99	1999	29	6	spruce Creek	Todd SWCD	0.03	0.08	0.55	0.066		0.55	0.03	0.08	0.07	0.55	0.03	0.08	0.07
7/20/99	1999	20	7	spruce Creek	Todd SWCD	0.28	0.08	0.11	0.058		0.11	0.28	0.08	0.06				
8/3/99	1999	3	8	spruce Creek	Todd SWCD	0.02	0.16	0.47	0.063		0.47	0.02	0.16	0.06				
8/21/01	2001	21	8	spruce Creek	Wenck	**0.01**	**0.1**	0.79	0.048	4.64	0.79	**0.01**	**0.10**	0.05				
9/25/01	2001	25	9	spruce Creek	Wenck	**0.01**	0.55	0.59	0.032	11.07								
average						0.045	0.18	0.55	0.061	**7.86**	**0.510**	**0.065**	**0.107**	**0.066**	**0.579**	**0.024**	**0.154**	**0.067**
count						11	11	11	11	2	6	6	6	6	7	7	7	7
6/15/99	1999	15	6	dismal Creek	Todd SWCD	0.02	0.09	0.94	0.043		0.94	0.02	0.09	0.04	0.94	0.02	0.09	0.04
7/20/99	1999	20	7	dismal Creek	Todd SWCD	0.02	0.14	1.08	0.066		1.08	0.02	0.14	0.07				
8/3/99	1999	3	8	dismal Creek	Todd SWCD	0.02	0.47	1.18	0.054		1.18	0.02	0.47	0.05				
8/21/01	2001	21	8	dismal Creek	Wenck	**0.01**	0.55	0.49	0.02	2.32	0.49	**0.01**	0.55	0.02				
average						0.018	0.31	0.92	0.046	**2.32**	**0.923**	**0.018**	**0.313**	**0.046**	**0.940**	**0.020**	**0.090**	**0.043**
count						4	4	4	4	1	4	4	4	4	1	1	1	1
4/11/02	2002	11	4	Eagle creek	Todd SWCD	0.320	0.74	1.68	0.225						1.68	0.32	0.74	0.23
4/23/02	2002	23	4	Eagle creek	Todd SWCD	0.011	0.35	1.089	0.063						1.09	0.01	0.35	0.06
5/21/02	2002	21	5	Eagle creek	Todd SWCD	0.050	0.45	0.81	0.067						0.81	0.05	0.45	0.07
6/4/02	2002	4	6	Eagle creek	Todd SWCD	0.060	0.71	0.6	0.085		0.60	0.06	0.71	0.09	0.60	0.06	0.71	0.09
6/17/02	2002	17	6	Eagle creek	Todd SWCD	0.011	0.78	0.529	0.048		0.53	0.01	0.78	0.05	0.53	0.01	0.78	0.05
7/9/02	2002	9	7	Eagle creek	Todd SWCD	0.011	0.41	1.089	0.097		1.09	0.01	0.41	0.10				
7/24/02	2002	24	7	Eagle creek	Todd SWCD	0.030	0.53	0.6	0.077		0.60	0.03	0.53	0.08				
7/30/02	2002	30	7	Eagle creek	Todd SWCD	0.011	0.71	0.759	0.060		0.76	0.01	0.71	0.06				
8/13/02	2002	13	8	Eagle creek	Todd SWCD	0.030	0.65	0.56	0.048		0.56	0.03	0.65	0.05				
8/26/02	2002	26	8	Eagle creek	Todd SWCD	0.011	0.75	0.479	0.055		0.48	0.01	0.75	0.06				
9/11/02	2002	11	9	Eagle creek	Todd SWCD	0.011	0.82	0.199	0.071									
9/24/02	2002	24	9	Eagle creek	Todd SWCD	0.150	0.85	0.8	0.143									
10/8/02	2002	8	10	Eagle creek	Todd SWCD	0.011	0.33	0.859	0.094									
4/10/97	1997	10	4	Eagle creek	Todd SWCD	0.01	0.60	0.99	0.080						0.99	0.01	0.60	0.08
4/15/97	1997	15	4	Eagle creek	Todd SWCD	0.01	0.26	0.67	0.050						0.67	0.01	0.26	0.05
4/22/97	1997	22	4	Eagle creek	Todd SWCD	0.02	0.15	0.98	0.030						0.98	0.02	0.15	0.03
4/30/97	1997	30	4	Eagle creek	Todd SWCD	0.02	0.28	0.87	0.020						0.87	0.02	0.28	0.02
5/6/97	1997	6	5	Eagle creek	Todd SWCD	0.02	0.28	0.63	0.050						0.63	0.02	0.28	0.05
5/13/97	1997	13	5	Eagle creek	Todd SWCD	0.02	0.40	0.51	0.040						0.51	0.02	0.40	0.04
5/21/97	1997	21	5	Eagle creek	Todd SWCD	0.02	0.29	0.65	0.050						0.65	0.02	0.29	0.05
5/28/97	1997	28	5	Eagle creek	Todd SWCD	0.02	0.22	0.66	0.030						0.66	0.02	0.22	0.03
6/3/97	1997	3	6	Eagle creek	Todd SWCD	0.02	0.25	0.58	0.040		0.58	0.02	0.25	0.04	0.58	0.02	0.25	0.04
6/24/97	1997	24	6	Eagle creek	Todd SWCD	0.02	0.19	0.49	0.050		0.49	0.02	0.19	0.05	0.49	0.02	0.19	0.05
6/30/97	1997	30	6	Eagle creek	Todd SWCD	0.05	0.27	0.5	0.080		0.50	0.05	0.27	0.08	0.50	0.05	0.27	0.08
7/8/97	1997	8	7	Eagle creek	Todd SWCD	0.03	0.24	0.51	0.050		0.51	0.03	0.24	0.05				
7/15/97	1997	15	7	Eagle creek	Todd SWCD	0.02	0.19	0.67	0.080		0.67	0.02	0.19	0.08				
7/22/97	1997	22	7	Eagle creek	Todd SWCD	0.02	0.25	0.75	0.080		0.75	0.02	0.25	0.08				
8/12/97	1997	12	8	Eagle creek	Todd SWCD	0.03	0.29	0.43	0.060		0.43	0.03	0.29	0.06				
9/9/97	1997	9	9	Eagle creek	Todd SWCD	0.25	0.19	0.19	0.050									
9/23/97	1997	23	9	Eagle creek	Todd SWCD	0.07	0.26	0.37	0.030	14.10								
3/31/98	1998	31	3	Eagle creek	Todd SWCD	0.08	0.67	1.27	0.120									
4/6/98	1998	6	4	Eagle creek	Todd SWCD	0.02	0.25	0.804	0.080						0.80	0.02	0.25	0.08
4/14/98	1998	14	4	Eagle creek	Todd SWCD	0.02	0.210	0.908	0.055						0.91	0.02	0.21	0.06
4/21/98	1998	21	4	Eagle creek	Todd SWCD	0.02	0.341	0.859	0.037						0.86	0.02	0.34	0.04
4/22/98	1998	22	4	Eagle creek	Todd SWCD	0.05	0.340	0.69	0.058						0.69	0.05	0.34	0.06
4/28/98	1998	28	4	Eagle creek	Todd SWCD	0.04	0.448	0.58	0.050						0.58	0.04	0.45	0.05
5/12/98	1998	12	5	Eagle creek	Todd SWCD	0.02	0.310	0.85	0.093	1.45					0.85	0.02	0.31	0.09
5/19/98	1998	19	5	Eagle creek	Todd SWCD	0.02	0.110	1.41	0.133						1.41	0.02	0.11	0.13
5/26/98	1998	26	5	Eagle creek	Todd SWCD	0.08	0.550	0.69	0.130						0.69	0.08	0.55	0.13
6/2/98	1998	2	6	Eagle creek	Todd SWCD	0.03	0.370	0.66	0.078		0.66	0.03	0.37	0.08	0.66	0.03	0.37	0.08
6/25/98	1998	25	6	Eagle creek	Todd SWCD	0.05	0.200	1.17	0.110	2.61	1.17	0.05	0.20	0.11	1.17	0.05	0.20	0.11
7/28/98	1998	28	7	Eagle creek	Todd SWCD	0.020	0.420	0.86	0.050		0.86	0.02	0.42	0.05				
8/11/98	1998	11	8	Eagle creek	Todd SWCD	0.03	0.41	0.46	0.040		0.46	0.03	0.41	0.04				
8/25/98	1998	25	8	Eagle creek	Todd SWCD	0.05	0.52	0.4	0.070		0.40	0.05	0.52	0.07				
4/13/99	1999	13	4	Eagle creek	Todd SWCD	0.02	0.16	0.78	0.05						0.78	0.02	0.16	0.05
4/21/99	1999	21	4	Eagle creek	Todd SWCD	0.02	0.23	0.51	0.04						0.51	0.02	0.23	0.04
4/27/99	1999	27	4	Eagle creek	Todd SWCD	0.02	0.26	0.49	0.05						0.49	0.02	0.26	0.05
5/11/99	1999	11	5	Eagle creek	Todd SWCD	0.05	0.23	1.35	0.10						1.35	0.05	0.23	0.10
5/26/99	1999	26	5	Eagle creek	Todd SWCD	0.03	0.26	0.91	0.08						0.91	0.03	0.26	0.08

Appendix F, Table F-22

MPCA Long Prairie River Watershed TMDL Final Project Report

Tributary Water Quality Monitoring Data Collected During Phase II by Wenck and Todd SWCD

						All Data					Summer Data				Spring Data			
DATE	**Year**	**Day**	**Month**	**Trib ID**	**Sampled by**	**Ammonia**	**NO2+3**	**ON**	**TP**	**CBODu**	ON	Ammonia	NO2+3	TP	ON	Ammonia	NO2+3	TP
						(mg/L)	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
6/2/99	1999	2	6	Eagle creek	Todd SWCD	0.02	0.69	0.49	0.07		0.49	0.02	0.69	0.07	0.49	0.02	0.69	0.07
6/15/99	1999	15	6	Eagle creek	Todd SWCD	0.02	0.05	0.84	0.096		0.84	0.02	0.05	0.10	0.84	0.02	0.05	0.10
6/29/99	1999	29	6	Eagle creek	Todd SWCD	0.65	0.21	0.13	0.091		0.13	0.65	0.21	0.09	0.13	0.65	0.21	0.09
7/20/99	1999	20	7	Eagle creek	Todd SWCD	0.24	0.11	0.56	0.097		0.56	0.24	0.11	0.10				
8/3/99	1999	3	8	Eagle creek	Todd SWCD	0.04	0.43	0.37	0.062		0.37	0.04	0.43	0.06				
6/6/00	2000	6	6	Eagle creek	Todd SWCD	0.02	0.17	0.7	0.039		0.70	0.02	0.17	0.04	0.70	0.02	0.17	0.04
4/10/01	2001	10	4	Eagle creek	Todd SWCD	0.08	1.00	1.02	0.196						1.02	0.08	1.00	0.20
4/18/01	2001	18	4	Eagle creek	Todd SWCD	0.10	0.52	0.84	0.076						0.84	0.10	0.52	0.08
4/24/01	2001	24	4	Eagle creek	Todd SWCD	0.09	1.10	0.88	0.112						0.88	0.09	1.10	0.11
5/8/01	2001	8	5	Eagle creek	Todd SWCD	0.02	0.17	0.52	0.045						0.52	0.02	0.17	0.05
5/23/01	2001	23	5	Eagle creek	Todd SWCD	0.0500	0.29	0.66	0.074						0.66	0.05	0.29	0.07
6/5/01	2001	5	6	Eagle creek	Todd SWCD	0.0500	0.55	0.45	0.068		0.45	0.05	0.55	0.07	0.45	0.05	0.55	0.07
6/19/01	2001	19	6	Eagle creek	Todd SWCD	0.0067	0.01	1.0933	0.135		1.09	0.01	0.01	0.14	1.09	0.01	0.01	0.14
7/3/01	2001	3	7	Eagle creek	Todd SWCD	0.0500	0.48	1.05	0.151		1.05	0.05	0.48	0.15				
8/15/01	2001	15	8	Eagle creek	Todd SWCD	0.0067	0.73	0.3733	0.021		0.37	0.01	0.73	0.02				
8/22/01	2001	22	8	Eagle creek	Wenck	**0.01**	0.77	0.69	0.033	(a)	0.69	**0.01**	0.77	0.03				
9/25/01	2001	25	9	Eagle creek	Wenck	**0.01**	0.85	0.49	0.032	14.76								
2/8/02	2002	8	2	Eagle creek	Wenck	0.08	1.39	0.02	0.057	1								
average						0.053	0.43	0.71	0.073	**6.78**	**0.628**	**0.055**	**0.411**	**0.071**	**0.756**	**0.054**	**0.363**	**0.075**
count						67	67	67	67	5	30	30	30	30	43	42	42	42
4/11/02	2002	11	4	turtle creek	Todd SWCD	0.300	0.13	1.3	0.134						1.30	0.30	0.13	0.13
4/23/02	2002	23	4	turtle creek	Todd SWCD	0.040	0.04	0.86	0.052						0.86	0.04	0.04	0.05
5/7/02	2002	7	5	turtle creek	Todd SWCD	0.020	0.03	0.97	0.033						0.97	0.02	0.03	0.03
5/21/02	2002	21	5	turtle creek	Todd SWCD	0.011	0.0067	0.929	0.045						0.93	0.01	0.01	0.05
6/4/02	2002	4	6	turtle creek	Todd SWCD	0.020	0.0067	0.85	0.052		0.85	0.02	0.01	0.05	0.85	0.02	0.01	0.05
6/17/02	2002	17	6	turtle creek	Todd SWCD	0.011	0.03	1.089	0.071		1.09	0.01	0.03	0.07	1.09	0.01	0.03	0.07
7/9/02	2002	9	7	turtle creek	Todd SWCD	0.011	0.01	1.489	0.074		1.49	0.01	0.01	0.07				
7/24/02	2002	24	7	turtle creek	Todd SWCD	0.240	0.01	1.16	0.231		1.16	0.24	0.01	0.23				
7/30/02	2002	30	7	turtle creek	Todd SWCD	0.011	0.01	1.389	0.112		1.39	0.01	0.01	0.11				
8/13/02	2002	13	8	turtle creek	Todd SWCD	0.120	0.01	1.48	0.089		1.48	0.12	0.01	0.09				
8/26/02	2002	26	8	turtle creek	Todd SWCD	0.011	0.03	1.189	0.057		1.19	0.01	0.03	0.06				
9/11/02	2002	11	9	turtle creek	Todd SWCD	0.030	0.06	0.58	0.062									
9/24/02	2002	24	9	turtle creek	Todd SWCD	0.030	0.03	1.57	0.030									
10/8/02	2002	8	10	turtle creek	Todd SWCD	0.011	0.01	0.619	0.035									
4/9/97	1997	9	4	turtle creek	Todd SWCD	0.06	0.33	0.89	0.090						0.89	0.06	0.33	0.09
4/15/97	1997	15	4	turtle creek	Todd SWCD	0.01	0.09	0.68	0.050						0.68	0.01	0.09	0.05
4/22/97	1997	22	4	turtle creek	Todd SWCD	0.02	0.02	1.08	0.040						1.08	0.02	0.02	0.04
5/1/97	1997	1	5	turtle creek	Todd SWCD	0.06	0.02	1.14	0.010						1.14	0.06	0.02	0.01
5/7/97	1997	7	5	turtle creek	Todd SWCD	0.02	0.02	1.08	0.030						1.08	0.02	0.02	0.03
5/13/97	1997	13	5	turtle creek	Todd SWCD	0.03	0.02	0.86	0.040						0.86	0.03	0.02	0.04
5/21/97	1997	21	5	turtle creek	Todd SWCD	0.02	0.02	1.08	0.060						1.08	0.02	0.02	0.06
5/28/97	1997	28	5	turtle creek	Todd SWCD	0.02	0.02	1.08	0.050						1.08	0.02	0.02	0.05
6/3/97	1997	3	6	turtle creek	Todd SWCD	0.02	0.04	0.98	0.050		0.98	0.02	0.04	0.05	0.98	0.02	0.04	0.05
6/24/97	1997	24	6	turtle creek	Todd SWCD	0.02	0.13	0.76	0.060		0.76	0.02	0.13	0.06	0.76	0.02	0.13	0.06
6/30/97	1997	30	6	turtle creek	Todd SWCD	0.02	0.02	0.62	0.070		0.62	0.02	0.02	0.07	0.62	0.02	0.02	0.07
7/8/97	1997	8	7	turtle creek	Todd SWCD	0.04	0.04	0.67	0.040		0.67	0.04	0.04	0.04				
7/15/97	1997	15	7	turtle creek	Todd SWCD	0.02	0.02	0.98	0.060		0.98	0.02	0.02	0.06				
7/22/97	1997	22	7	turtle creek	Todd SWCD	0.02	0.02	0.98	0.060		0.98	0.02	0.02	0.06				
8/12/97	1997	12	8	turtle creek	Todd SWCD	0.02	0.02	1.08	0.040		1.08	0.02	0.02	0.04				
9/9/97	1997	9	9	turtle creek	Todd SWCD	0.08	0.02	0.92	0.030									
9/23/97	1997	23	9	turtle creek	Todd SWCD	0.04	0.02	0.85	0.020									
3/31/98	1998	31	3	turtle creek	Todd SWCD	0.15	0.32	0.97	0.120	19.86								
4/6/98	1998	6	4	turtle creek	Todd SWCD	0.02	0.02	0.806	0.040						0.81	0.02	0.02	0.04
4/14/98	1998	14	4	turtle creek	Todd SWCD	0.02	0.020	0.875	0.040						0.88	0.02	0.02	0.04
4/21/98	1998	21	4	turtle creek	Todd SWCD	0.02	0.028	0.815	0.012						0.82	0.02	0.03	0.01
4/28/98	1998	28	4	turtle creek	Todd SWCD	0.02	0.028	0.87	0.050						0.87	0.02	0.03	0.05
5/12/98	1998	12	5	turtle creek	Todd SWCD	0.02	0.050	0.97	0.063	4.64					0.97	0.02	0.05	0.06
5/19/98	1998	19	5	turtle creek	Todd SWCD	0.02	0.050	1.04	0.076	16.66					1.04	0.02	0.05	0.08
5/26/98	1998	26	5	turtle creek	Todd SWCD	0.02	0.020	1.18	0.100						1.18	0.02	0.02	0.10
6/2/98	1998	2	6	turtle creek	Todd SWCD	0.02	0.050	0.9	0.058	1.45	0.90	0.02	0.05	0.06	0.90	0.02	0.05	0.06
6/9/98	1998	9	6	turtle creek	Todd SWCD	0.02	0.050	0.81	0.047	2.61	0.81	0.02	0.05	0.05	0.81	0.02	0.05	0.05
6/25/98	1998	25	6	turtle creek	Todd SWCD	0.02	0.050	1.17	0.064	2.9	1.17	0.02	0.05	0.06	1.17	0.02	0.05	0.06
7/7/98	1998	7	7	turtle creek	Todd SWCD	0.03	0.020	1.25	0.118		1.25	0.03	0.02	0.12				
7/28/98	1998	28	7	turtle creek	Todd SWCD	0.020	0.020	1.08	0.090		1.08	0.02	0.02	0.09				
8/11/98	1998	11	8	turtle creek	Todd SWCD	0.02	0.02	0.98	0.060		0.98	0.02	0.02	0.06				
8/25/98	1998	25	8	turtle creek	Todd SWCD	0.05	0.02	0.91	0.100		0.91	0.05	0.02	0.10				
8/27/98	1998	27	8	turtle creek	Todd SWCD				0.099					0.10				
9/9/98	1998	9	9	turtle creek	Todd SWCD	0.02	0.02	1.08	0.060									
4/13/99	1999	13	4	turtle creek	Todd SWCD	0.02	0.02	0.98	0.03						0.98	0.02	0.02	0.03

Appendix F, Table F-22

MPCA Long Prairie River Watershed TMDL Final Project Report

Tributary Water Quality Monitoring Data Collected During Phase II by Wenck and Todd SWCD

						All Data					Summer Data				Spring Data			
DATE	Year	Day	Month	Trib ID	Sampled by	Ammonia	NO2+3	ON	TP	CBODu	ON	Ammonia	NO2+3	TP	ON	Ammonia	NO2+3	TP
						(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
4/21/99	1999	21	4	turtle creek	Todd SWCD	0.02	0.02	0.56	0.03						0.56	0.02	0.02	0.03
4/27/99	1999	27	4	turtle creek	Todd SWCD	0.02	0.02	0.66	0.04						0.66	0.02	0.02	0.04
5/11/99	1999	11	5	turtle creek	Todd SWCD	0.02	4.90	1.68	0.08						1.68	0.02	4.90	0.08
5/26/99	1999	26	5	turtle creek	Todd SWCD	0.10	0.04	1.1	0.05						1.10	0.10	0.04	0.05
6/2/99	1999	2	6	turtle creek	Todd SWCD	0.02	0.02	0.9	0.05		0.90	0.02	0.02	0.05	0.90	0.02	0.02	0.05
6/29/99	1999	29	6	turtle creek	Todd SWCD	0.55	0.02	0.29	0.056		0.29	0.55	0.02	0.06	0.29	0.55	0.02	0.06
7/20/99	1999	20	7	turtle creek	Todd SWCD	0.02	0.02	0.83	0.068		0.83	0.02	0.02	0.07				
8/3/99	1999	3	8	turtle creek	Todd SWCD	0.02	0.02	0.82	0.049		0.82	0.02	0.02	0.05				
6/19/00	2000	19	6	turtle creek	Todd SWCD	0.02	0.02	1.08	0.057		1.08	0.02	0.02	0.06	1.08	0.02	0.02	0.06
7/12/00	2000	12	7	turtle creek	Todd SWCD	0.02	0.02	1.08	0.058		1.08	0.02	0.02	0.06				
4/10/01	2001	10	4	turtle creek	Todd SWCD	0.18	0.50	0.82	0.198						0.82	0.18	0.50	0.20
4/18/01	2001	18	4	turtle creek	Todd SWCD	0.13	0.23	0.51	0.068						0.51	0.13	0.23	0.07
4/24/01	2001	24	4	turtle creek	Todd SWCD	0.16	0.15	0.4	0.047						0.40	0.16	0.15	0.05
5/8/01	2001	8	5	turtle creek	Todd SWCD	0.06	0.02	0.73	0.046						0.73	0.06	0.02	0.05
5/23/01	2001	23	5	turtle creek	Todd SWCD	0.0067	0.01	0.8733	0.049						0.87	0.01	0.01	0.05
6/5/01	2001	5	6	turtle creek	Todd SWCD	0.0067	0.01	0.8333	0.052		0.83	0.01	0.01	0.05	0.83	0.01	0.01	0.05
6/19/01	2001	19	6	turtle creek	Todd SWCD	0.0067	0.01	0.9233	0.099		0.92	0.01	0.01	0.10	0.92	0.01	0.01	0.10
7/3/01	2001	3	7	turtle creek	Todd SWCD	0.1500	0.01	1.15	0.158		1.15	0.15	0.01	0.16				
8/15/01	2001	15	8	turtle creek	Todd SWCD	0.0067	0.01	1.6933	0.126		1.69	0.01	0.01	0.13				
8/21/01	2001	21	8	turtle creek	Wenck	**0.01**	**0.1**	1.29	0.084	5.8	1.29	**0.01**	**0.10**	0.08				
8/28/01	2001	28	8	turtle creek	Todd SWCD	0.0067	0.08	1.1933	0.063		1.19	0.01	0.08	0.06				
9/25/01	2001	25	9	turtle creek	Wenck	**0.01**	**0.1**	0.89	0.014	14.76								
10/2/01	2001	2	10	turtle creek	Todd SWCD	0.0067	0.01	0.7933	0.026									
2/8/02	2002	8	2	turtle creek	Wenck	0.15	**0.1**	0.55	0.021	(a)								
average						0.050	0.12	0.97	0.064	**8.59**	**1.027**	**0.049**	**0.029**	**0.077**	**0.905**	**0.053**	**0.175**	**0.058**
count						72	72	72	73	8	33	33	33	34	42	42	42	42
4/6/98	1998	6	4	moran creek	Todd SWCD	0.03	0.02	0.76	0.030						0.76	0.03	0.02	0.03
4/14/98	1998	14	4	moran creek	Todd SWCD	0.02	0.020	0.83	0.064						0.83	0.02	0.02	0.06
4/21/98	1998	21	4	moran creek	Todd SWCD	0.02	0.020	1.13	0.028						1.13	0.02	0.02	0.03
4/28/98	1998	28	4	moran creek	Todd SWCD	0.02	0.033	0.73	0.010						0.73	0.02	0.03	0.01
5/12/98	1998	12	5	moran creek	Todd SWCD	0.02	0.050	0.88	0.062	3.19					0.88	0.02	0.05	0.06
5/19/98	1998	19	5	moran creek	Todd SWCD	0.02	0.050	1.25	0.071						1.25	0.02	0.05	0.07
5/26/98	1998	26	5	moran creek	Todd SWCD	0.04	0.040	0.96	0.090						0.96	0.04	0.04	0.09
6/2/98	1998	2	6	moran creek	Todd SWCD	0.02	0.050	0.78	0.057	2.03	0.78	0.02	0.05	0.06	0.78	0.02	0.05	0.06
6/9/98	1998	9	6	moran creek	Todd SWCD	0.02	0.050	0.68	0.042	2.03	0.68	0.02	0.05	0.04	0.68	0.02	0.05	0.04
6/25/98	1998	25	6	moran creek	Todd SWCD	0.05	0.050	0.89	0.046	2.9	0.89	0.05	0.05	0.05	0.89	0.05	0.05	0.05
7/7/98	1998	7	7	moran creek	Todd SWCD	0.05	0.020	1.12	0.050		1.12	0.05	0.02	0.05				
7/28/98	1998	28	7	moran creek	Todd SWCD	0.020	0.030	0.98	0.040		0.98	0.02	0.03	0.04				
8/11/98	1998	11	8	moran creek	Todd SWCD	0.02	0.03	0.7	0.050		0.70	0.02	0.03	0.05				
8/25/98	1998	25	8	moran creek	Todd SWCD	0.02	0.06	0.45	0.060		0.45	0.02	0.06	0.06				
8/27/98	1998	27	8	moran creek	Todd SWCD				0.048					0.05				
9/9/98	1998	9	9	moran creek	Todd SWCD	0.02	0.04	3.88	0.070									
4/21/99	1999	21	4	moran creek	Todd SWCD	0.02	0.02	0.6	0.03						0.60	0.02	0.02	0.03
4/27/99	1999	27	4	moran creek	Todd SWCD	0.02	0.02	0.54	0.04						0.54	0.02	0.02	0.04
5/11/99	1999	11	5	moran creek	Todd SWCD	0.02	0.05	1.18	0.06						1.18	0.02	0.05	0.06
5/26/99	1999	26	5	moran creek	Todd SWCD	0.03	0.02	0.97	0.04						0.97	0.03	0.02	0.04
6/2/99	1999	2	6	moran creek	Todd SWCD	0.02	0.05	0.73	0.04		0.73	0.02	0.05	0.04	0.73	0.02	0.05	0.04
6/15/99	1999	15	6	moran creek	Todd SWCD	0.02	0.02	0.94	0.043		0.94	0.02	0.02	0.04	0.94	0.02	0.02	0.04
6/29/99	1999	29	6	moran creek	Todd SWCD	0.3	0.02	0.61	0.044		0.61	0.30	0.02	0.04	0.61	0.30	0.02	0.04
7/20/99	1999	20	7	moran creek	Todd SWCD	0.02	0.02	0.75	0.066		0.75	0.02	0.02	0.07				
8/3/99	1999	3	8	moran creek	Todd SWCD	0.02	0.02	0.98	0.045		0.98	0.02	0.02	0.05				
8/21/01	2001	21	8	moran creek	Wenck	**0.01**	**0.1**	0.69	0.009	9.28	0.69	**0.01**	**0.10**	0.01				
9/25/01	2001	25	9	moran creek	Wenck	**0.01**	**0.1**	0.89	0.014	14.76								
2/8/02	2002	8	2	moran creek	Wenck	0.24	0.24	w detection	0.008	(a)								
2/8/02	2002	8	2	moran creek	Wenck	0.23	0.23	w detection	0.011	(a)								
average						0.048	0.05	**0.96**	0.044	**5.70**	**0.792**	**0.045**	**0.040**	**0.046**	**0.851**	**0.041**	**0.034**	**0.047**
count						28	28	26	29	6	13	13	13	14	17	17	17	17
8/21/01	2001	21	8	fish trap creek	Wenck	**0.01**	**0.1**	0.69	0.041	(a)	0.69	**0.01**	**0.10**	0.04				
9/25/01	2001	25	9	fish trap creek	Wenck	**0.01**	**0.1**	0.89	0.022	14.76								
2/8/02	2002	8	2	fish trap creek	Wenck	0.07	**0.1**	0.33	0.017	(a)								
average						0.030	0.10	0.64	0.027	**14.76**	**0.690**	**0.010**	**0.100**	**0.041**	**no data**	**no data**	**no data**	**no data**
count						3	3	3	3	1	1	1	1	1	0	0	0	0
										(a) indeterminate, observed value below detection limit								

Appendix F, Table F-23

MPCA Long Prairie River Watershed TMDL Final Project Report

Point Source Summary for TMDL Projection Simulation

Modified Spring 7Q10

Long Prairie River headwater flow increased from 1.88 to 3.87 cfs, and Eagle Creek headwater flow increased from 0.01 to 2.75 cfs.

Point Source Sites	Inflow at TMDL Site ID	Inflow Rate (cfs)	Temperature (C)	Chloride (mg/L)	DO (mg/L)	CBODu (mg/L)	ON (mg/L)	NH3-N (mg/L)	NO2/ NO3-N (mg/L)	TP (mg/L)	Chlorophyll-*a* (ug/L)
CARLOS WWTF	LPR 89.4	1.21	21	---	8.91	35.7	3.2	5.8	0.05	2.11	---
LP SUPERFUND SITE	LPR 47.3	0.67	13.52	---	8.58	13.38	1.02	0.04	0.88	0.1	---
LPRAIRIE WWTF SD004	LPR 46.6	0.77	21	---	6	30	2	22.1	100	5.9	---
LPRAIRIE WWTF SD003	LPR 44.9	0.88	21	---	6	31.7	3.7	16.0	0.43	1	---
BROWERVILLE WWTF	LPR 36.1	6.16	21	---	8.91	16.3	3.2	0.3	0.05	2.43	---
EAGLE BEND WWTF*	EC 12.0	1.01	21	---	8.91	16.1	3.2	5.8	0.05	2.7	---
CLARISSA WWTF*	EC 7.0	1.42	21	---	8.91	28.6	3.2	5.8	0.05	1.49	---

QUAL-TX Input File: pps137.in

NOTE: Browerville's spring NH_3-N loading rate under this scenario is the same as for an effluent concentration of 5.8 mg/L and a flow rate of 0.335 cfs, equal to half of Browerville's 1999-2001 maximum annual wastewater volume discharged at a constant rate over 75 days. The Browerville WWTF actually does not discharge in the spring but discharges in the fall only.

* See Section 9.8.3 for discussion of Eagle Bend and Clarissa WWTFs.

Summer 7Q10

Point Source Sites	Inflow at TMDL Site ID	Inflow Rate (cfs)	Temperature (C)	Chloride (mg/L)	DO (mg/L)	CBODu (mg/L)	ON (mg/L)	NH3-N (mg/L)	NO2/ NO3-N (mg/L)	TP (mg/L)	Chlorophyll-*a* (ug/L)
CARLOS WWTF	LPR 89.4	1.21	23	---	8.58	35.7	4.43	0.07	0.008	2.11	---
LP SUPERFUND SITE	LPR 47.3	0.67	13.52	---	8.58	13.38	1.02	0.04	0.88	0.1	---
LPRAIRIE WWTF SD004	LPR 46.6	0.77	23	---	6	30	2	22.1	100	5.9	---
LPRAIRIE WWTF SD003	LPR 44.9	0.88	23	---	6	31.7	2.4	10.3	0.43	1	---
BROWERVILLE WWTF	LPR 36.1	6.16	23	---	8.58	16.3	4.43	0.07	0.008	2.43	---
EAGLE BEND WWTF	EC 12.0	1.01	23	---	8.58	16.1	4.43	0.07	0.008	0.79	---
CLARISSA WWTF	EC 7.0	1.42	23	---	8.58	28.6	4.43	0.07	0.008	1.49	---

QUAL-TX Input File: sps137.in

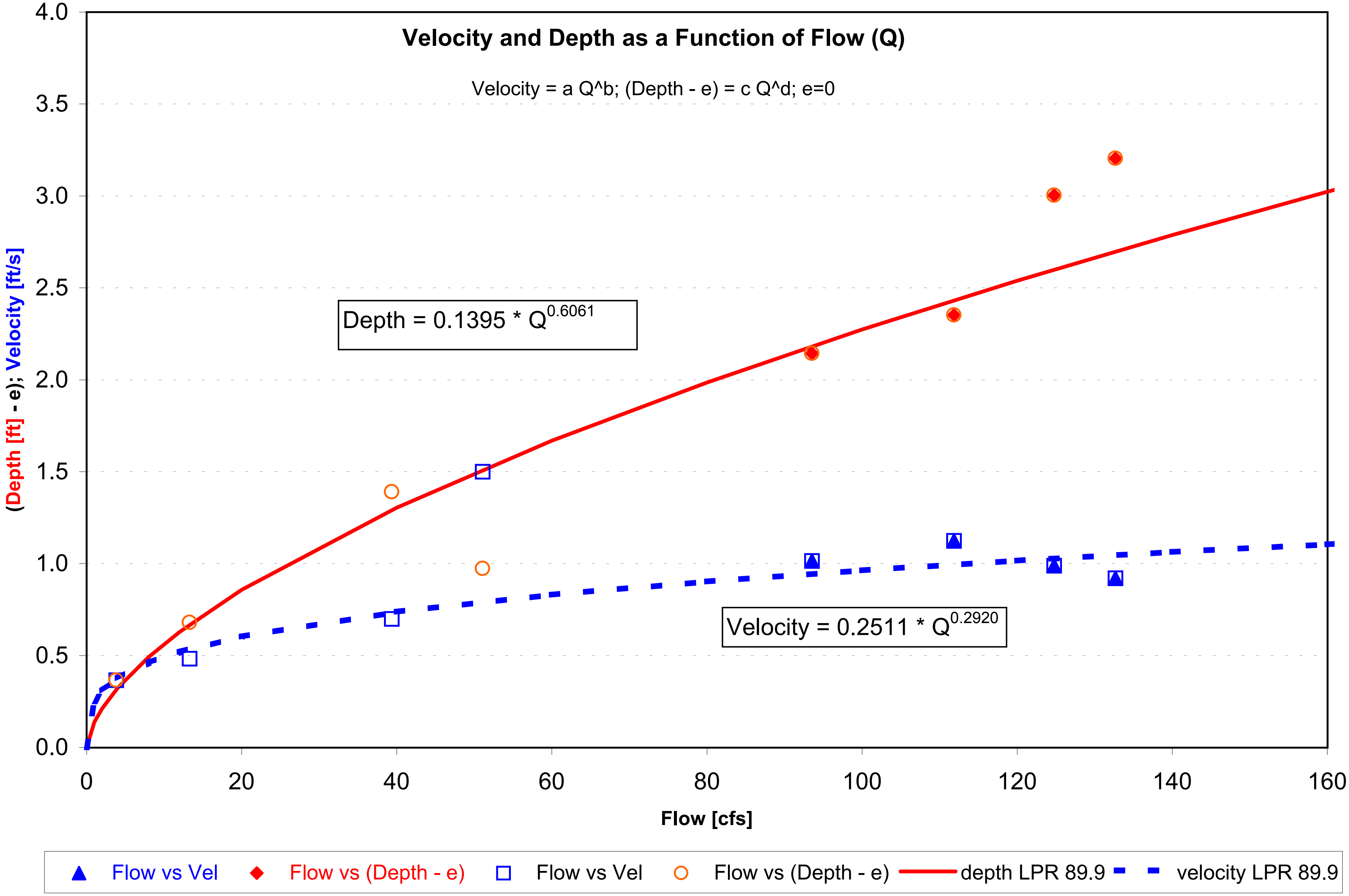
Winter 7Q10

Point Source Sites	Inflow at TMDL Site ID	Inflow Rate (cfs)	Temperature (C)	Chloride (mg/L)	DO (mg/L)	CBODu (mg/L)	ON (mg/L)	NH3-N (mg/L)	NO2/ NO3-N (mg/L)	TP (mg/L)	Chlorophyll-*a* (ug/L)
LP SUPERFUND SITE	LPR 47.3	0.67	13.52	---	14.62	13.38	1.02	0.04	0.88	0.1	---
LPRAIRIE WWTF SD004	LPR 46.6	0.77	0	---	6	30	2	22.1	100	5.9	---
LPRAIRIE WWTF SD003	LPR 44.9	0.88	0	---	6	31.7	2.4	10.3	0.43	1	---

QUAL-TX Input File: wps137.in

Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 89.9
MPCA Long Prairie River Watershed TMDL Final Project Report



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Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 83.1
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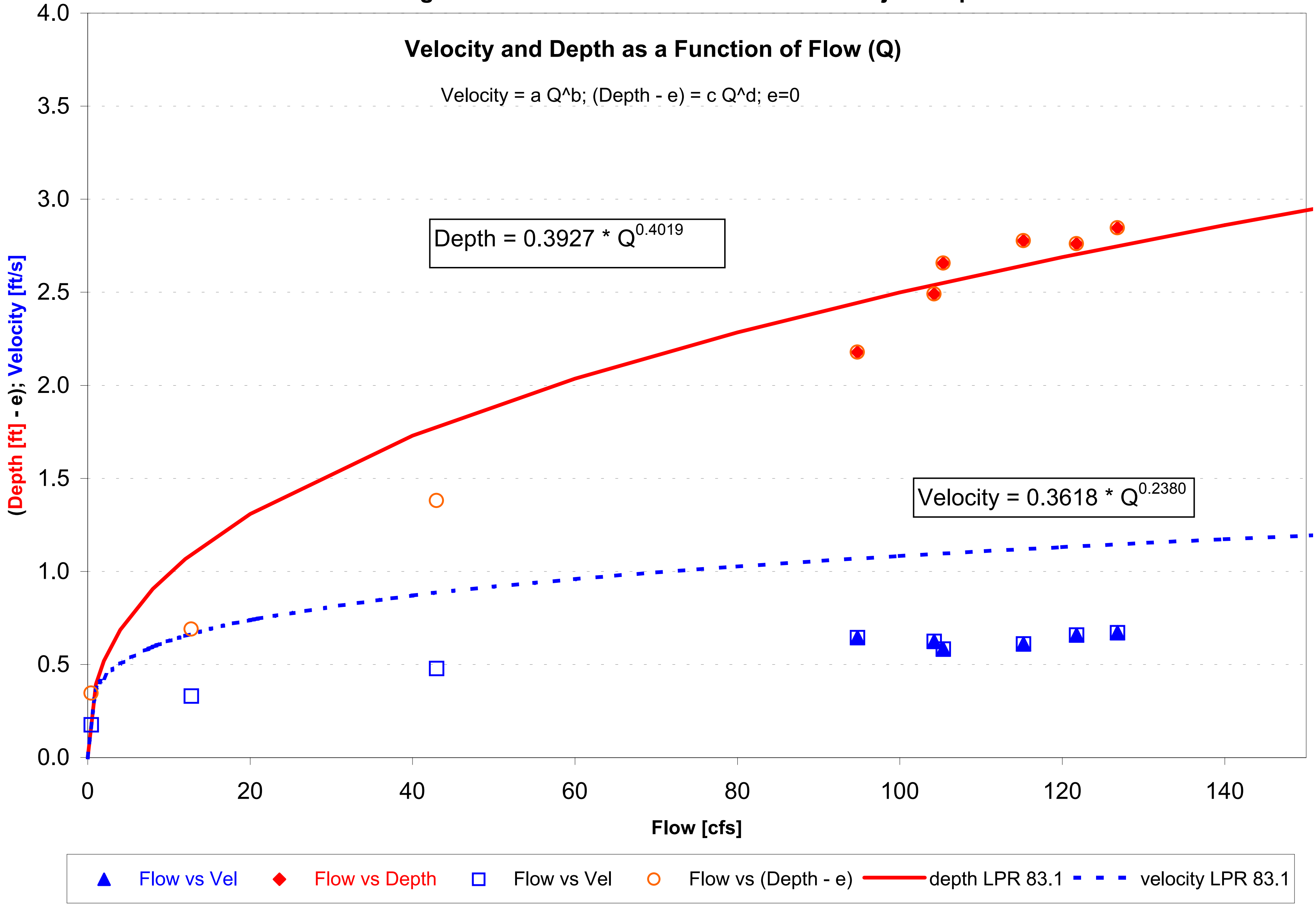

T:\0147\51\Phase III Rpt\Appendices\
\Appendix F FIG 01/LPR 83.1

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Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 76.7
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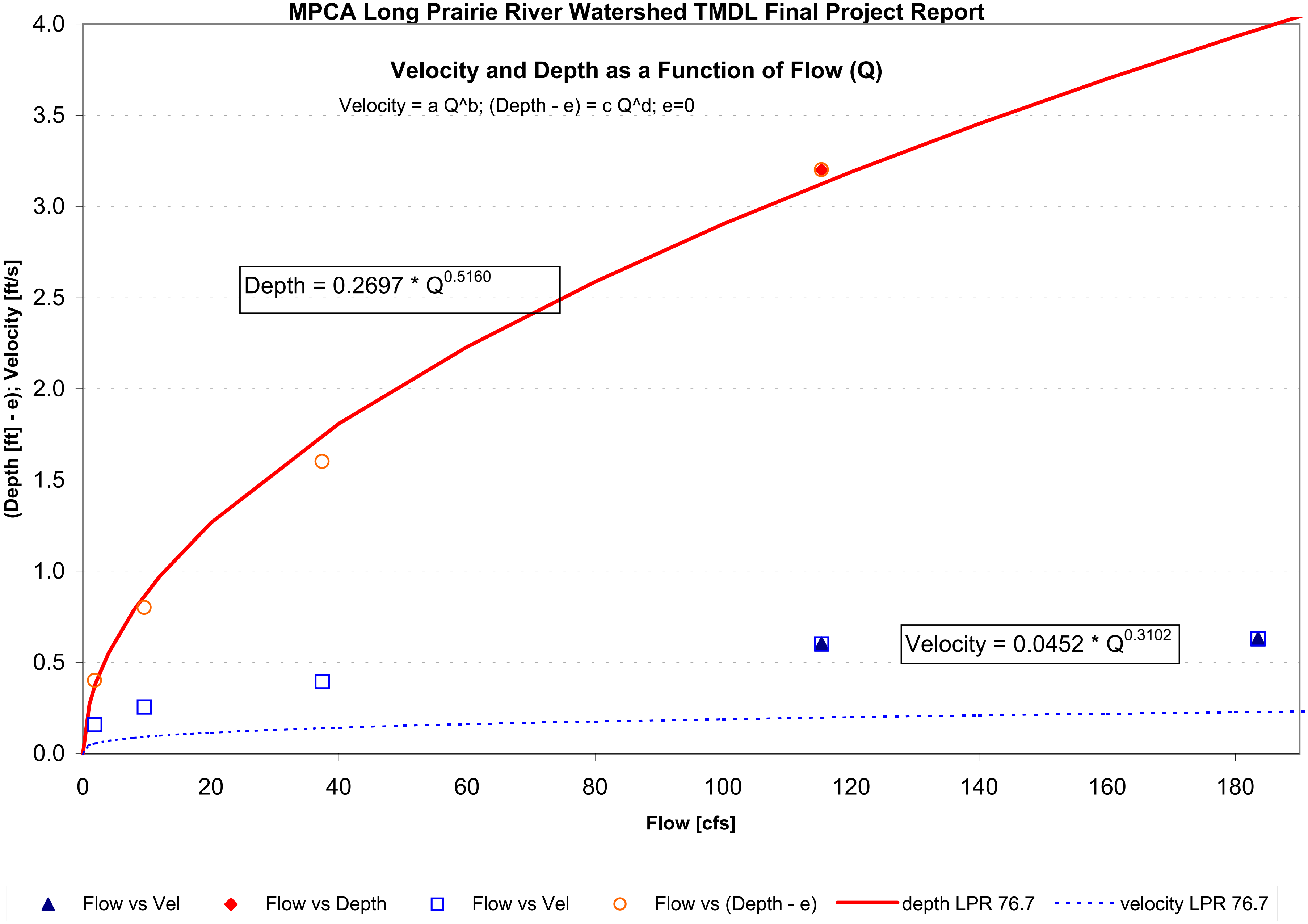

T:\0147\51\Phase III Rpt\Appendices\
\Appendix F FIG 01/LPR 76.7

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Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 67.0
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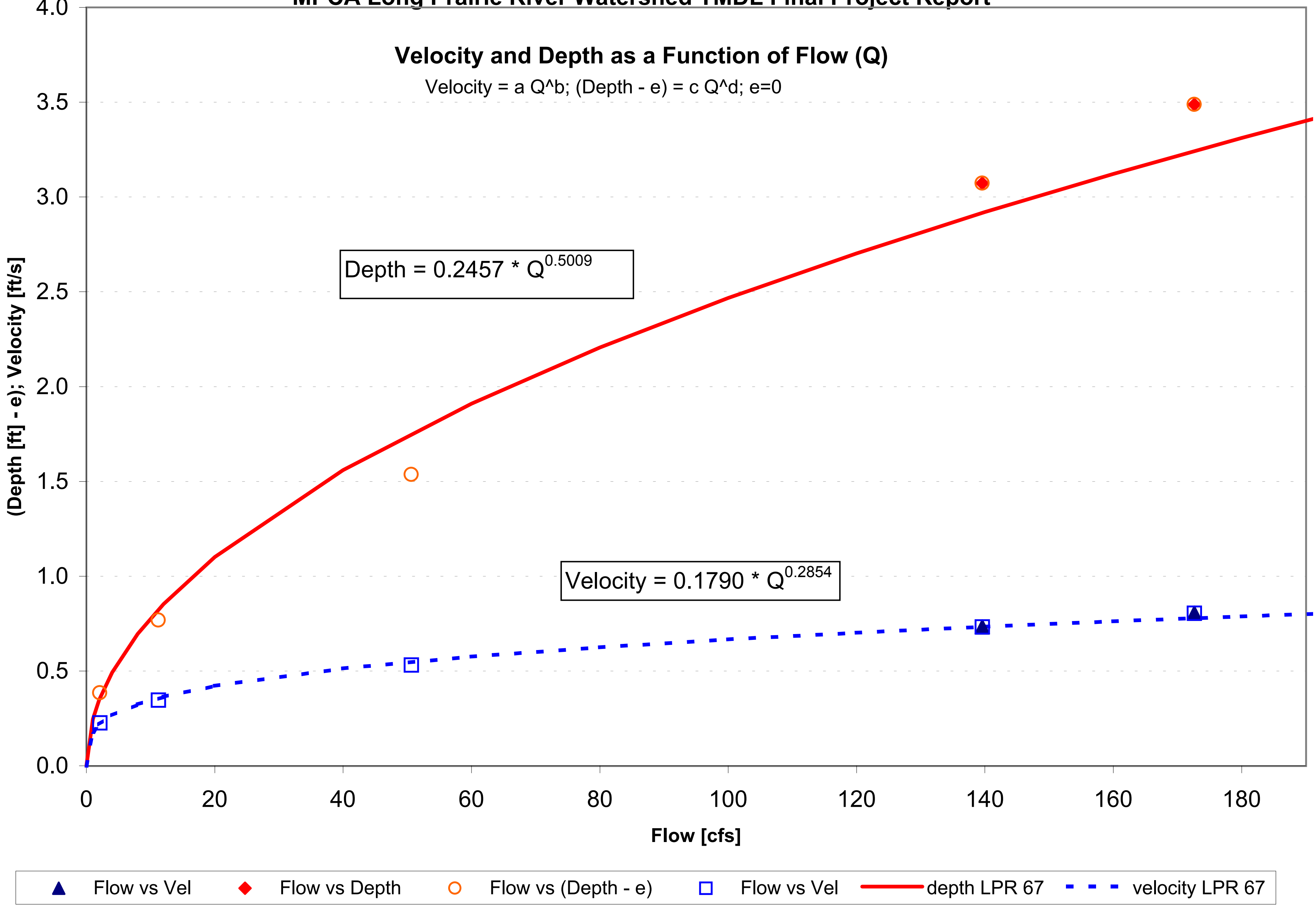
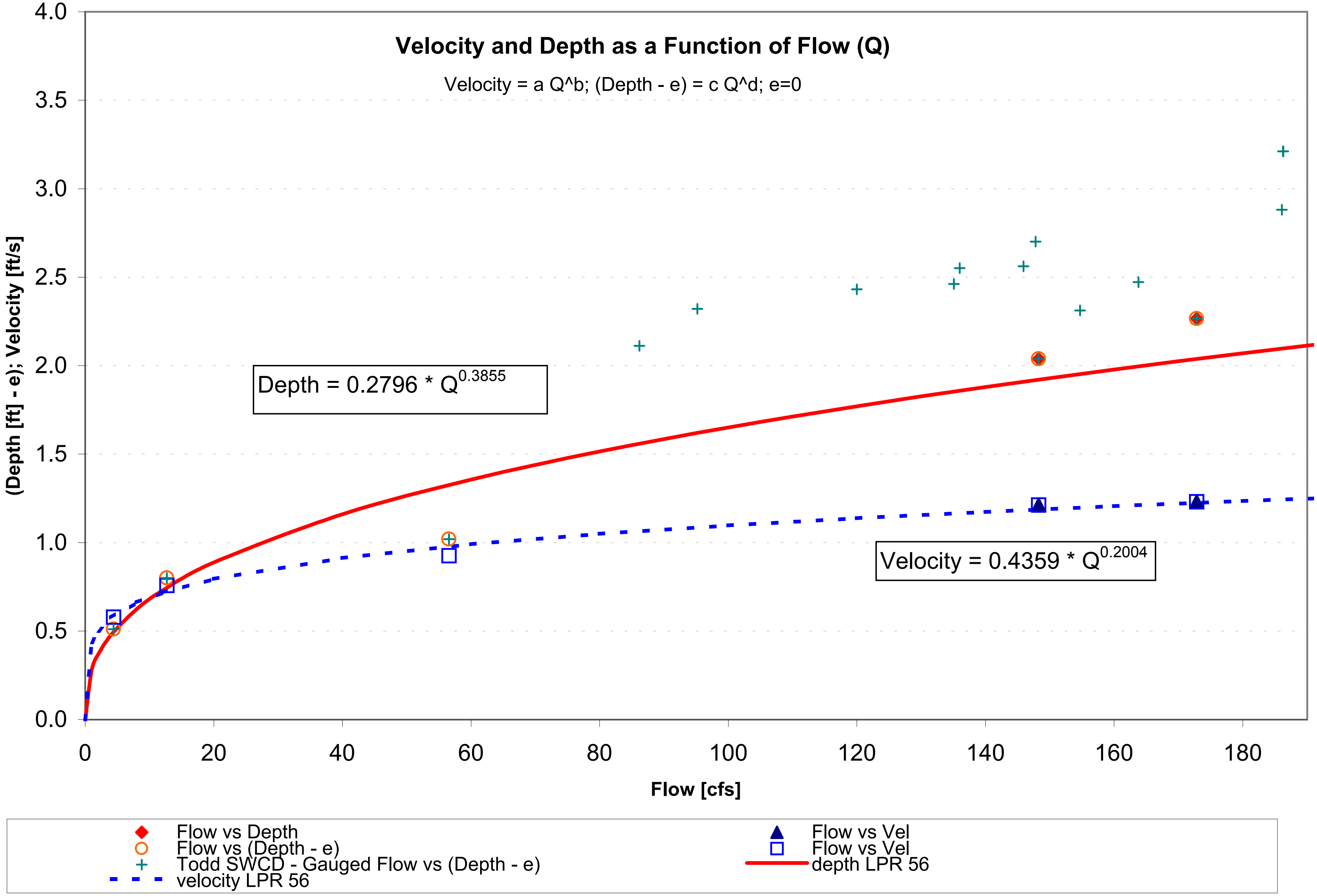


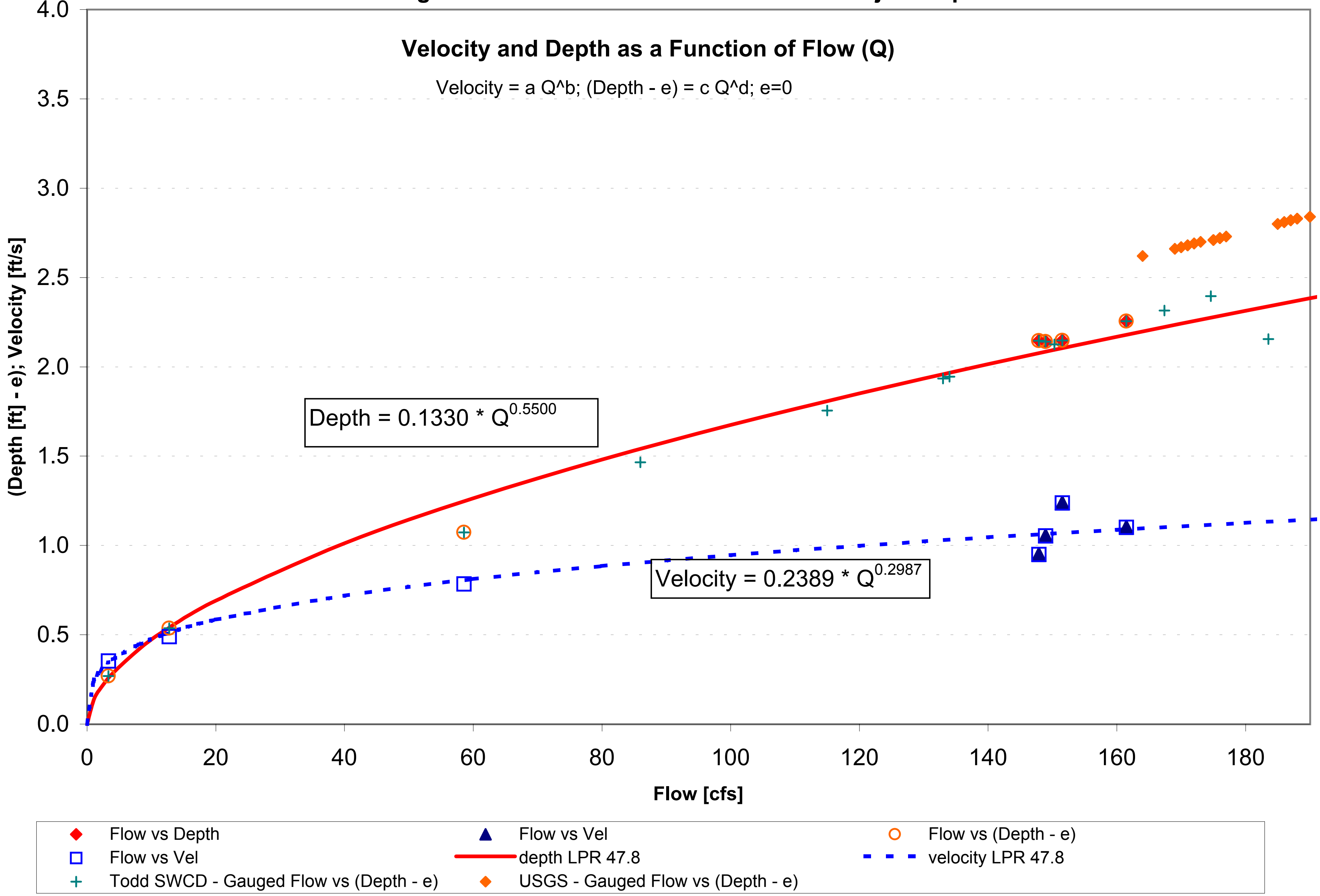
Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 56.0
MPCA Long Prairie River Watershed TMDL Final Project Report



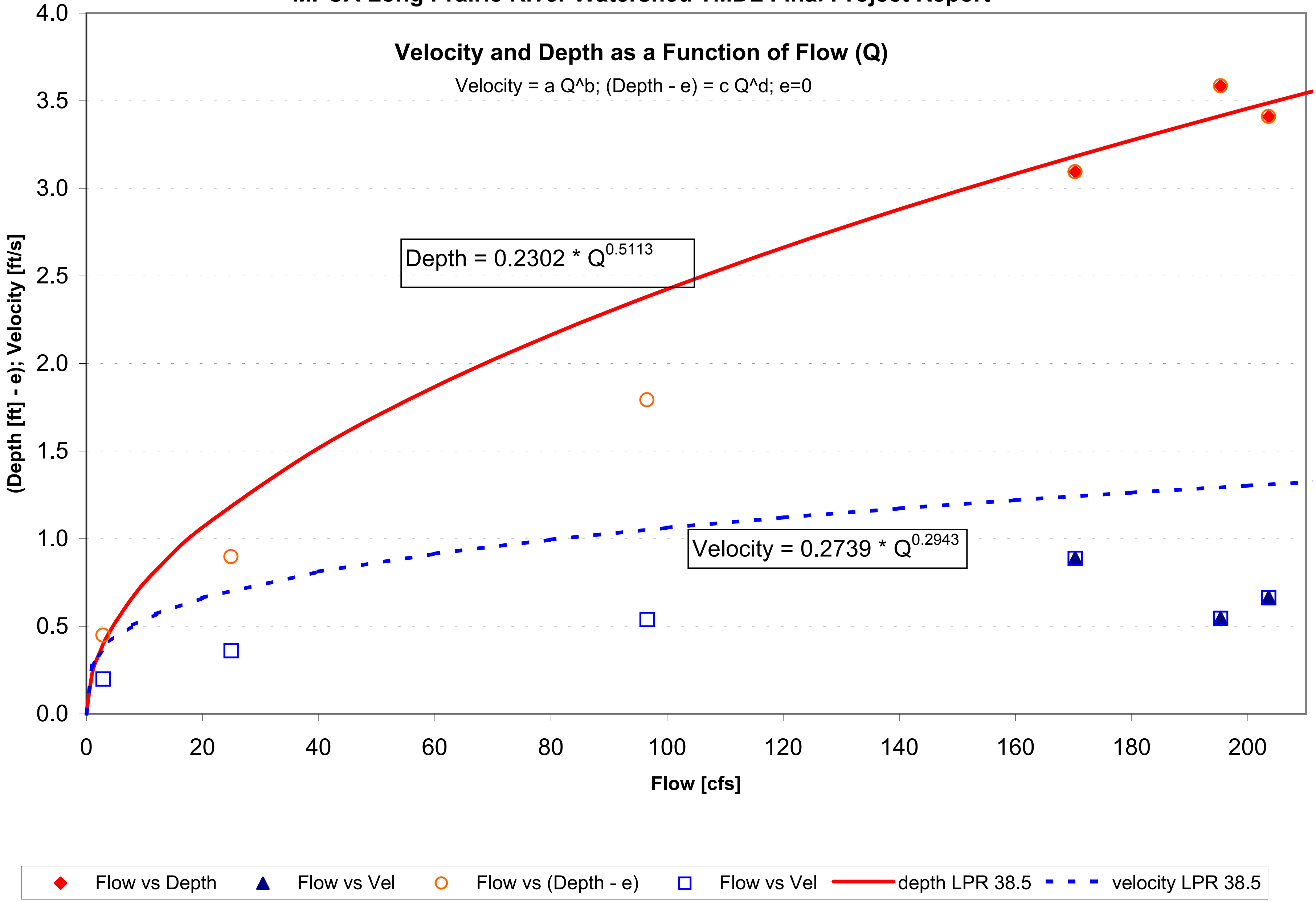
Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 47.8
MPCA Long Prairie River Watershed TMDL Final Project Report



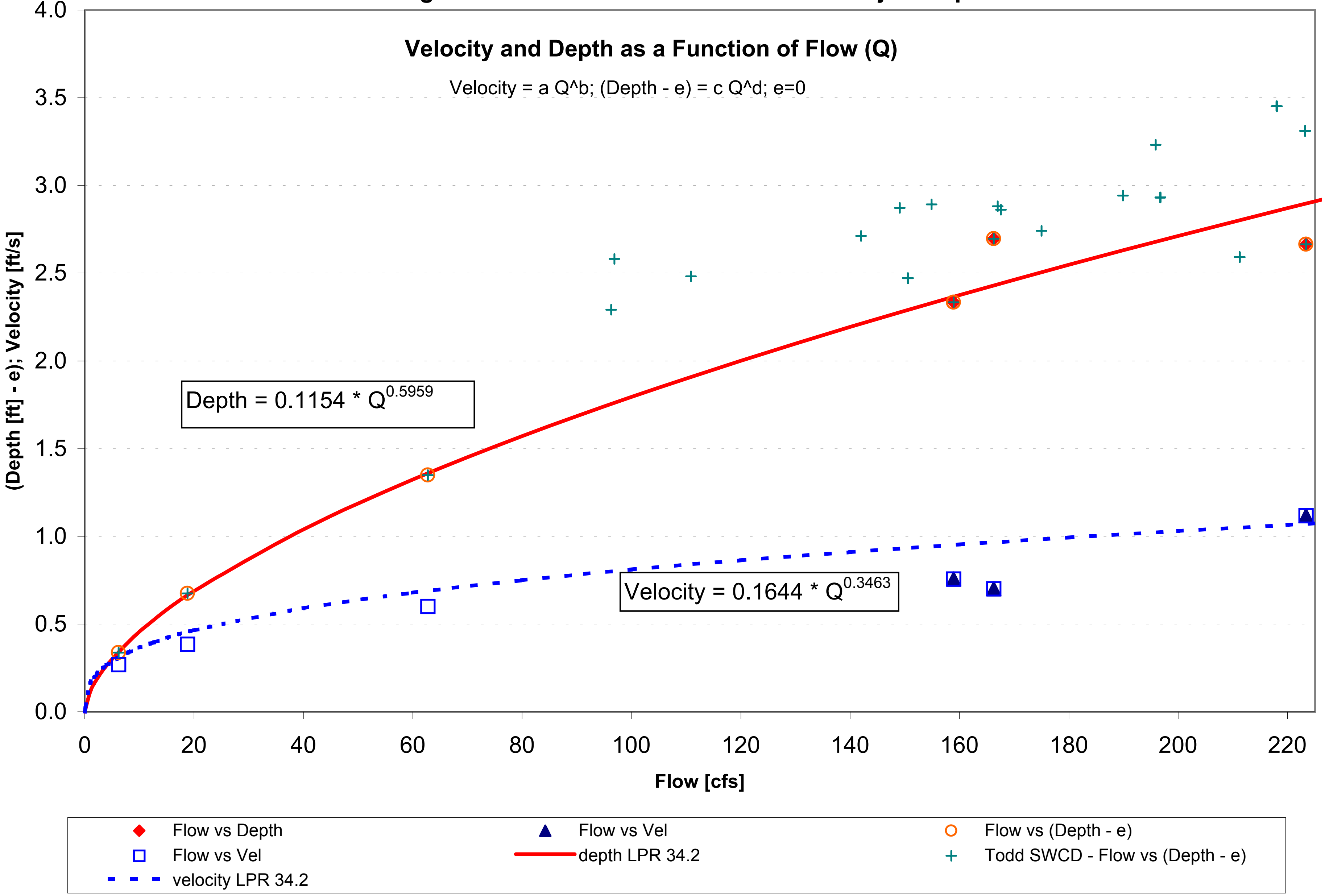
Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 38.5
MPCA Long Prairie River Watershed TMDL Final Project Report



Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 34.2
MPCA Long Prairie River Watershed TMDL Final Project Report



Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 30.8
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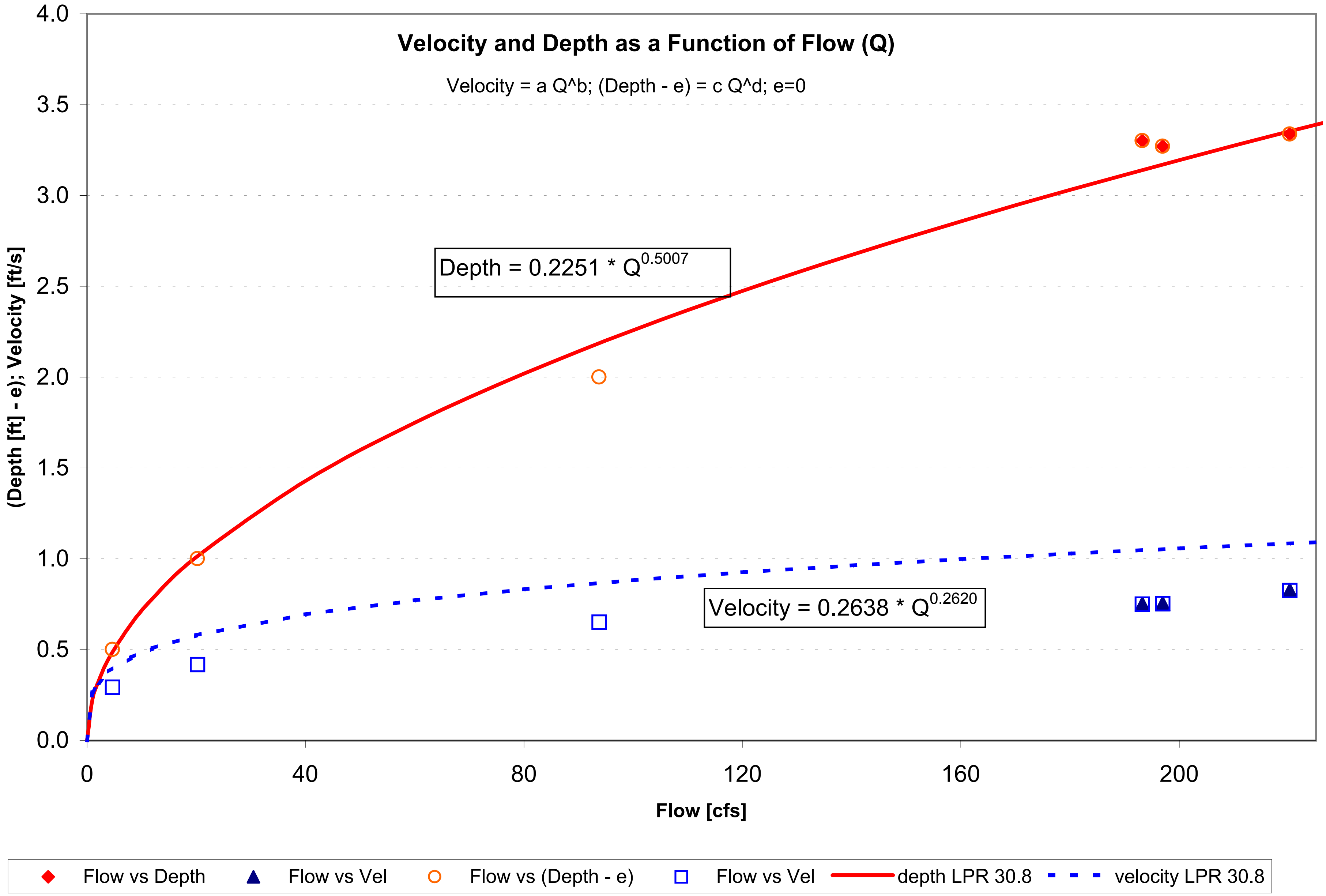

T:\0147\51\Phase III Rpt\Appendices\
\Appendix F FIG 01/LPR 30.8

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Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 26.1
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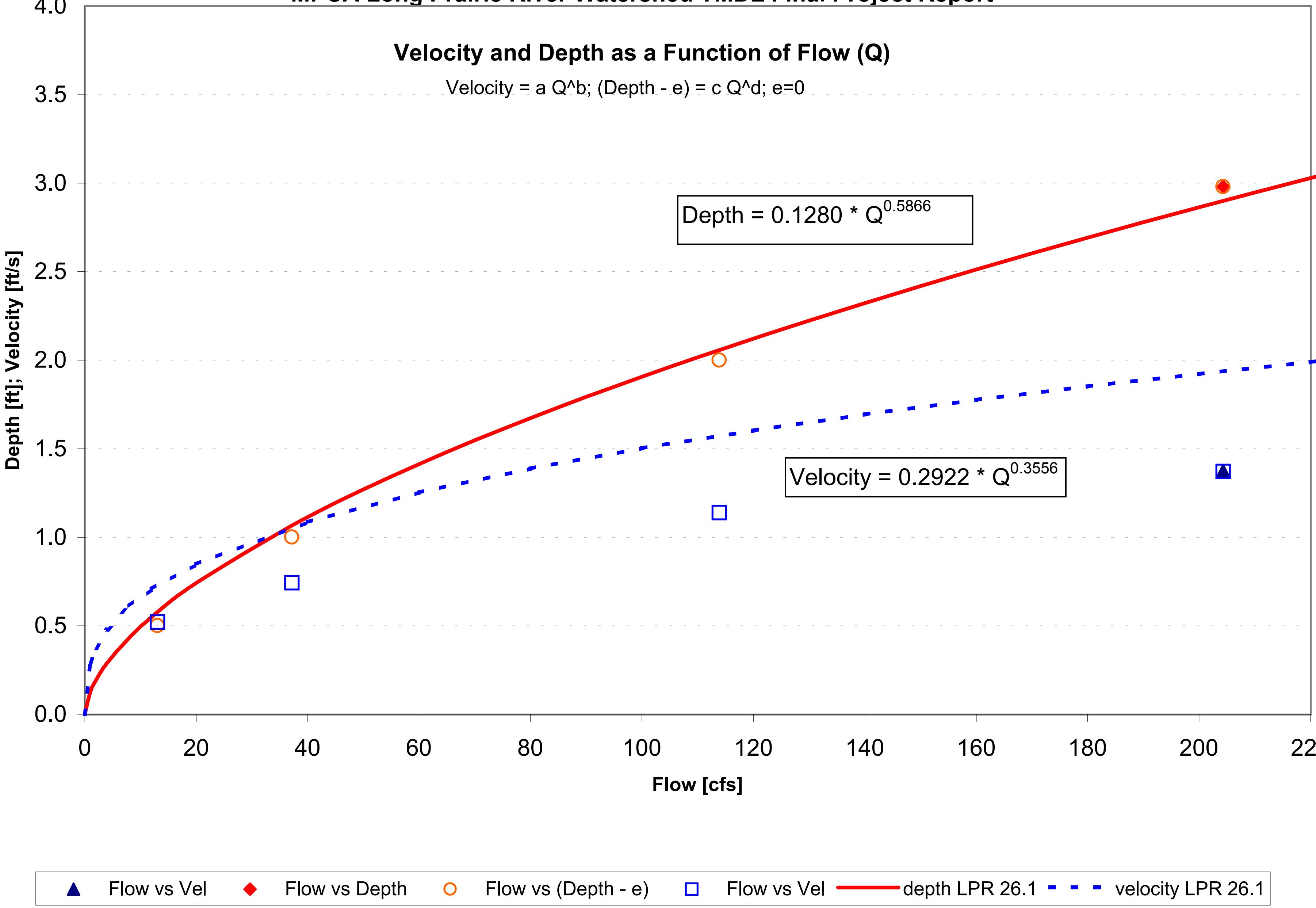

T:\0147\51\Phase III Rpt\Appendices\
\Appendix F FIG 01/LPR 26.1

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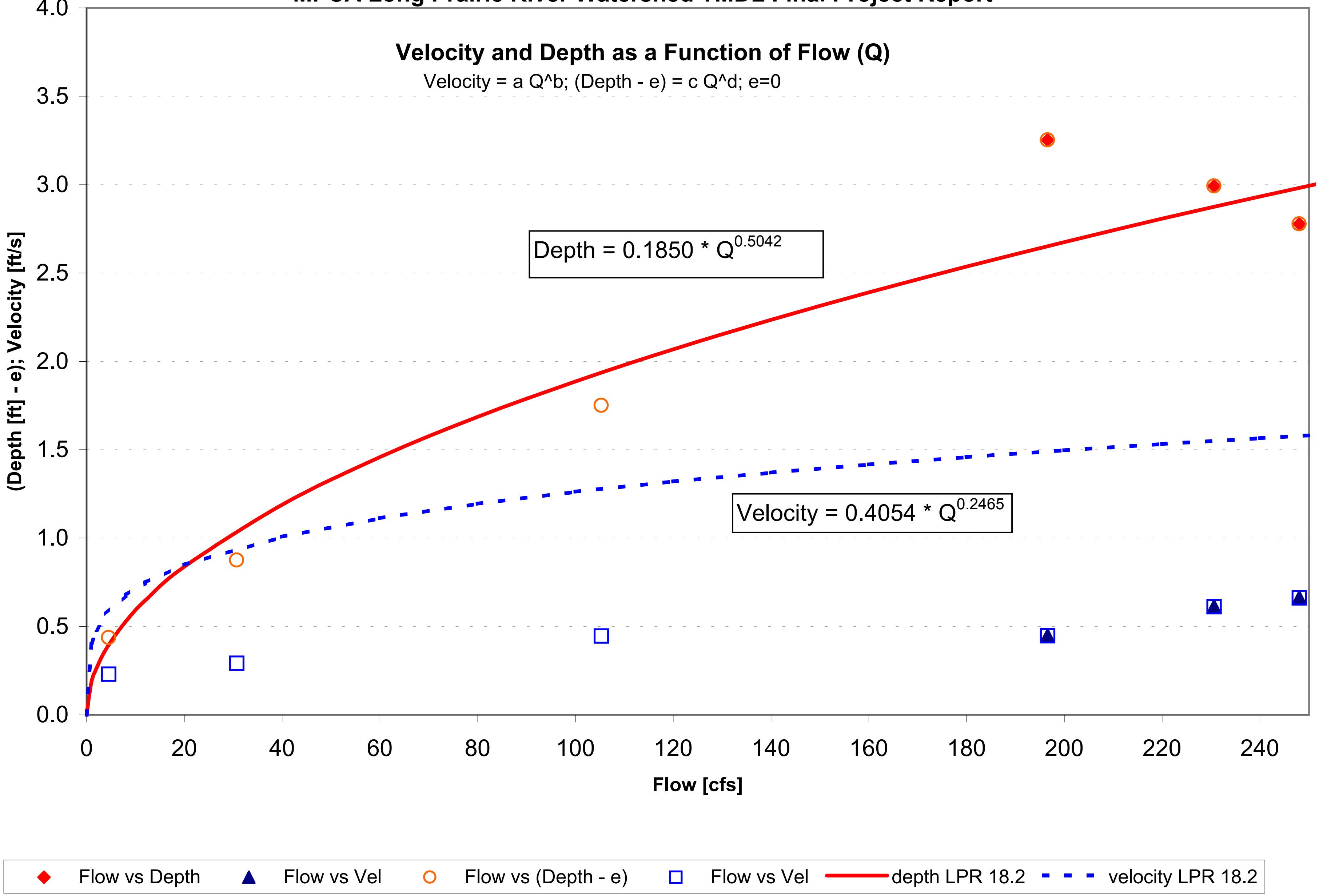
Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 18.2
MPCA Long Prairie River Watershed TMDL Final Project Report



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\Appendix F FIG 01/LPR 18.2

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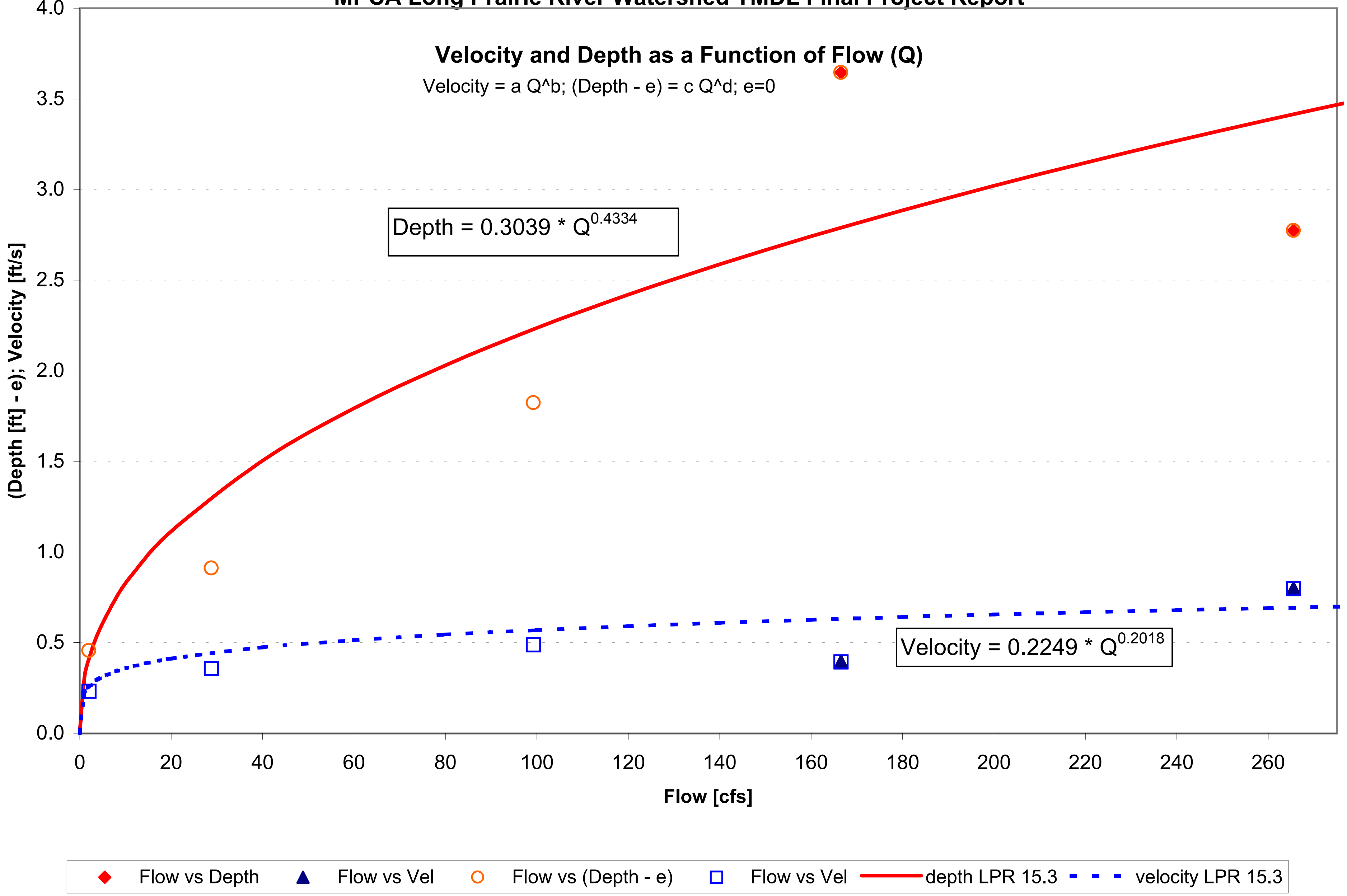
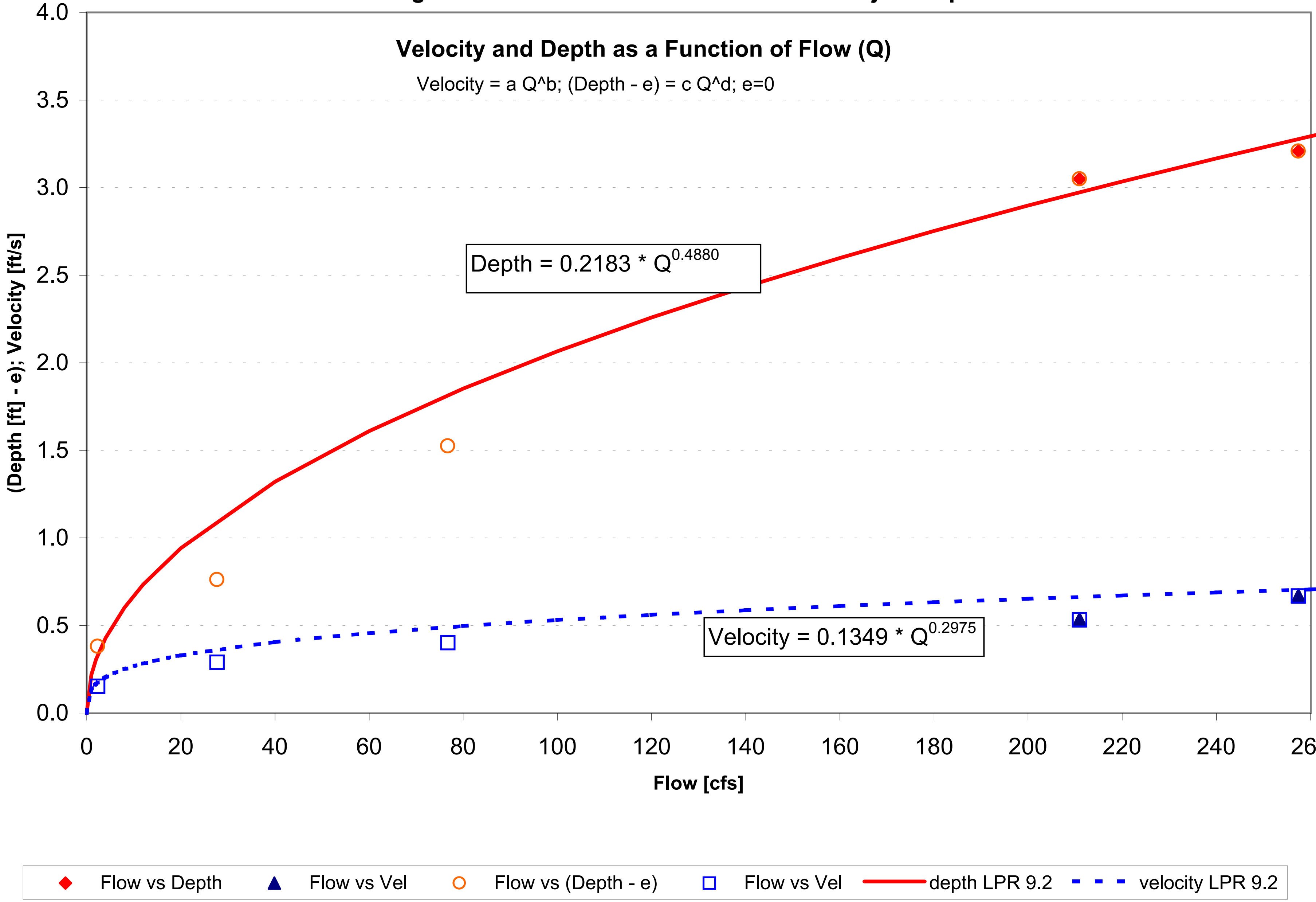
Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 15.3
MPCA Long Prairie River Watershed TMDL Final Project Report



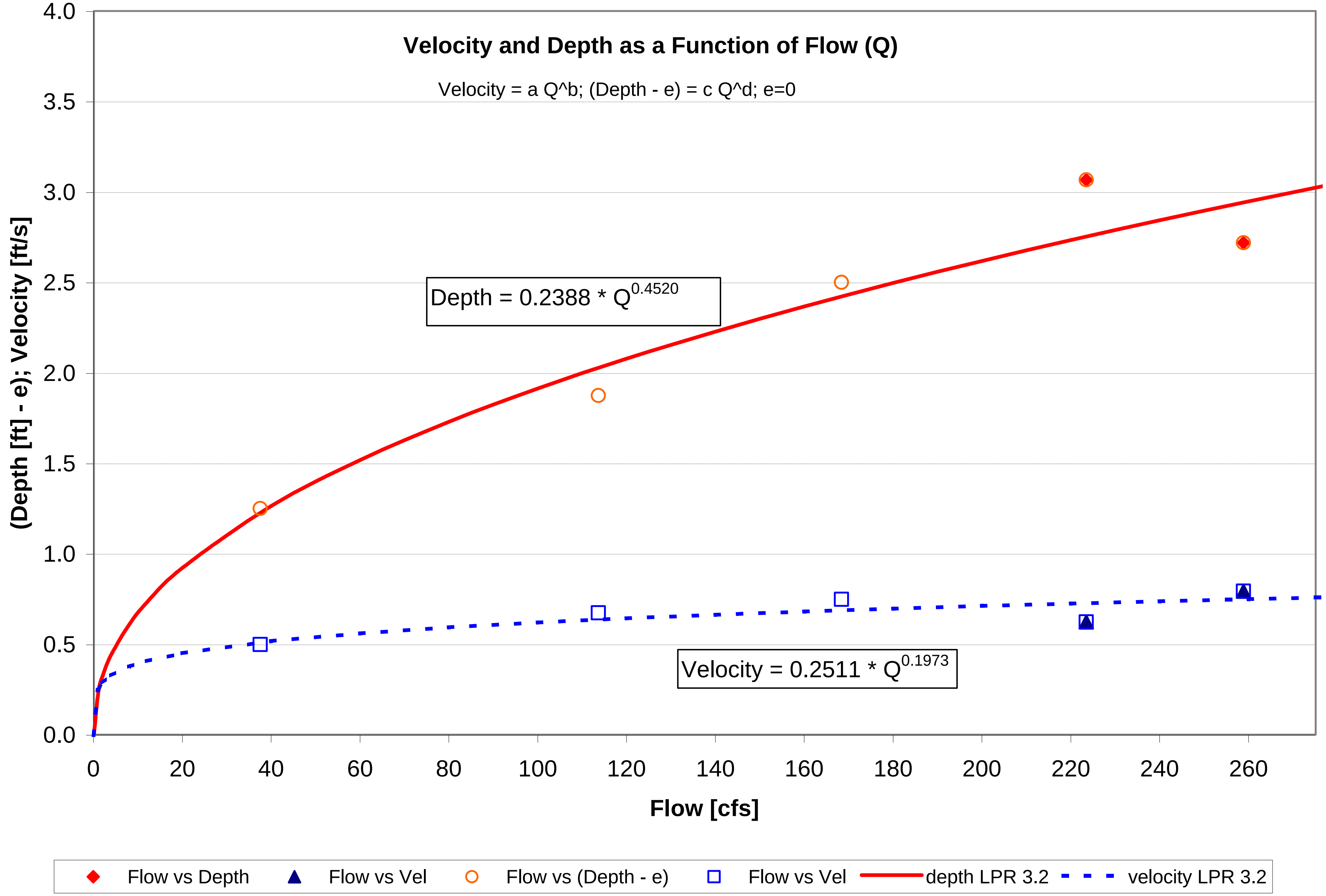
Appendix F, Figure F-1

Hydraulic Coefficient Plots for LPR 9.2
MPCA Long Prairie River Watershed TMDL Final Project Report



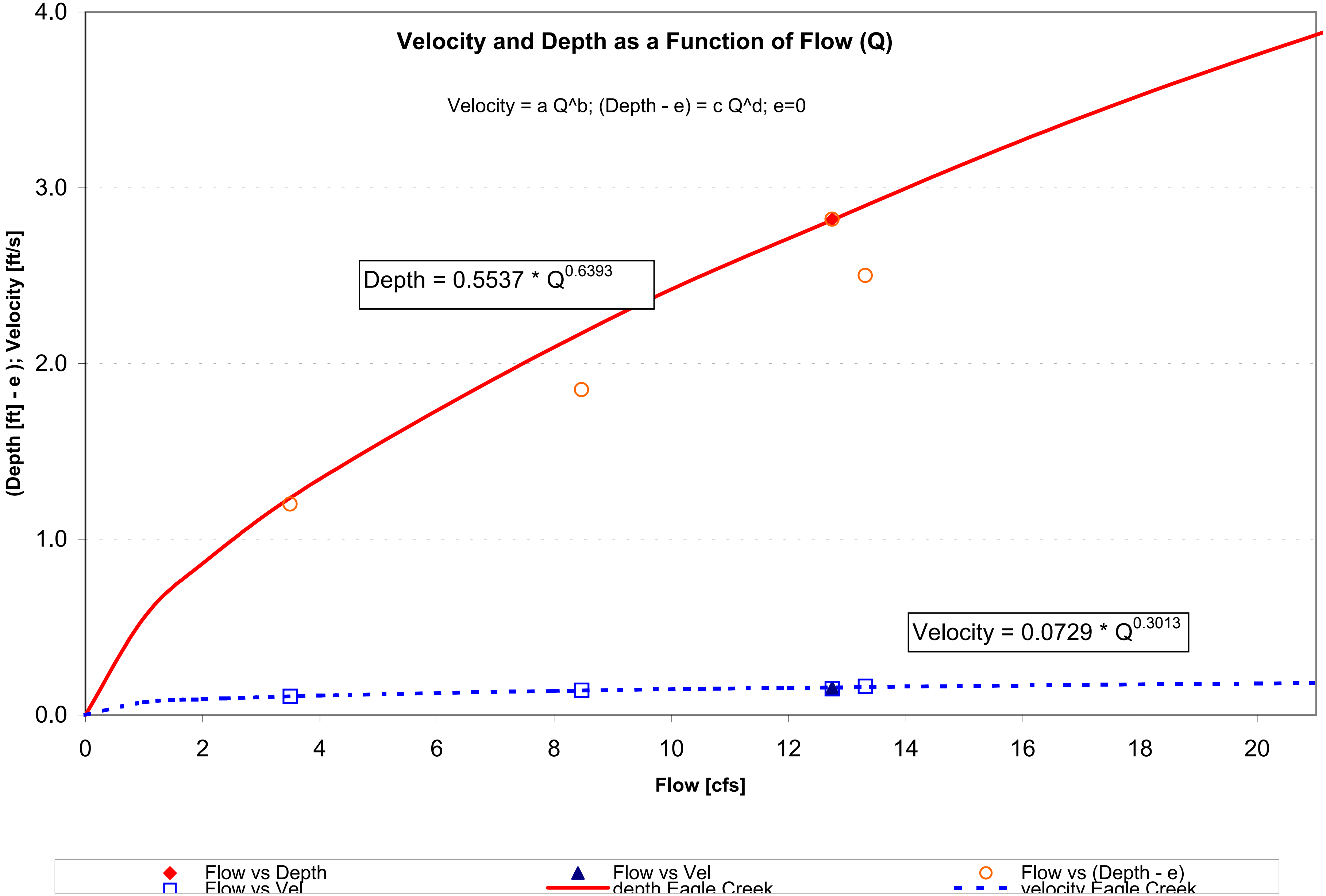
Appendix F, Figure F-1

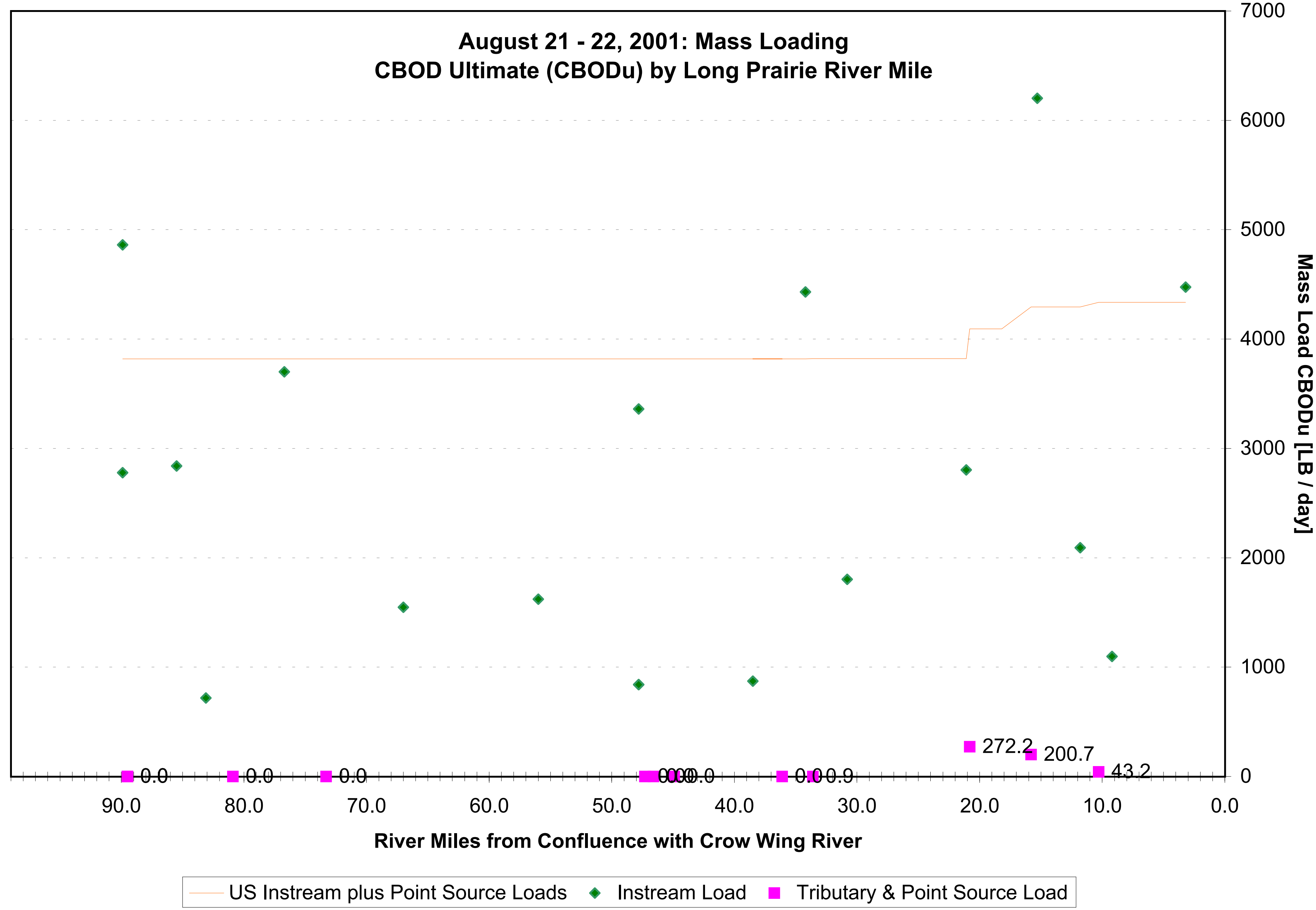
Hydraulic Coefficient Plots for LPR 3.2
MPCA Long Prairie River Watershed TMDL Final Project Report



Appendix F, Figure F-1

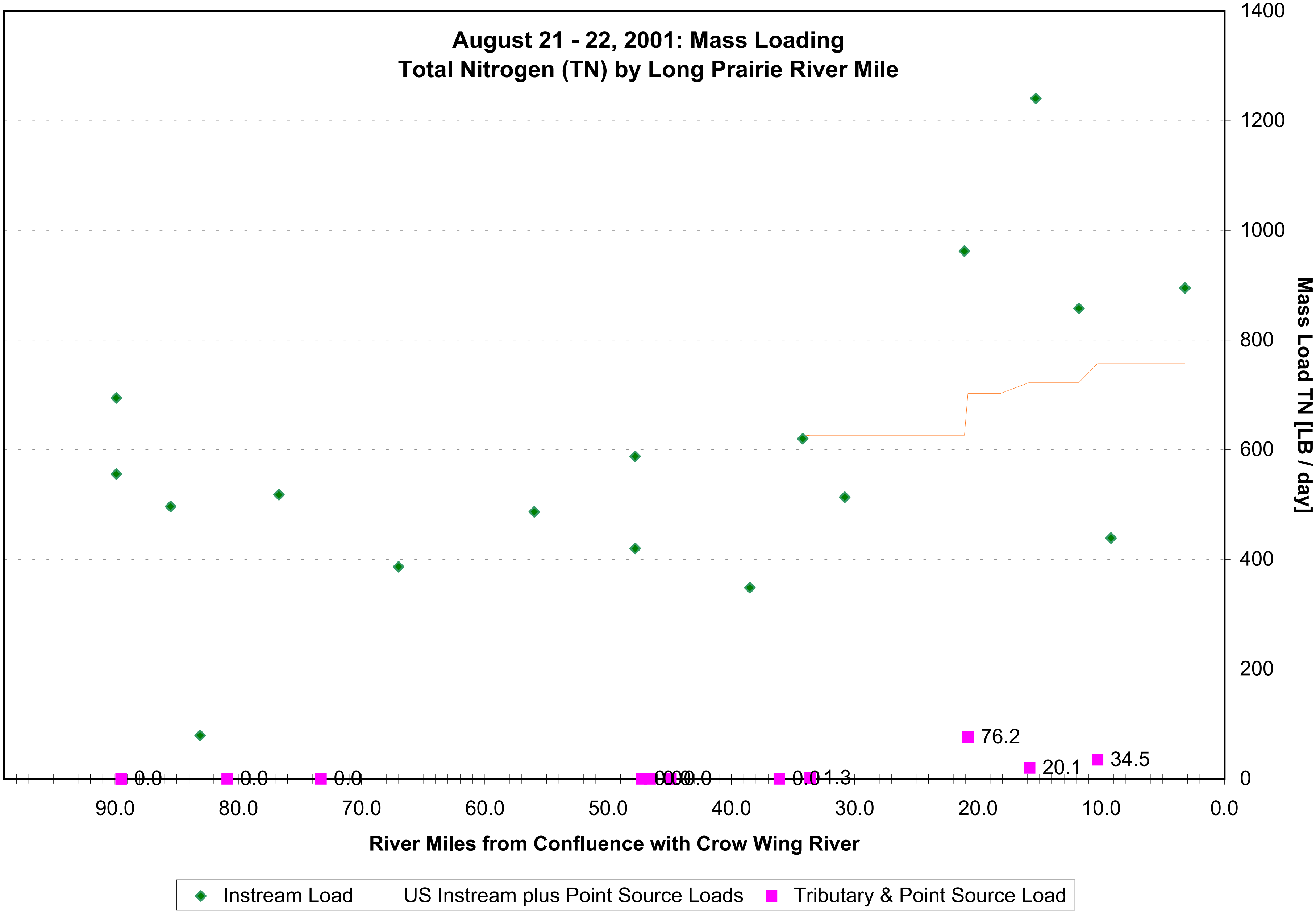
Hydraulic Coefficient Plots for Eagle Creek
MPCA Long Prairie River Watershed TMDL Final Project Report




August 21 - 22, 2001: Mass Loading
CBOD Ultimate (CBODu) by Long Prairie River Mile
Mass Load CBODu [LB / day]
7000
6000
5000
4000
3000
2000
1000
0
272.2
200.7
43.2
0.0
0.0
0.0
0.9
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
River Miles from Confluence with Crow Wing River
US Instream plus Point Source Loads
Instream Load
Tributary & Point Source Load

Appendix F, Figure F-2

MPCA Long Prairie River Watershed TMDL Final Project Report



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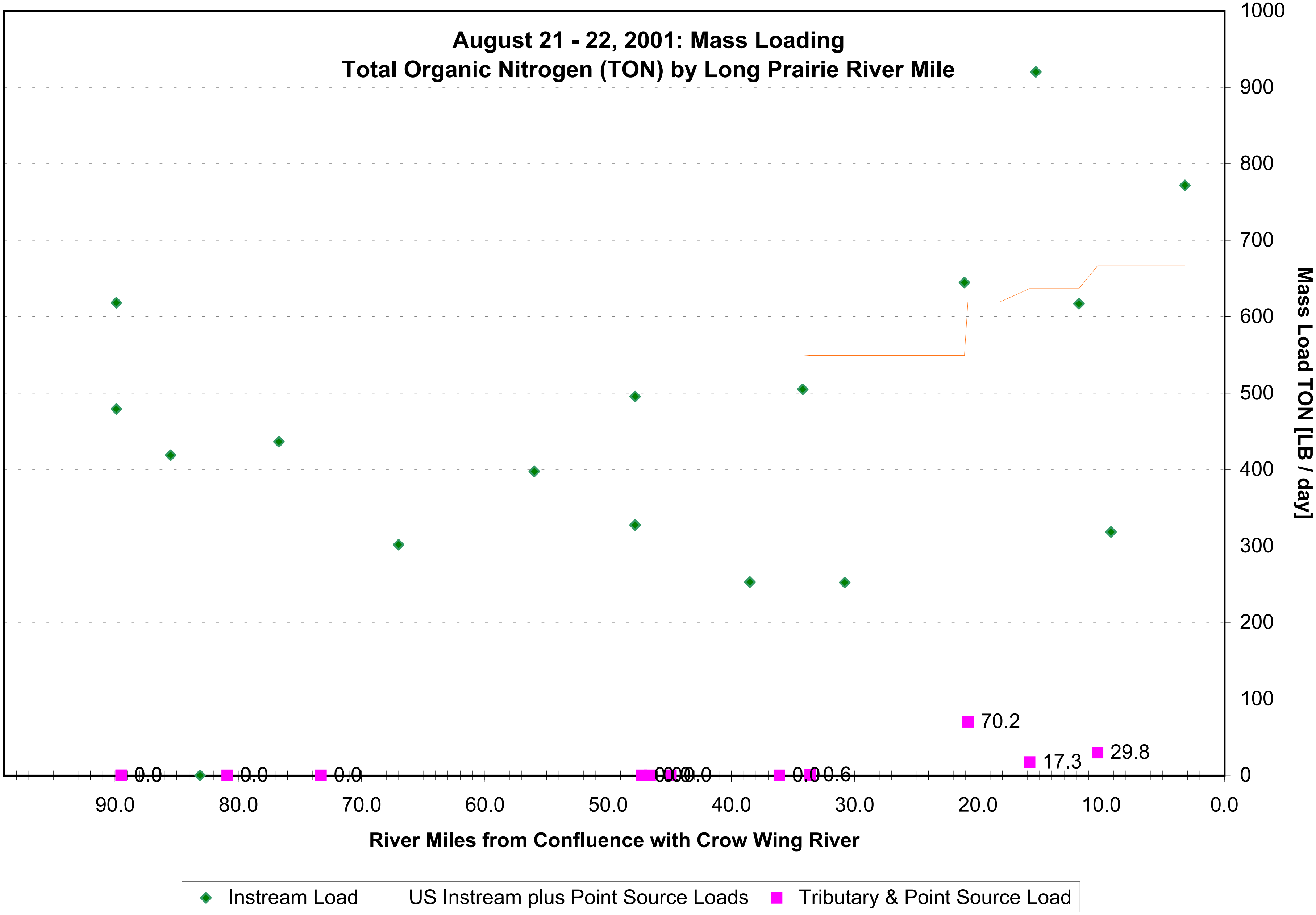
Appendix F, Figure F-2

MPCA Long Prairie River Watershed TMDL Final Project Report



T:/0147/51/Phase III Rpt/Appendices/Appendix F Fig 02_aug/Mass load TON vs RM

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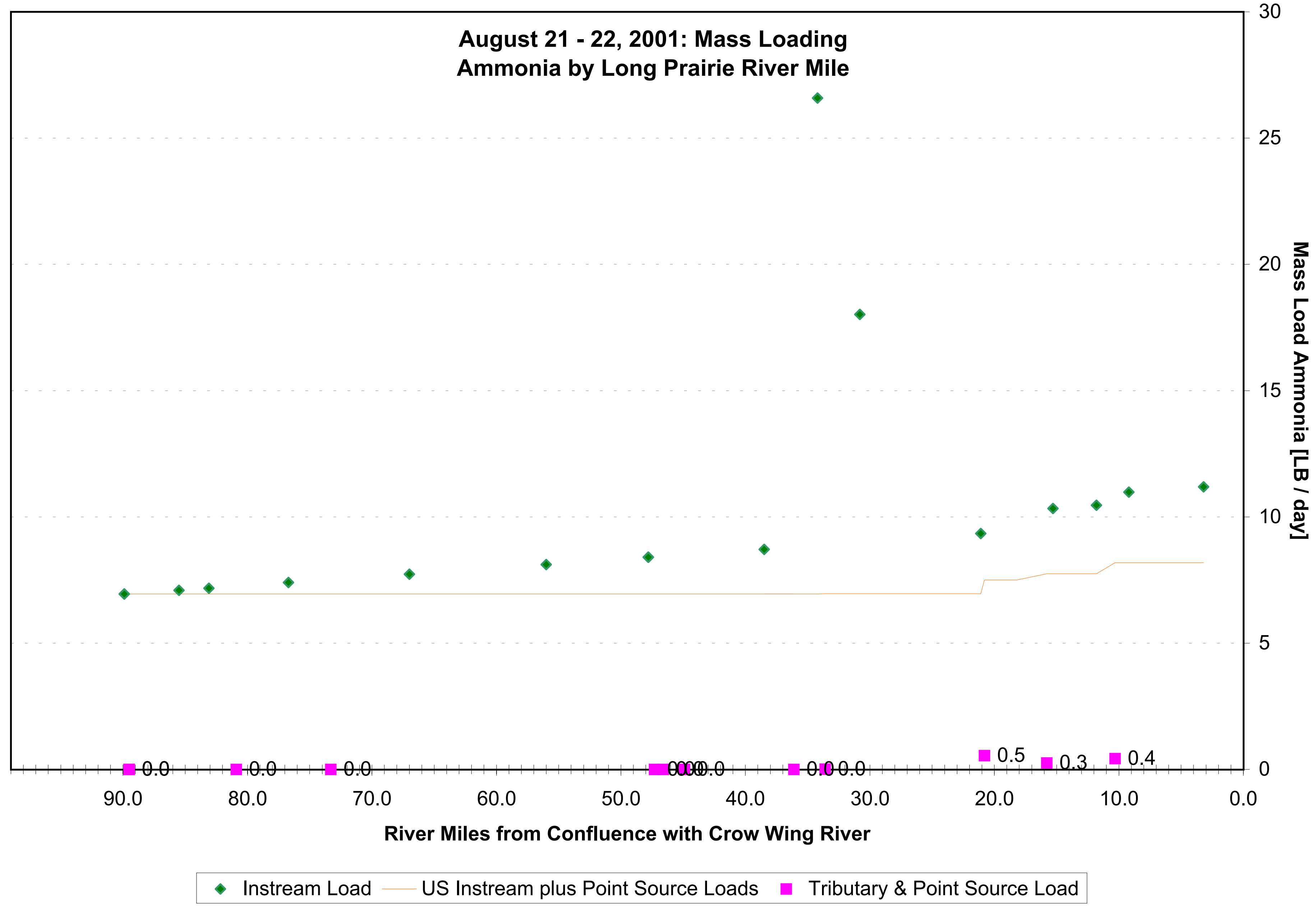
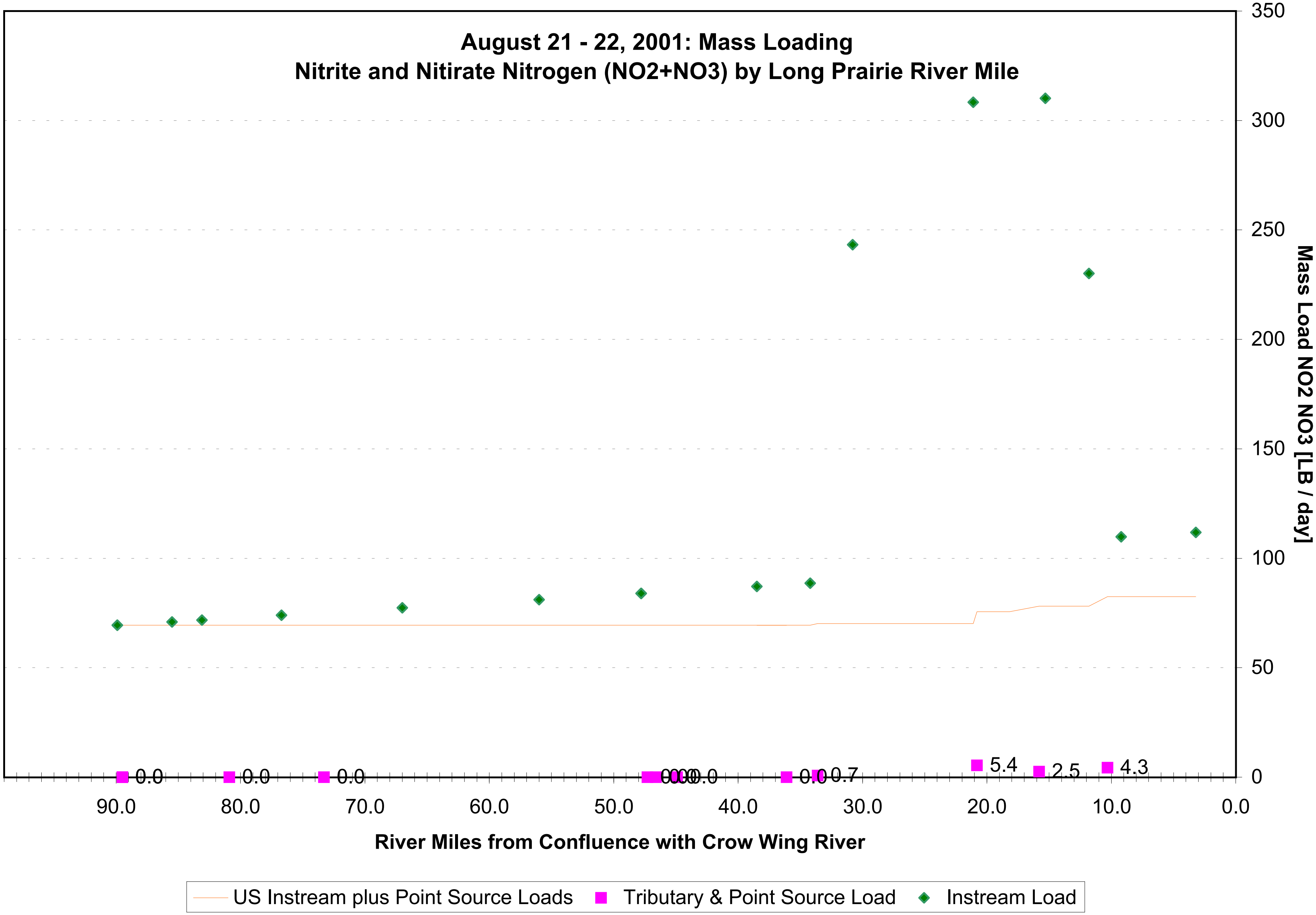
Appendix F, Figure F-2

MPCA Long Prairie River Watershed TMDL Final Project Report



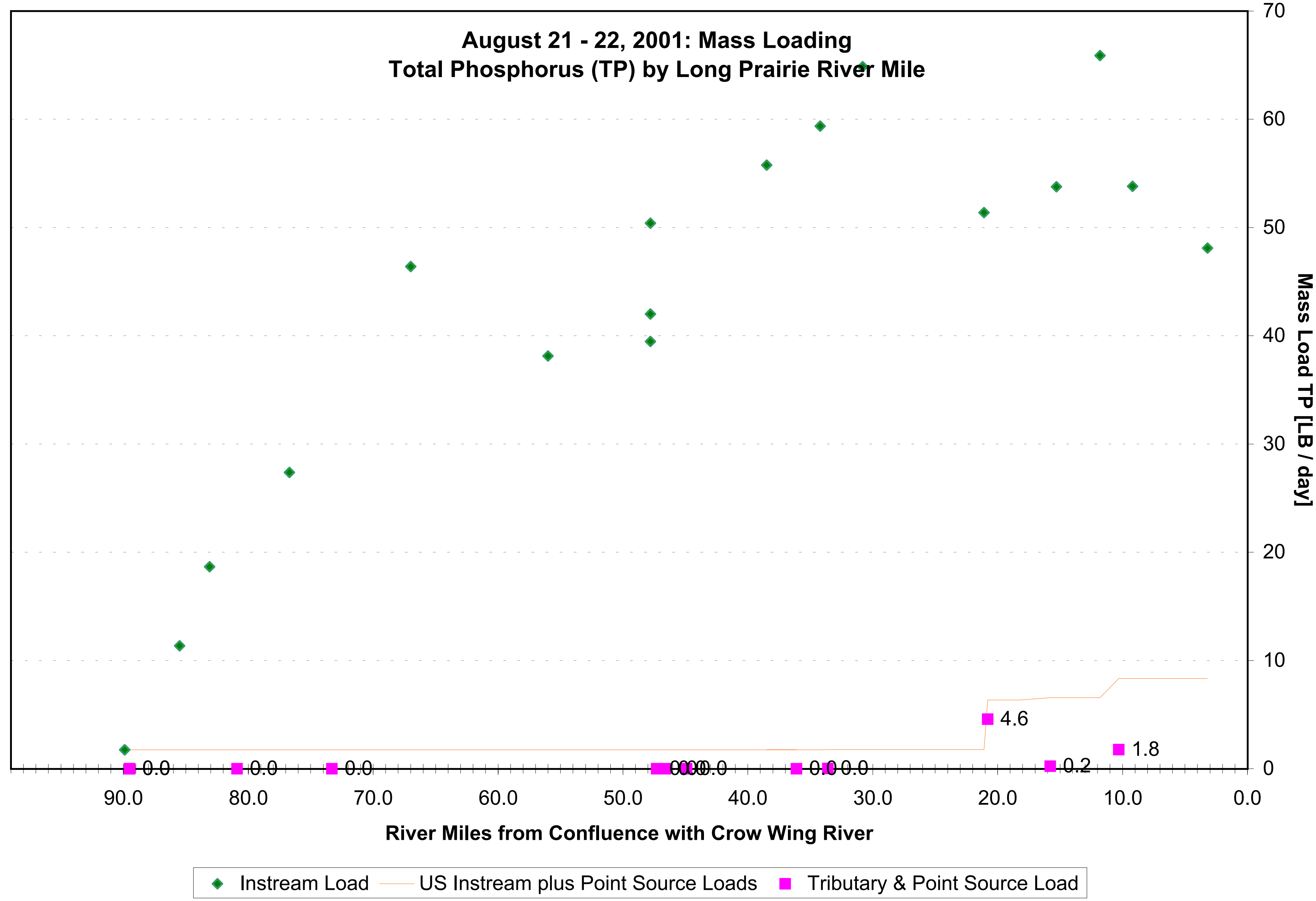
Appendix F, Figure F-2

MPCA Long Prairie River Watershed TMDL Final Project Report



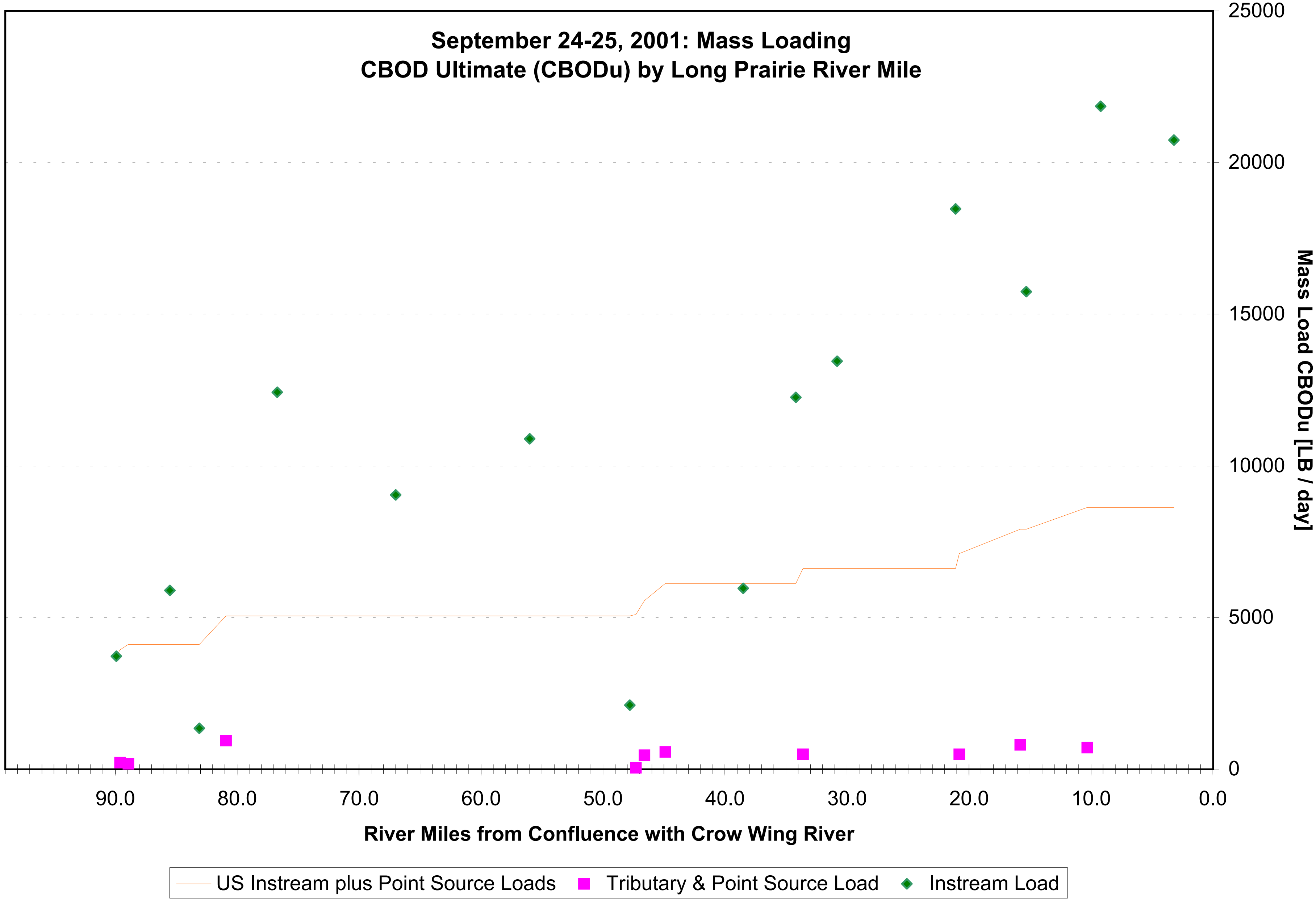
Appendix F, Figure F-2

MPCA Long Prairie River Watershed TMDL Final Project Report

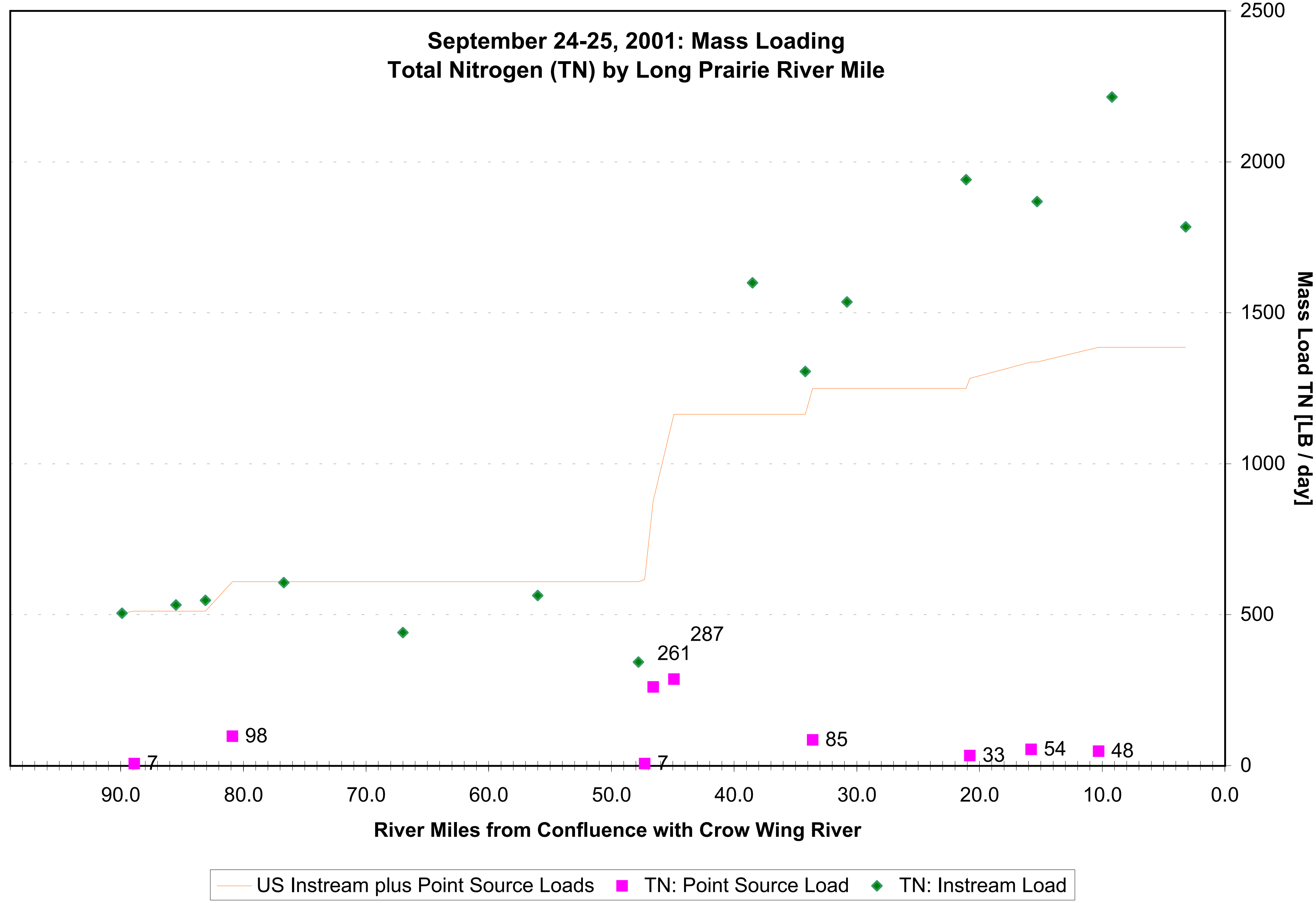


Appendix F, Figure F-2

MPCA Long Prairie River Watershed TMDL Final Project Report

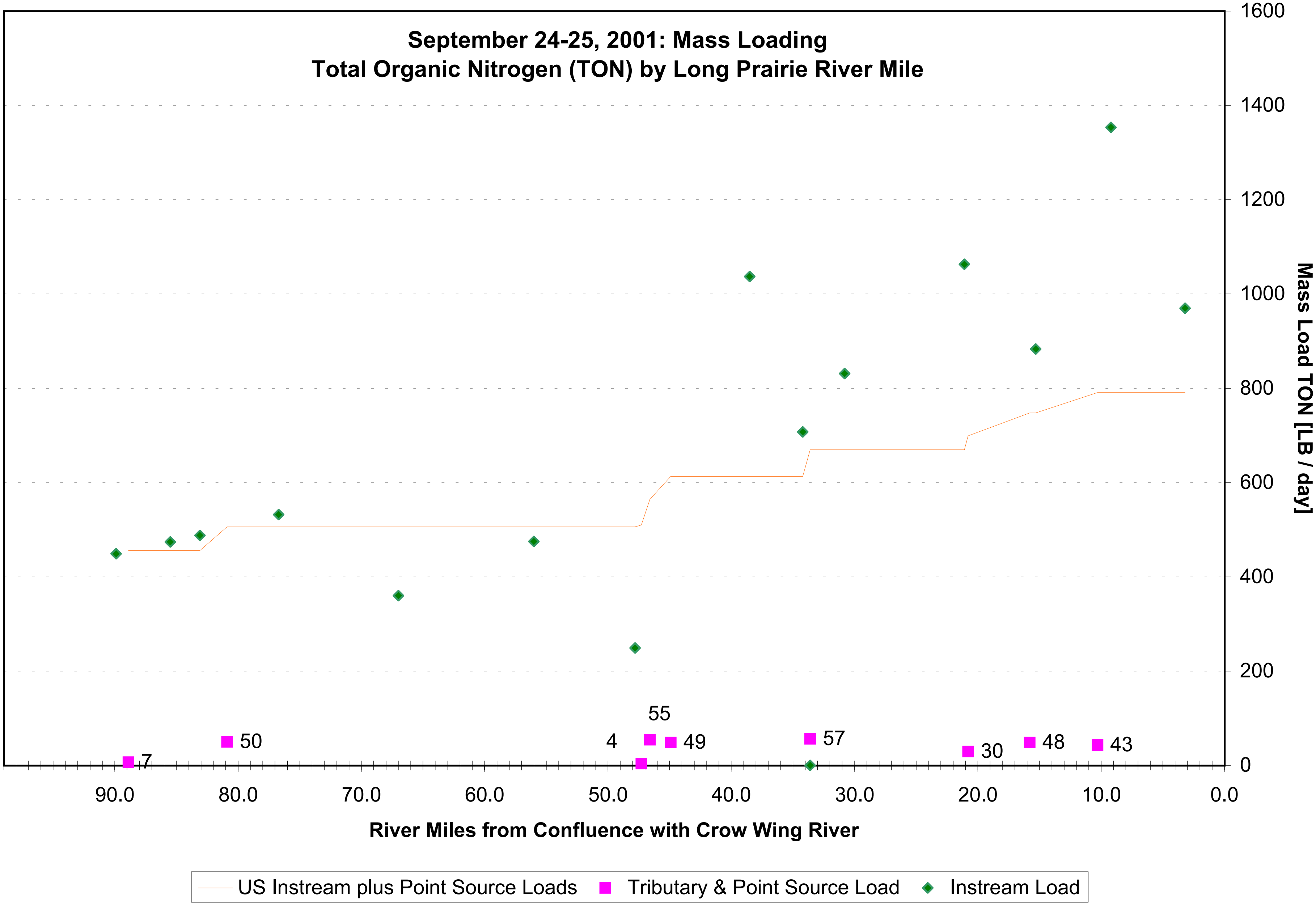


MPCA Long Prairie River Watershed TMDL Final Project Report



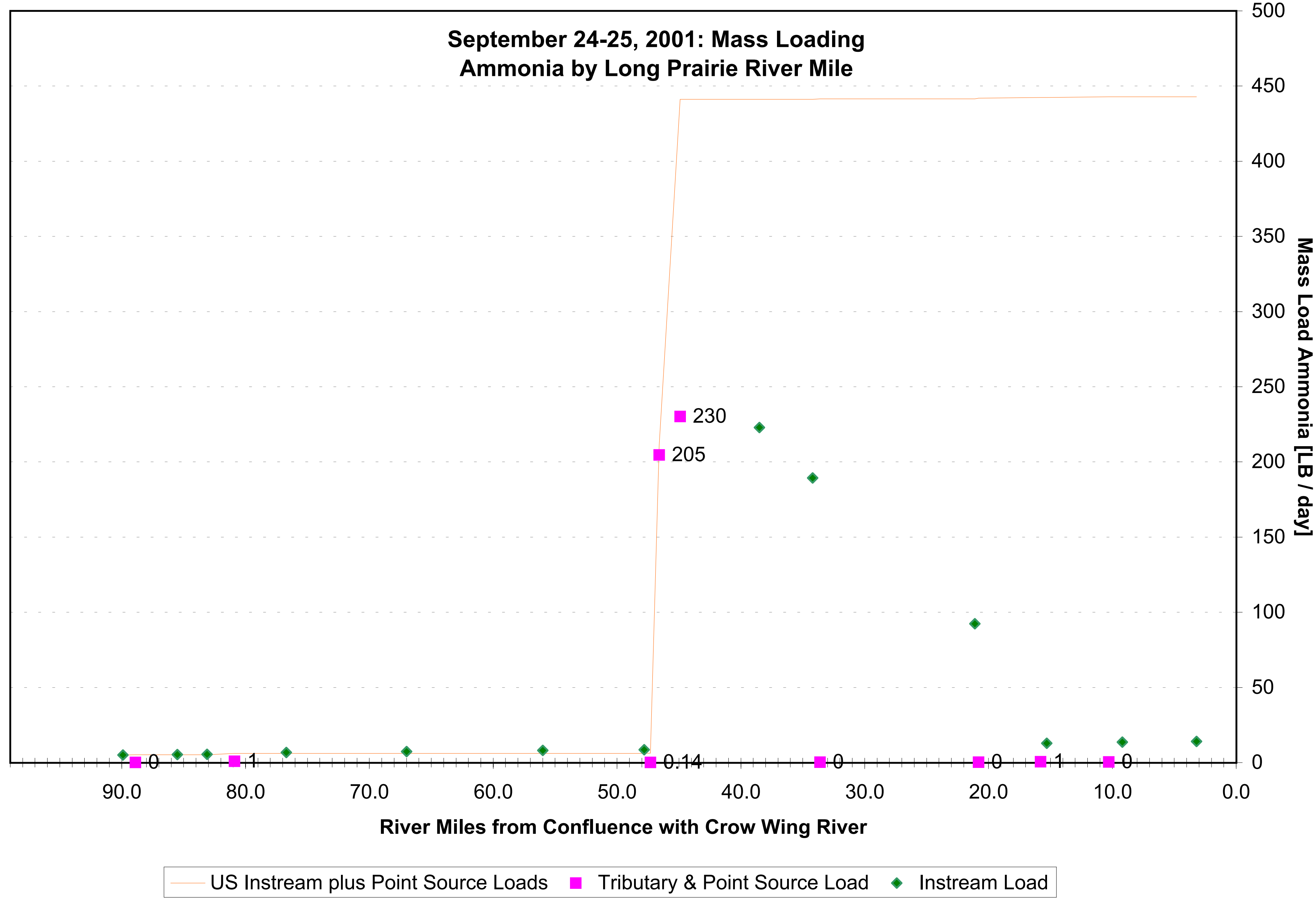
Appendix F, Figure F-2

MPCA Long Prairie River Watershed TMDL Final Project Report



Appendix F, Figure F-2

MPCA Long Prairie River Watershed TMDL Final Project Report



T:/0147/51/Phase III Rpt/Appendices/Appendix F Fig 02_sept/Mass load NH3 vs RM

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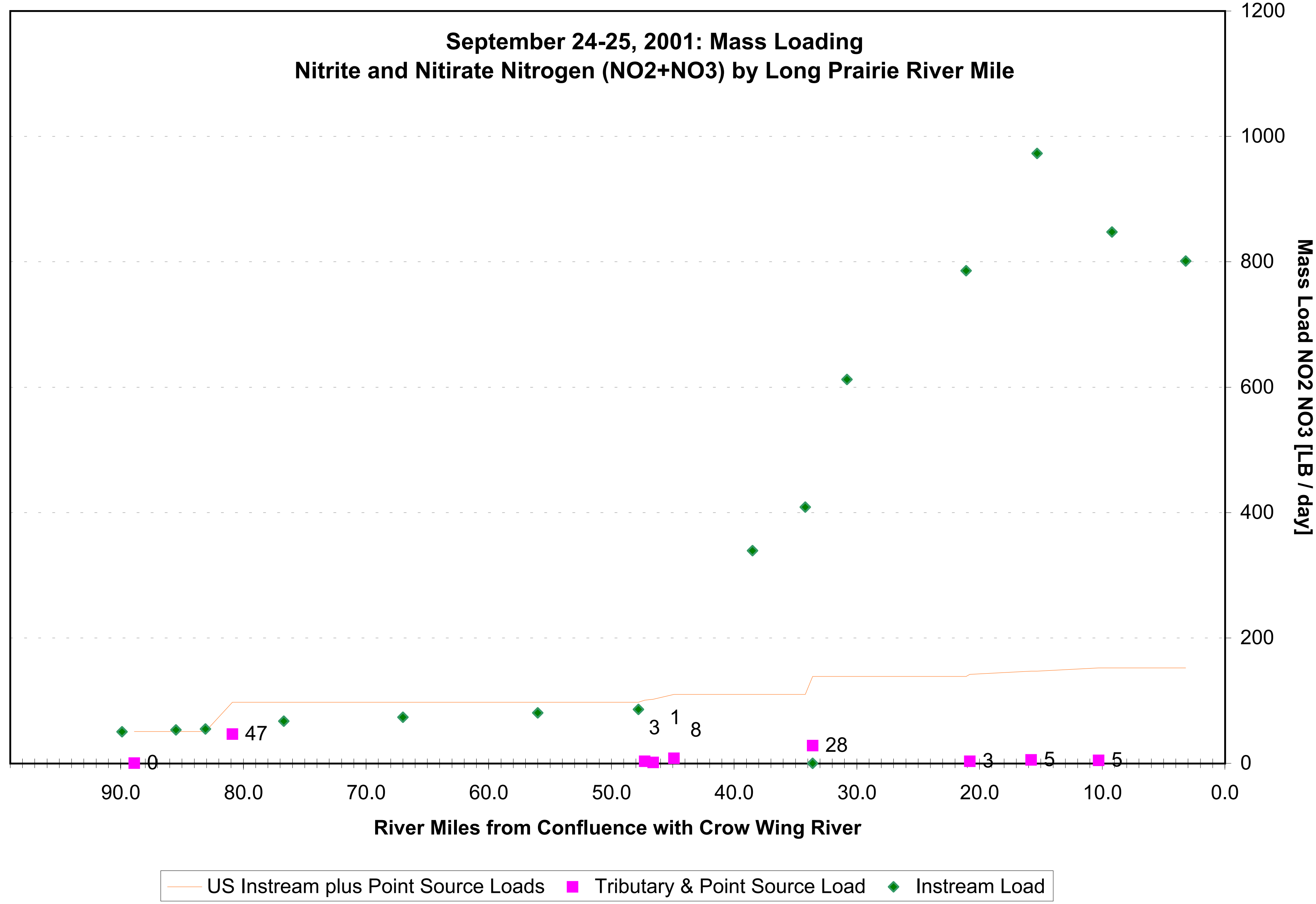
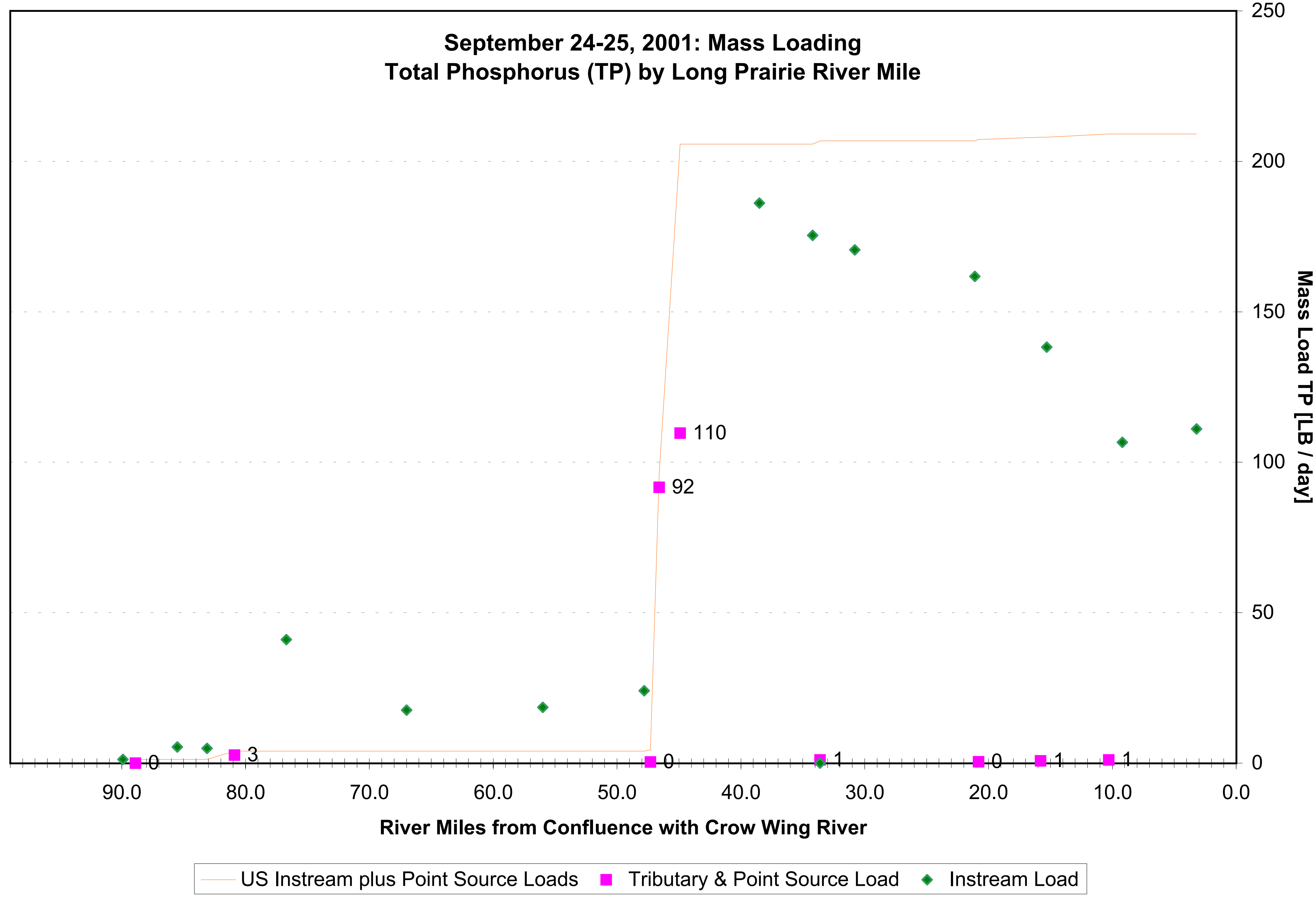
Appendix F, Figure F-2

MPCA Long Prairie River Watershed TMDL Final Project Report



Appendix F, Figure F-2

MPCA Long Prairie River Watershed TMDL Final Project Report



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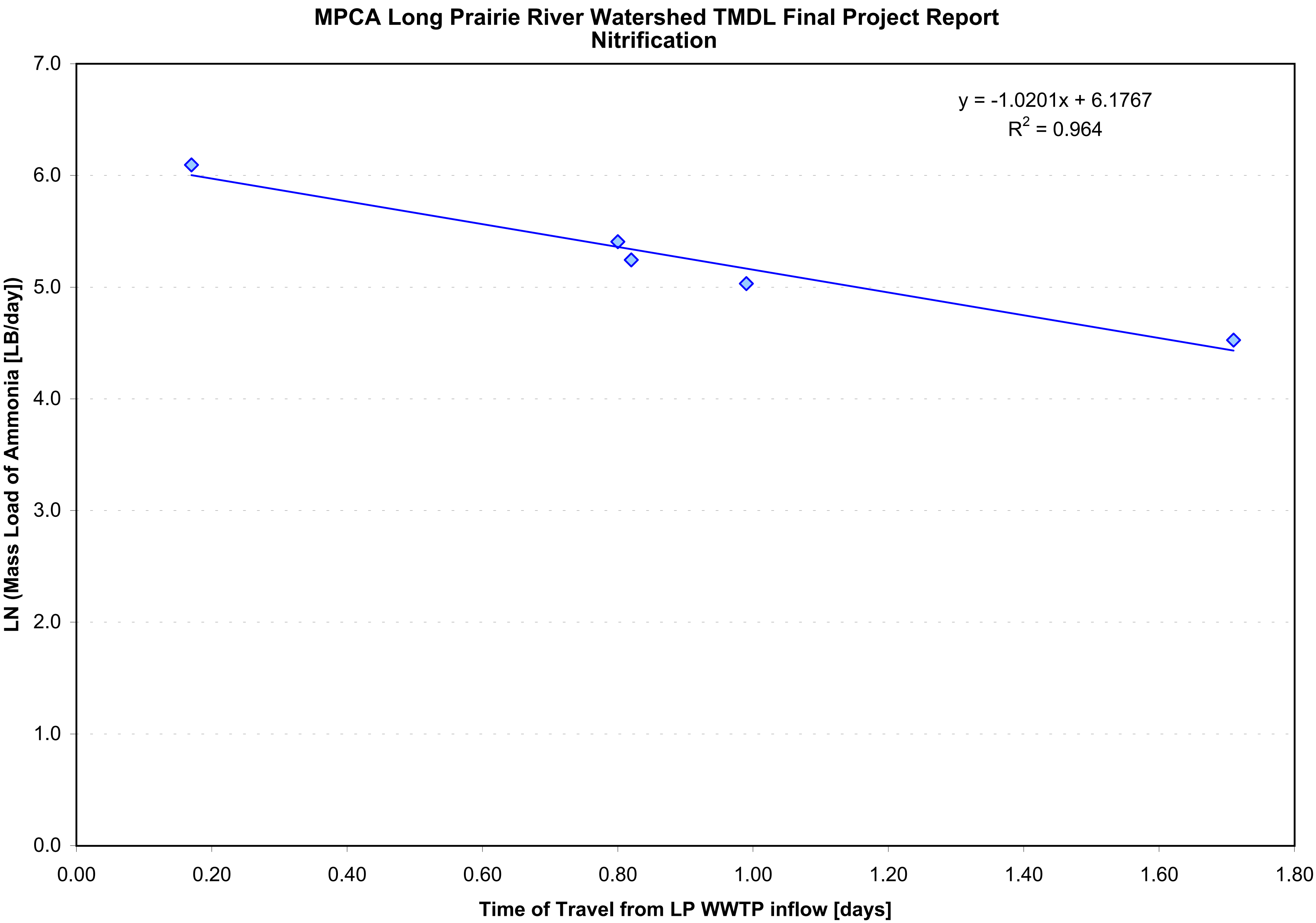
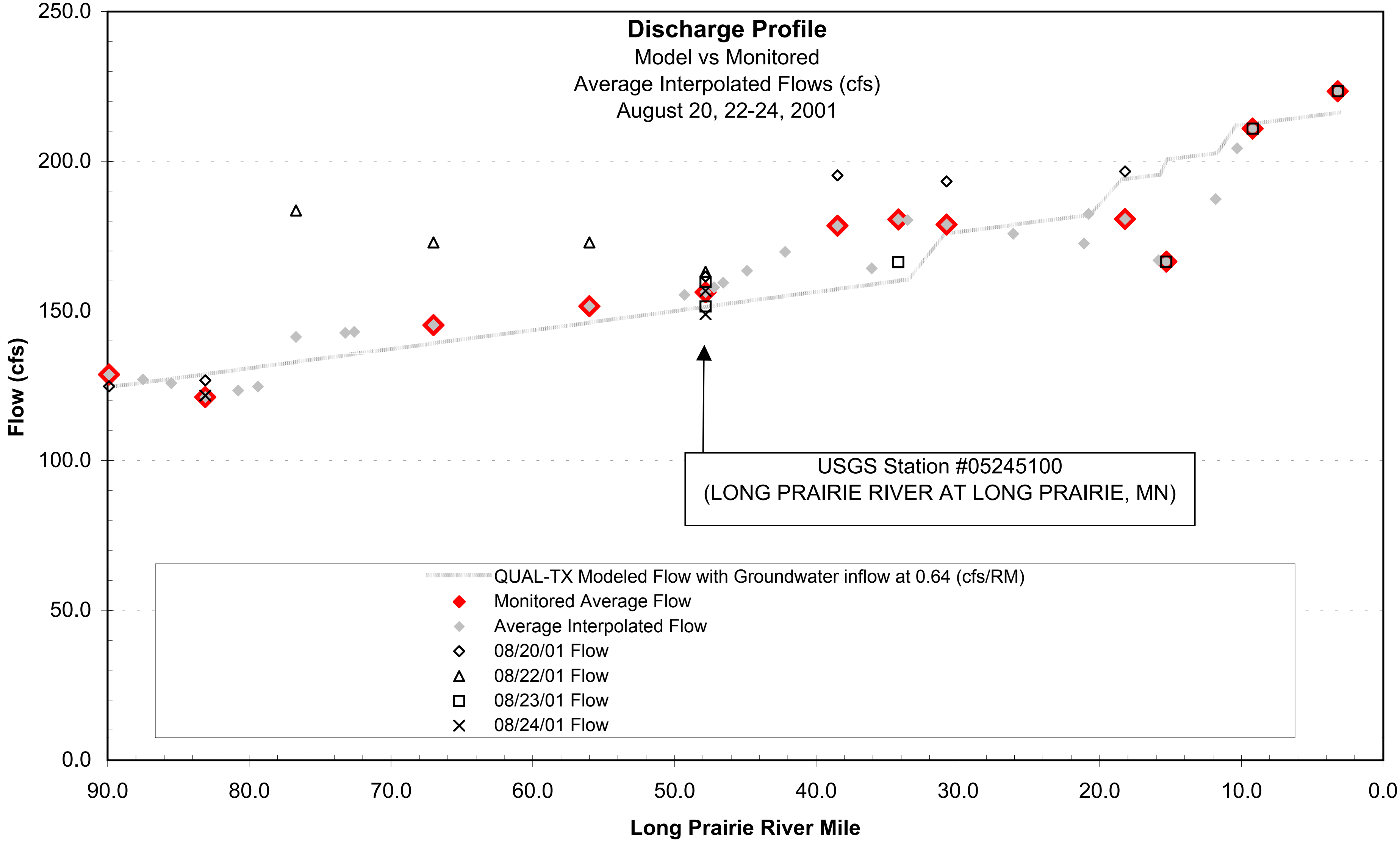
Appendix F, Figure F-3



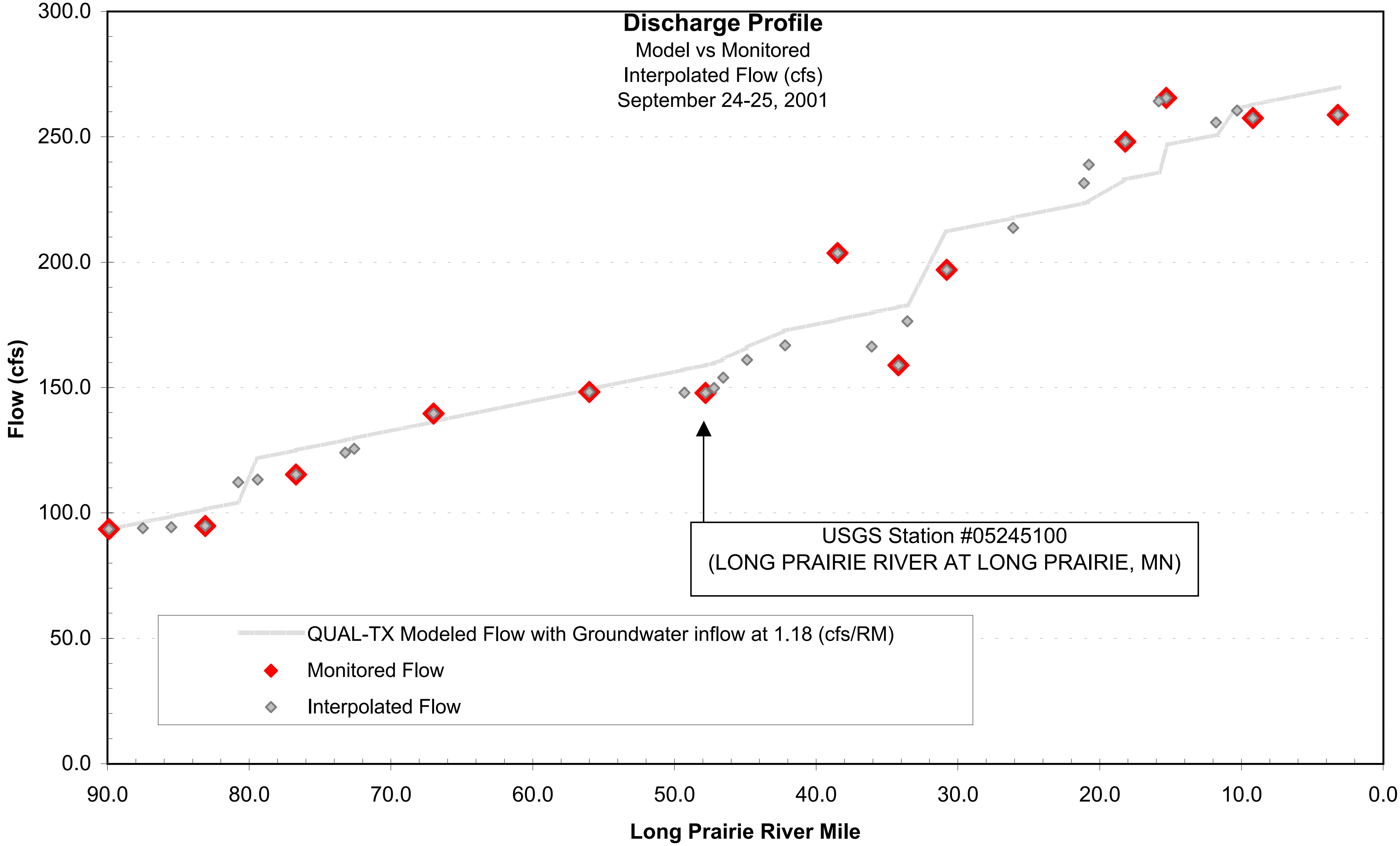
Appendix F, Figure F-4

MPCA Long Prairie River Watershed TMDL Final Project Report



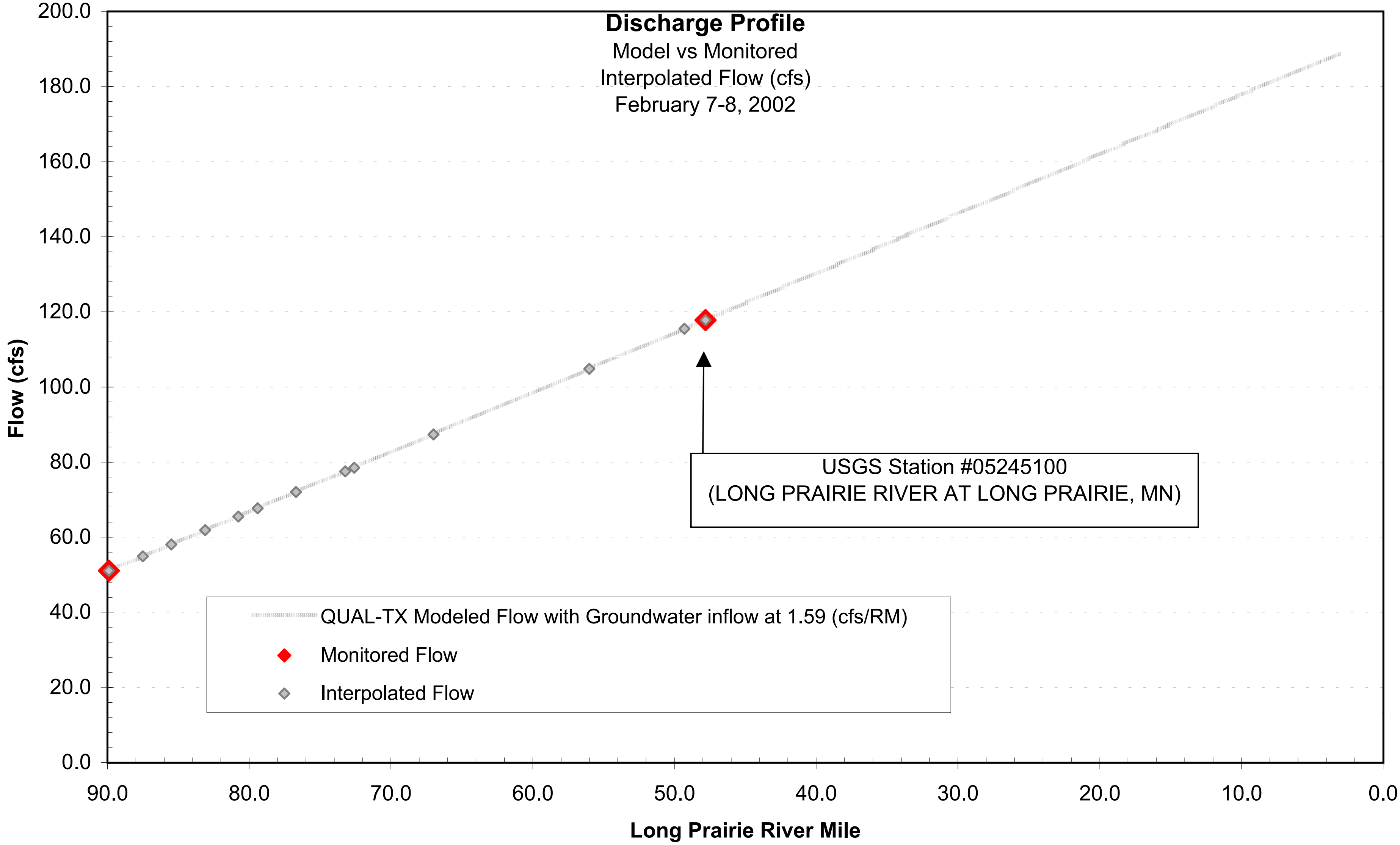
Appendix F, Figure F-4

MPCA Long Prairie River Watershed TMDL Final Project Report



Appendix F, Figure F-4

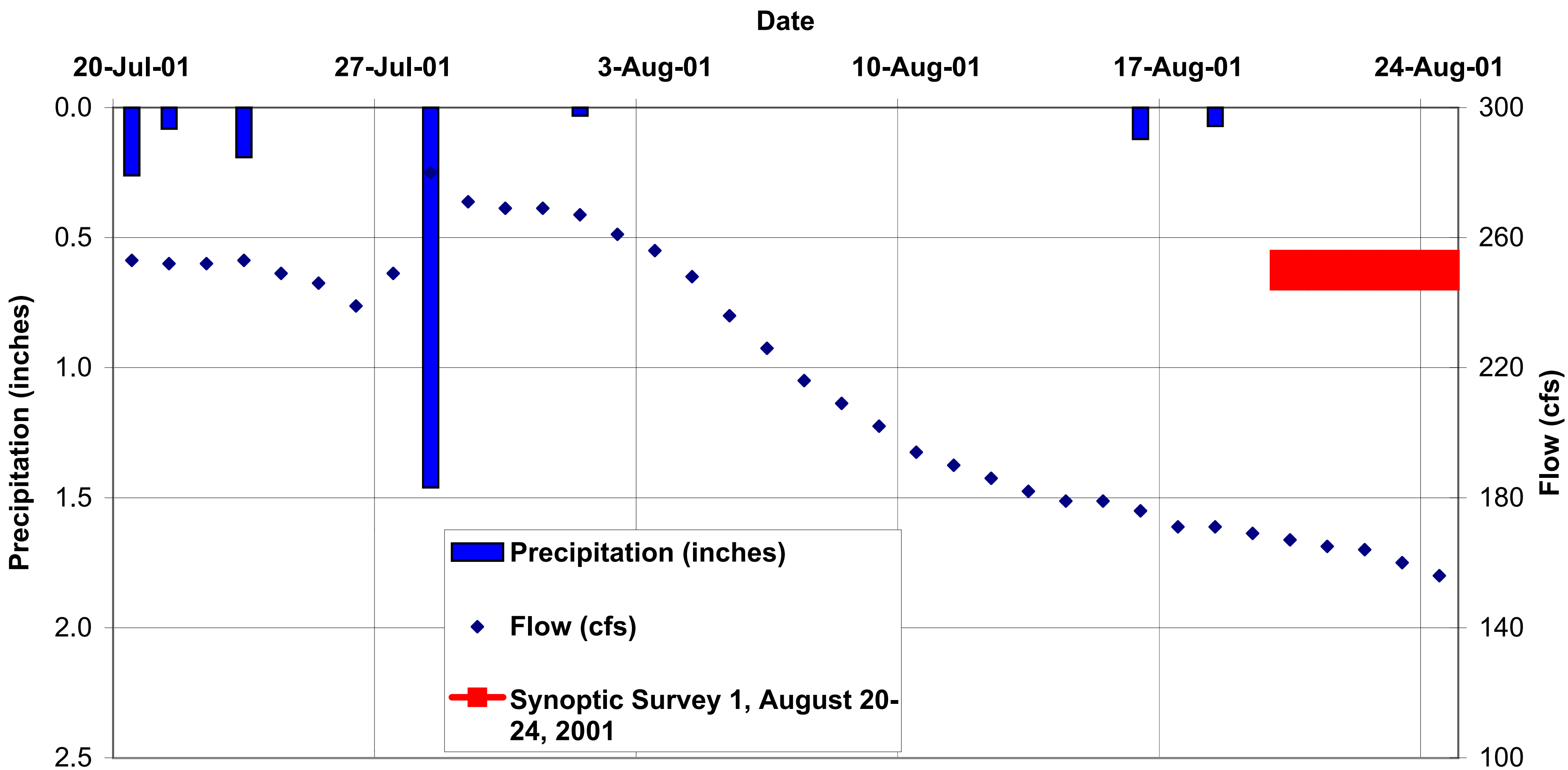
MPCA Long Prairie River Watershed TMDL Final Project Report



Appendix F, Figure F-5a

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Daily Flow and Precipitation at Long Prairie
Survey 1



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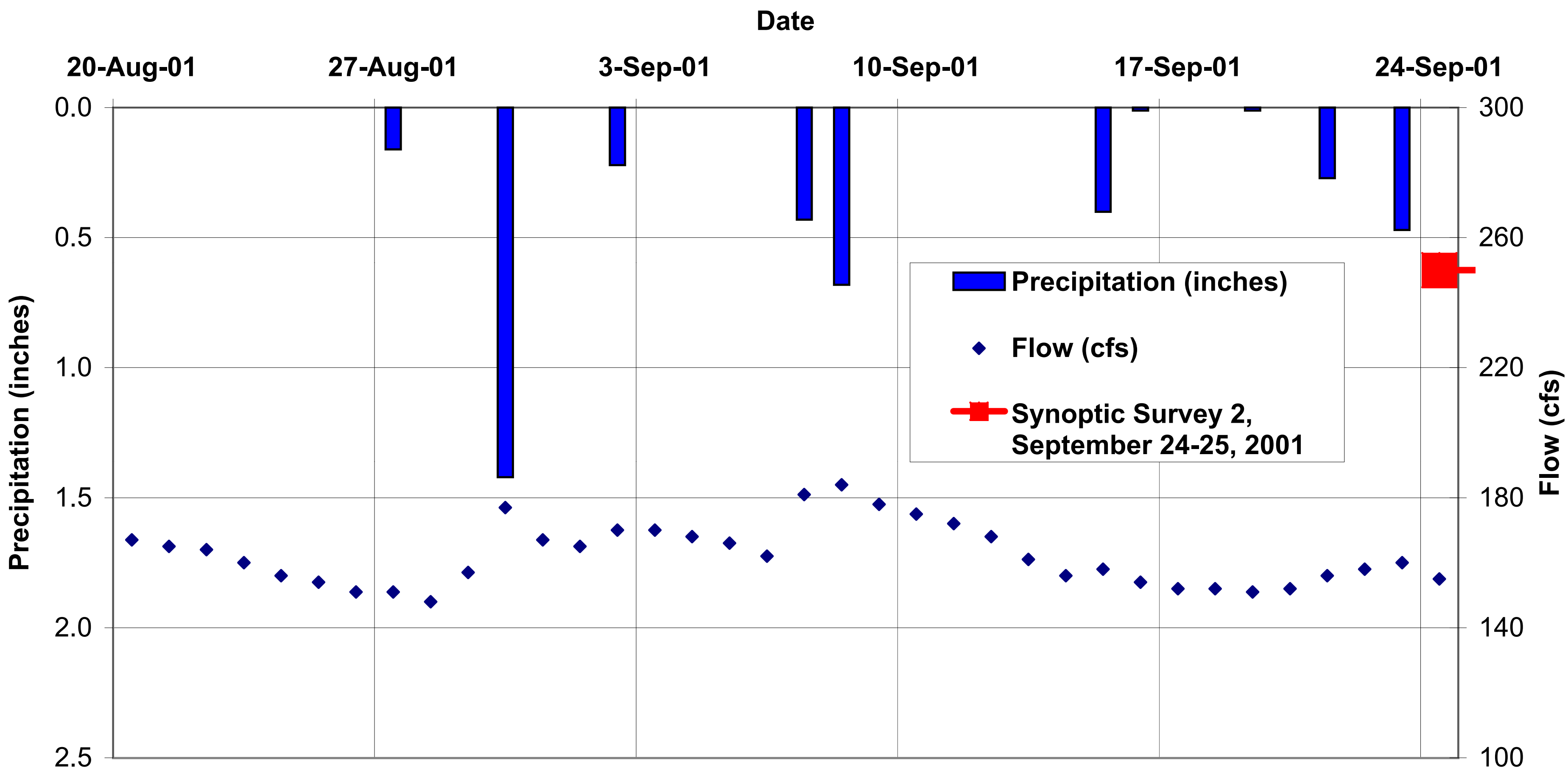
Appendix F, Figure F-5b

MPCA Long Prairie River Watershed TMDL Final Project Report

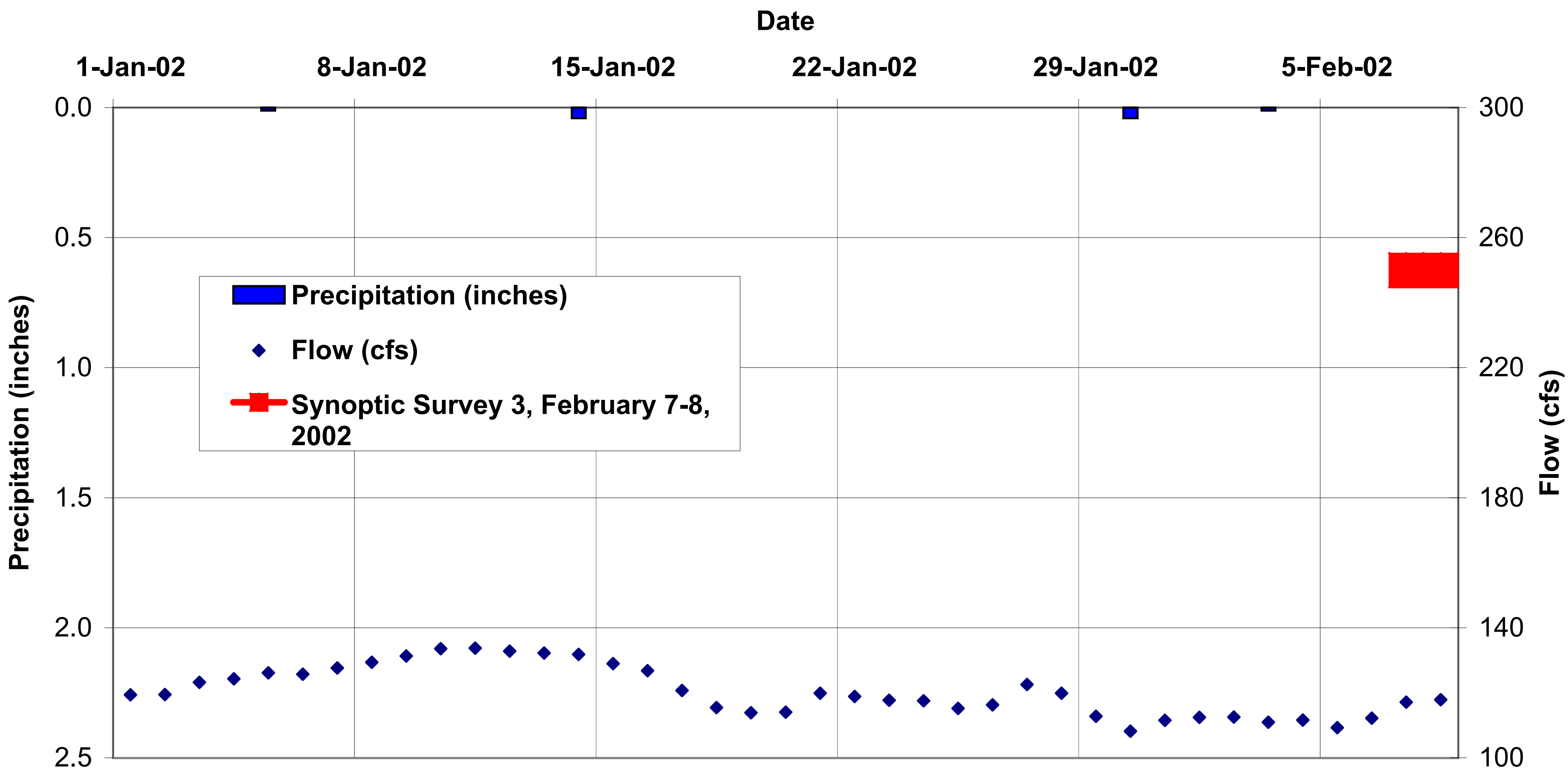
Long Prairie River Daily Flow and Precipitation at Long Prairie
Survey 2



Appendix F, Figure F-5c

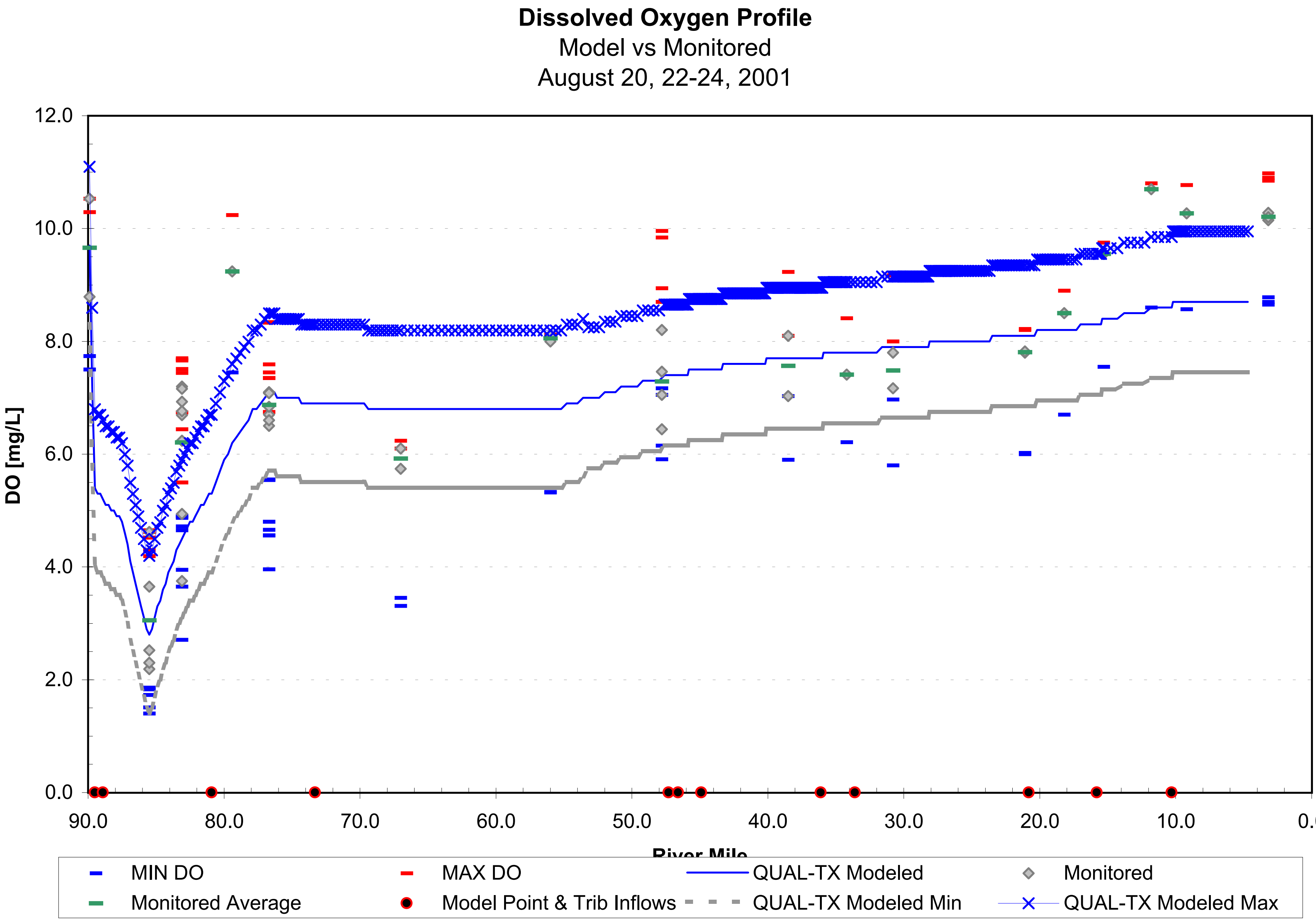
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Daily Flow and Precipitation at Long Prairie
Survey 3



Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report



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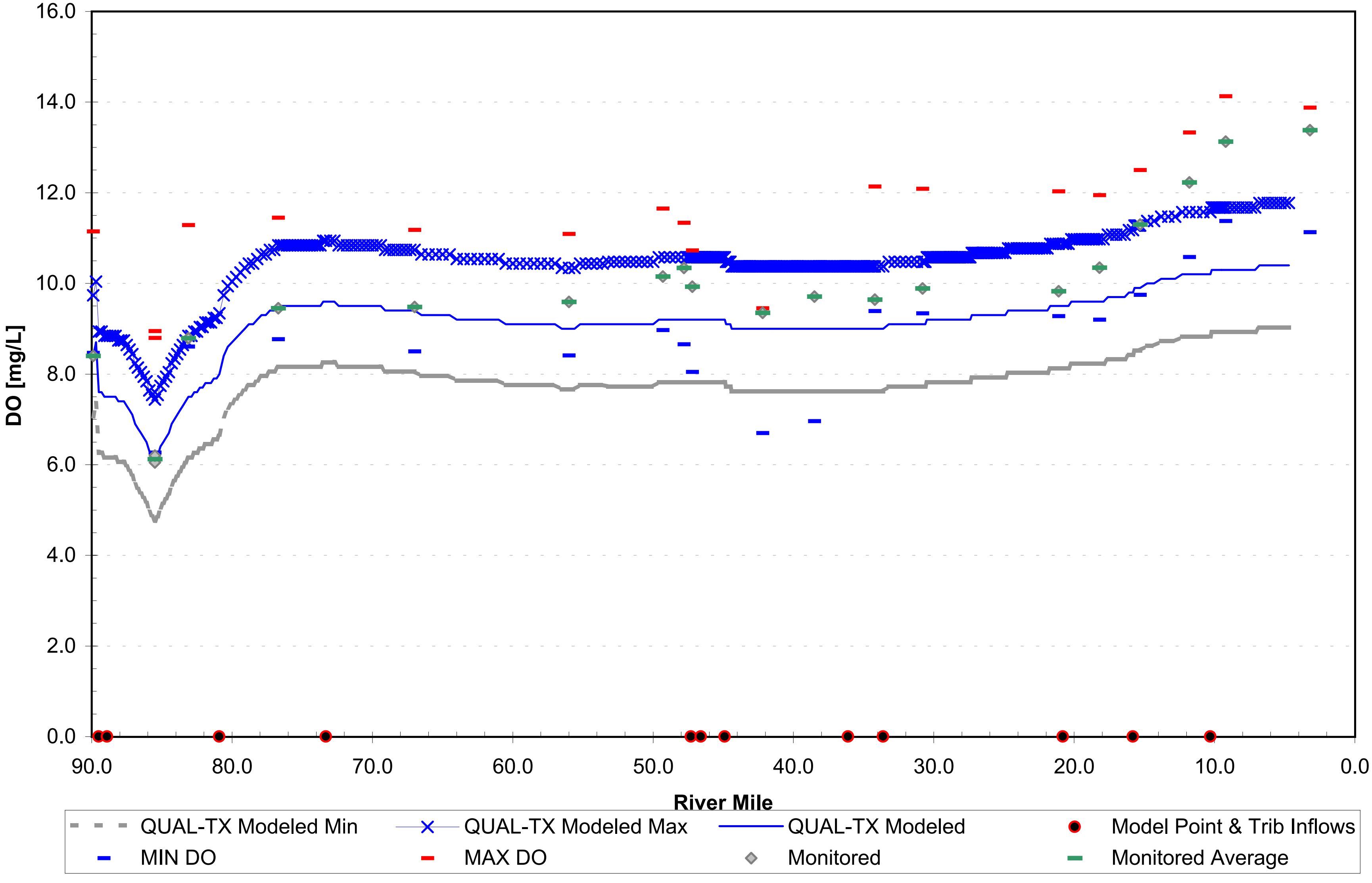
Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Dissolved Oxygen Profile

Model vs Monitored

September 24-25, 2001



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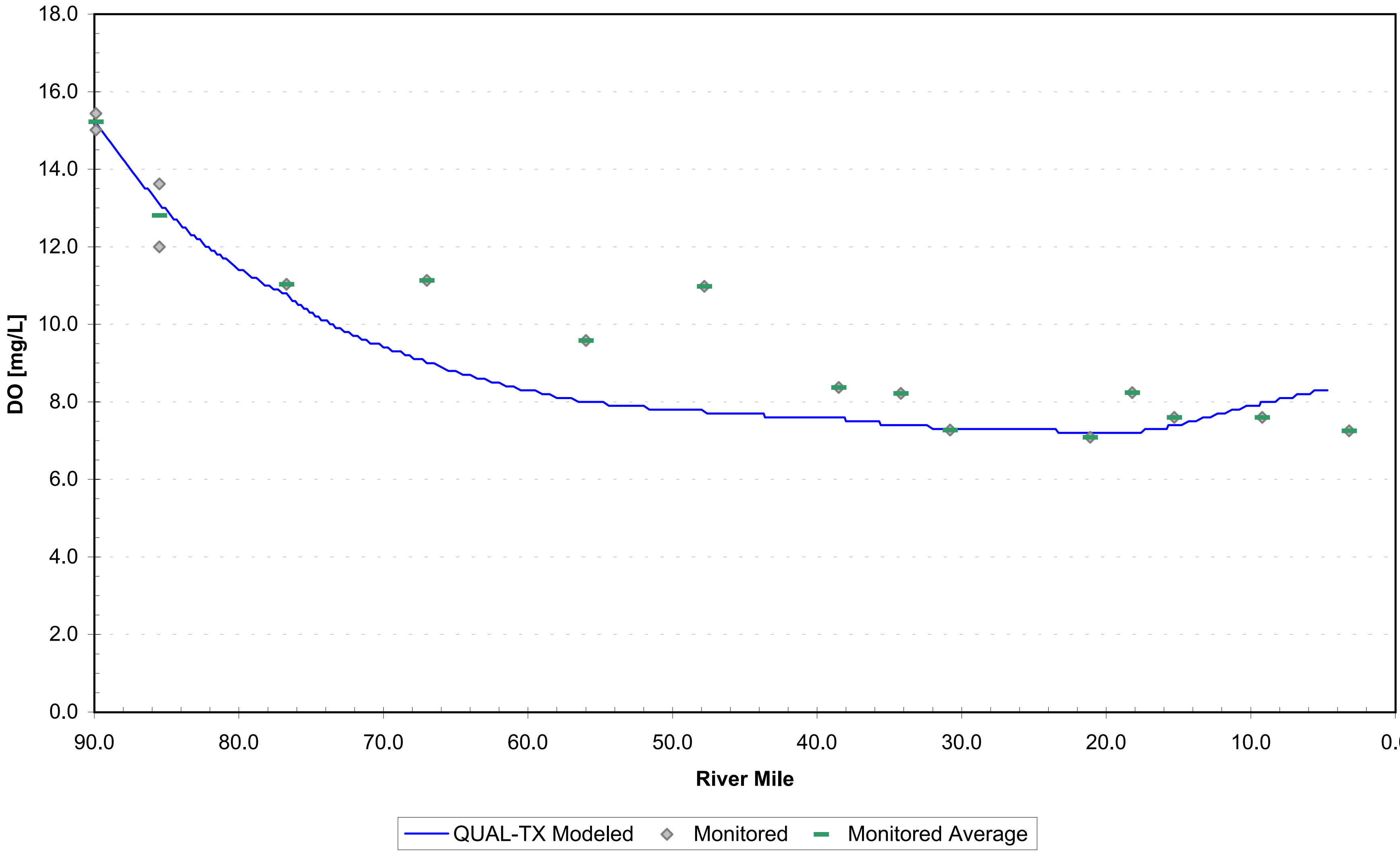
Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Dissolved Oxygen Profile
Model vs Monitored
February 7-8, 2002



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Appendix F_tab18_fig06 Feb DO

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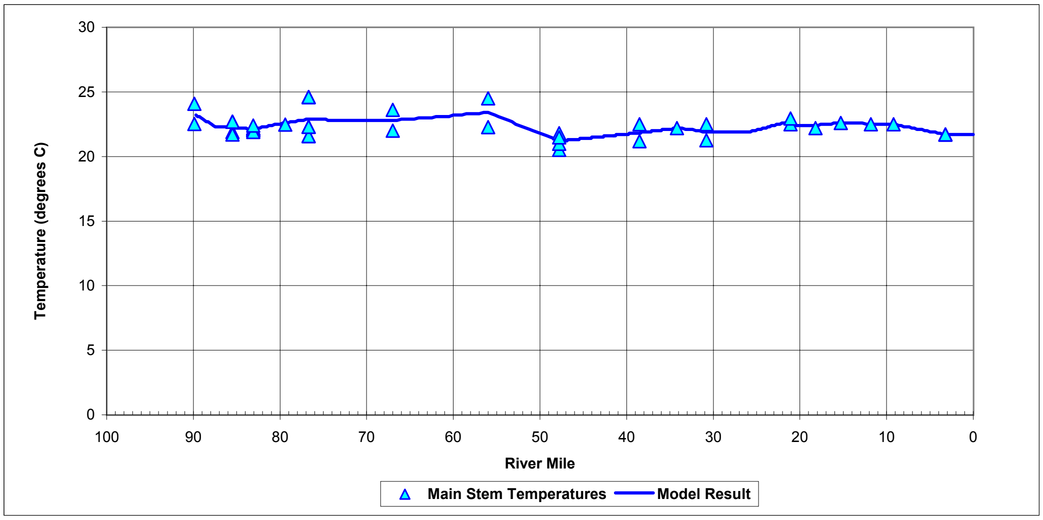
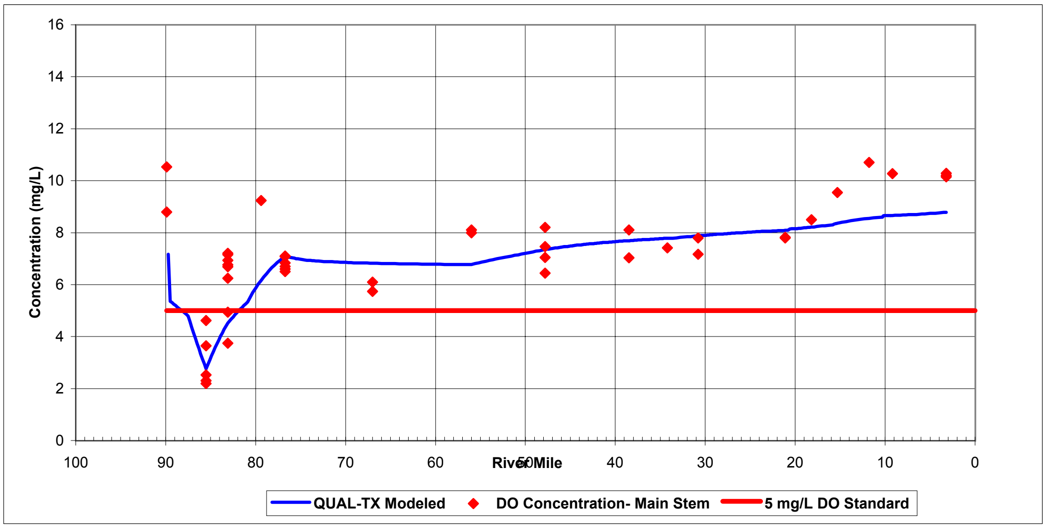
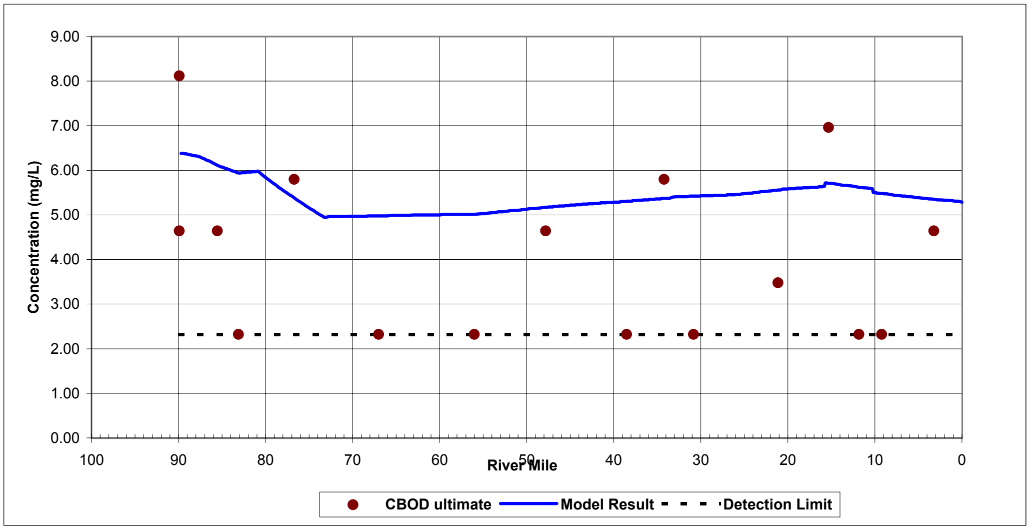
Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #1
August 20 to 24, 2001



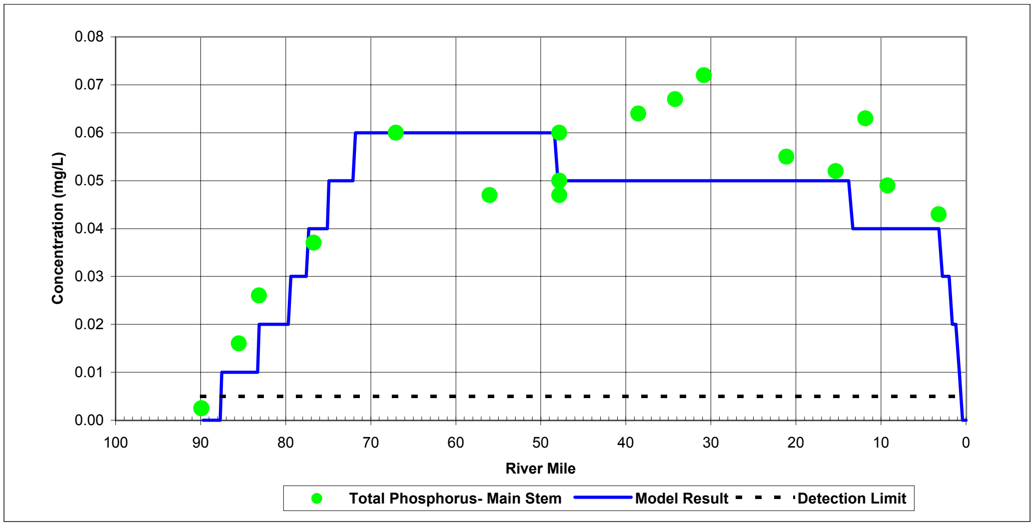


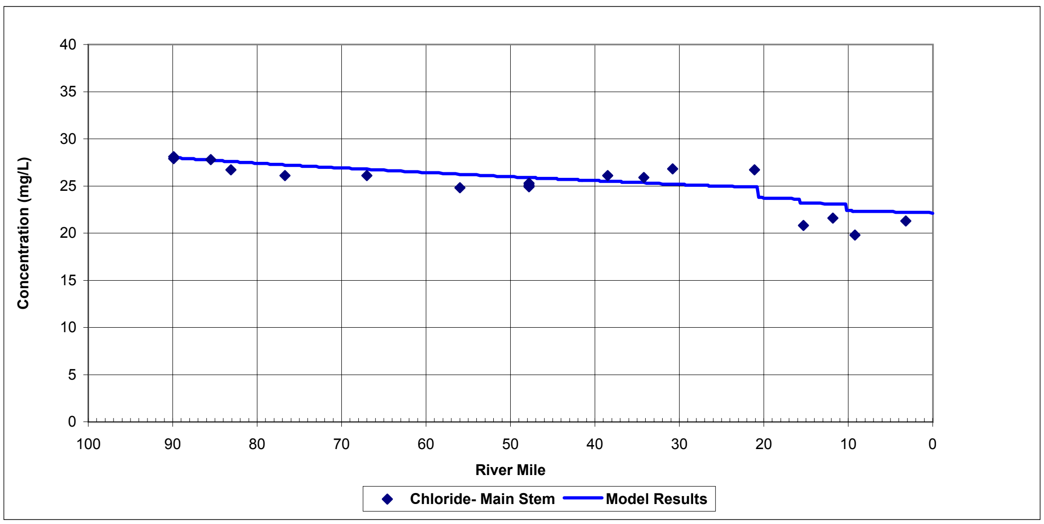


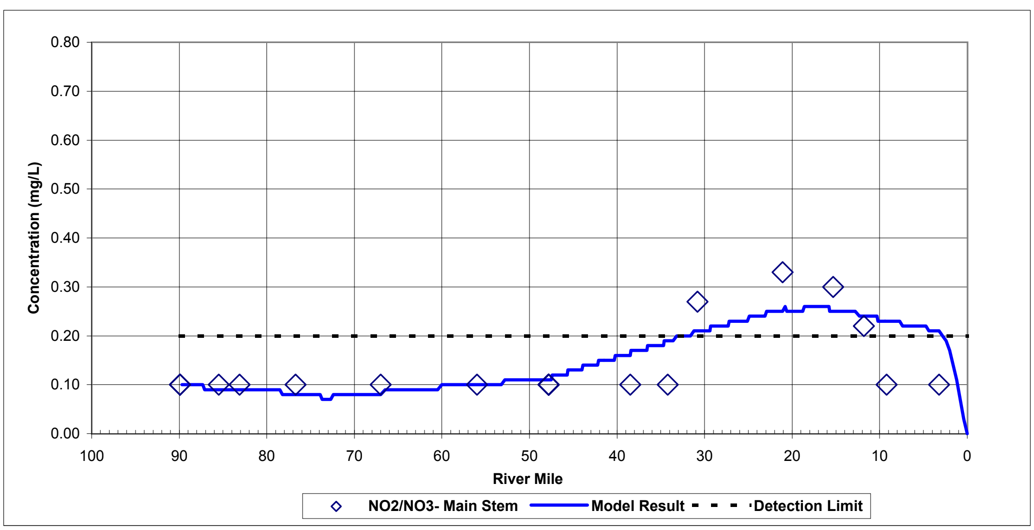
Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #1
August 20 to 24, 2001



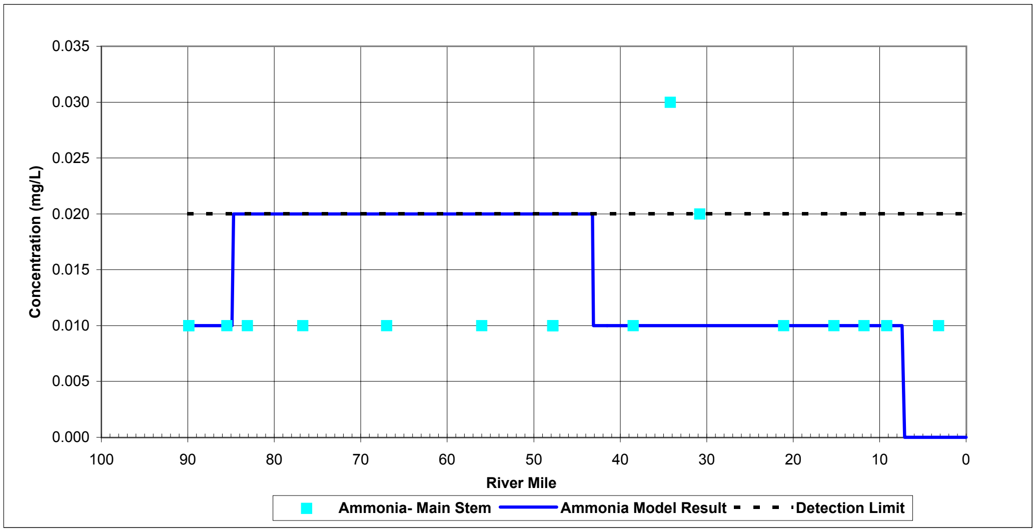


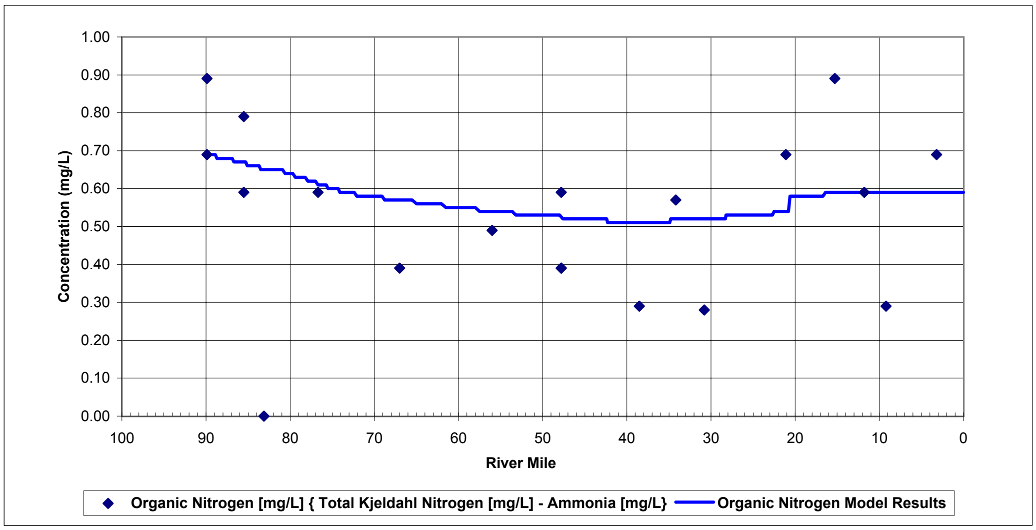


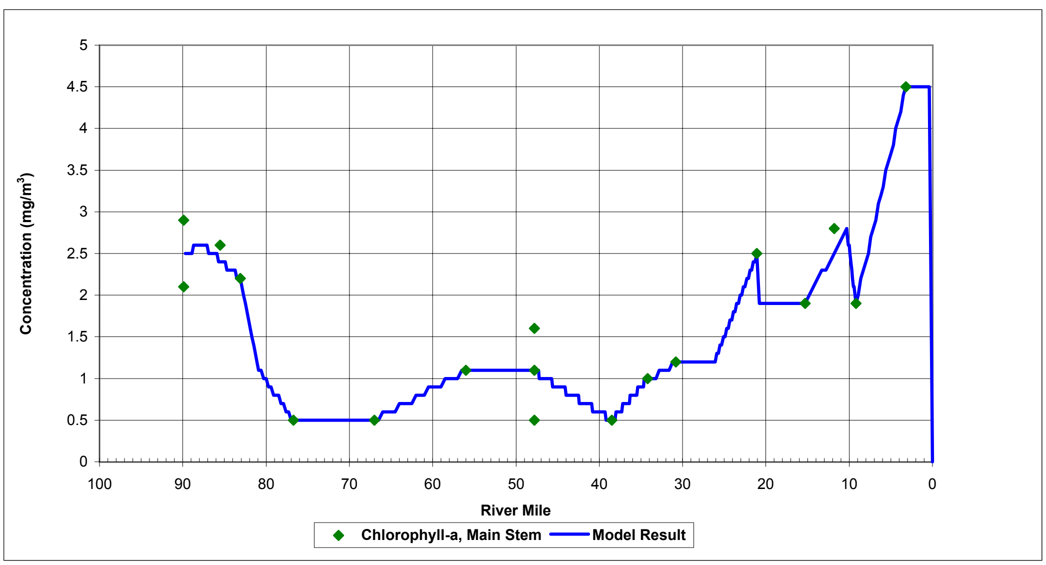
Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs: QUAL-TX Calibration to Synoptic Survey #1 August 20 to 24, 2001



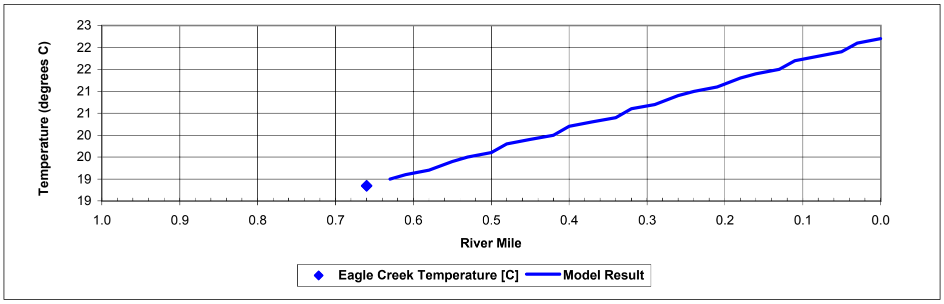


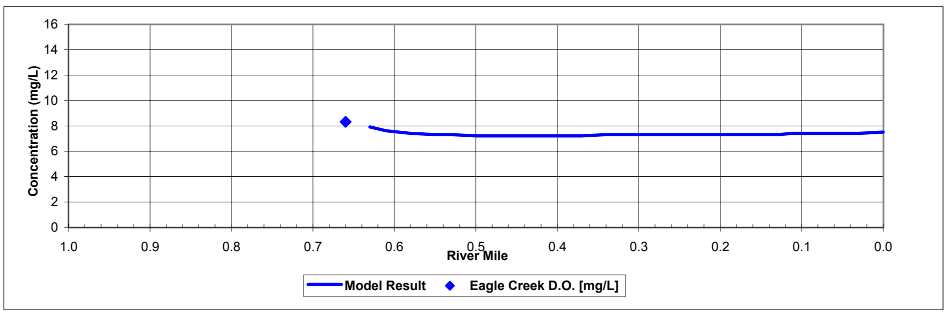


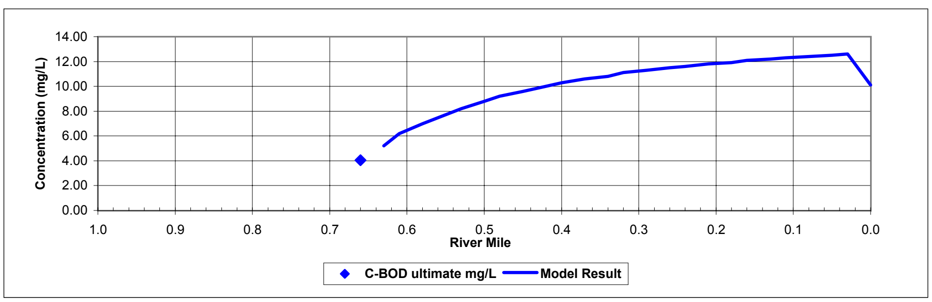
Appendix F, Figure F-6

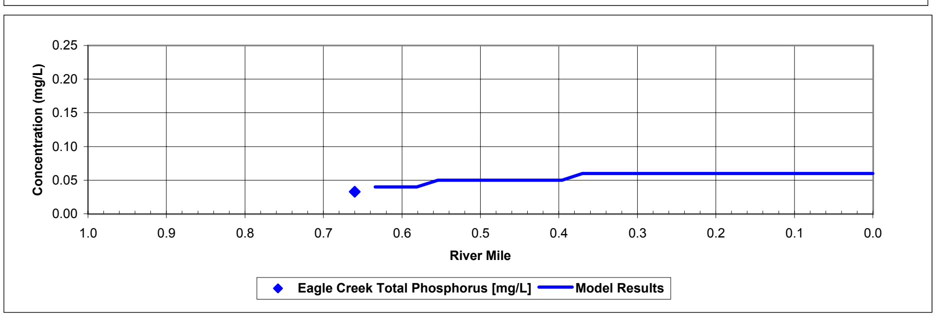
MPCA Long Prairie River Watershed TMDL Final Project Report

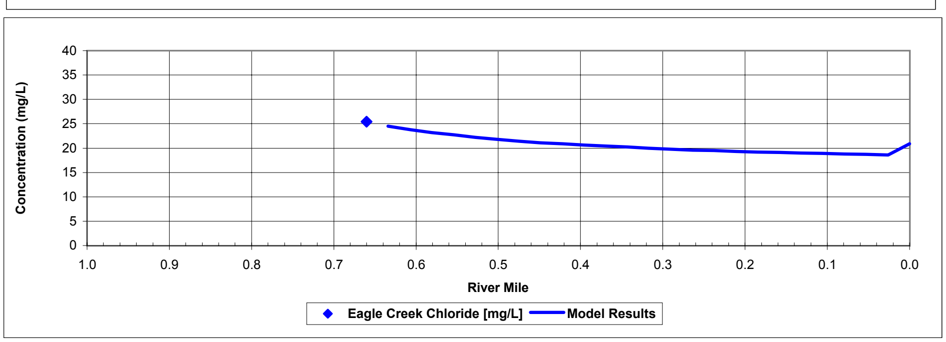
Eagle Creek Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #1
August 20 to 24, 2001







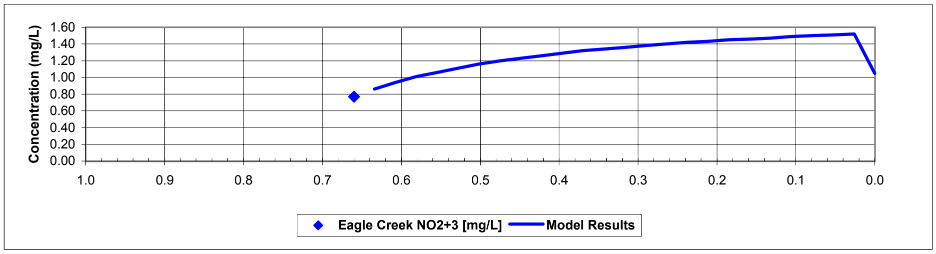


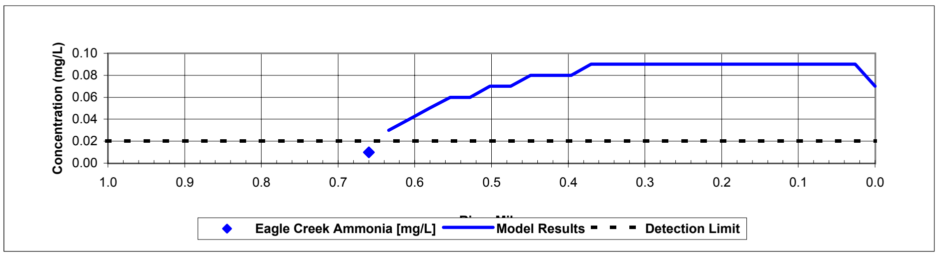


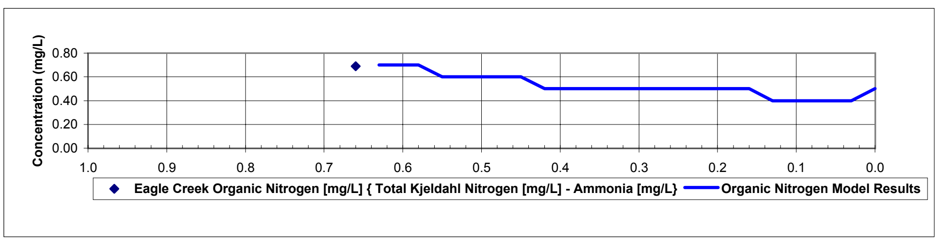
Appendix F, Figure F-6

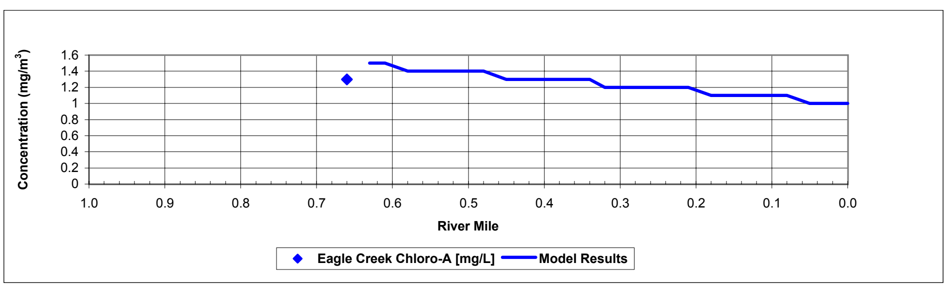
MPCA Long Prairie River Watershed TMDL Final Project Report

Eagle Creek Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #1
August 20 to 24, 2001





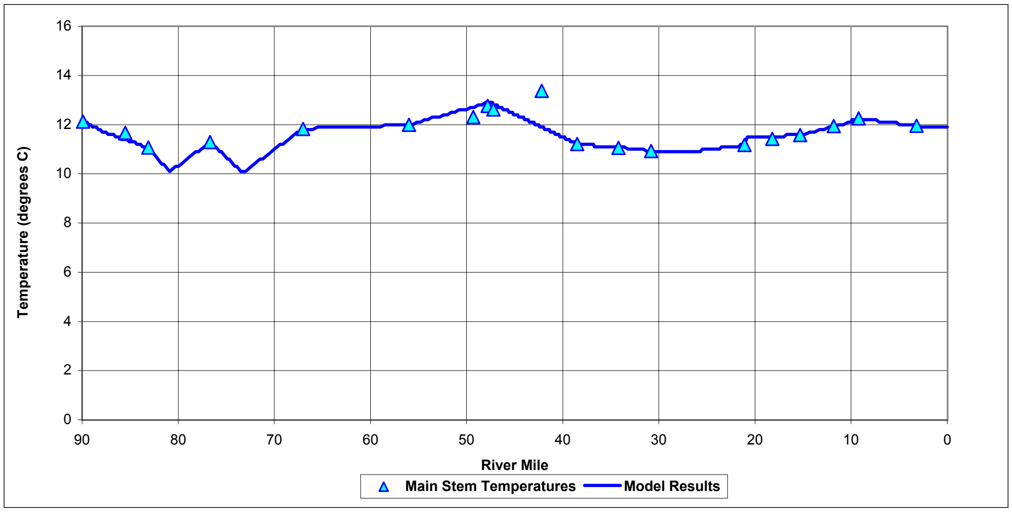


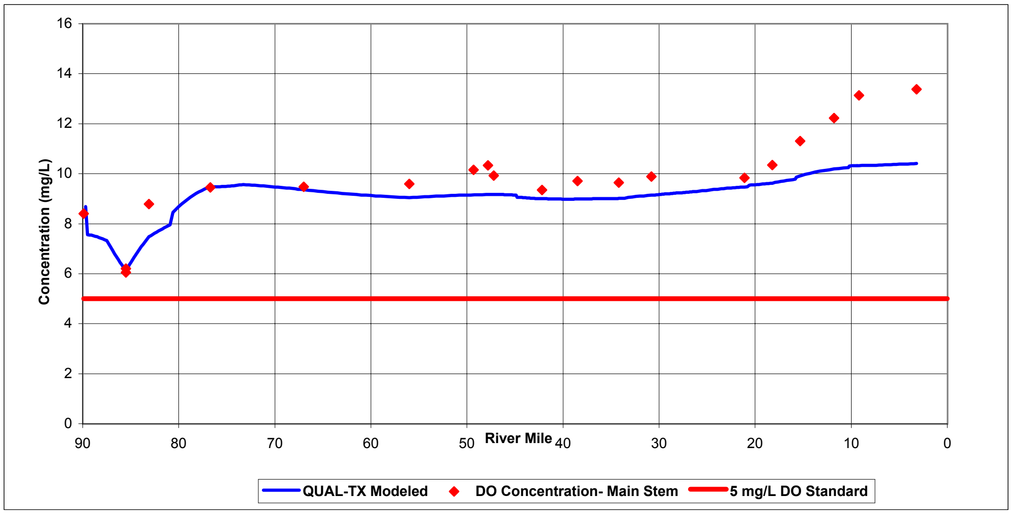


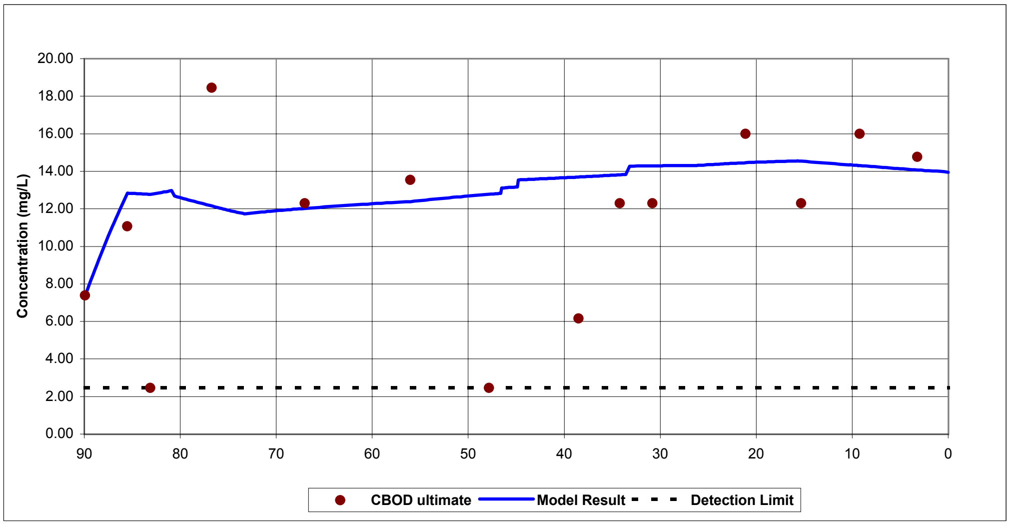
Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #2
September 24 and 25, 2001







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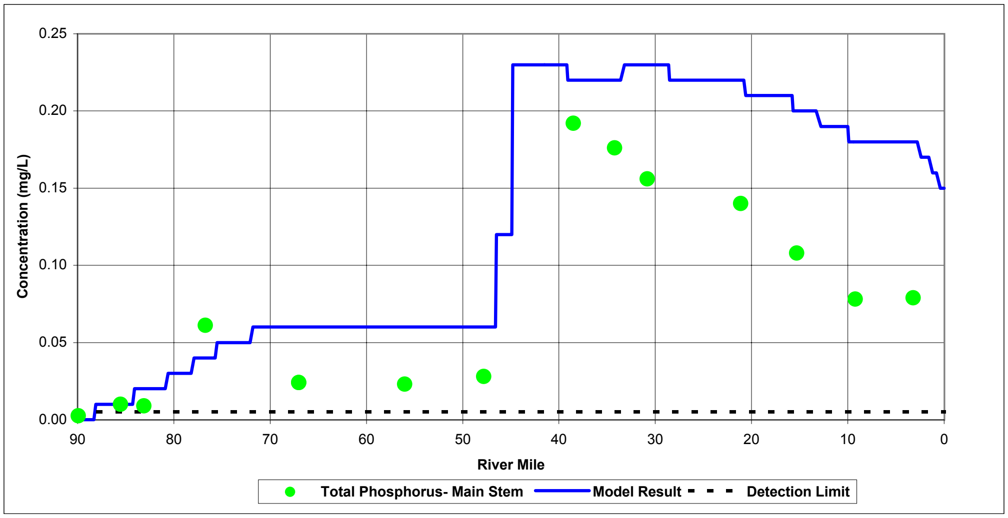
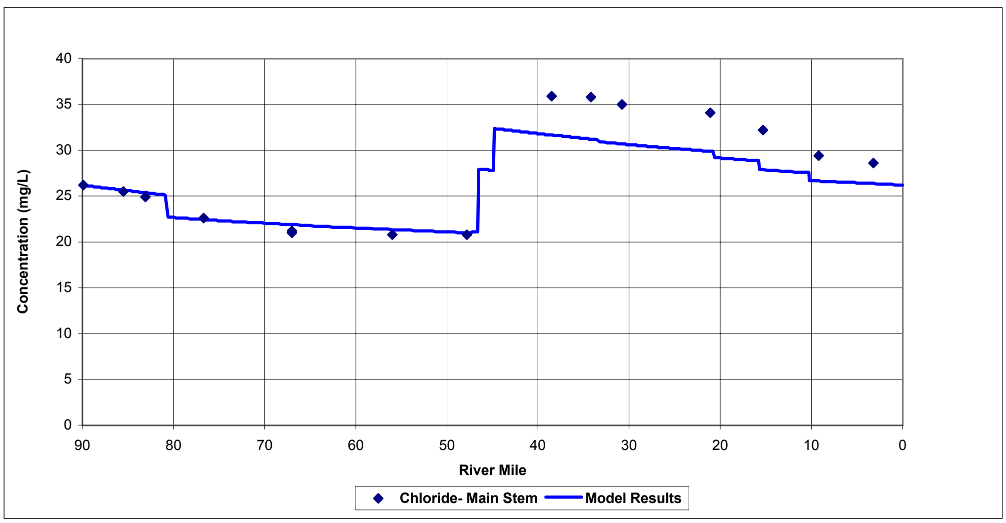
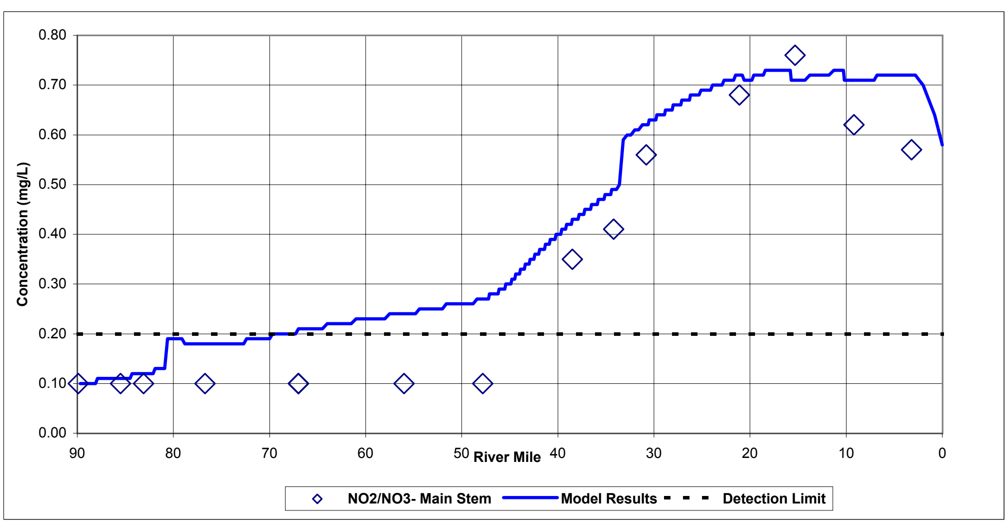
Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #2
September 24 and 25, 2001



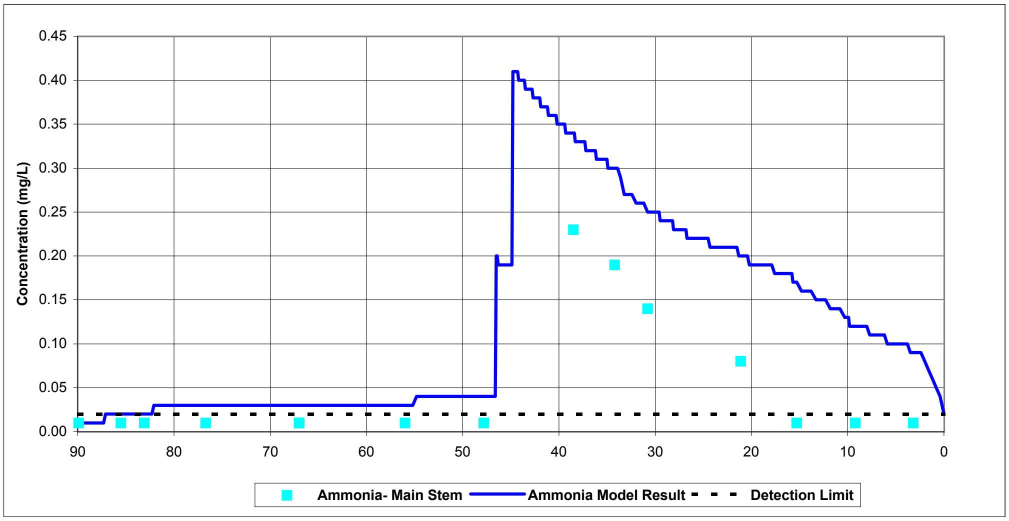


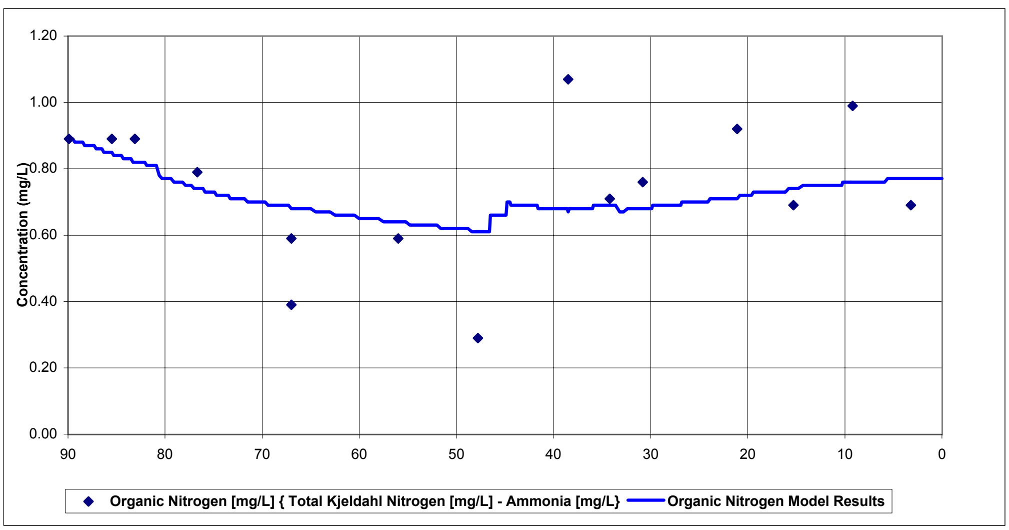


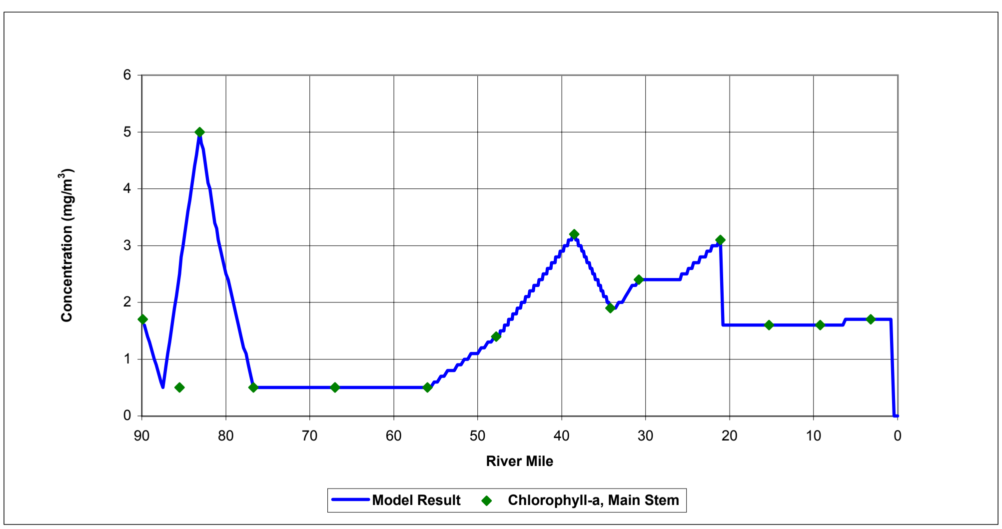
Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #2
September 24 and 25, 2001



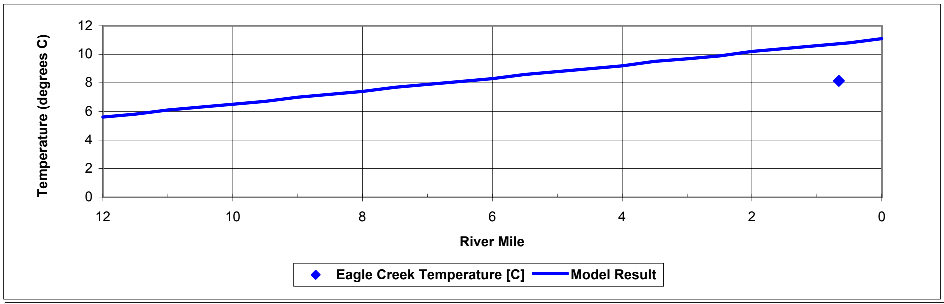


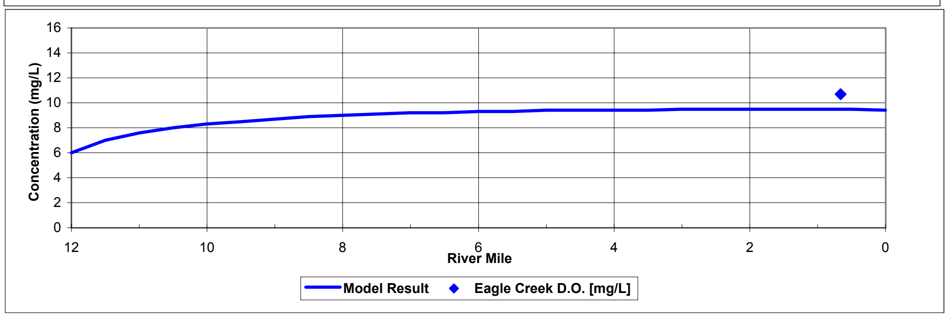


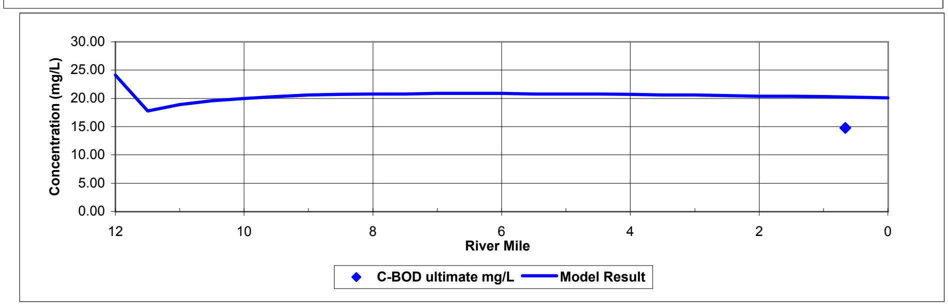
Appendix F, Figure F-6

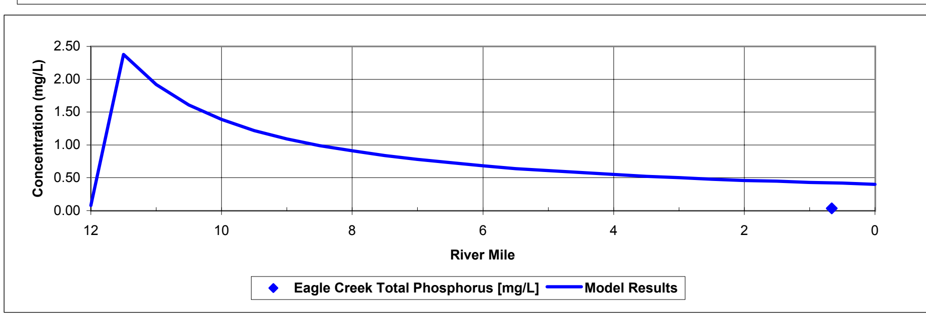
MPCA Long Prairie River Watershed TMDL Final Project Report

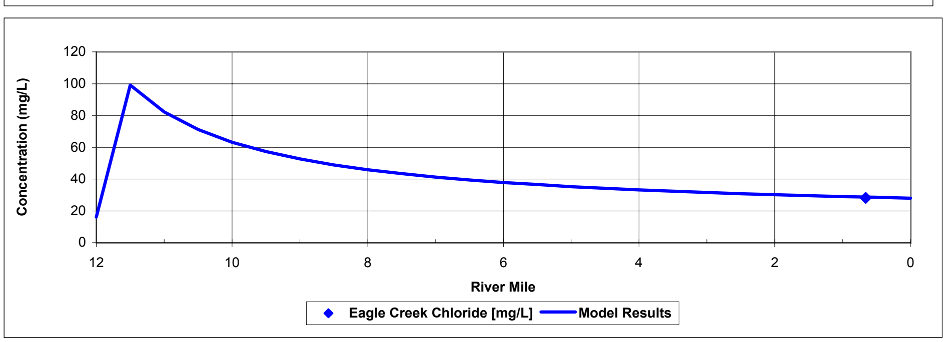
Eagle Creek Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #2
September 24 and 25, 2001







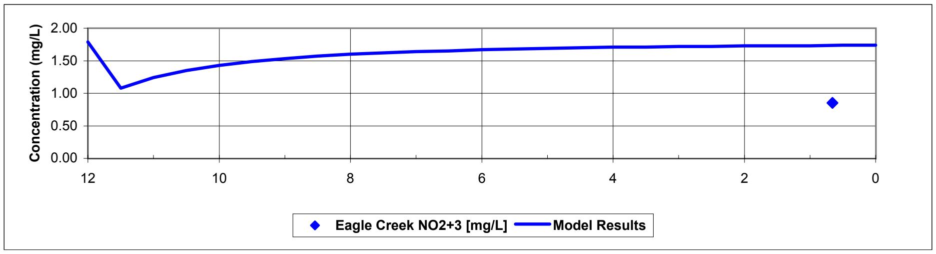


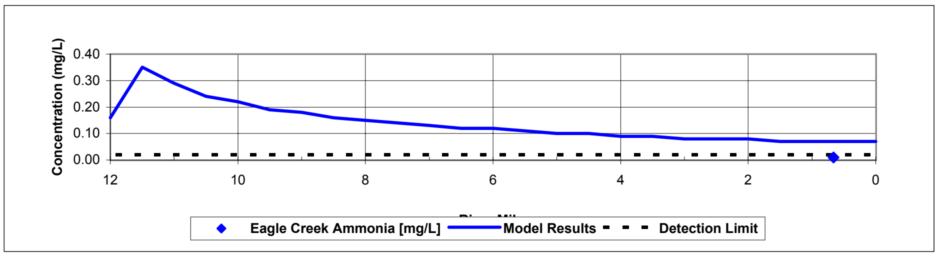


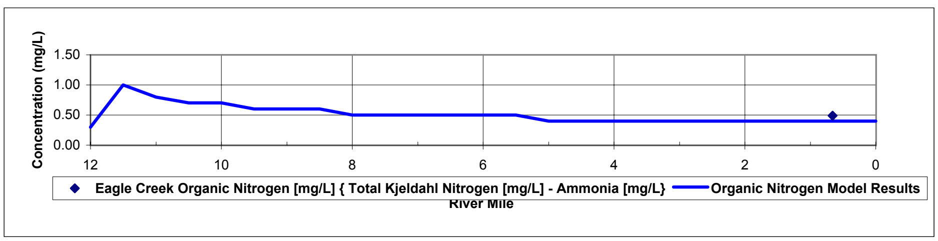
Appendix F, Figure F-6

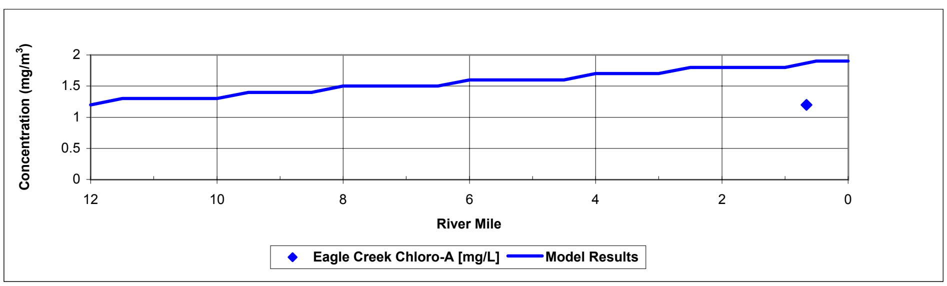
MPCA Long Prairie River Watershed TMDL Final Project Report

Eagle Creek Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #2
September 24 and 25, 2001





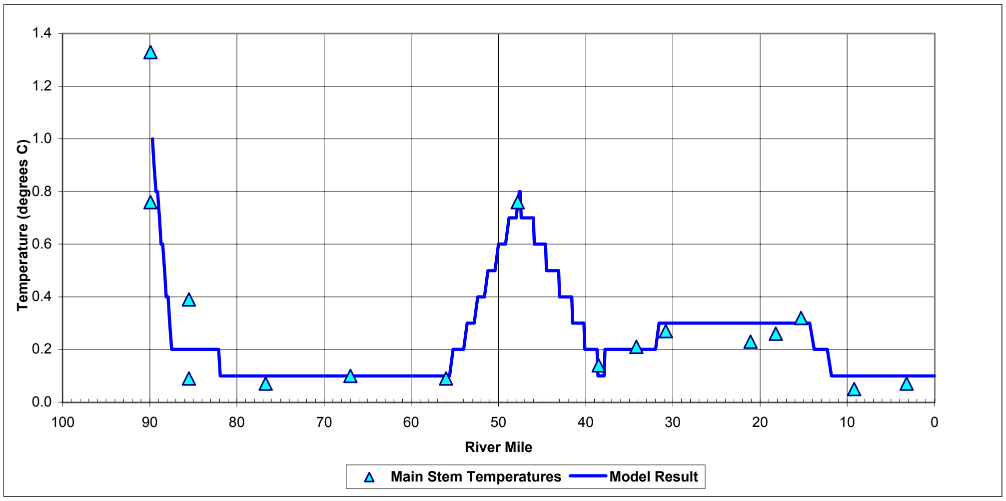


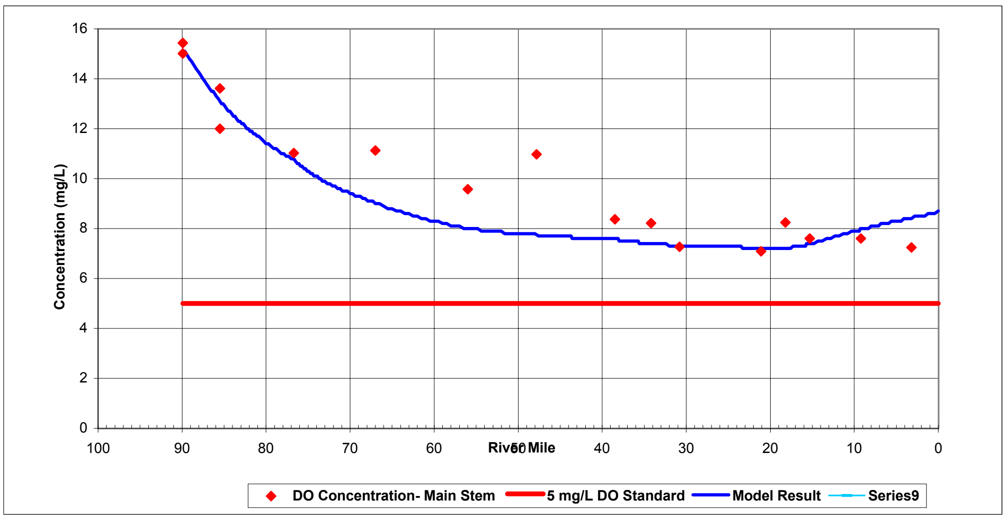


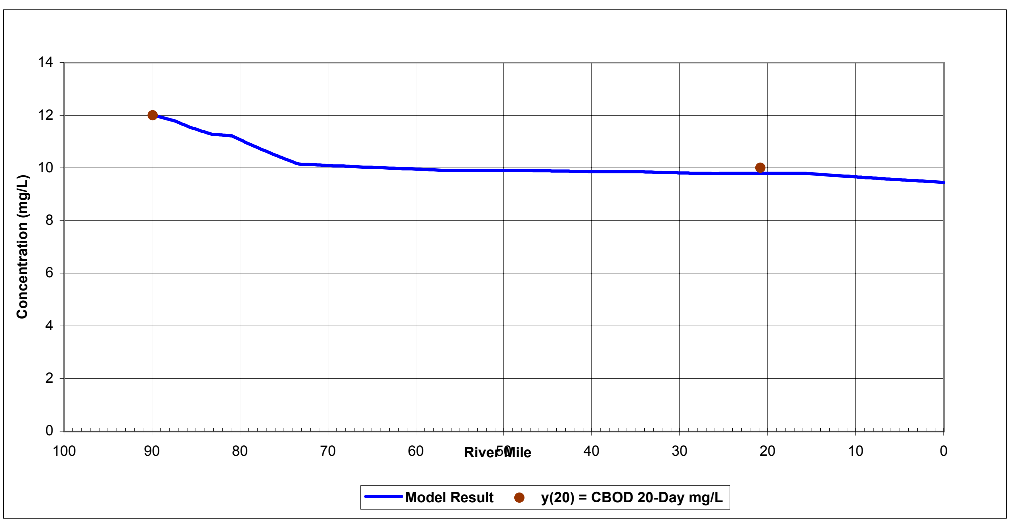
Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #3
February 7 and 8, 2002



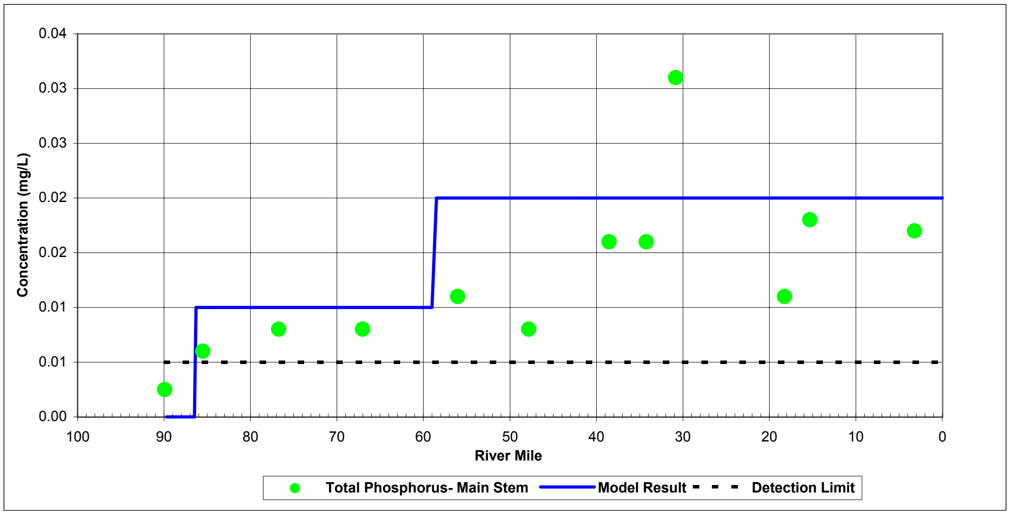


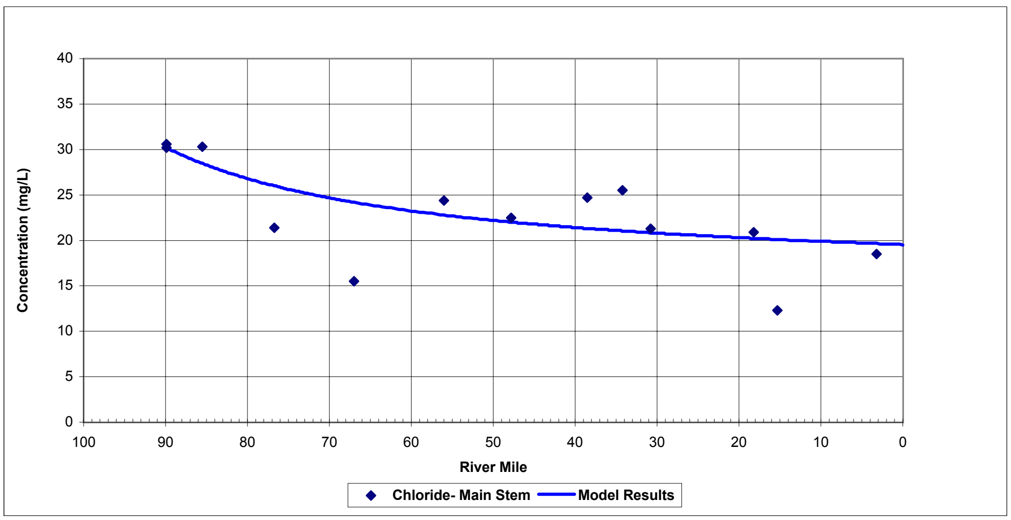


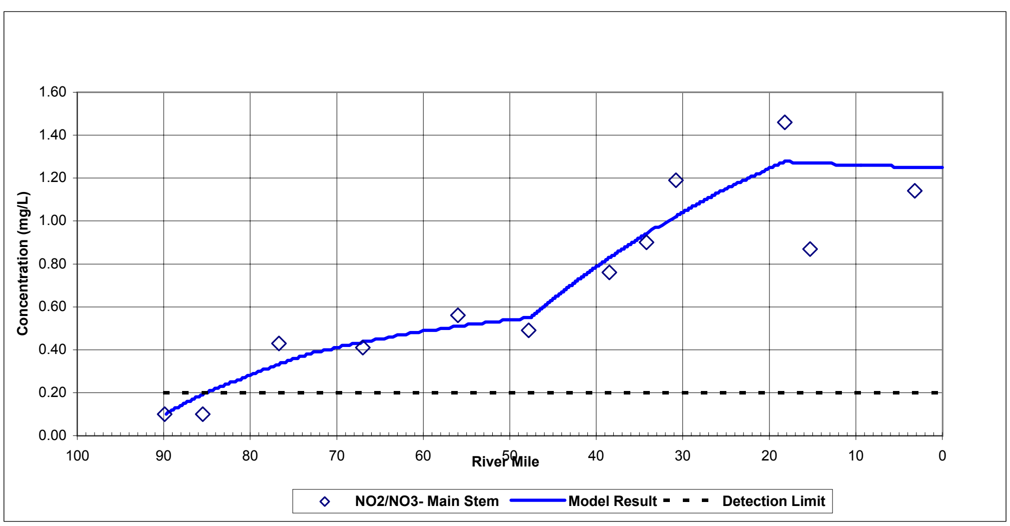
Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #3
February 7 and 8, 2002



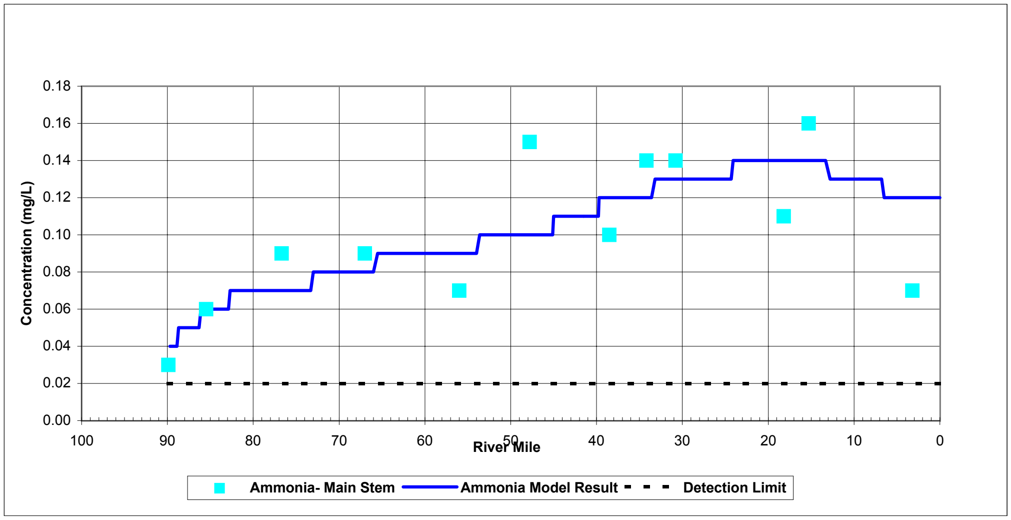


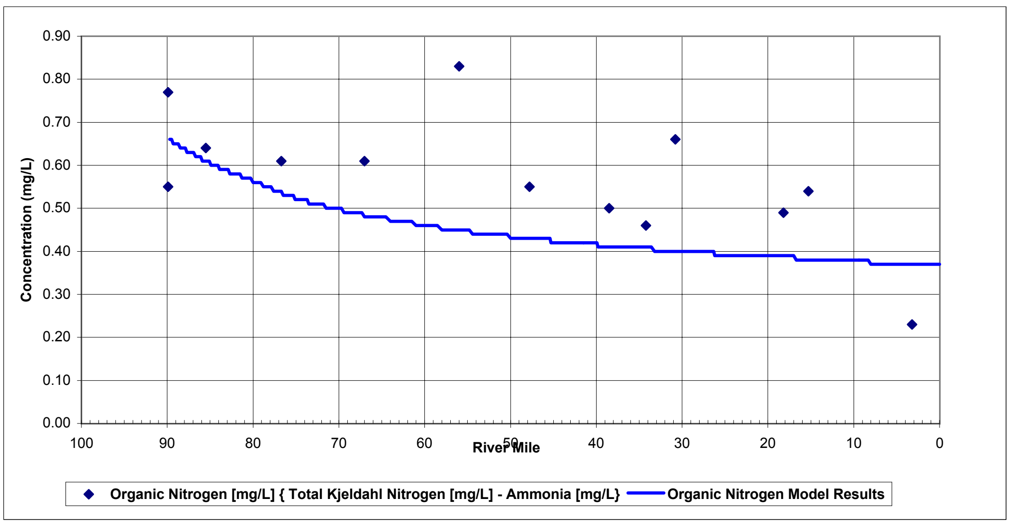


Appendix F, Figure F-6

MPCA Long Prairie River Watershed TMDL Final Project Report

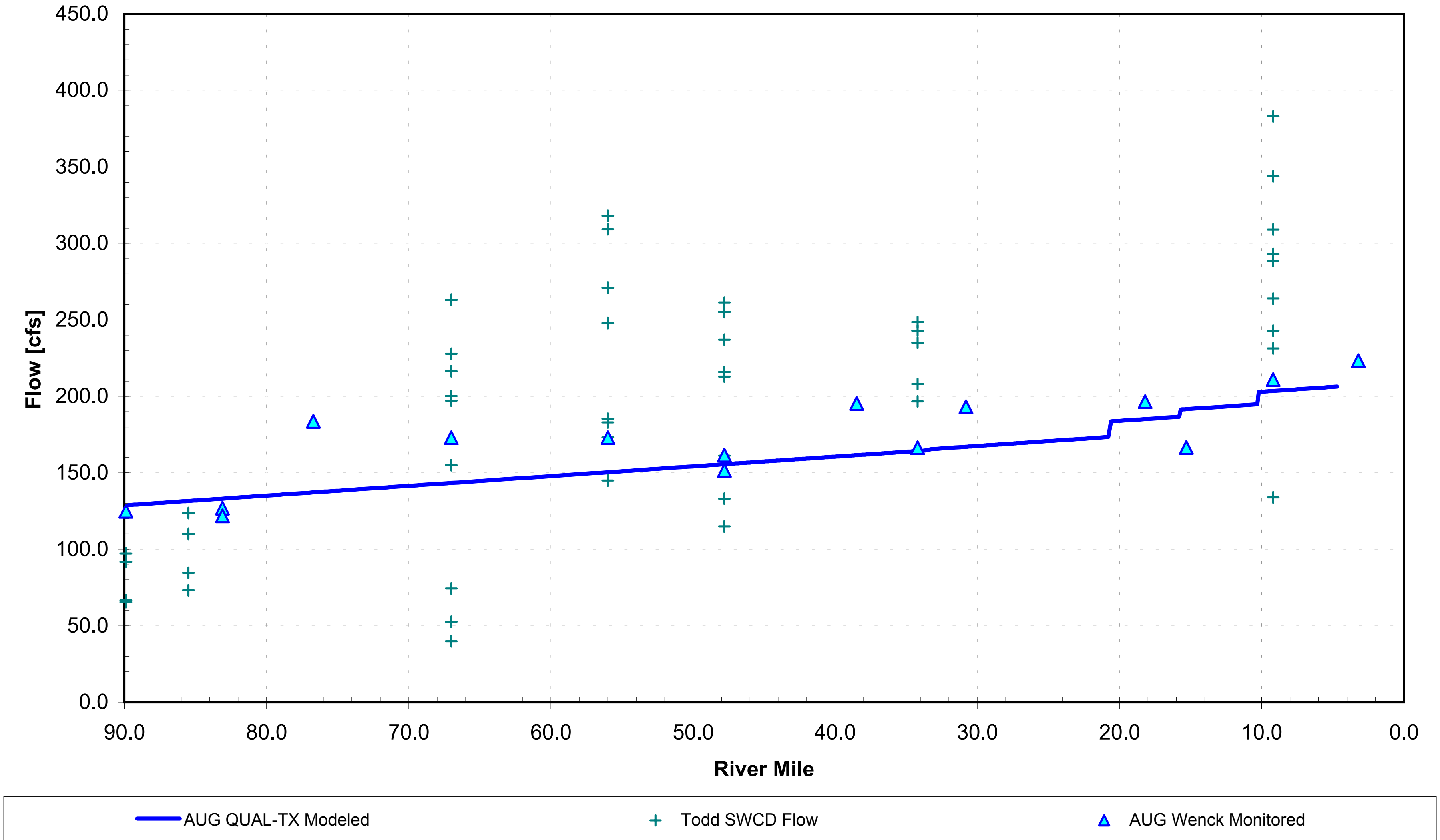
Long Prairie River Profile Graphs:
QUAL-TX Calibration to Synoptic Survey #3
February 7 and 8, 2002





Appendix F, Figure F-7

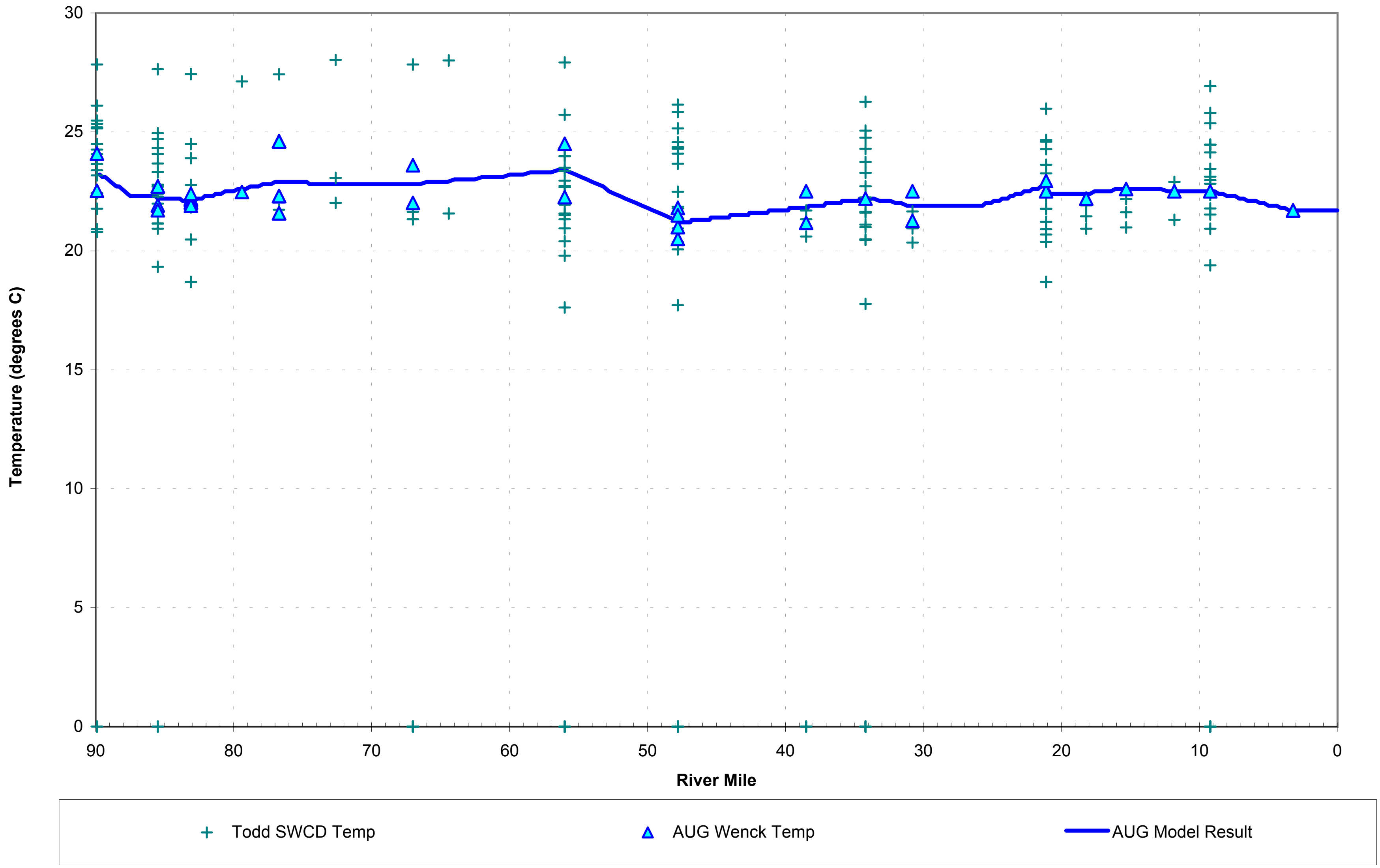
MPCA Long Prairie River Watershed TMDL Final Project Report
Discharge Profile
August Model vs Monitored outside of Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-7

MPCA Long Prairie River Watershed TMDL Final Project Report
Temperature Profile

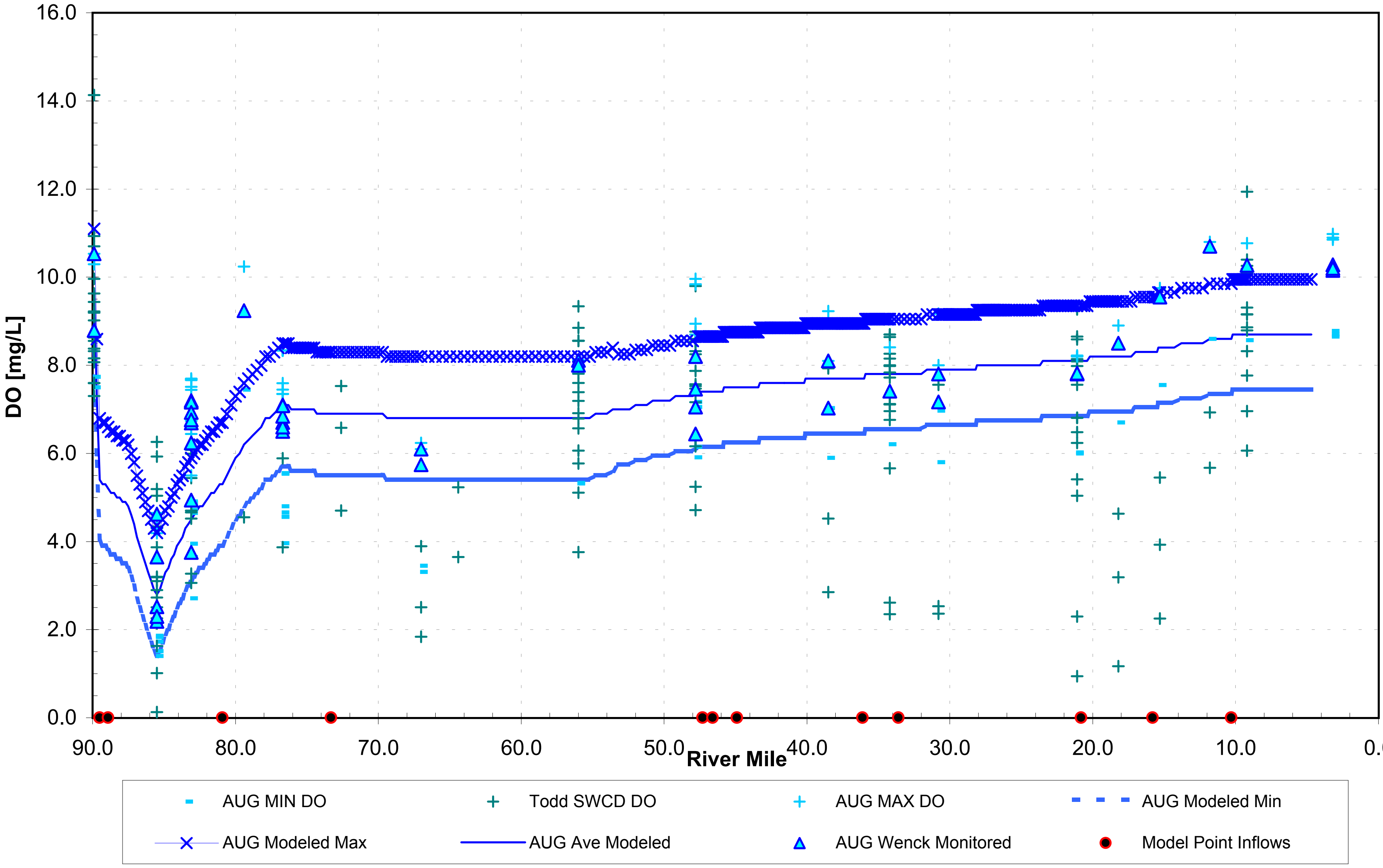
August Model vs Monitored outside of Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-7

MPCA Long Prairie River Watershed TMDL Final Project Report
Dissolved Oxygen Profile

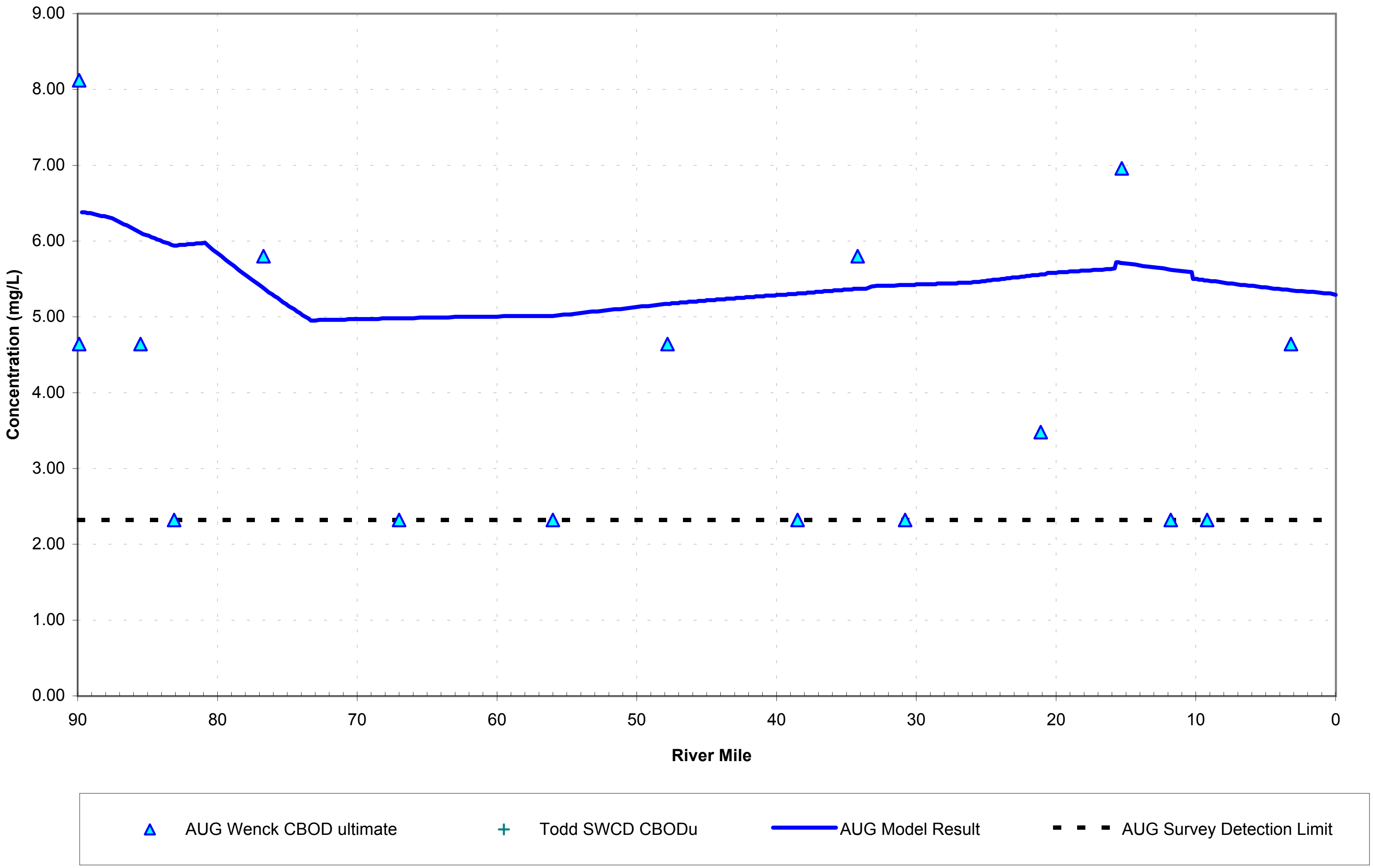
August Model vs Monitored outside of Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-7

MPCA Long Prairie River Watershed TMDL Final Project Report
CBODu Profile

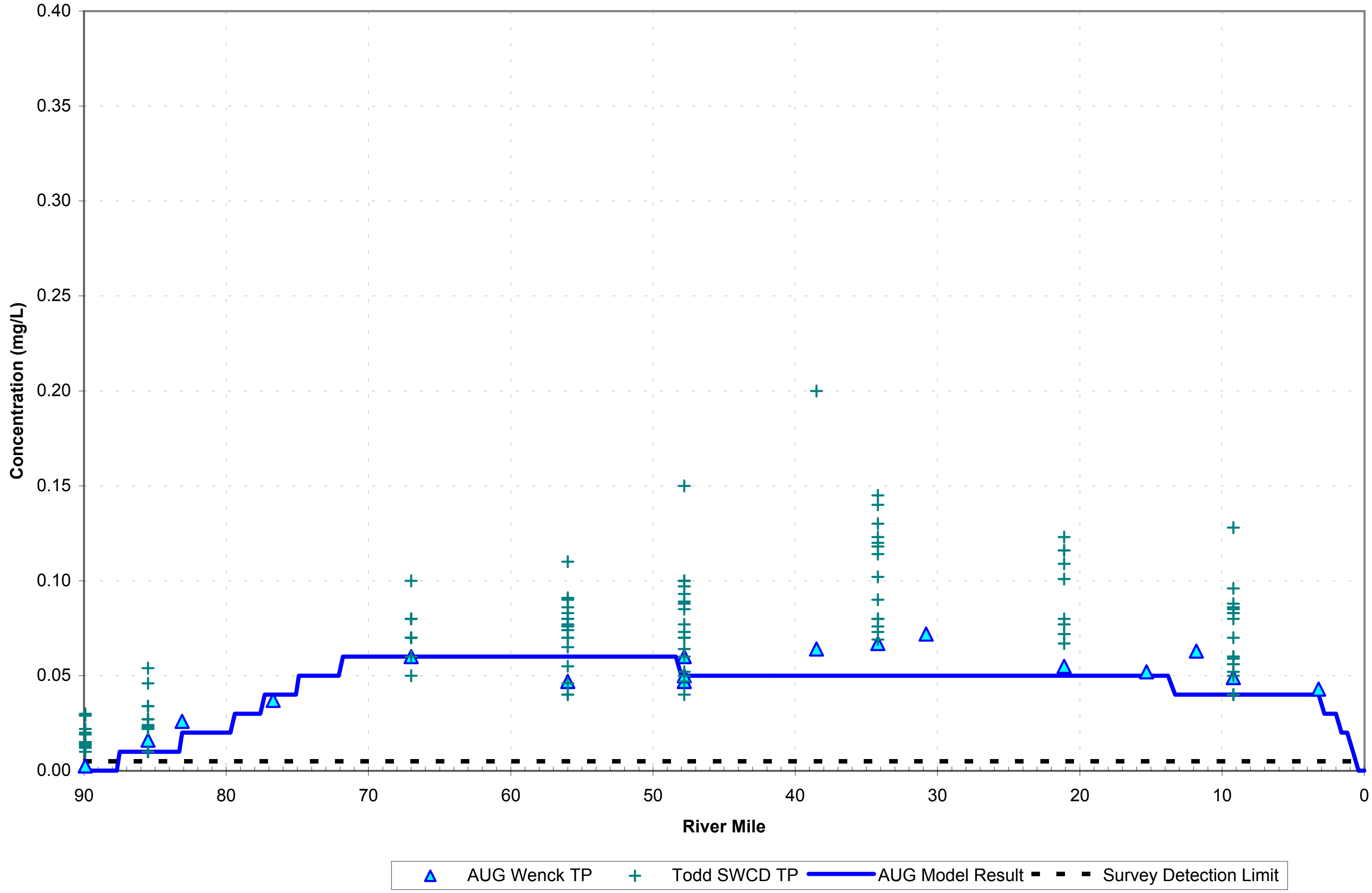
August Model vs Monitored outside of Permitted Discharge Period
(No Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-7

MPCA Long Prairie River Watershed TMDL Final Project Report
TP Profile

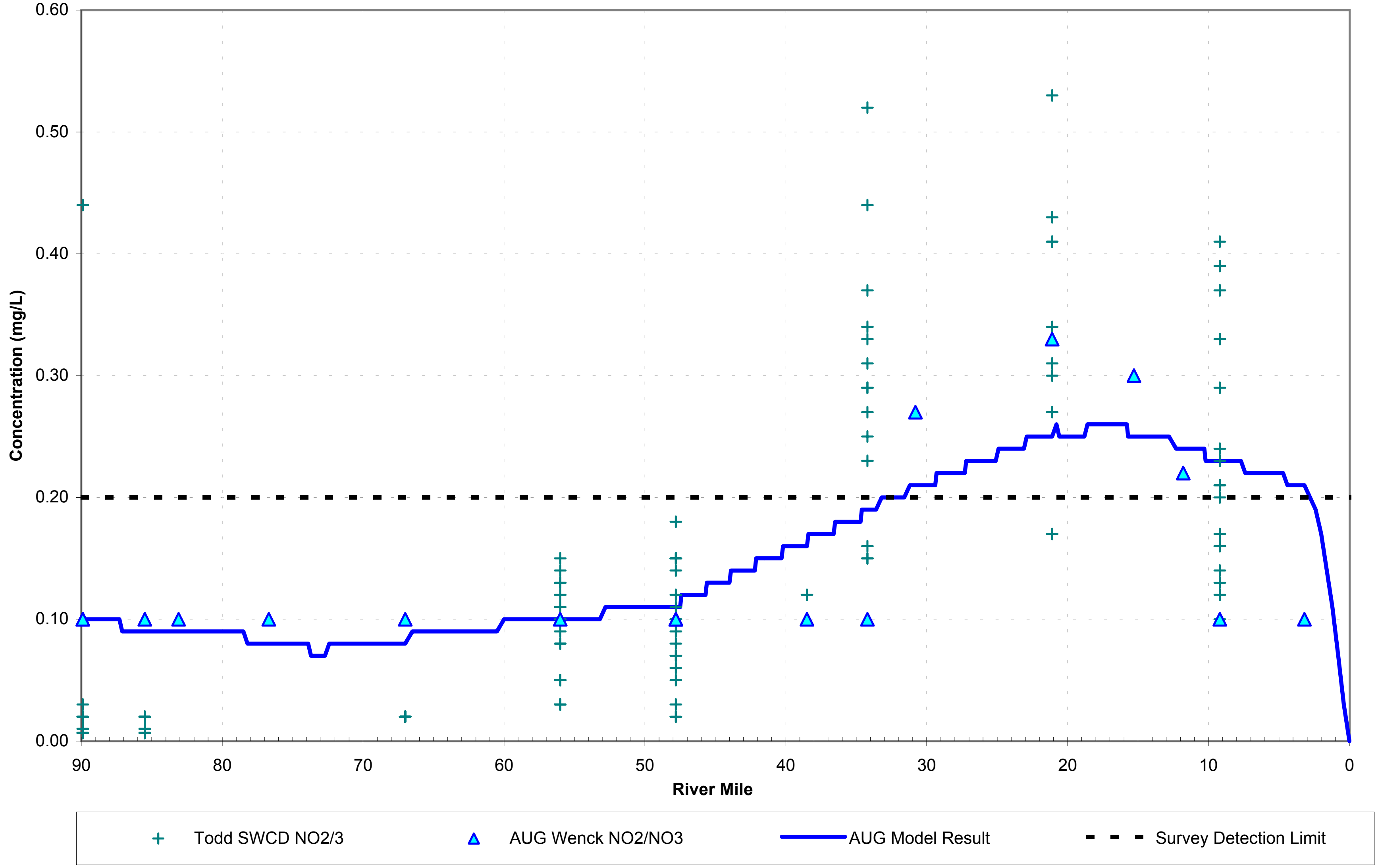
August Model vs Monitored outside of Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



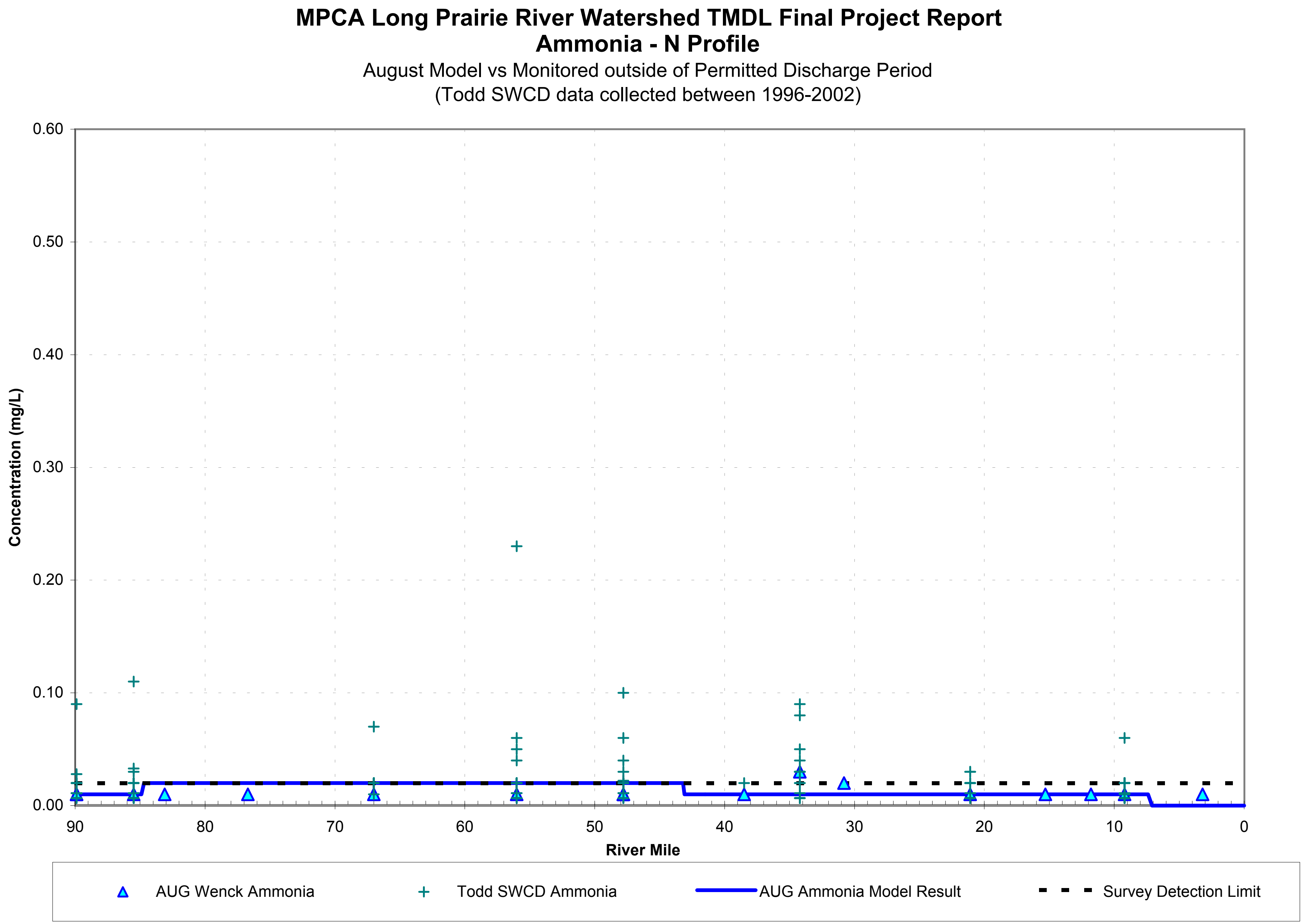
Appendix F, Figure F-7

MPCA Long Prairie River Watershed TMDL Final Project Report
NO2+3 Profile

August Model vs Monitored outside of Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



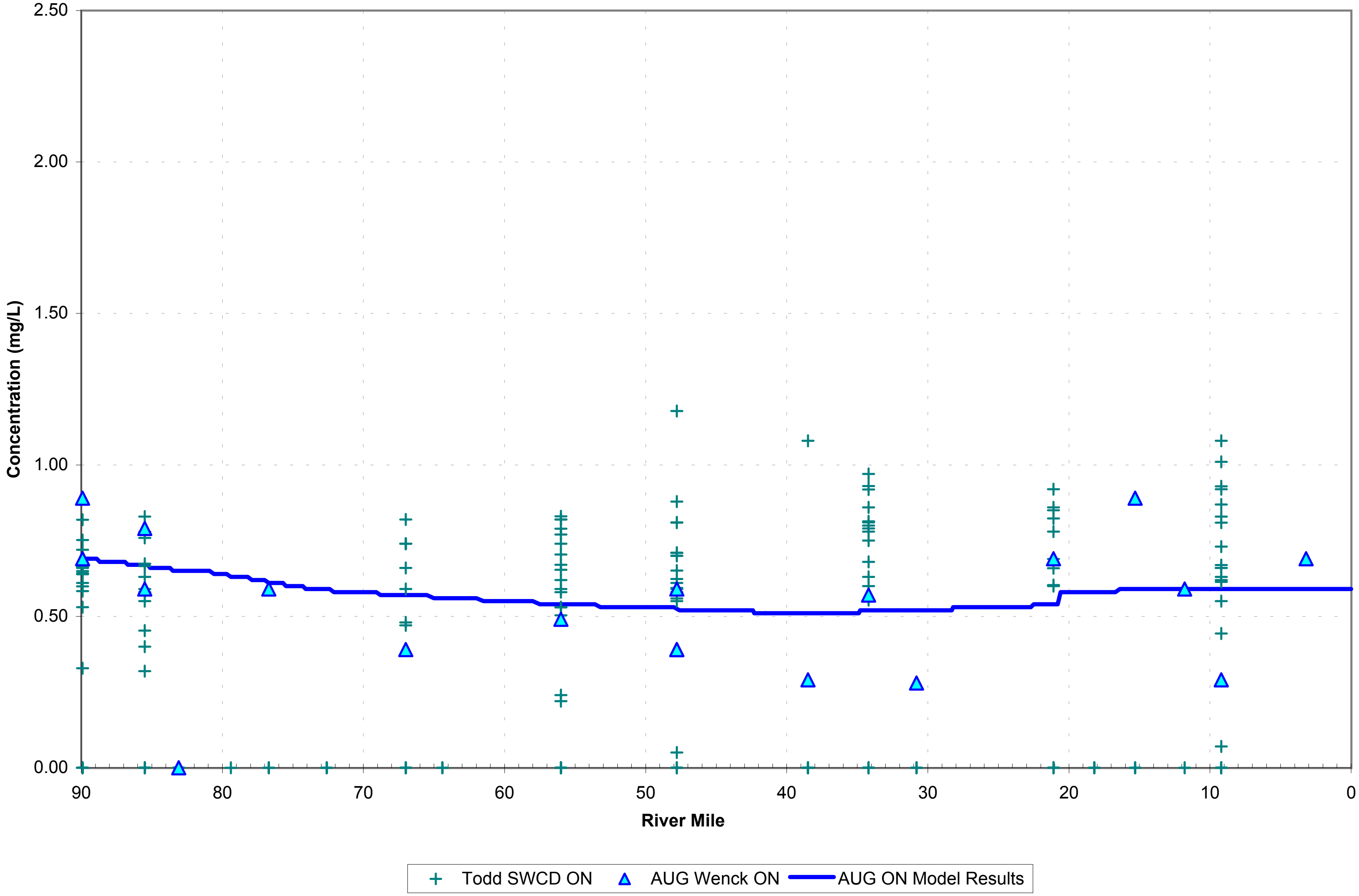
Appendix F, Figure F-7



Appendix F, Figure F-7

MPCA Long Prairie River Watershed TMDL Final Project Report
ON Profile

August Model vs Monitored outside of Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



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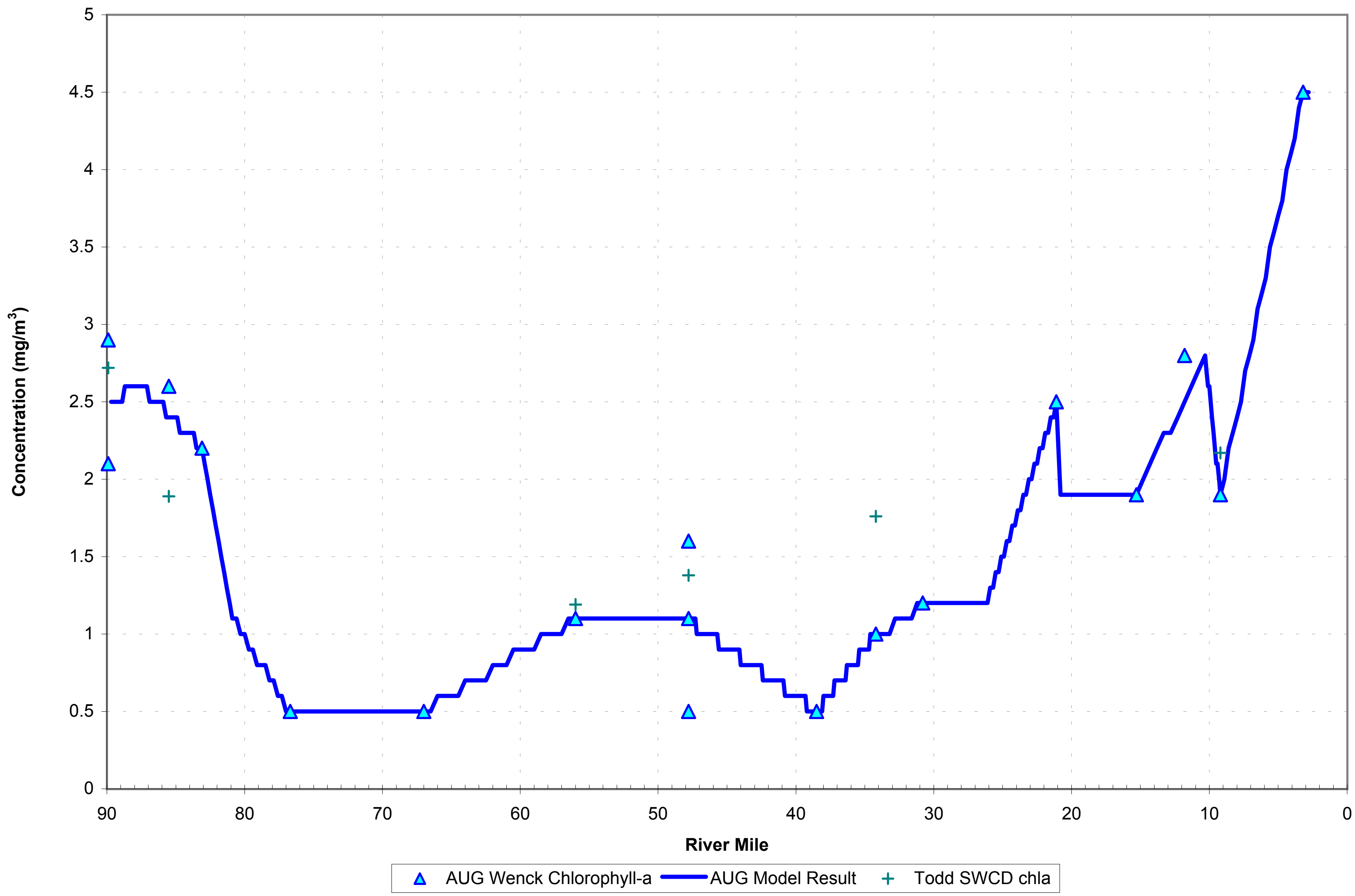
Wenck Associates, Inc.

Appendix F, Figure F-7

MPCA Long Prairie River Watershed TMDL Final Project Report
Chlorophyll-a Profile
August Model vs Monitored outside of Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)

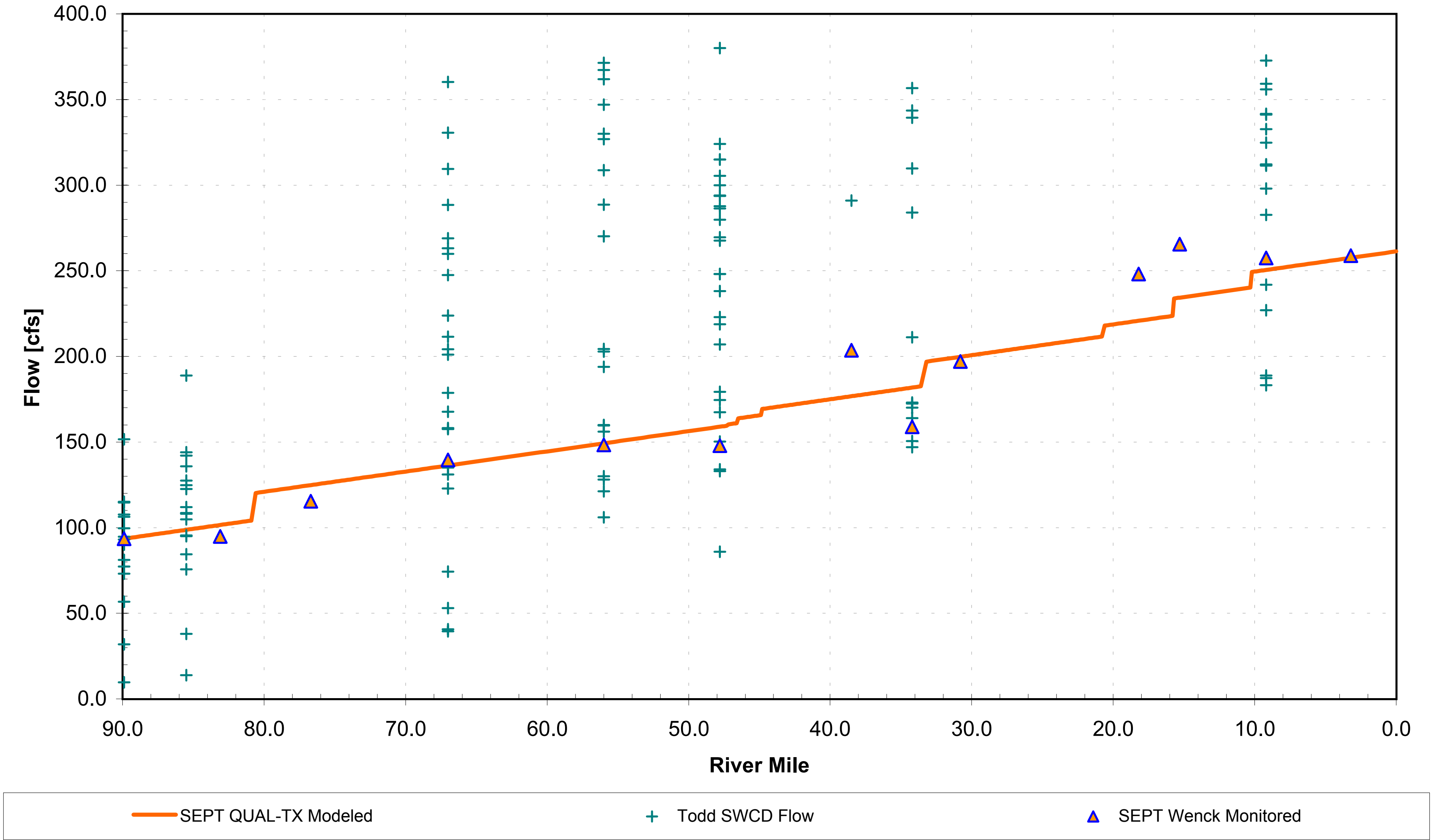


Appendix F, Figure F-8

MPCA Long Prairie River Watershed TMDL Final Project Report

Discharge Profile

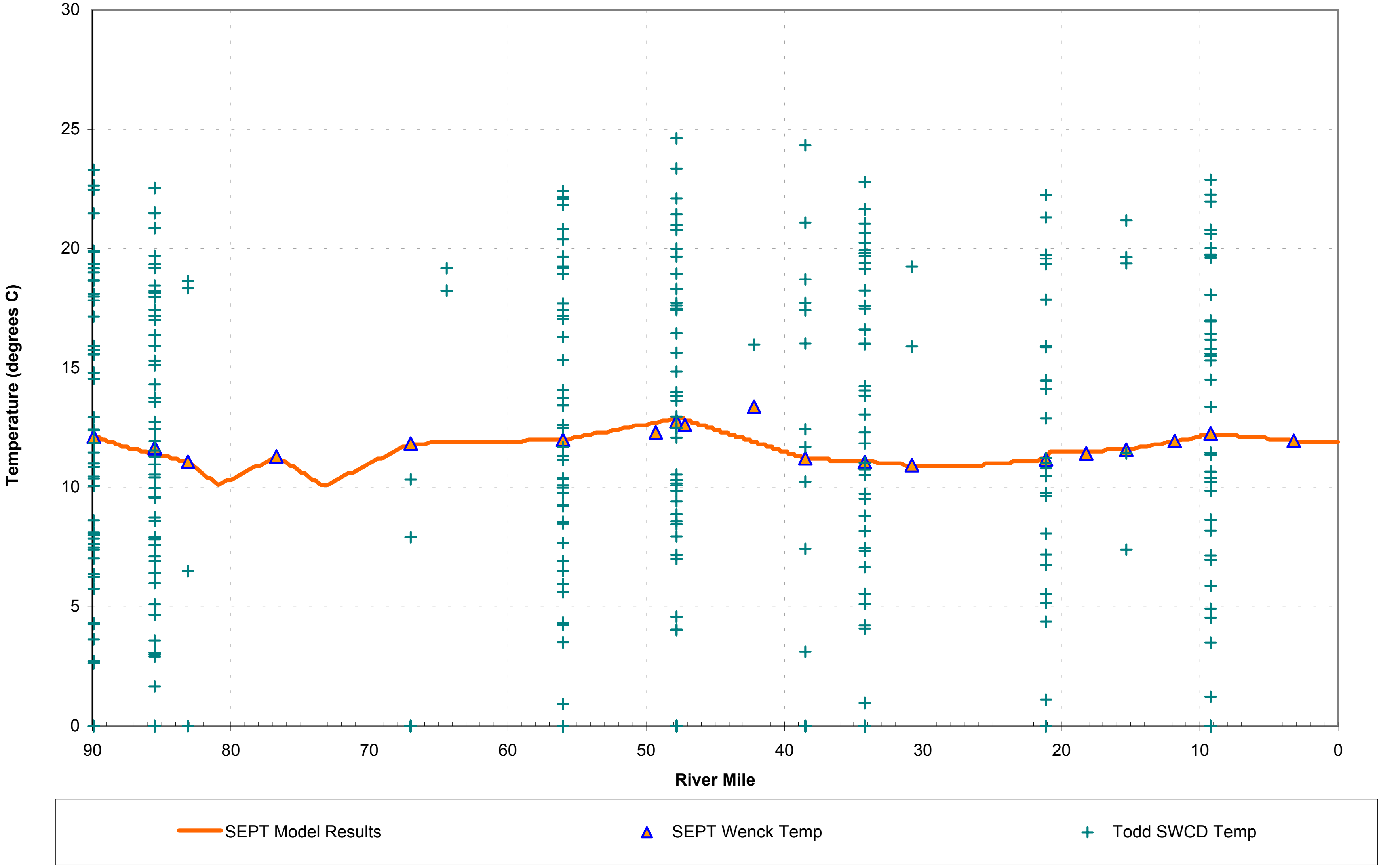
September Model vs Monitored during Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-8

MPCA Long Prairie River Watershed TMDL Final Project Report
Temperature Profile

September Model vs Monitored during Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)

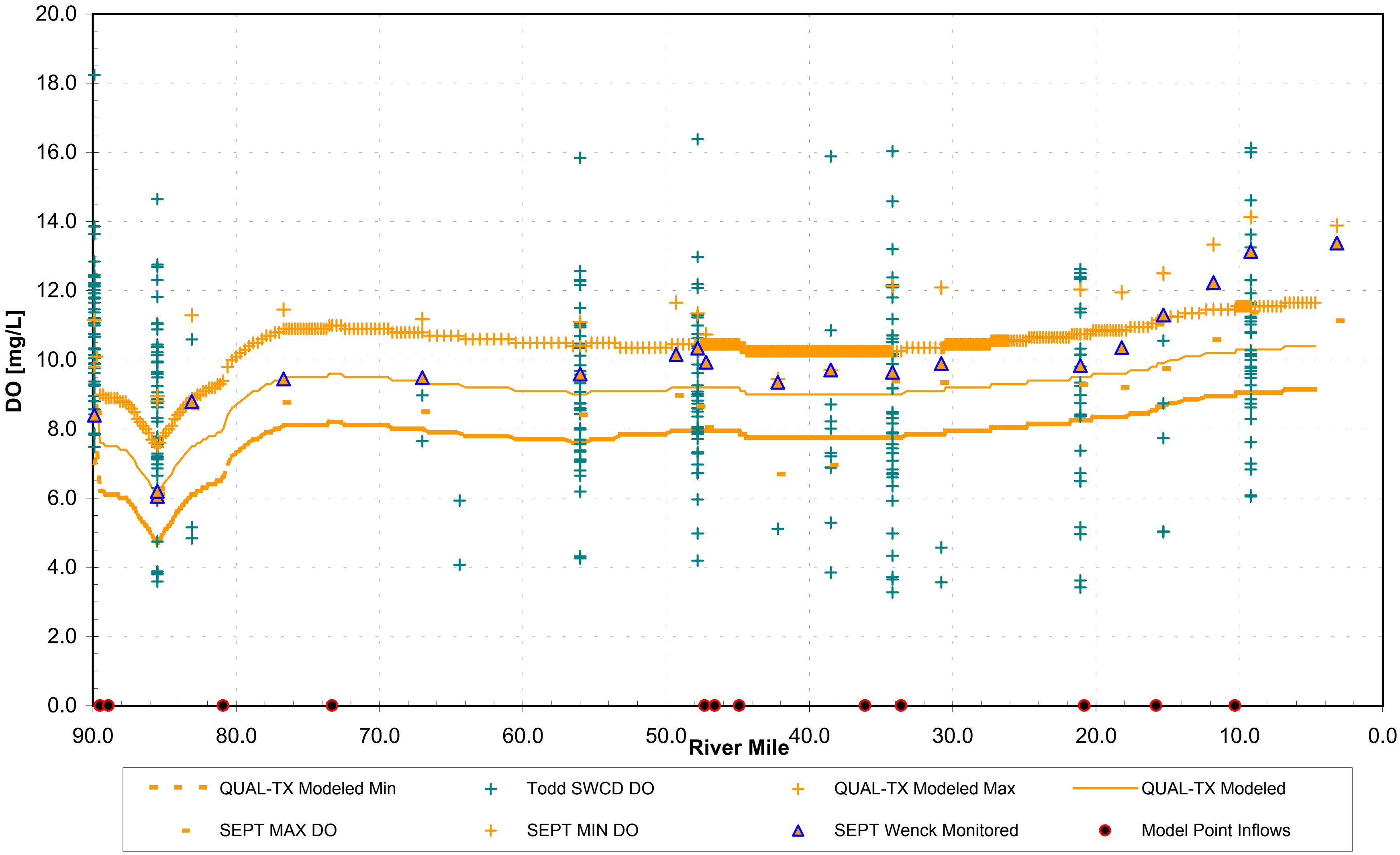


Appendix F, Figure F-8

MPCA Long Prairie River Watershed TMDL Final Project Report

Dissolved Oxygen Profile

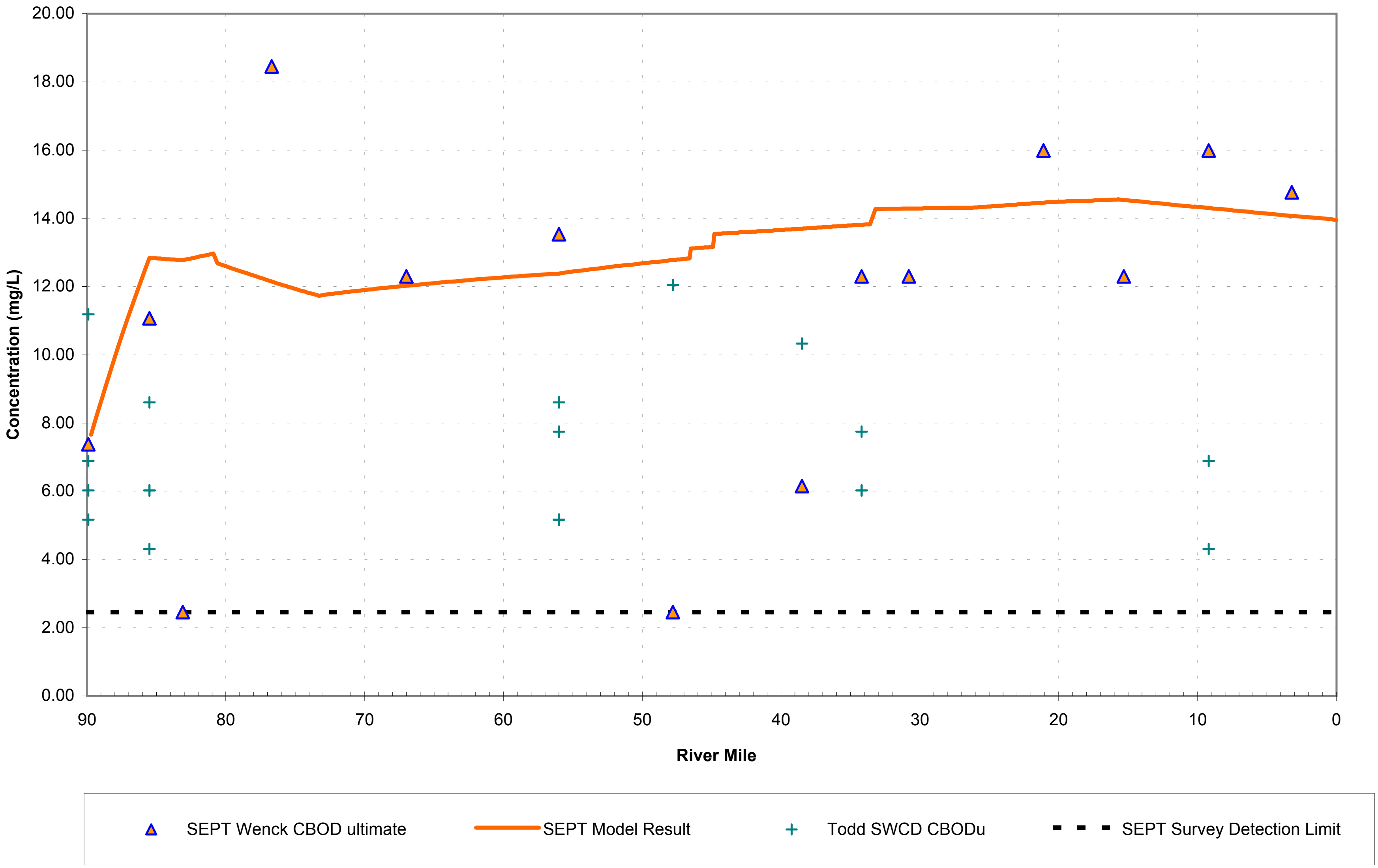
September Model vs Monitored during Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-8

MPCA Long Prairie River Watershed TMDL Final Project Report
CBODu Profile

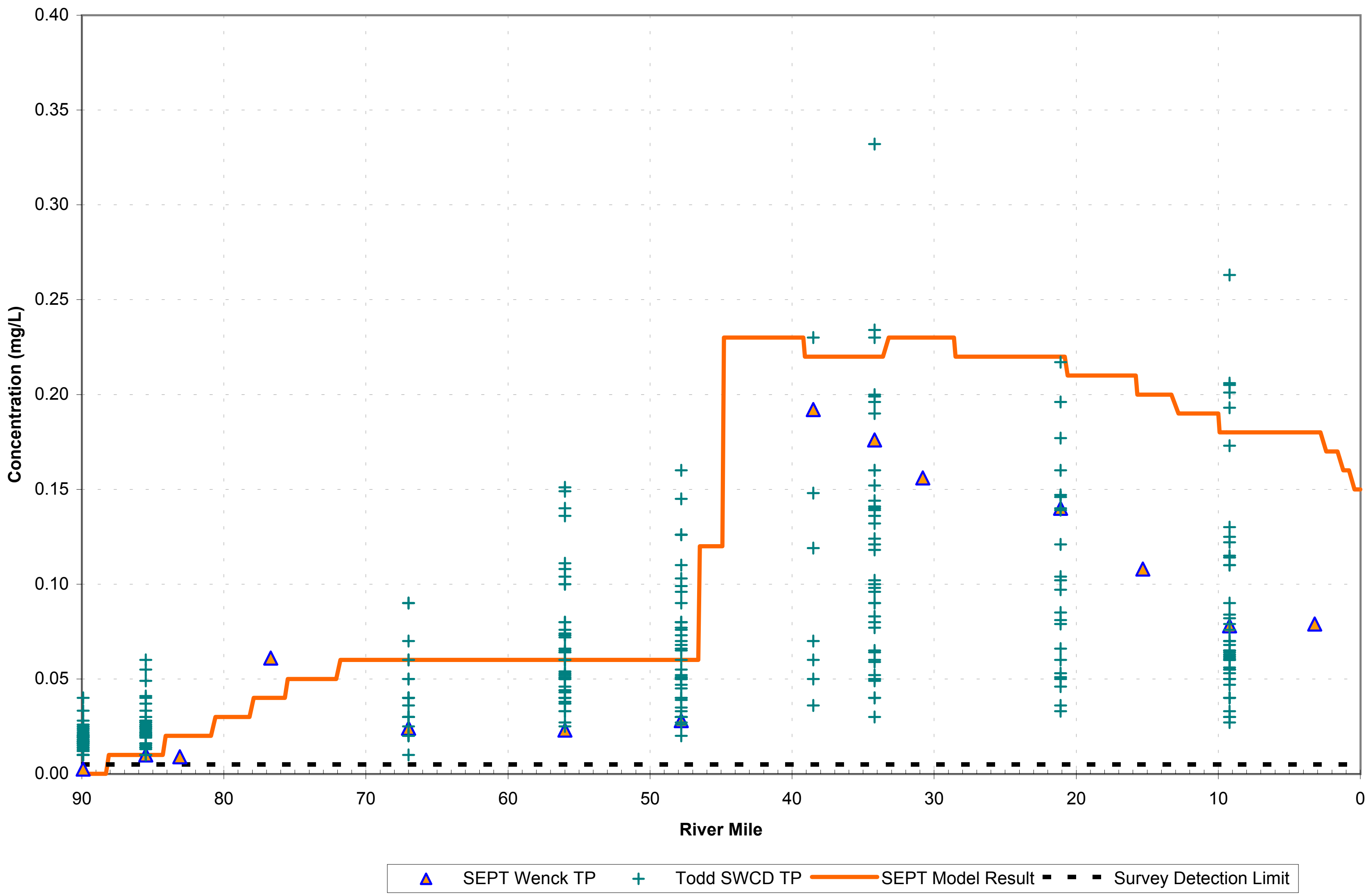
September Model vs Monitored during Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-8

MPCA Long Prairie River Watershed TMDL Final Project Report
TP Profile

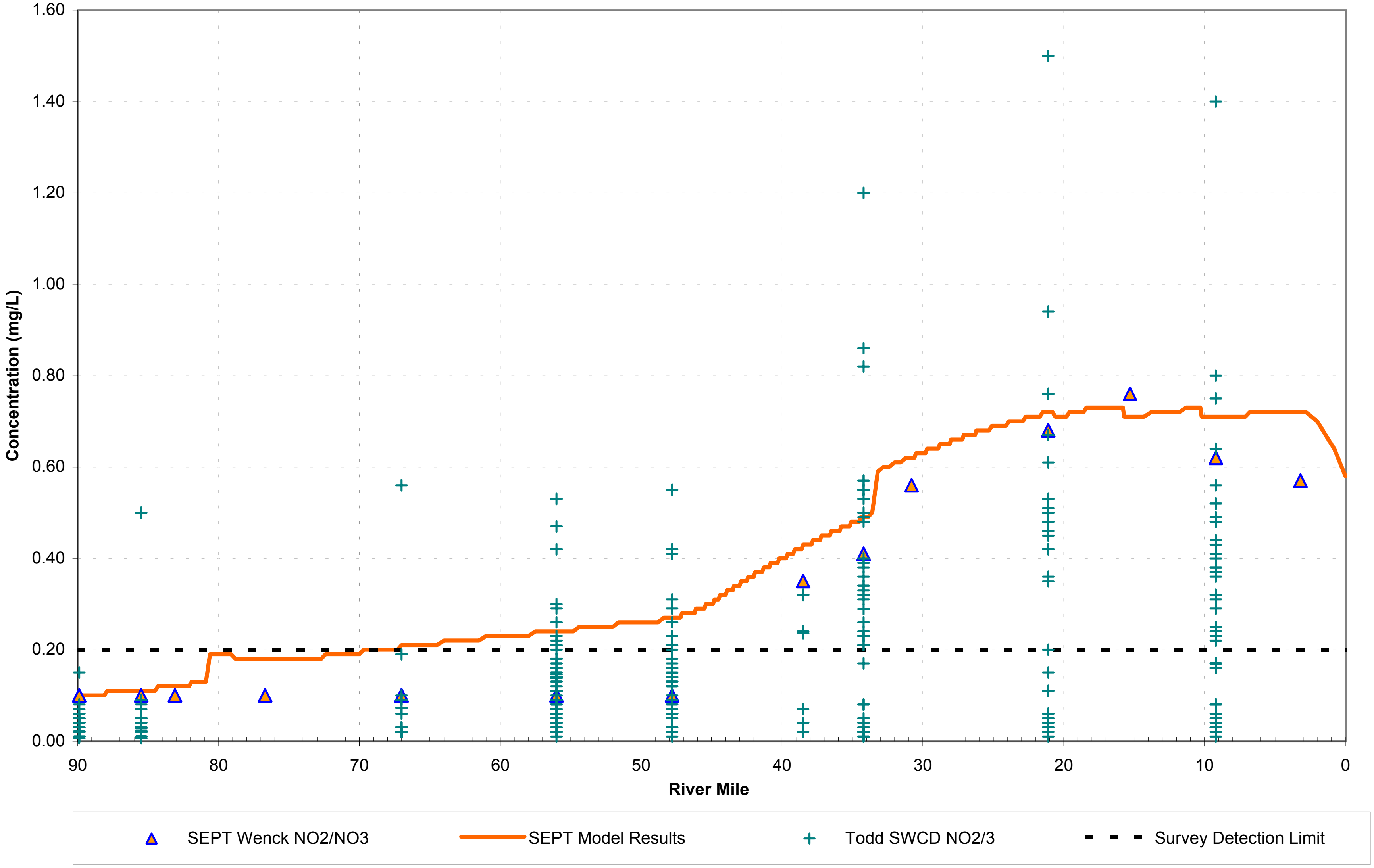
September Model vs Monitored during Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-8

MPCA Long Prairie River Watershed TMDL Final Project Report
NO2+3 Profile

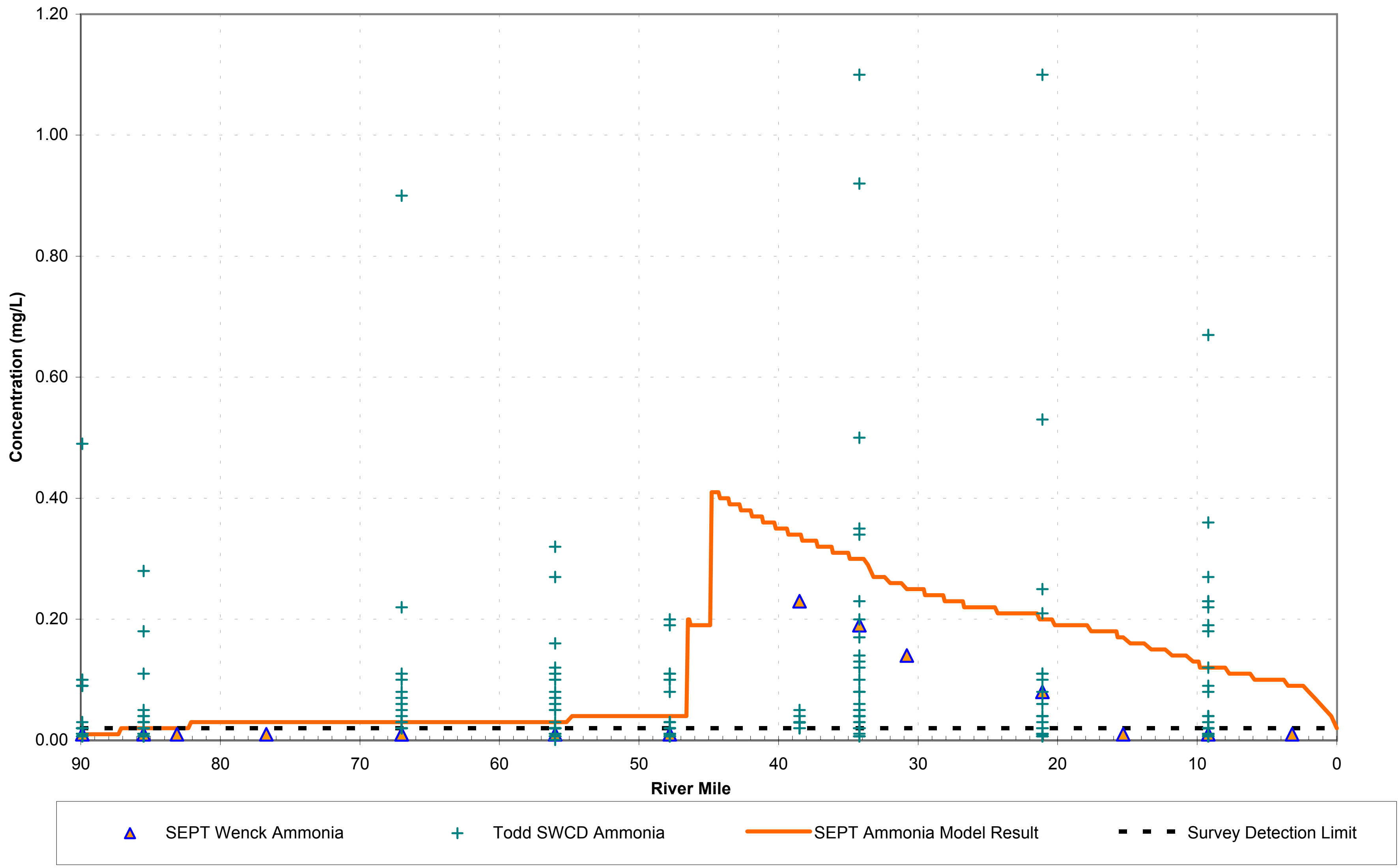
September Model vs Monitored during Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-8

MPCA Long Prairie River Watershed TMDL Final Project Report
Ammonia-N Profile

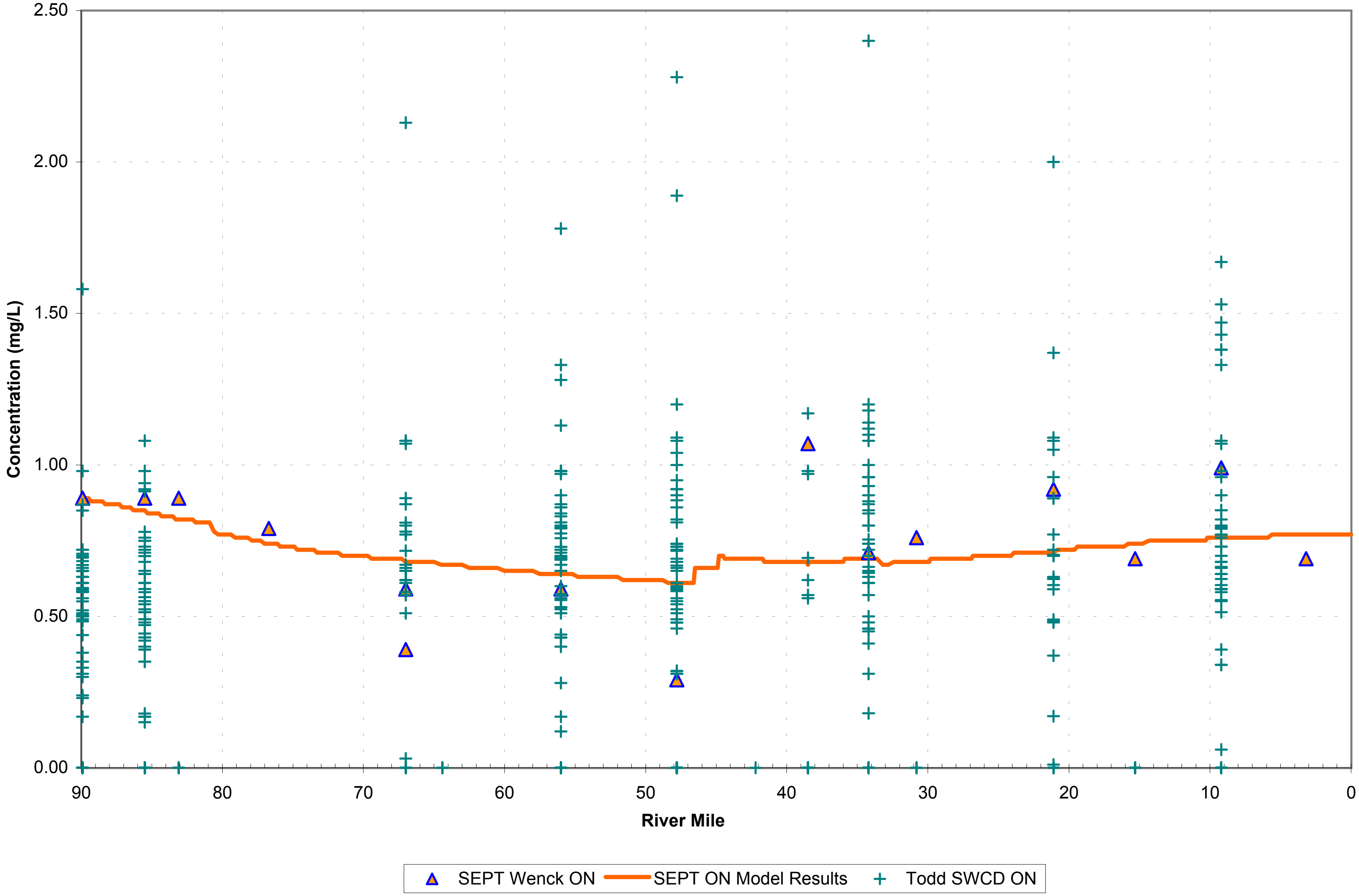
September Model vs Monitored during Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-8

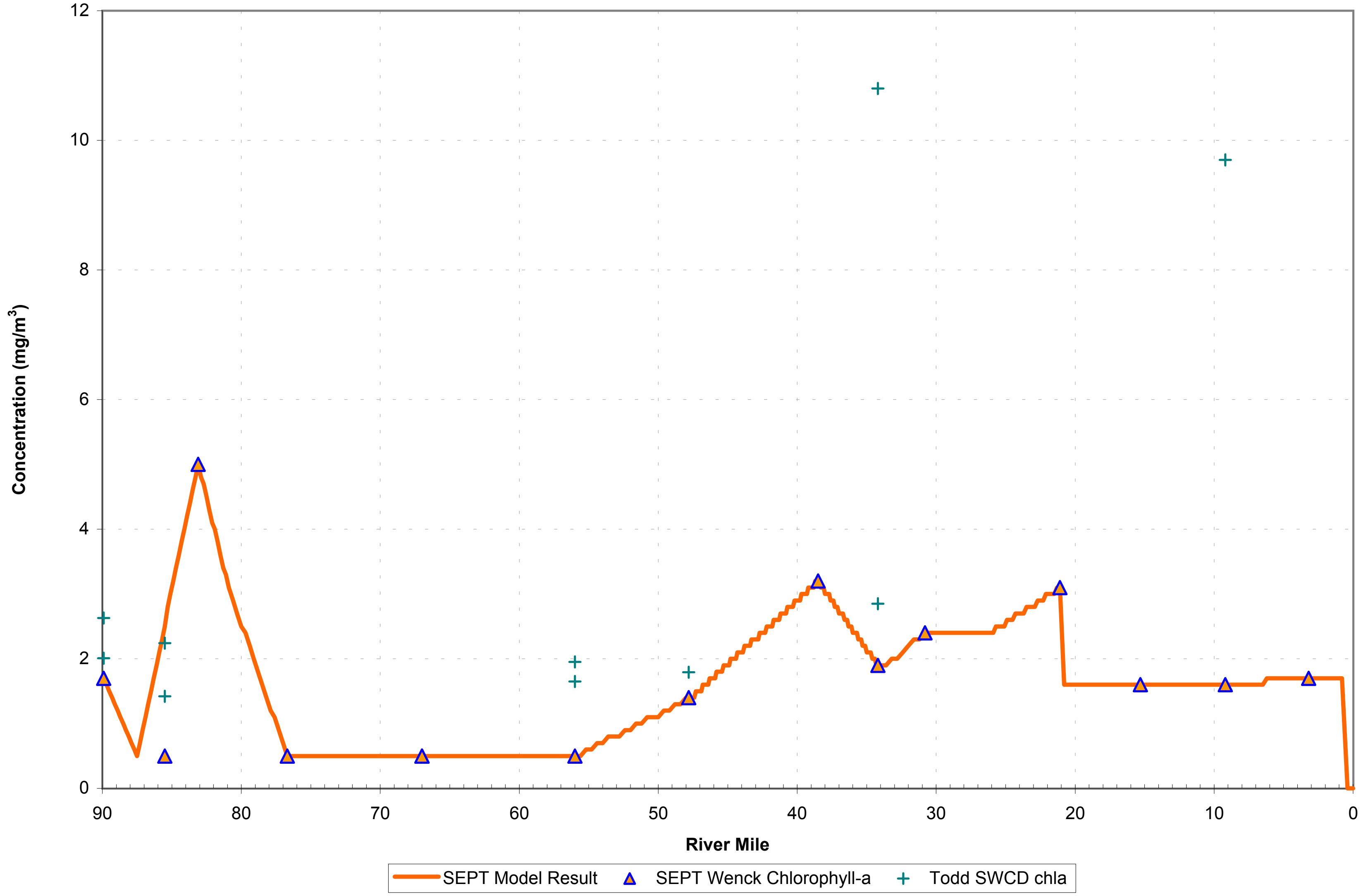
MPCA Long Prairie River Watershed TMDL Final Project Report
ON Profile

September Model vs Monitored during Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-8

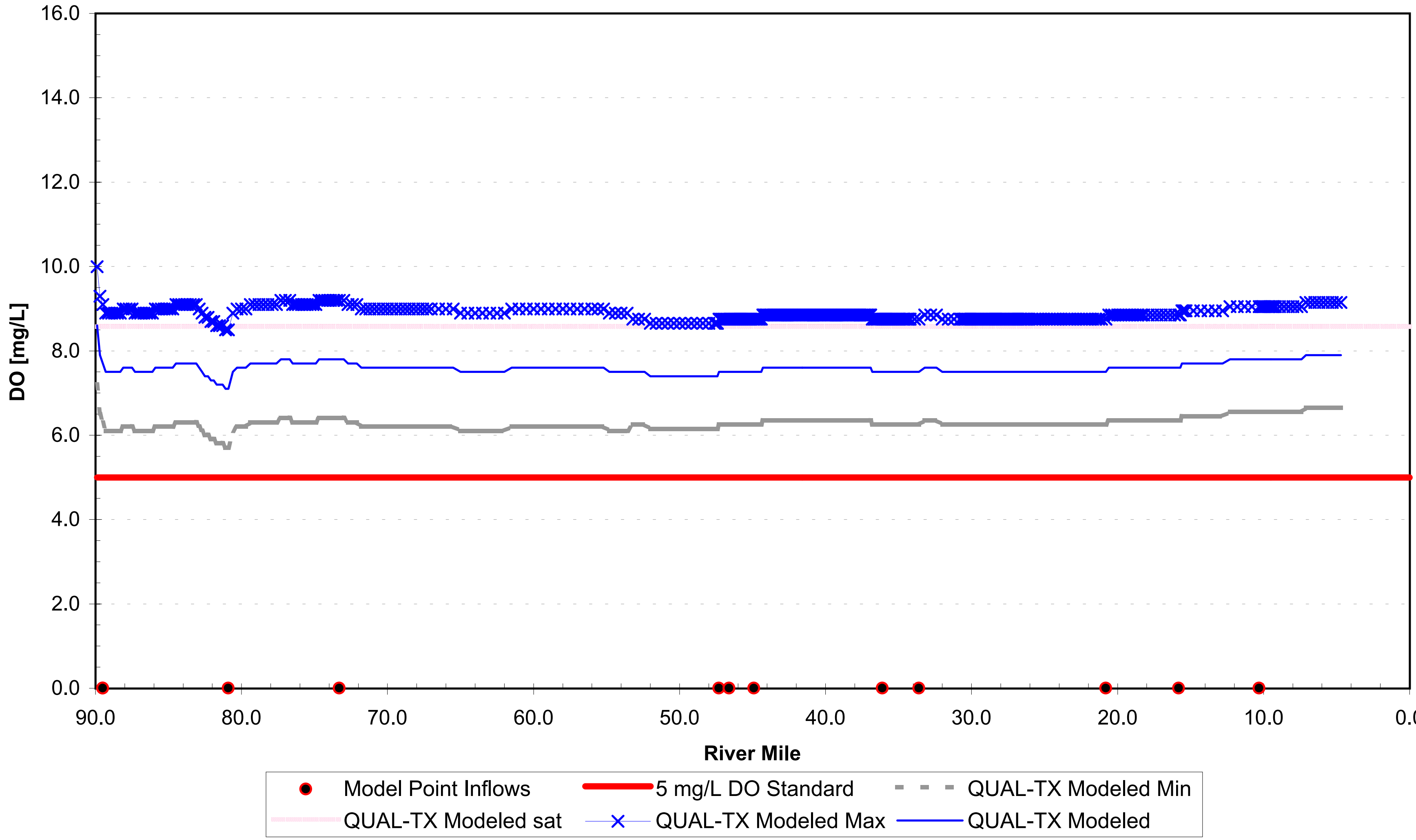
MPCA Long Prairie River Watershed TMDL Final Project Report
Chlorophyll-a Profile
September Model vs Monitored during Permitted Discharge Period
(Todd SWCD data collected between 1996-2002)



Appendix F, Figure F-9

MPCA Long Prairie River Watershed TMDL Final Project Report

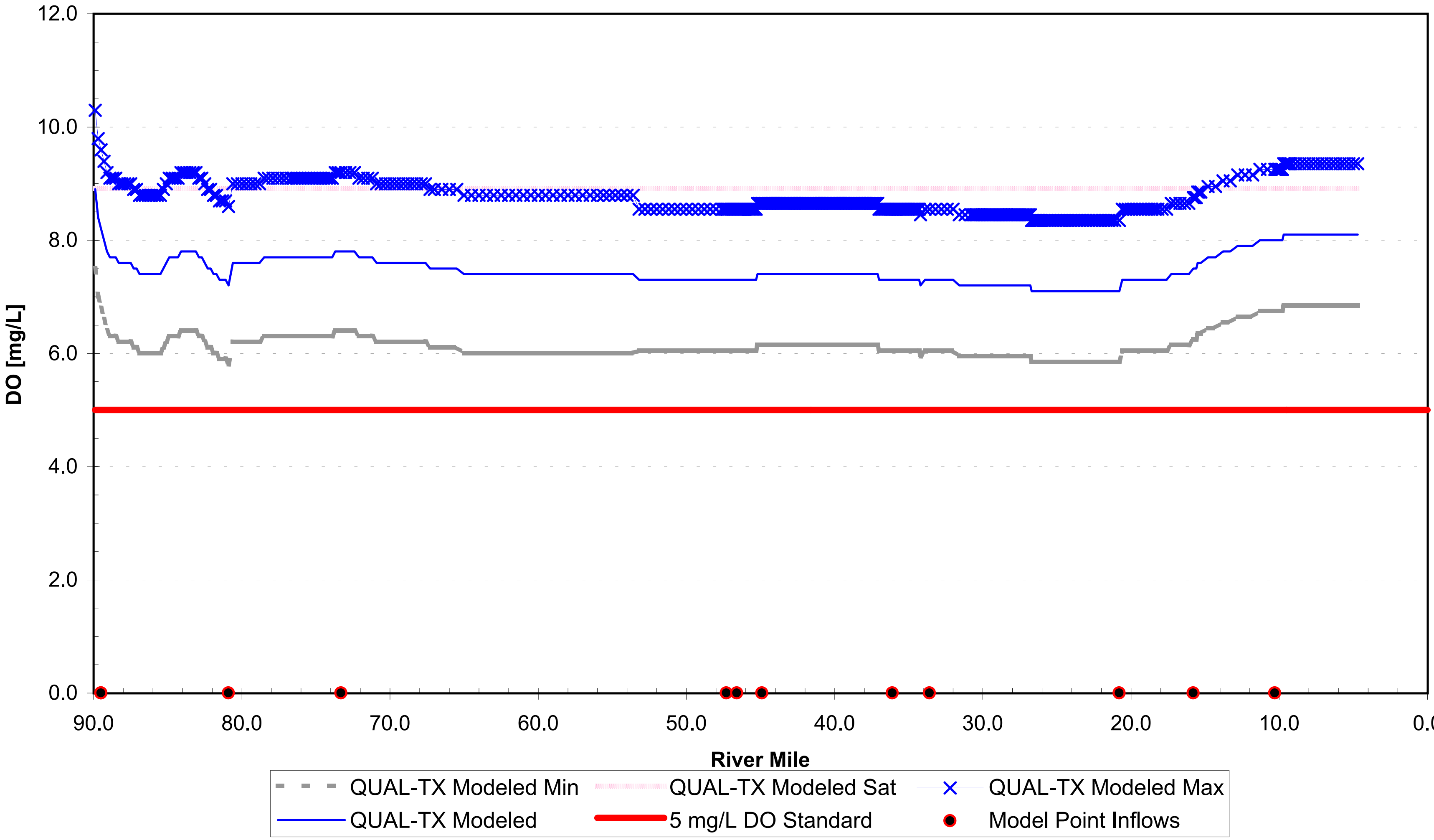
Long Prairie River Profile Graphs: QUAL-TX Summer 7Q10 DO Critical Conditions without Point Sources



Appendix F, Figure F-9

MPCA Long Prairie River Watershed TMDL Final Project Report

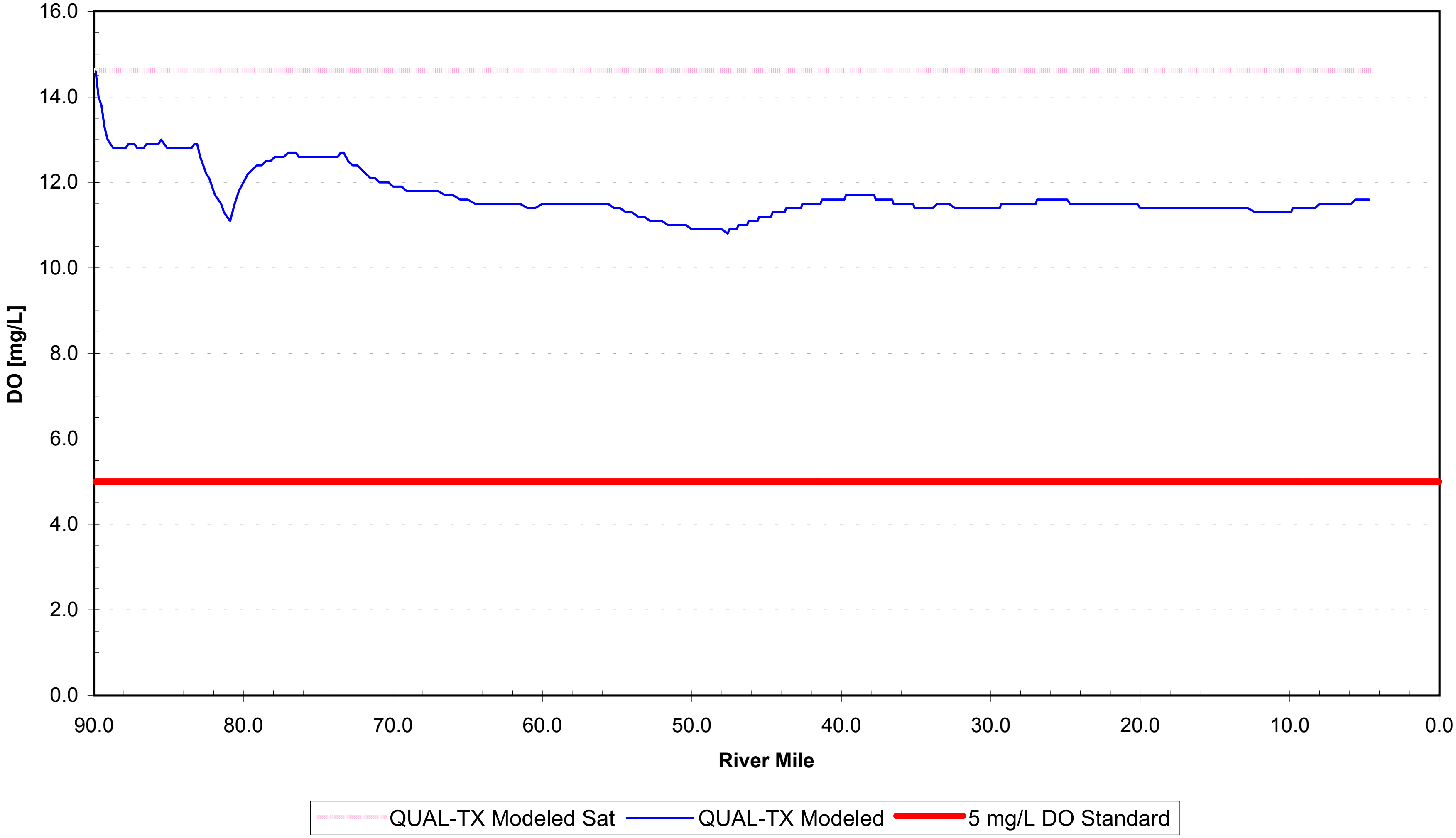
Long Prairie River Profile Graphs:
QUAL-TX Spring 7Q10 DO
Critical Conditions without Point Sources



Appendix F, Figure F-9

MPCA Long Prairie River Watershed TMDL Final Project Report

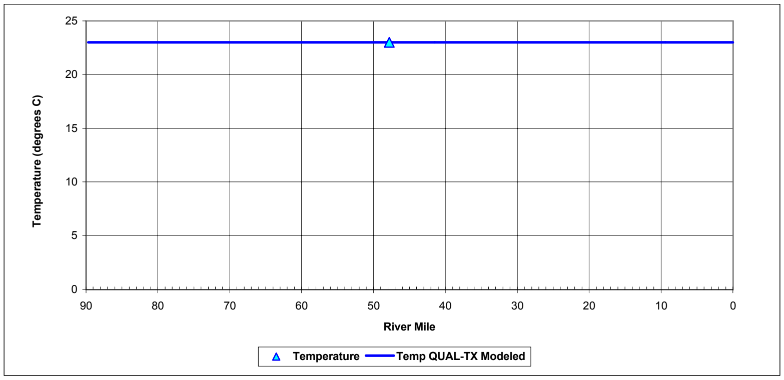
Long Prairie River Profile Graphs: QUAL-TX Winter 7Q10 DO Critical Conditions without Point Sources

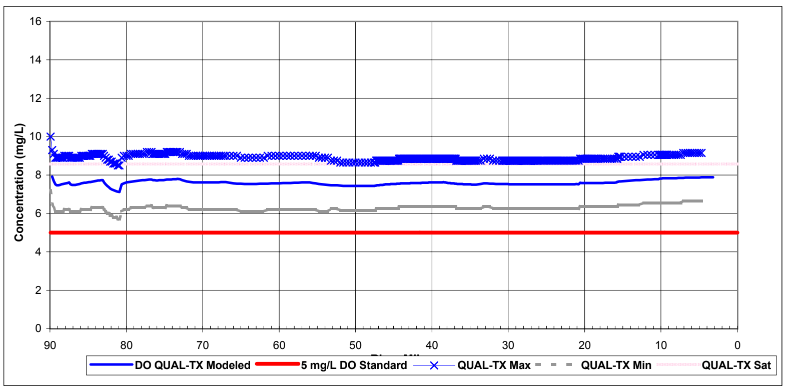


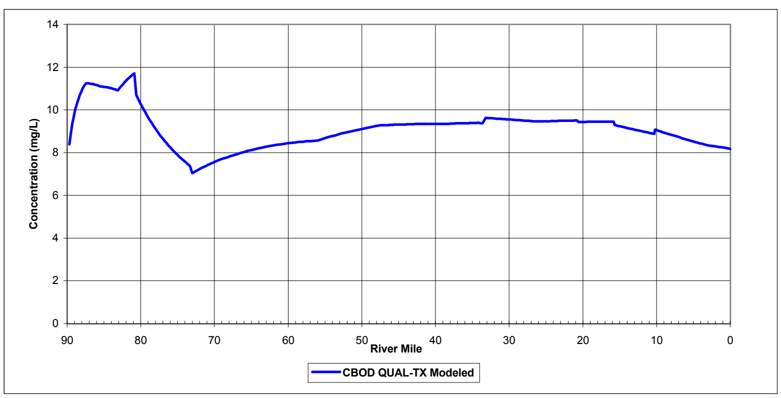
Appendix F, Figure F-9

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Summer 7Q10
Critical Conditions without Point Sources



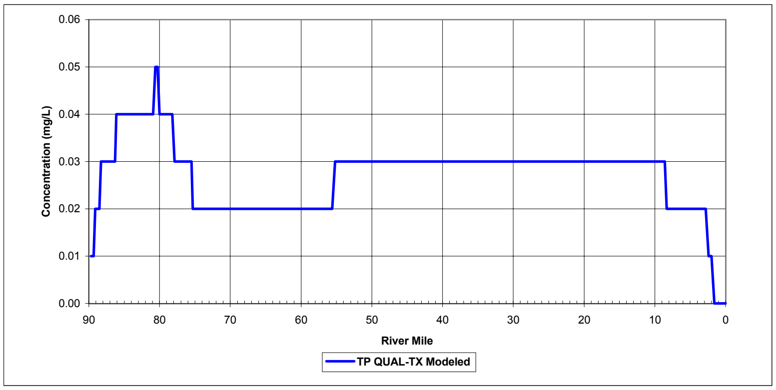


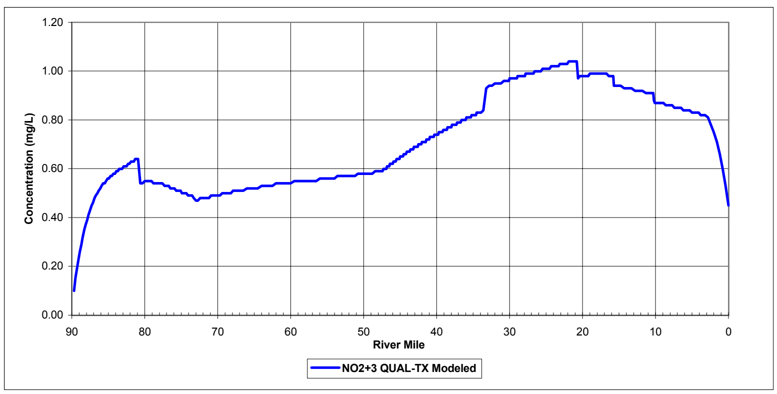


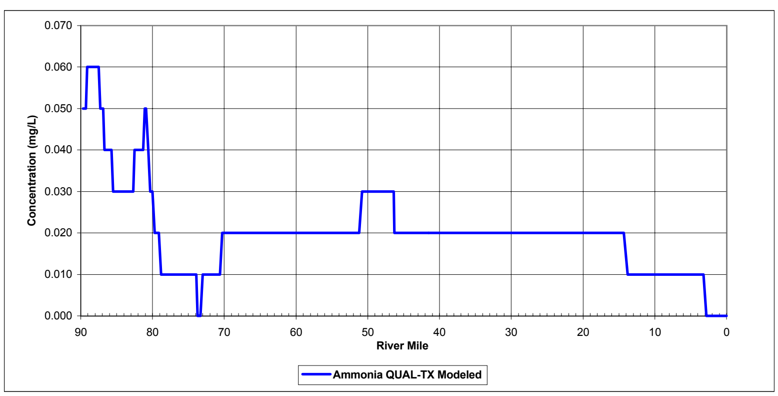
Appendix F, Figure F-9

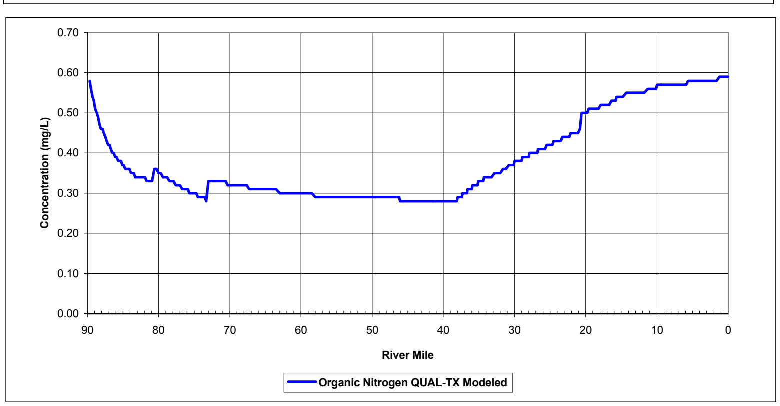
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Summer 7Q10
Critical Conditions without Point Sources





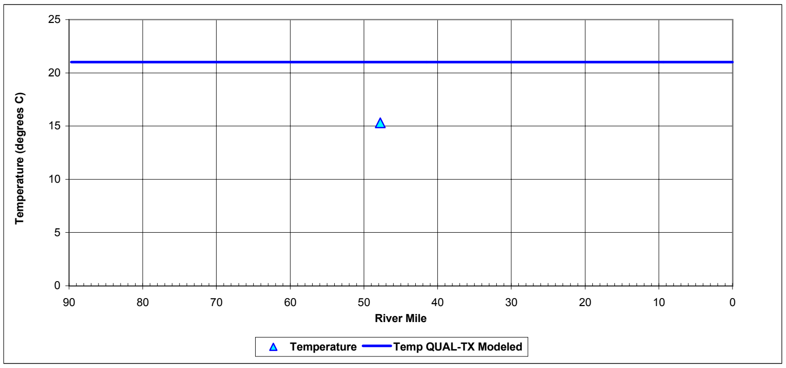


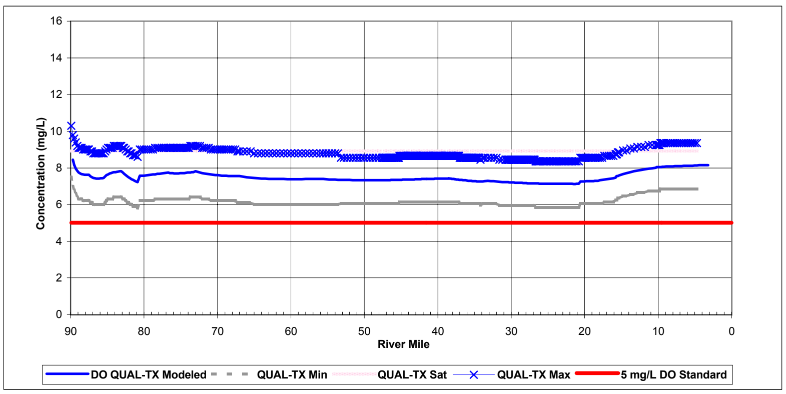


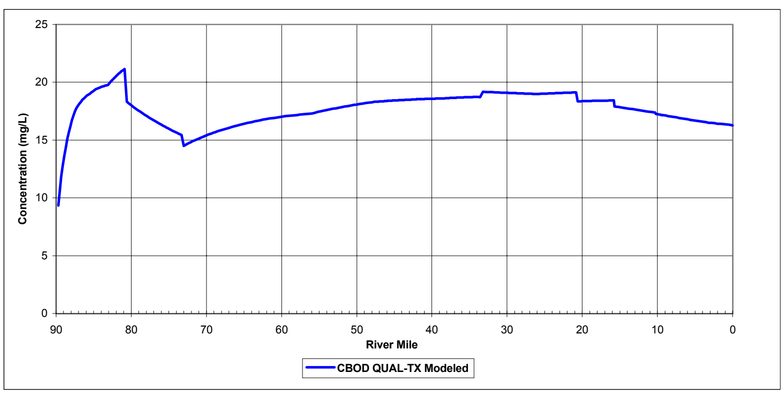
Appendix F, Figure F-9

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Spring 7Q10
Critical Conditions without Point Sources



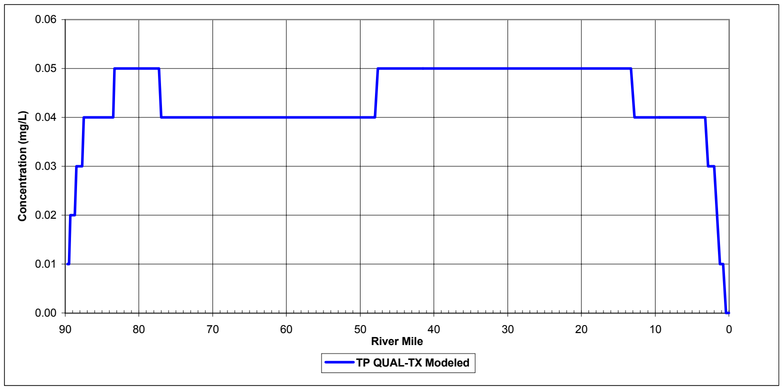


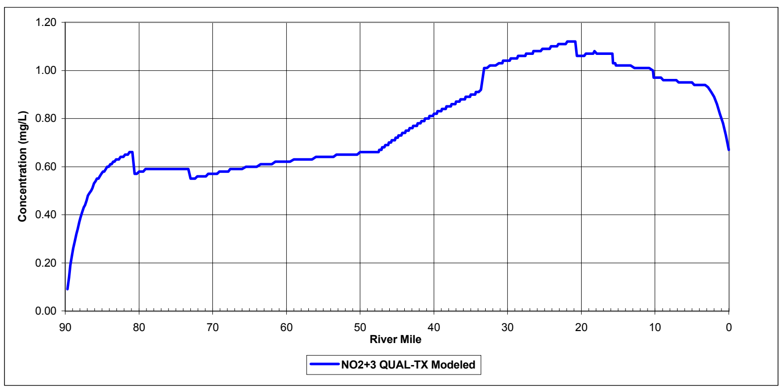


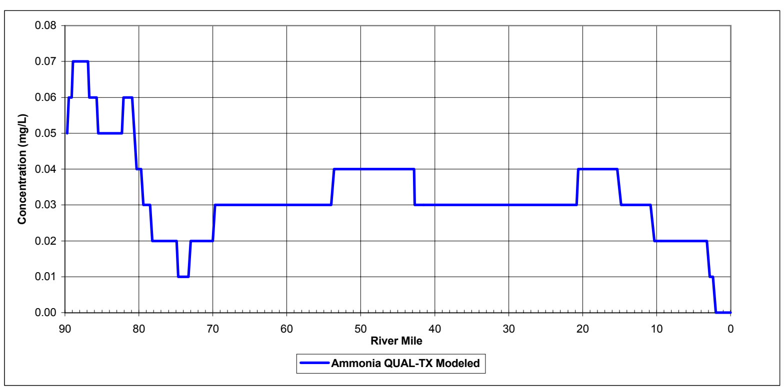
Appendix F, Figure F-9

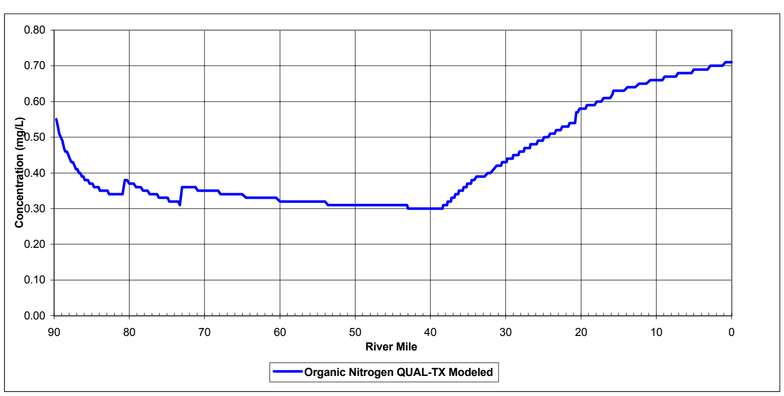
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Spring 7Q10
Critical Conditions without Point Sources





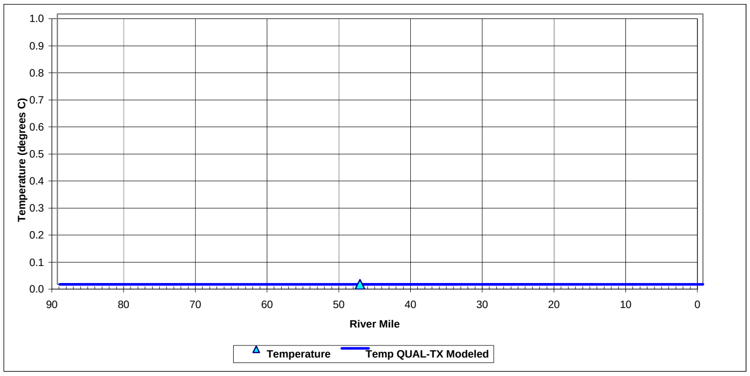


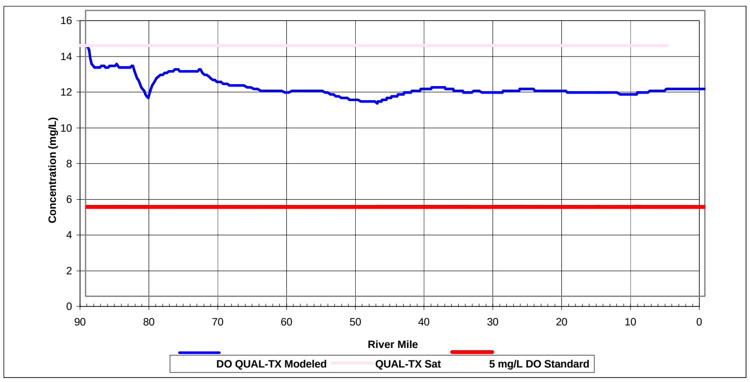


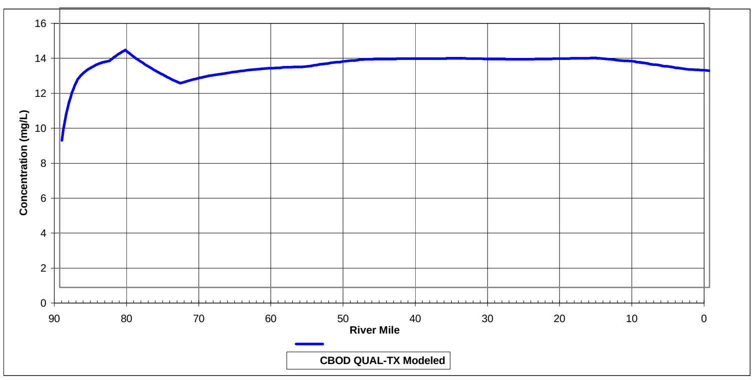
Appendix F, Figure F-9

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Winter 7Q10
Critical Conditions without Point Sources



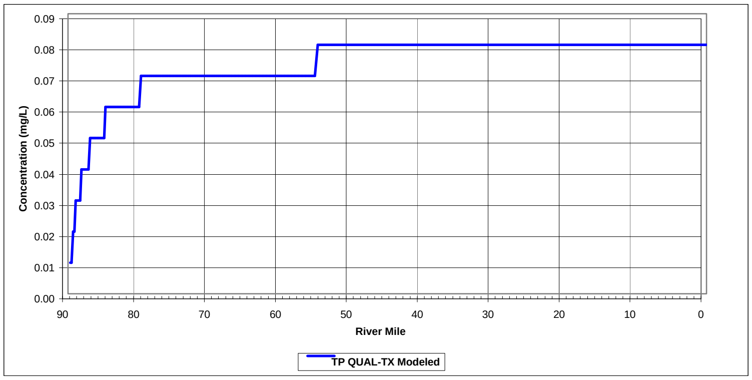


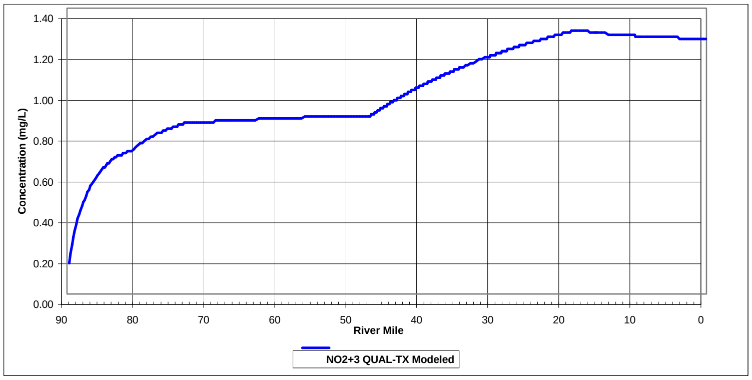


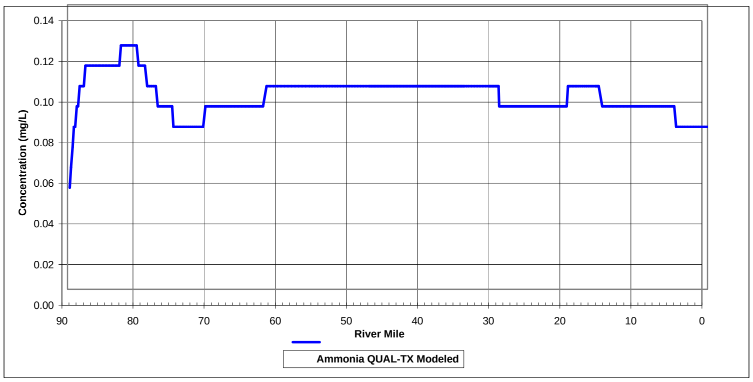
Appendix F, Figure F-9

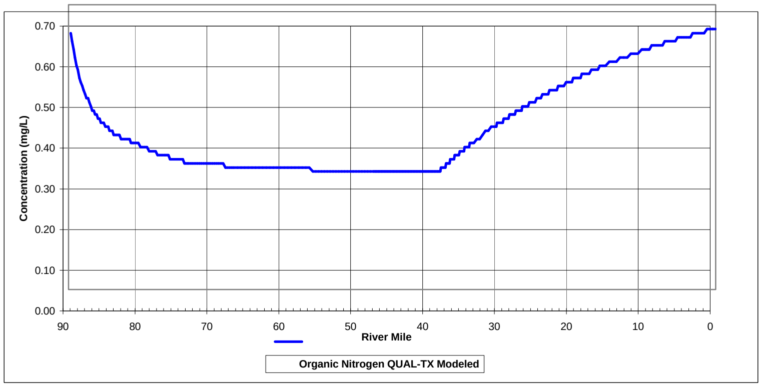
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Winter 7Q10
Critical Conditions without Point Sources





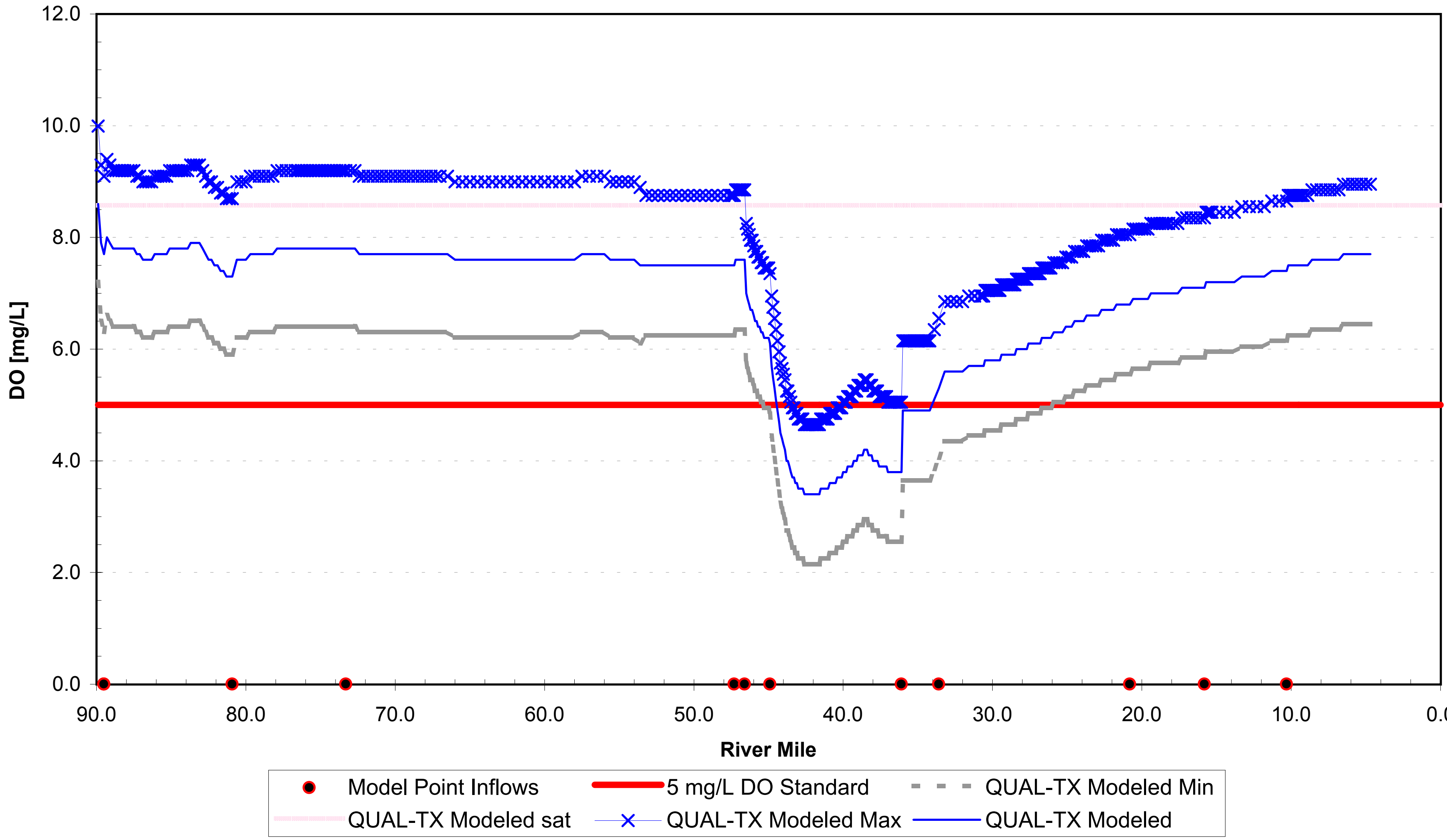




Appendix F, Figure F-10

MPCA Long Prairie River Watershed TMDL Final Project Report

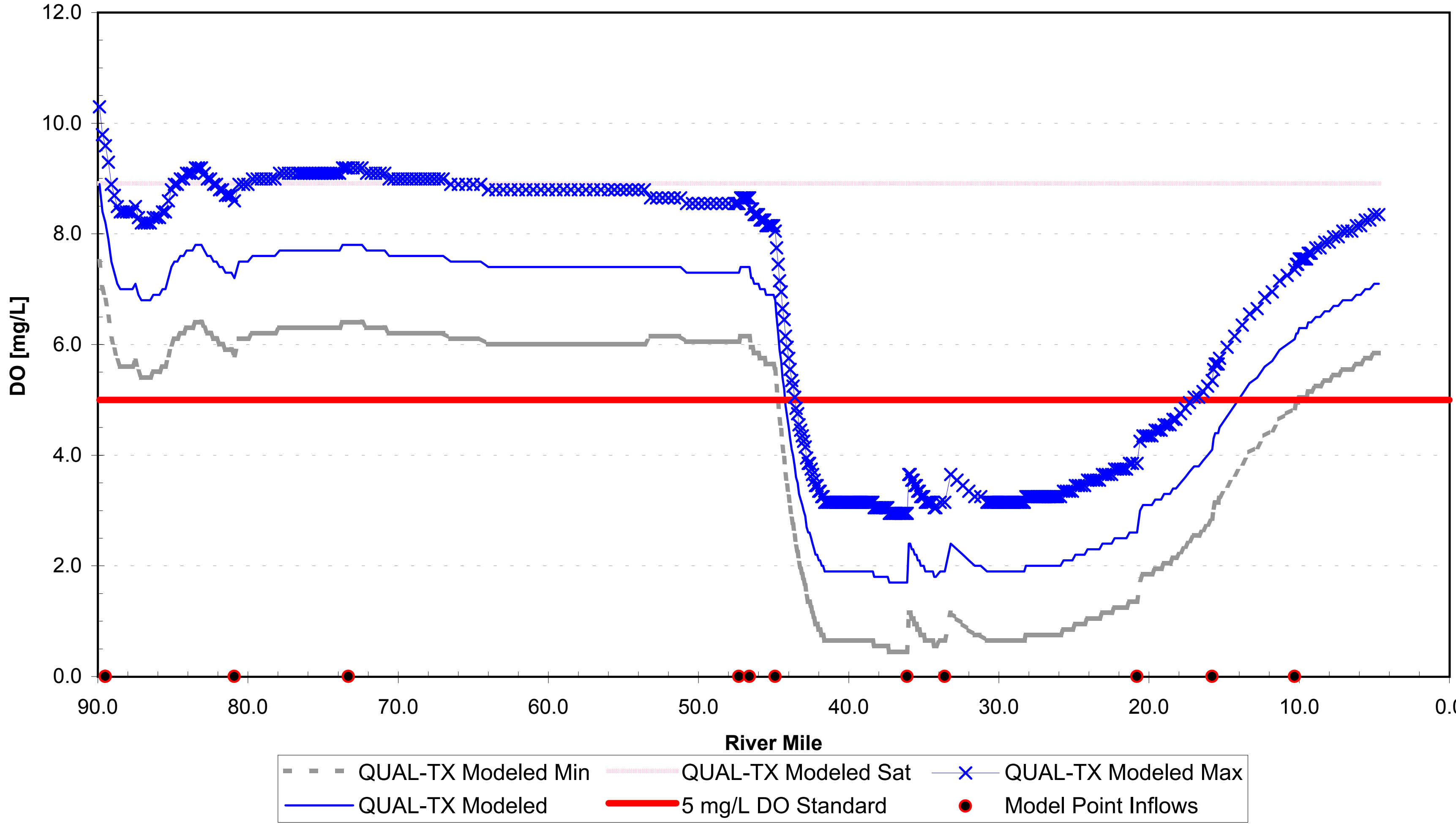
Long Prairie River Profile Graphs:
QUAL-TX Summer 7Q10 DO
Critical Conditions with Point Sources and no Load Reductions



Appendix F, Figure F-10

MPCA Long Prairie River Watershed TMDL Final Project Report

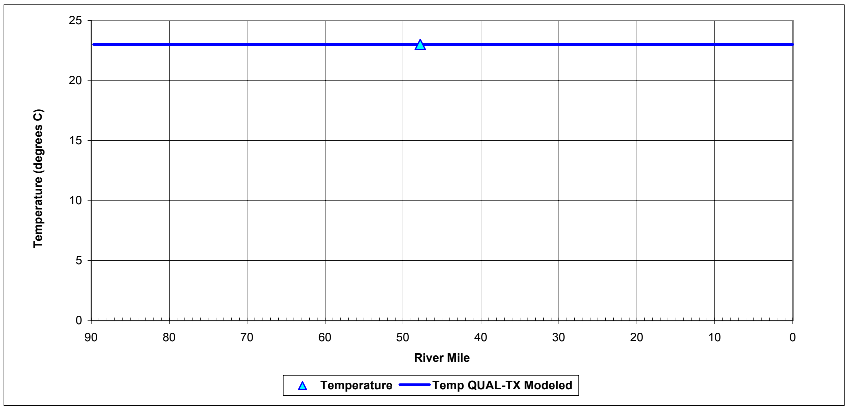
Long Prairie River Profile Graphs:
QUAL-TX Spring 7Q10 DO
Critical Conditions with Point Sources and no Load Reductions

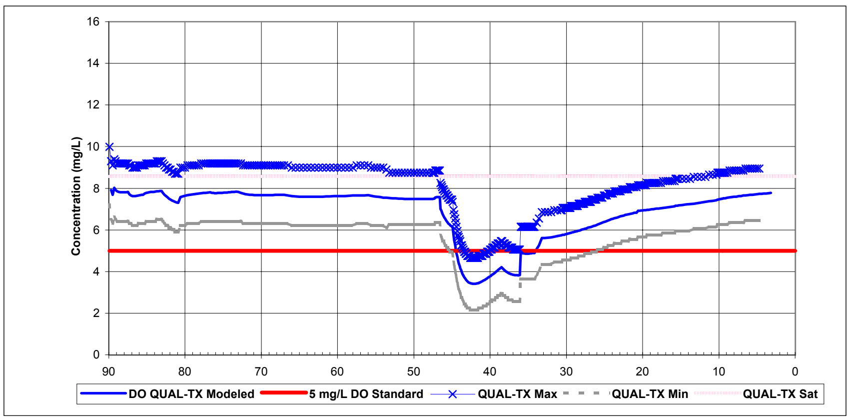


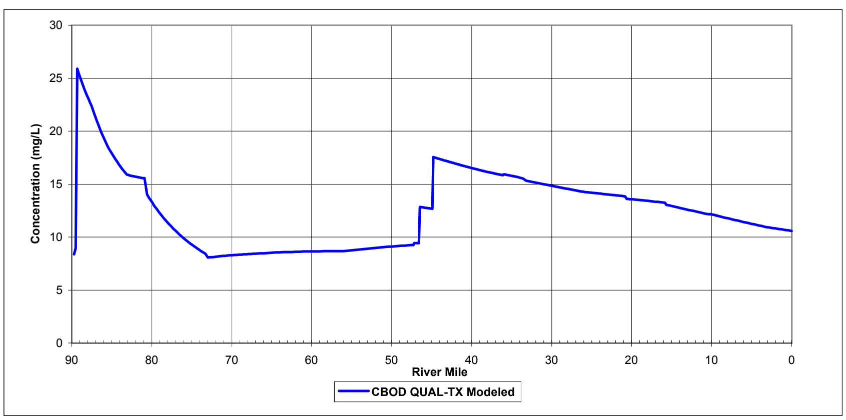
Appendix F, Figure F-10

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Summer 7Q10
Critical Conditions with Point Sources and no Load Reductions



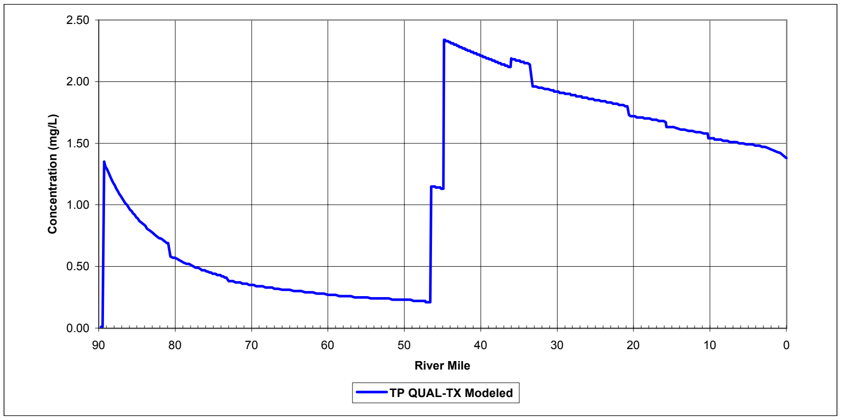


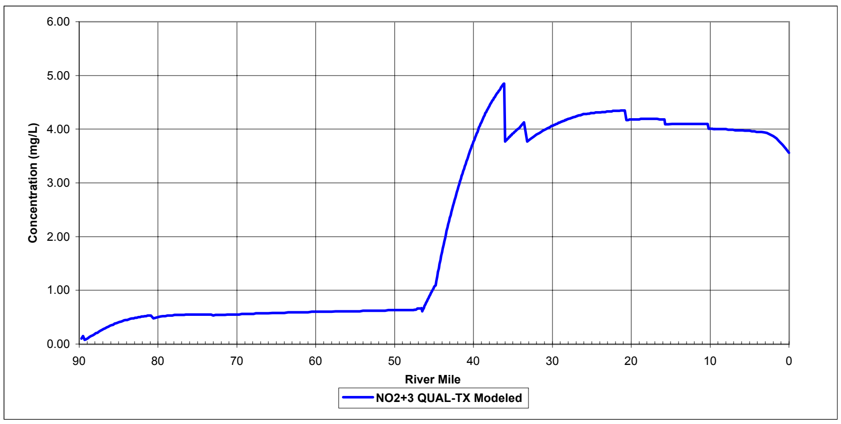


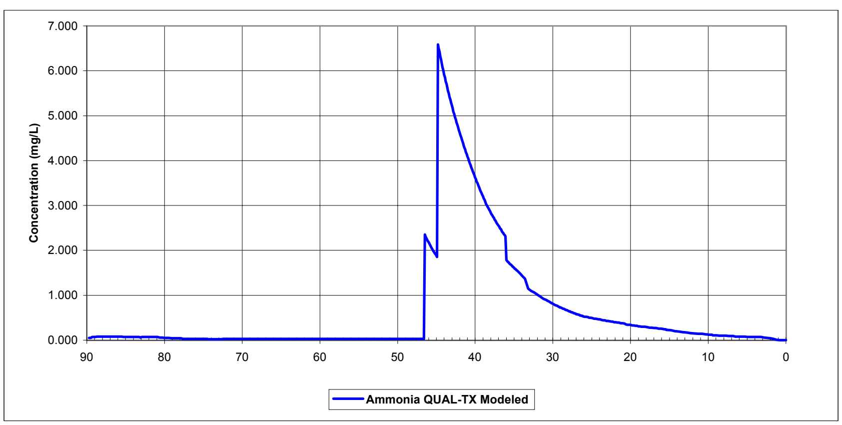
Appendix F, Figure F-10

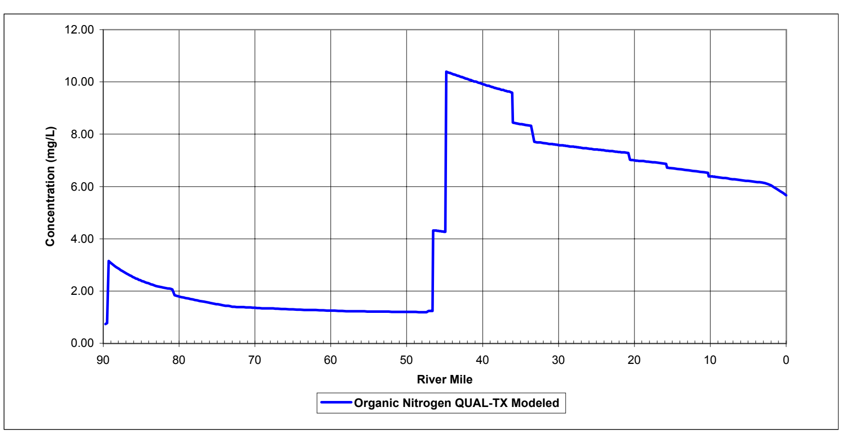
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Summer 7Q10
Critical Conditions with Point Sources and no Load Reductions





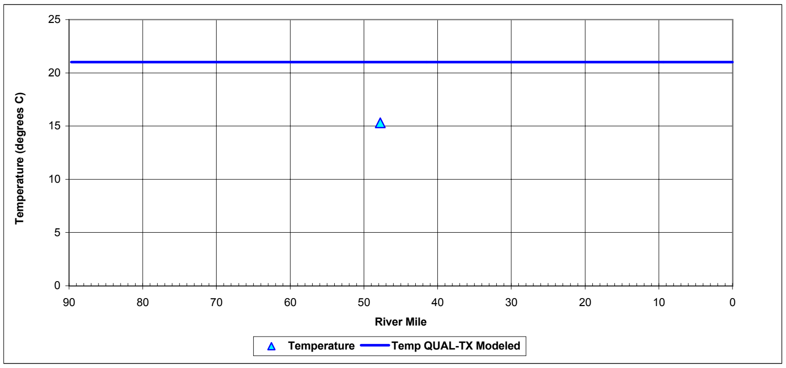


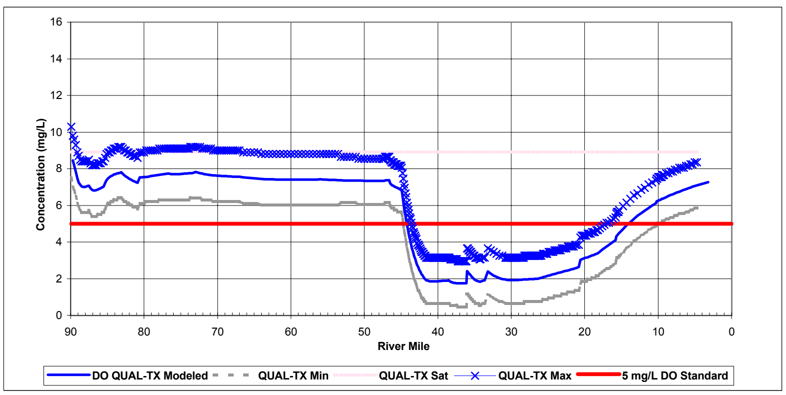


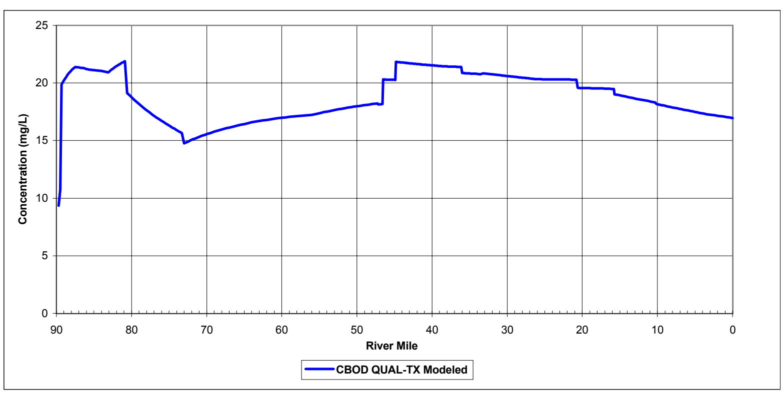
Appendix F, Figure F-10

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Spring 7Q10
Critical Conditions with Point Sources and no Load Reductions



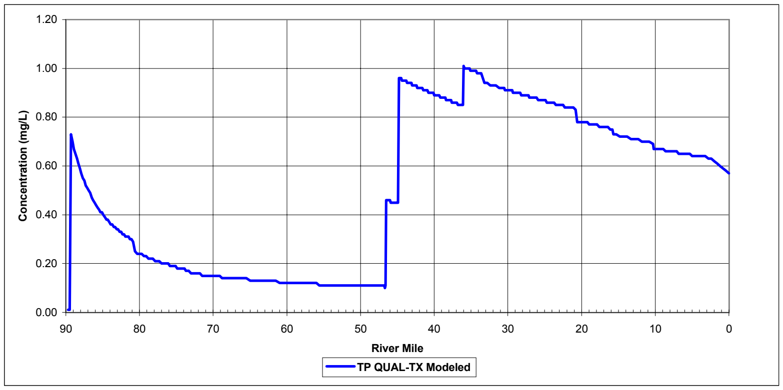


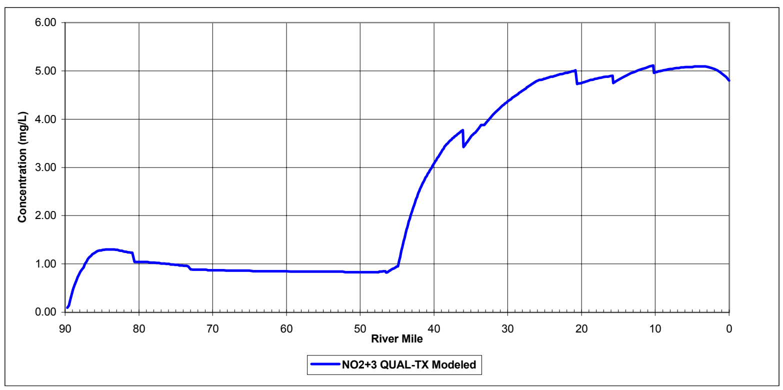


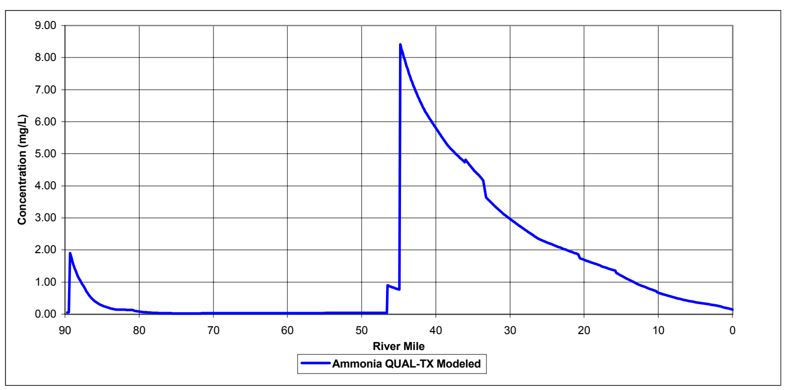
Appendix F, Figure F-10

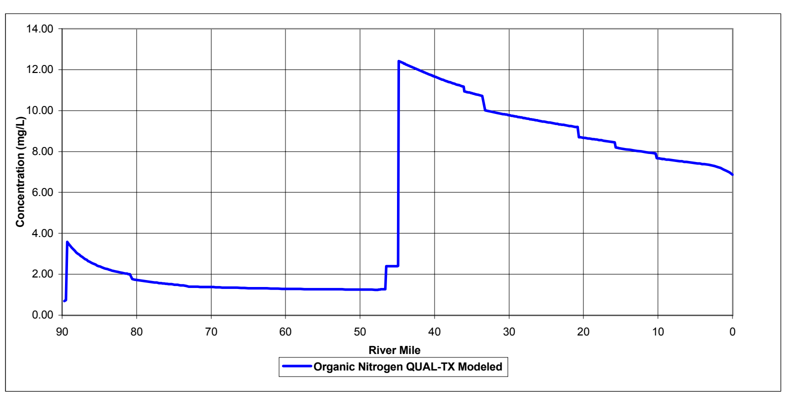
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Spring 7Q10
Critical Conditions with Point Sources and no Load Reductions





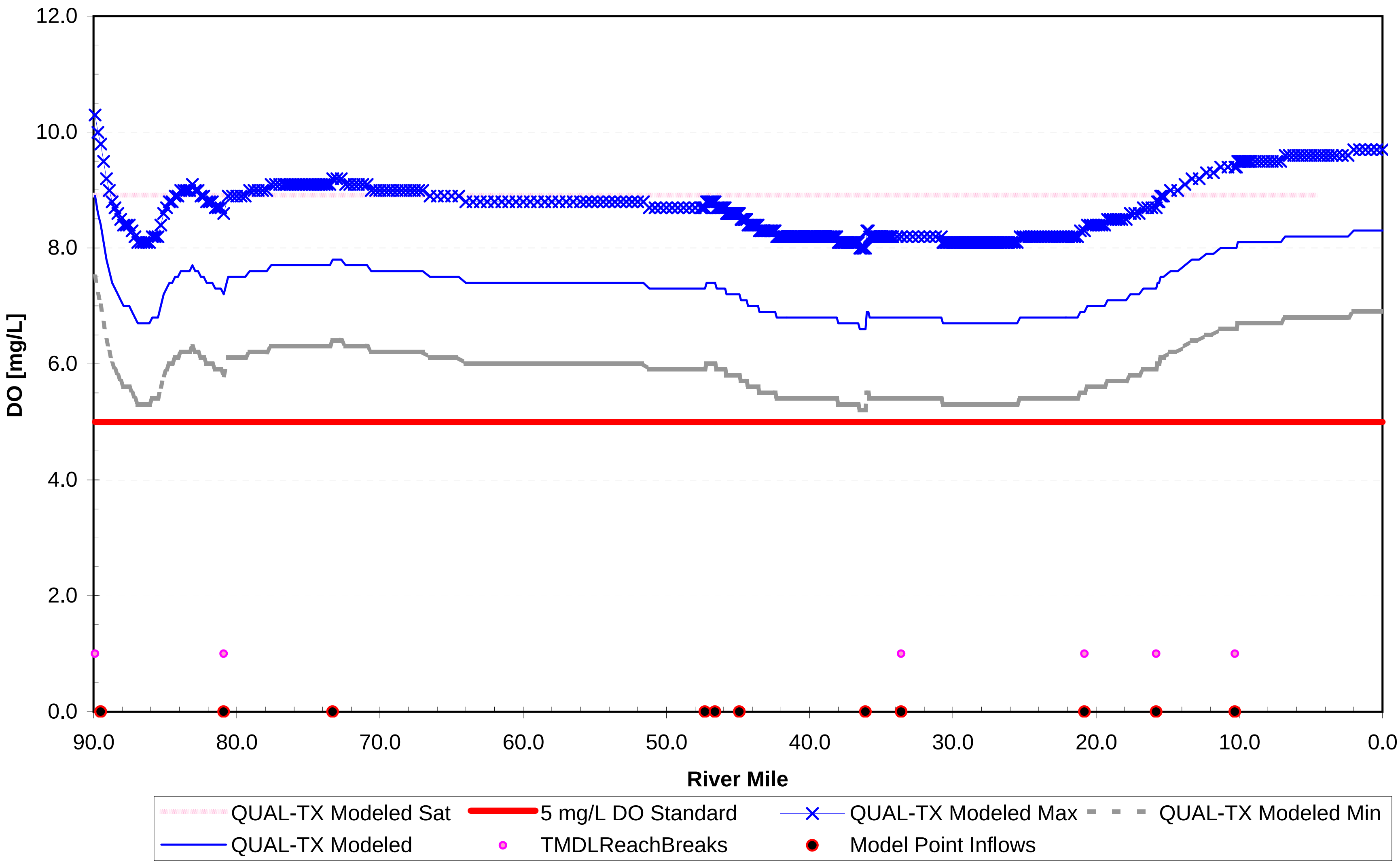




Appendix F, Figure F-11

MPCA Long Prairie River Watershed TMDL Final Project Report

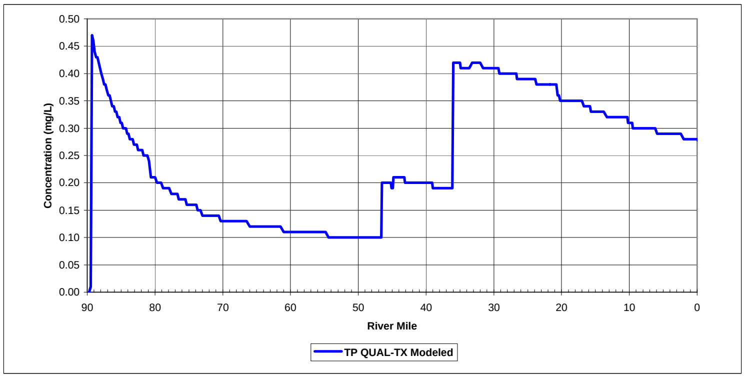
Long Prairie River Profiles: Modified Spring 7Q10 for TMDL Projection Simulation

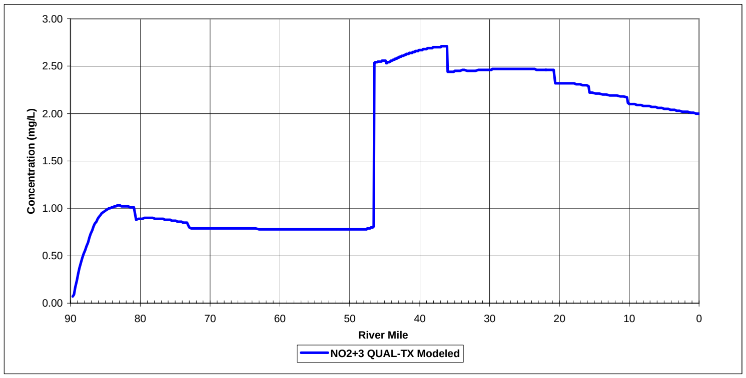


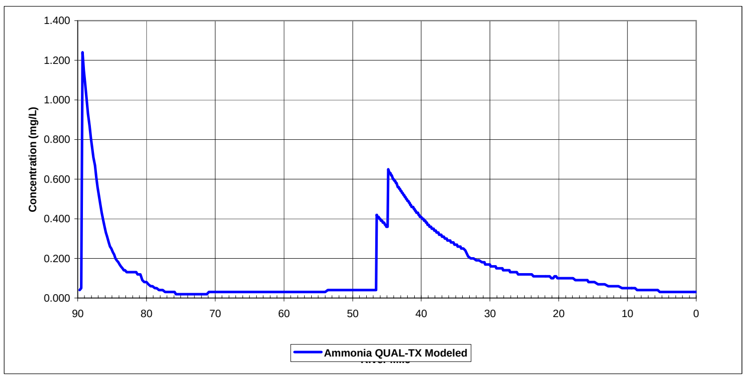
Appendix F, Figure F-11

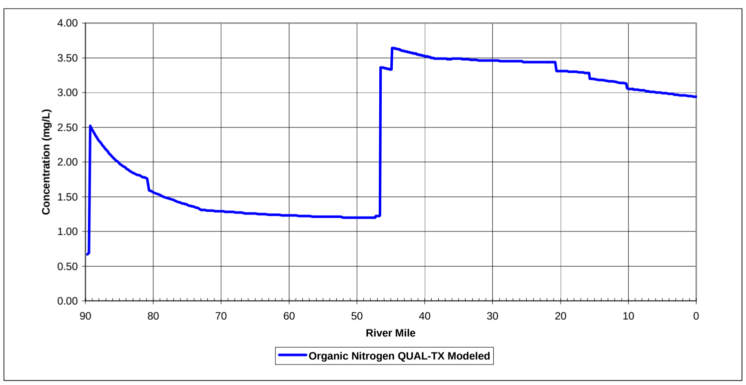
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profiles: Modified Spring 7Q10 for TMDL Projection Simulation





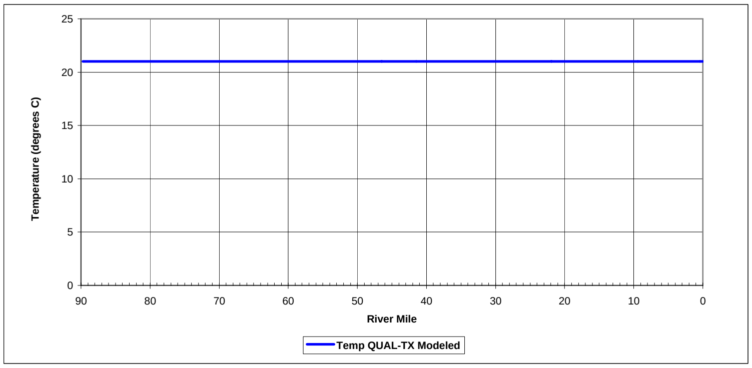


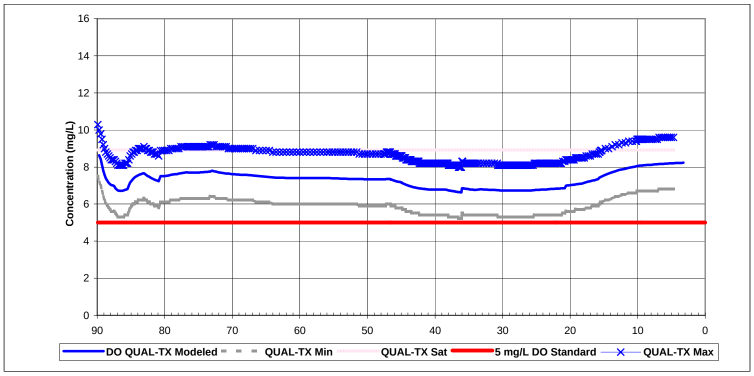


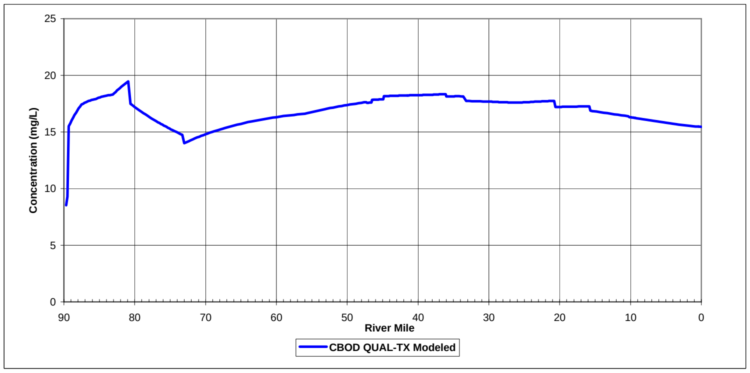
Appendix F, Figure F-11

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profiles: Modified Spring 7Q10 for TMDL Projection Simulation



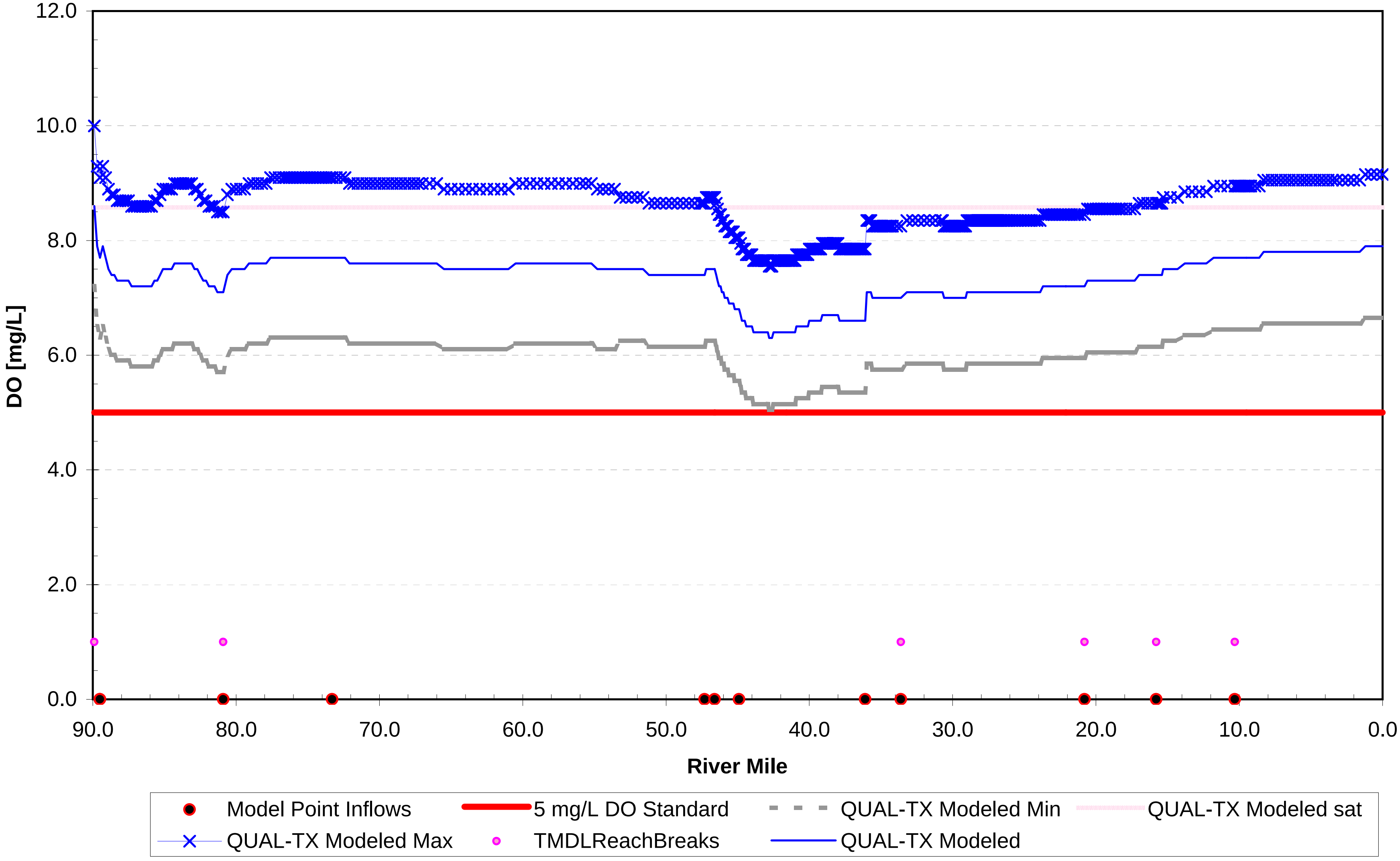




Appendix F, Figure F-12

MPCA Long Prairie River Watershed TMDL Final Project Report

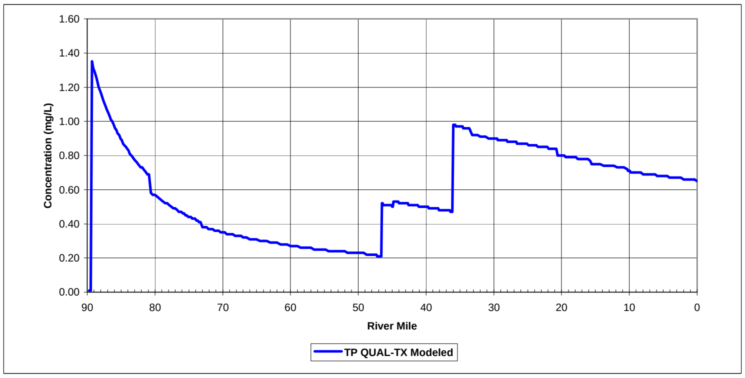
Long Prairie River Profile Graphs: QUAL-TX Summer DO
7Q10 Point Source Load Reduction

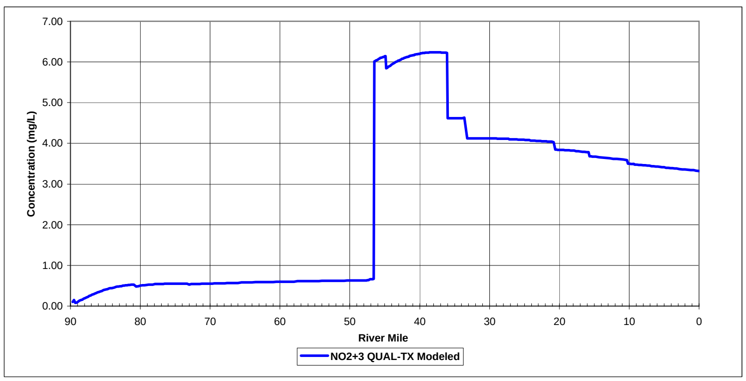


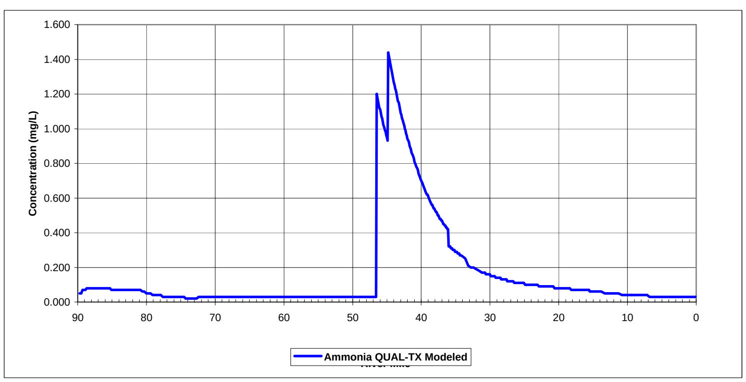
Appendix F, Figure F-12

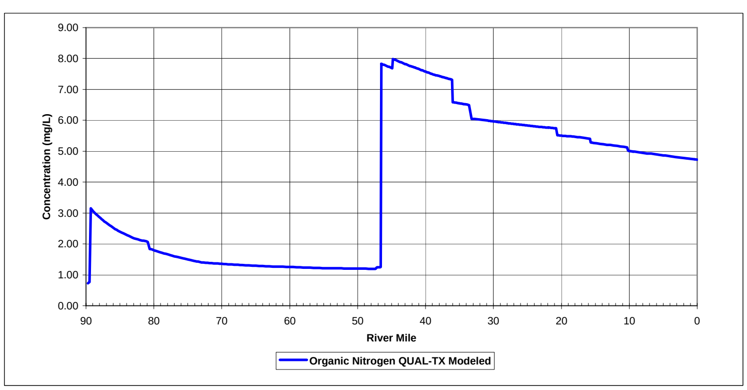
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs: QUAL-TX Summer DO
7Q10 Point Source Load Reduction





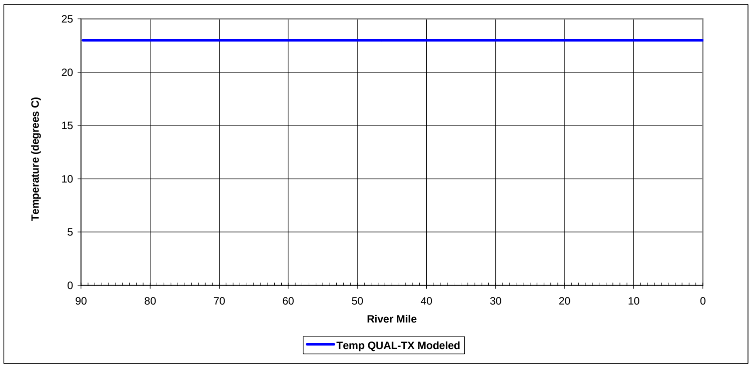


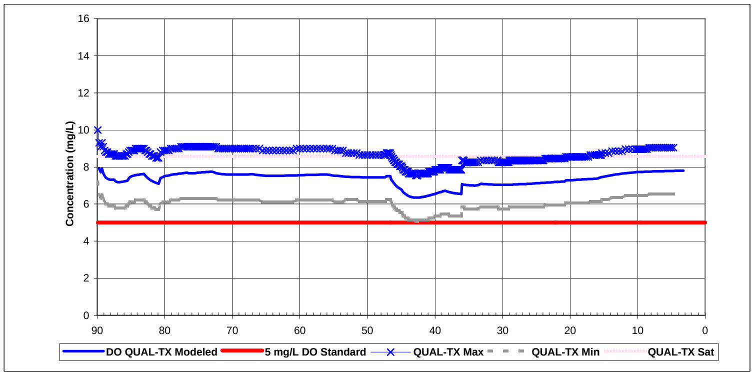


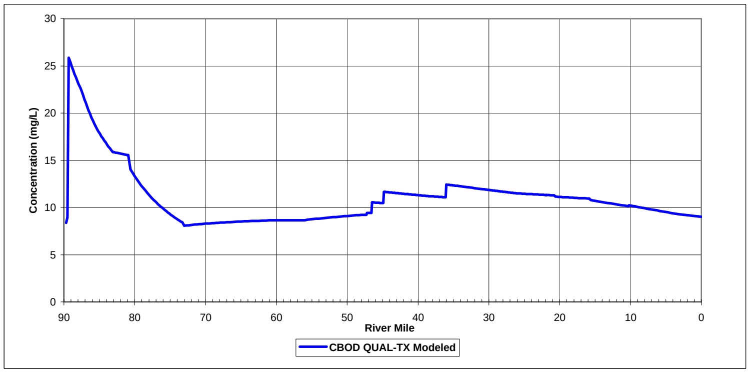
Appendix F, Figure F-12

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs: QUAL-TX Summer DO
7Q10 Point Source Load Reduction



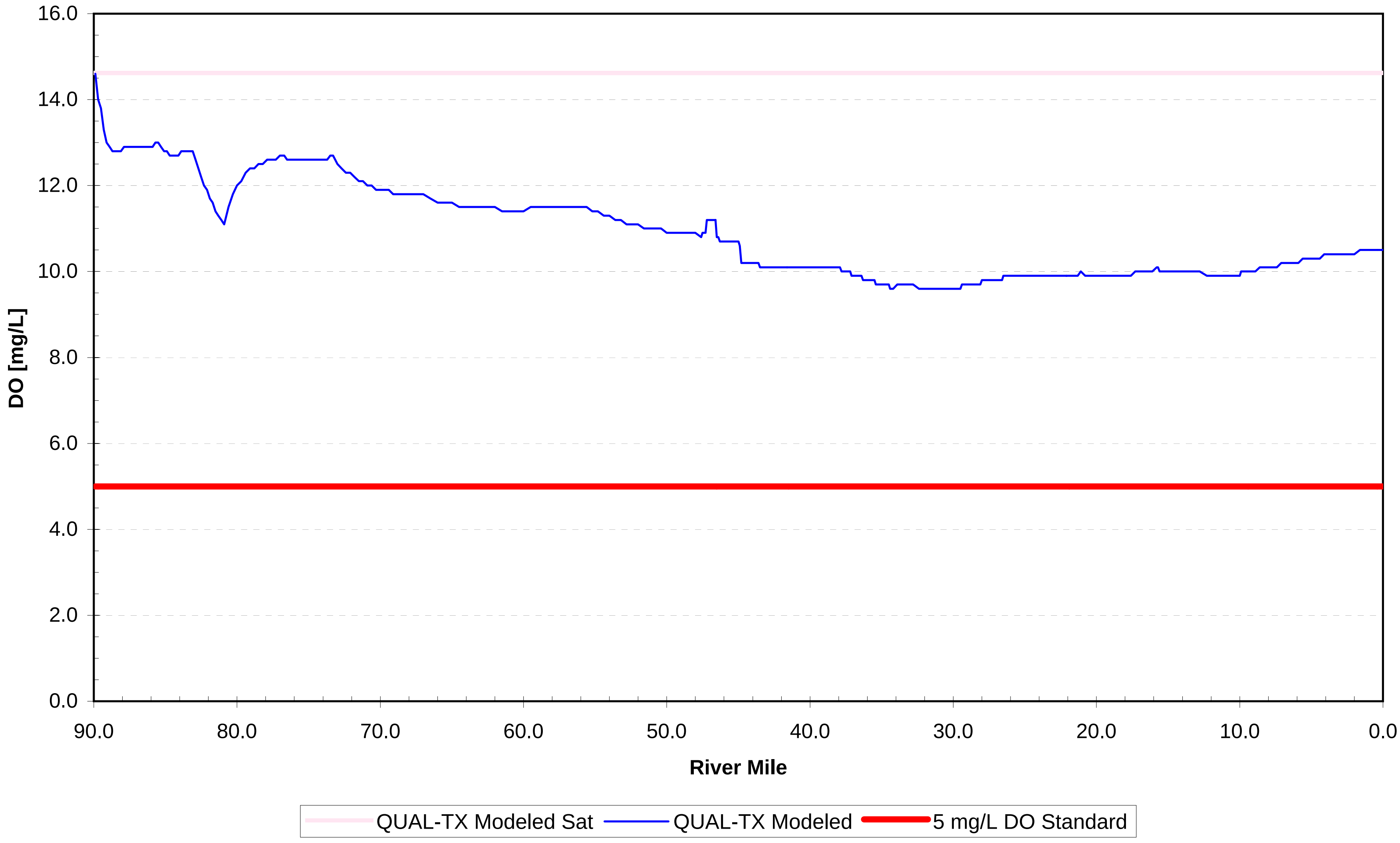




Appendix F, Figure F-13

MPCA Long Prairie River Watershed TMDL Final Project Report

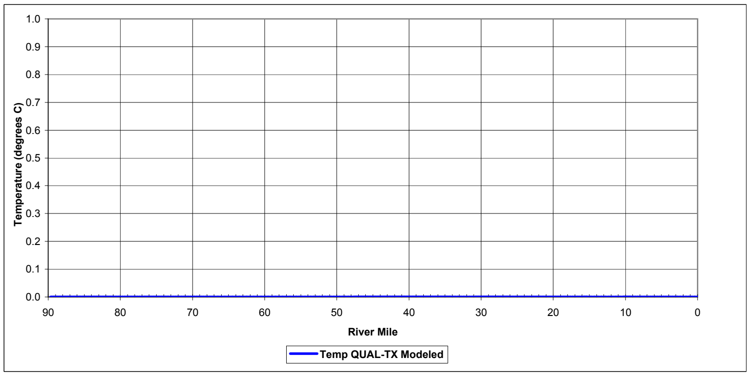
Long Prairie River Profile Graphs: QUAL-TX Winter DO
7Q10 Point Source Load Reduction

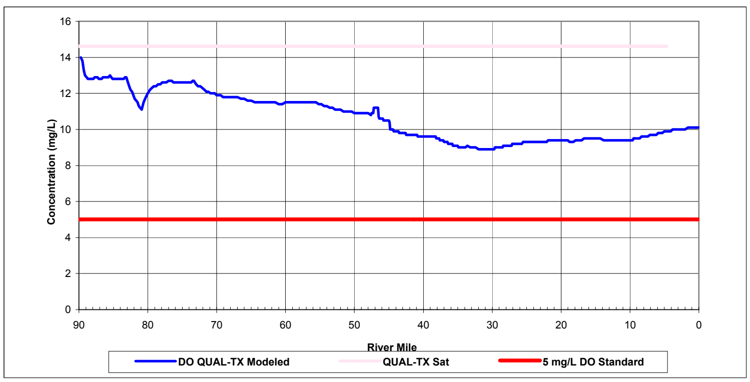


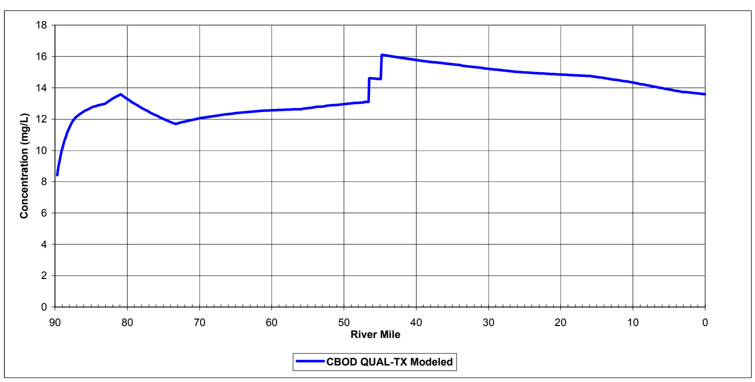
Appendix F, Figure F-13

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Winter 7Q10
7Q10 Point Source Load Reduction



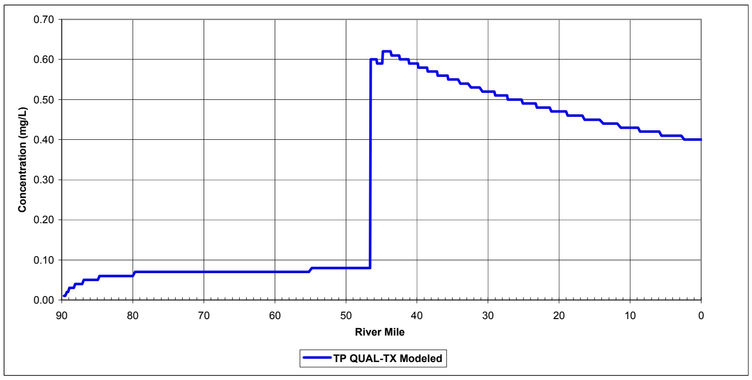


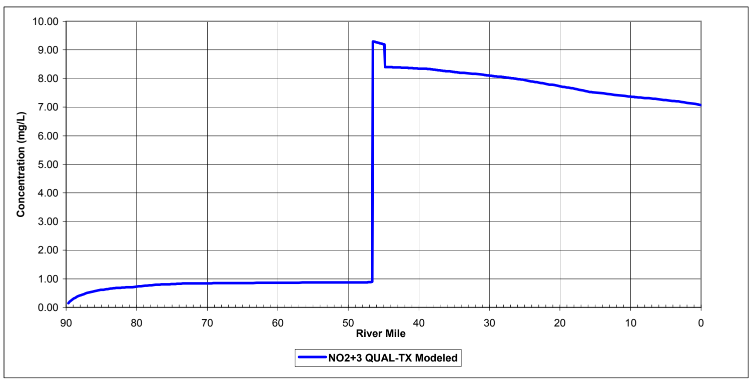


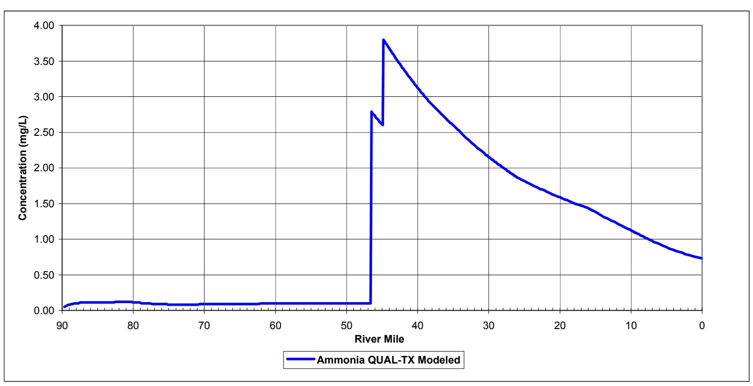
Appendix F, Figure F-13

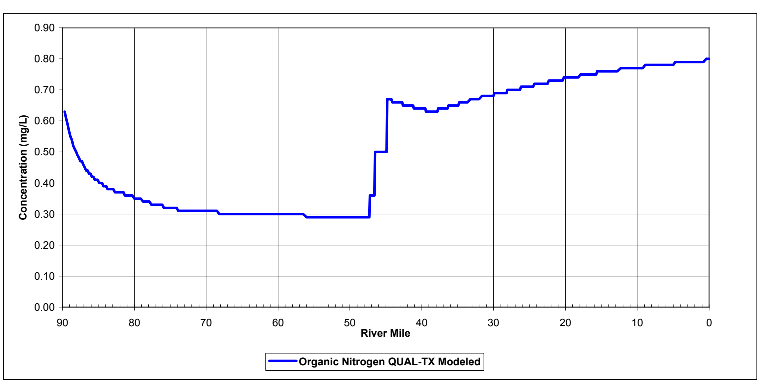
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profile Graphs:
QUAL-TX Winter 7Q10
7Q10 Point Source Load Reduction





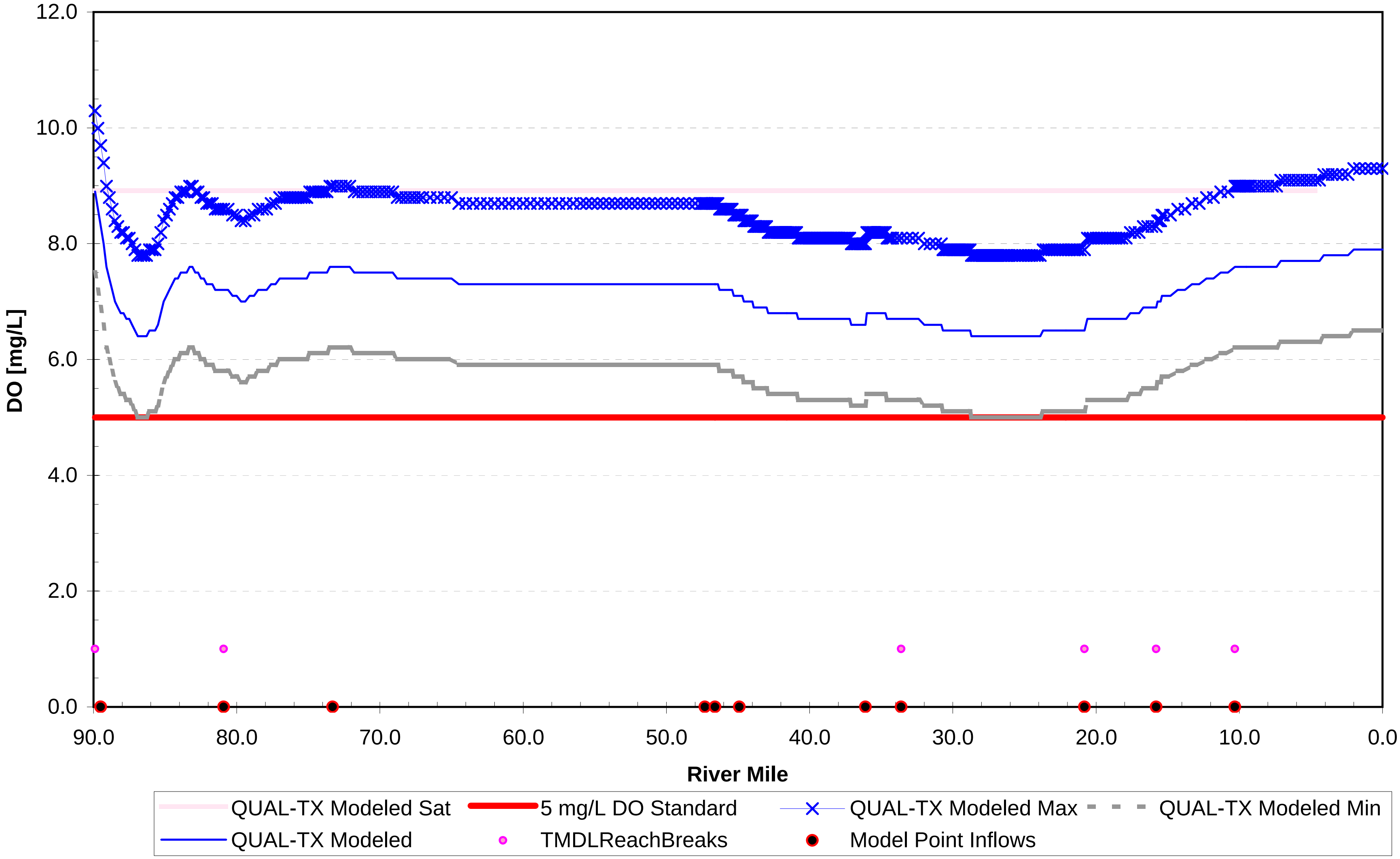




Appendix F, Figure F-14a

MPCA Long Prairie River Watershed TMDL Final Project Report

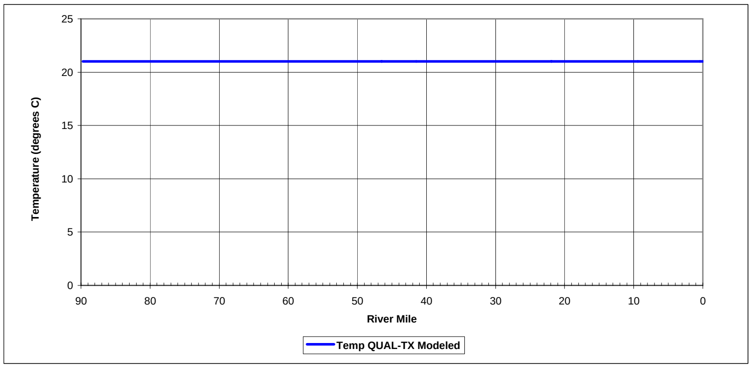
Long Prairie River Profiles:
Winter TMDL Demonstration (Modified Spring)

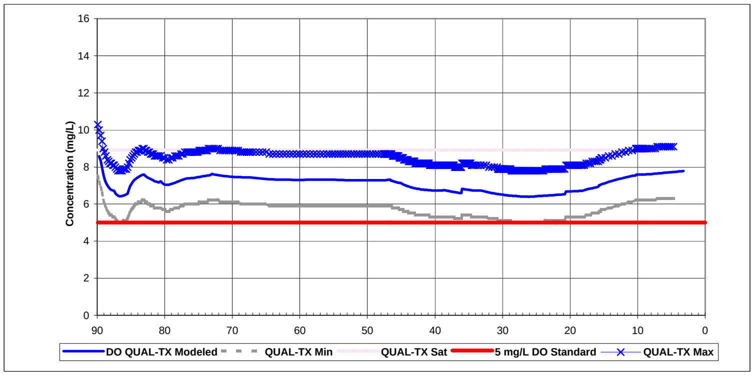


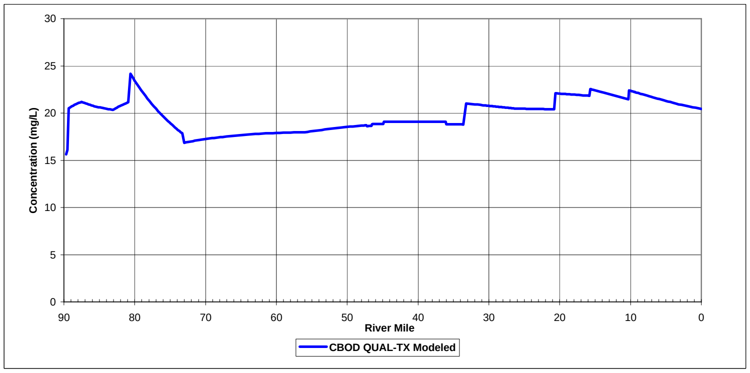
Appendix F, Figure F-14a

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profiles:
TMDL Demonstration (Modified Spring)



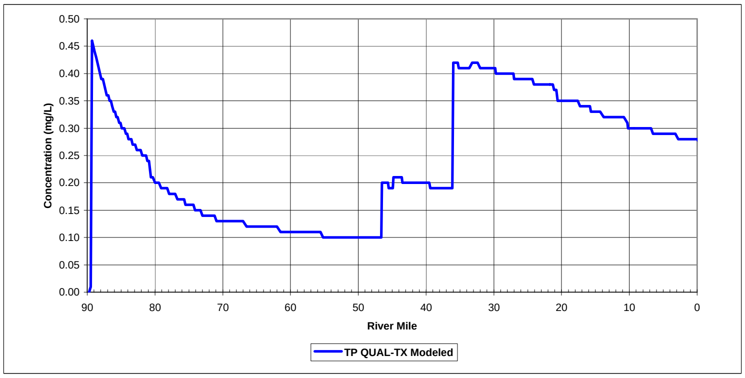


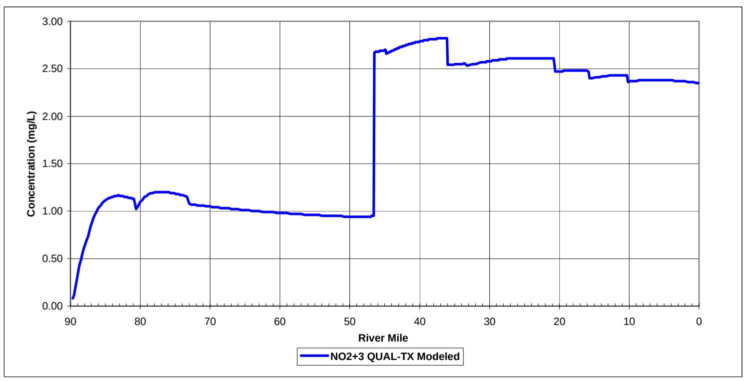


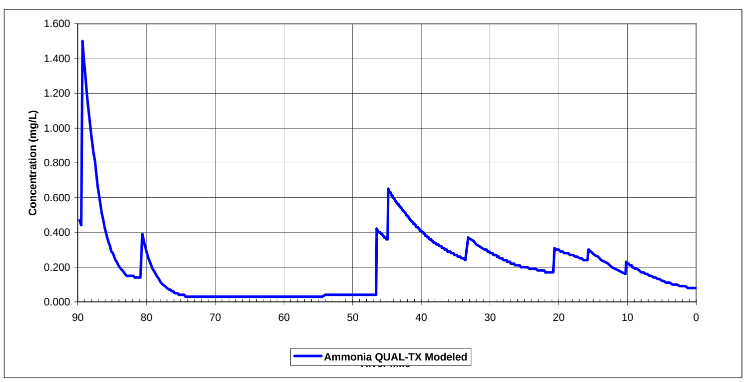
Appendix F, Figure F-14a

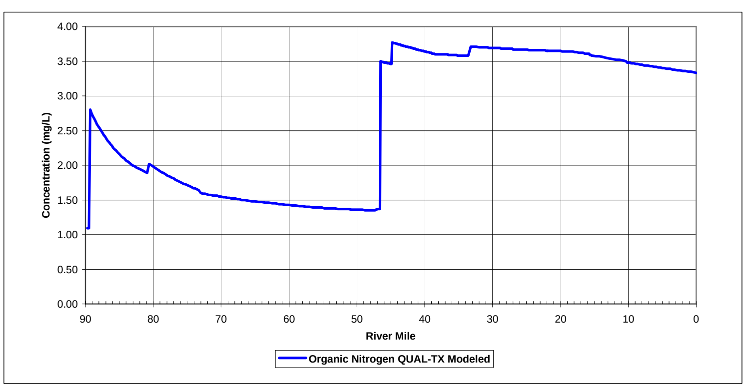
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profiles:
TMDL Demonstration (Modified Spring)



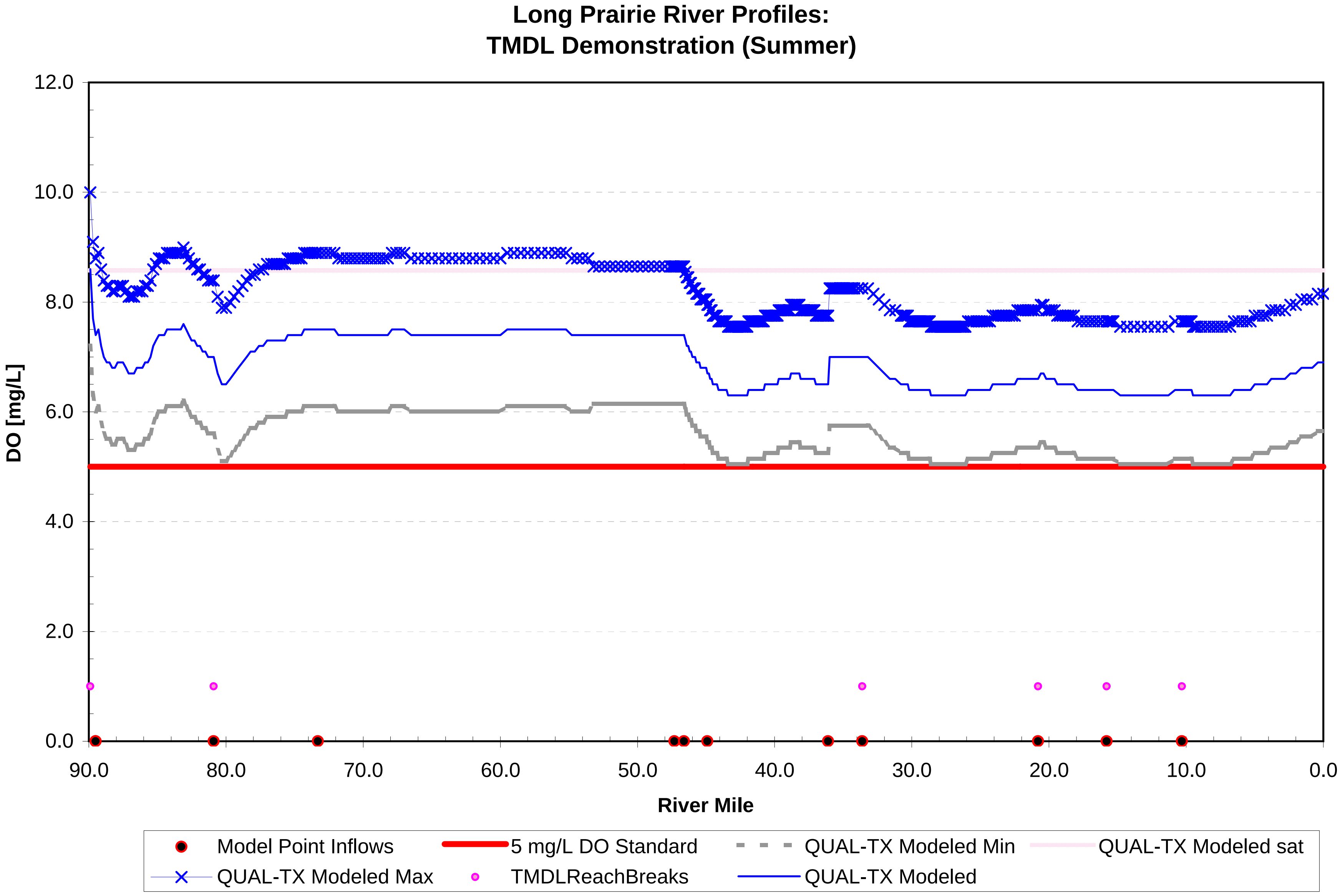






Appendix F, Figure F-14b

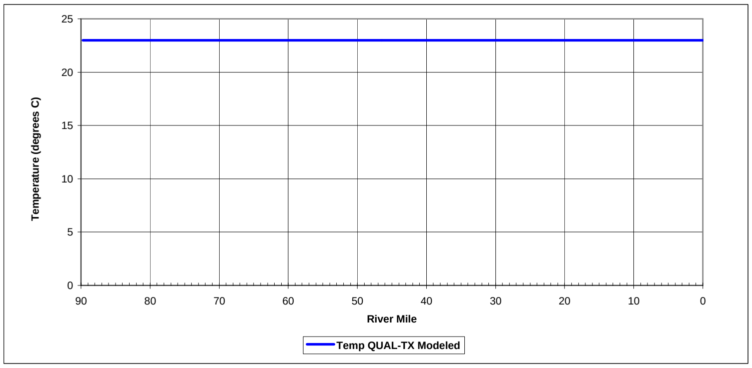
MPCA Long Prairie River Watershed TMDL Final Project Report

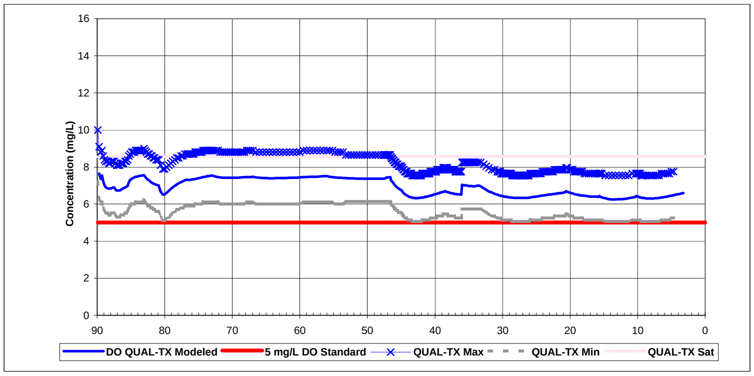


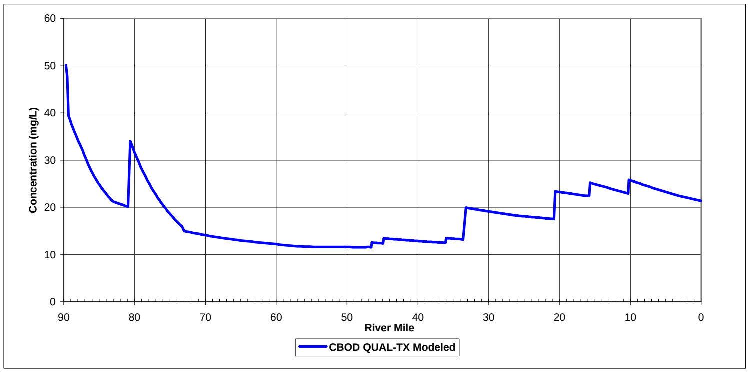
Appendix F, Figure F-14b

MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profiles:
TMDL Demonstration (Summer)



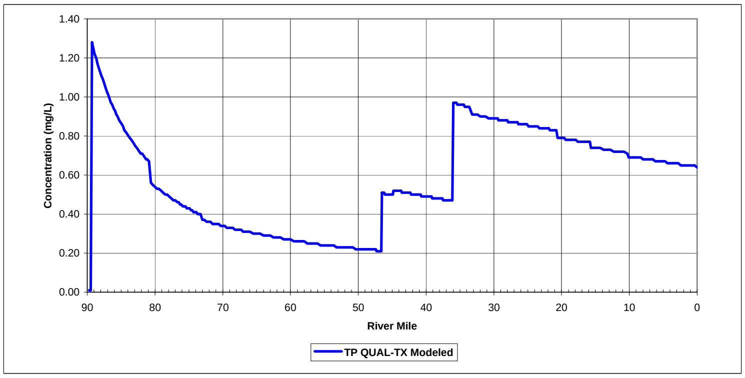


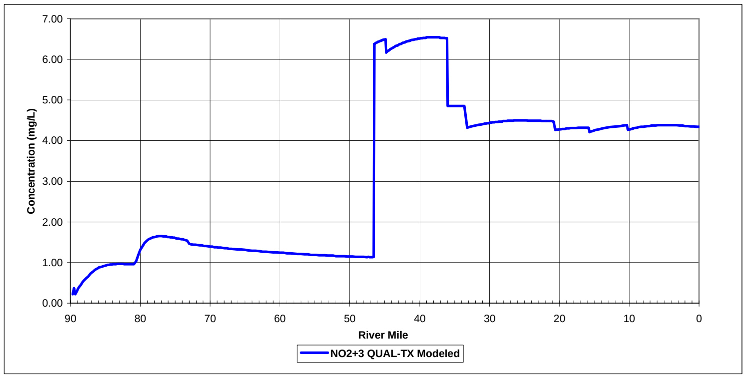


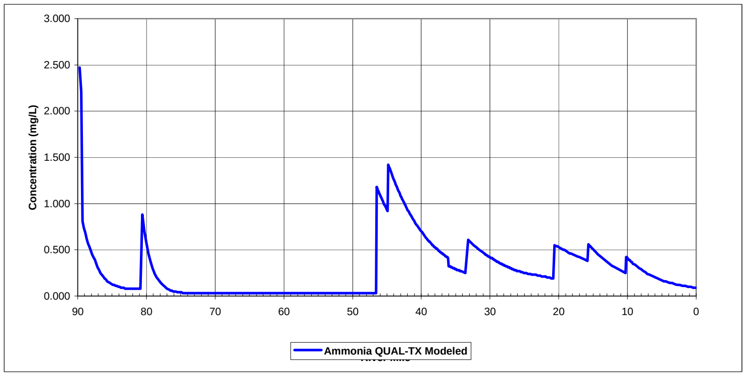
Appendix F, Figure F-14b

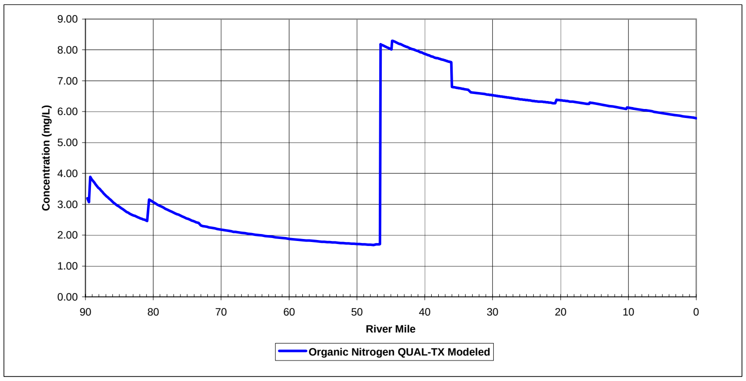
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profiles:
TMDL Demonstration (Summer)





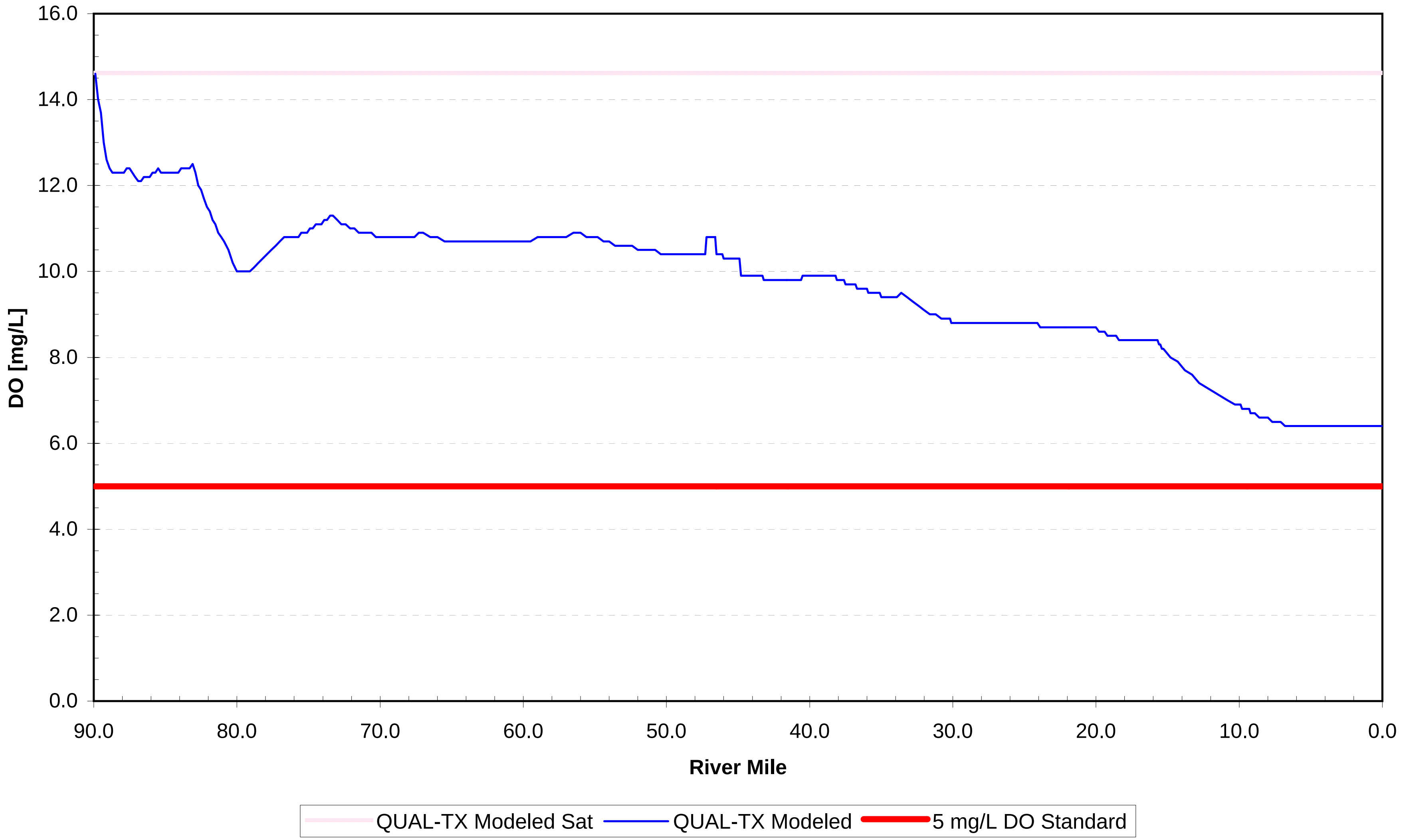




Appendix F, Figure F-14c

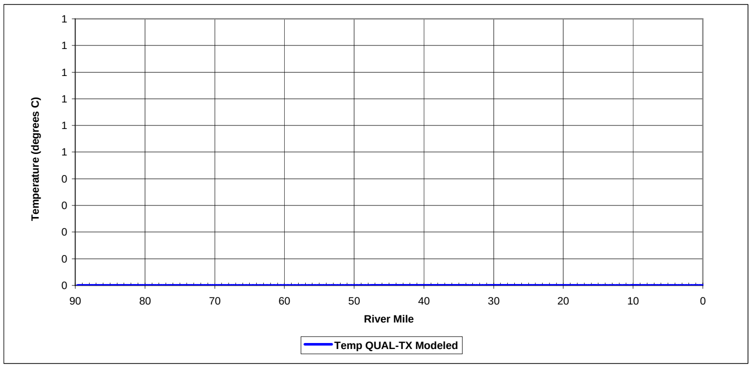
MPCA Long Prairie River Watershed TMDL Final Project Report

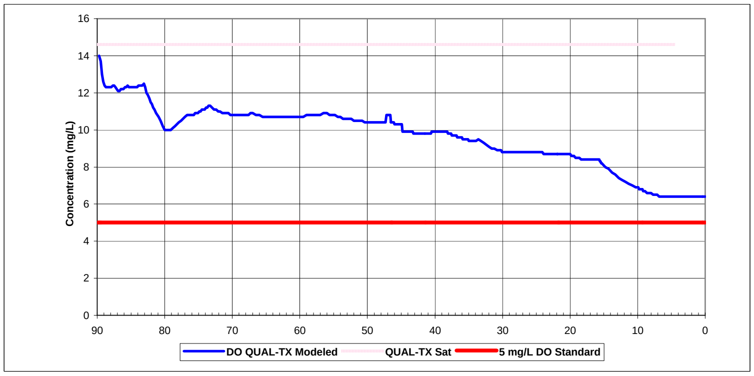
Long Prairie River Profiles:
Winter TMDL Demonstration (Winter)

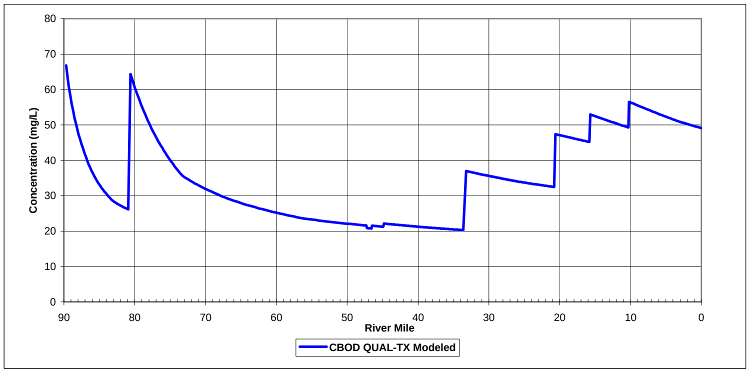


MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profiles:
Winter TMDL Demonstration (Winter)



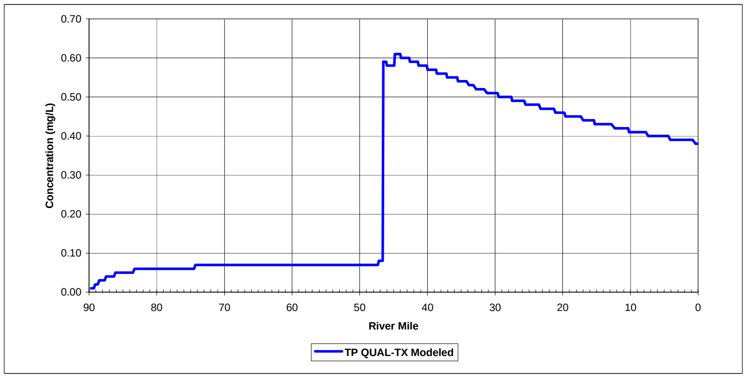


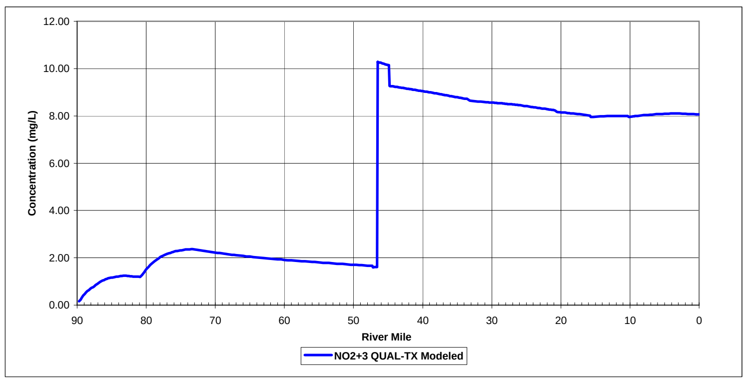


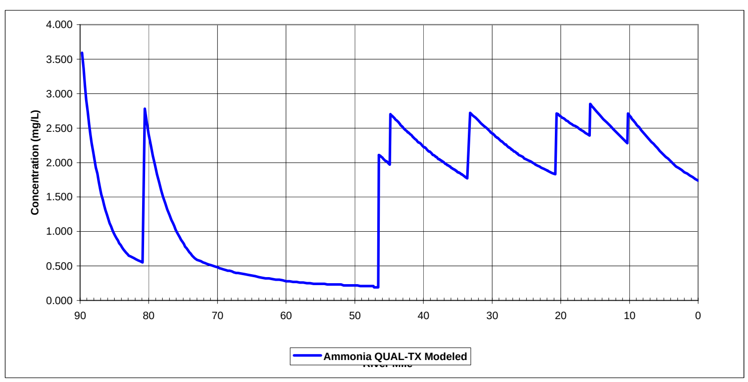
Appendix F, Figure F-14c

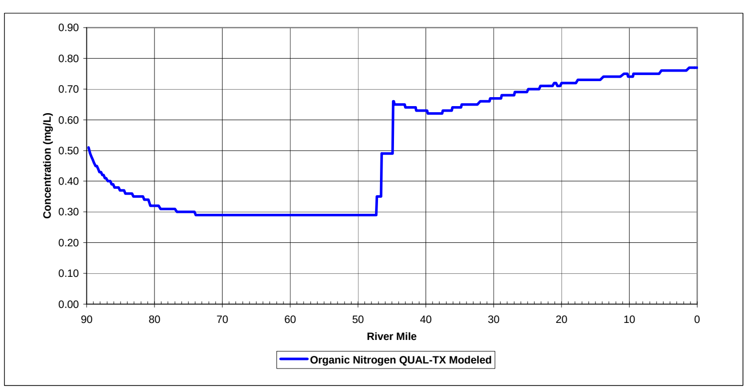
MPCA Long Prairie River Watershed TMDL Final Project Report

Long Prairie River Profiles:
Winter TMDL Demonstration (Winter)





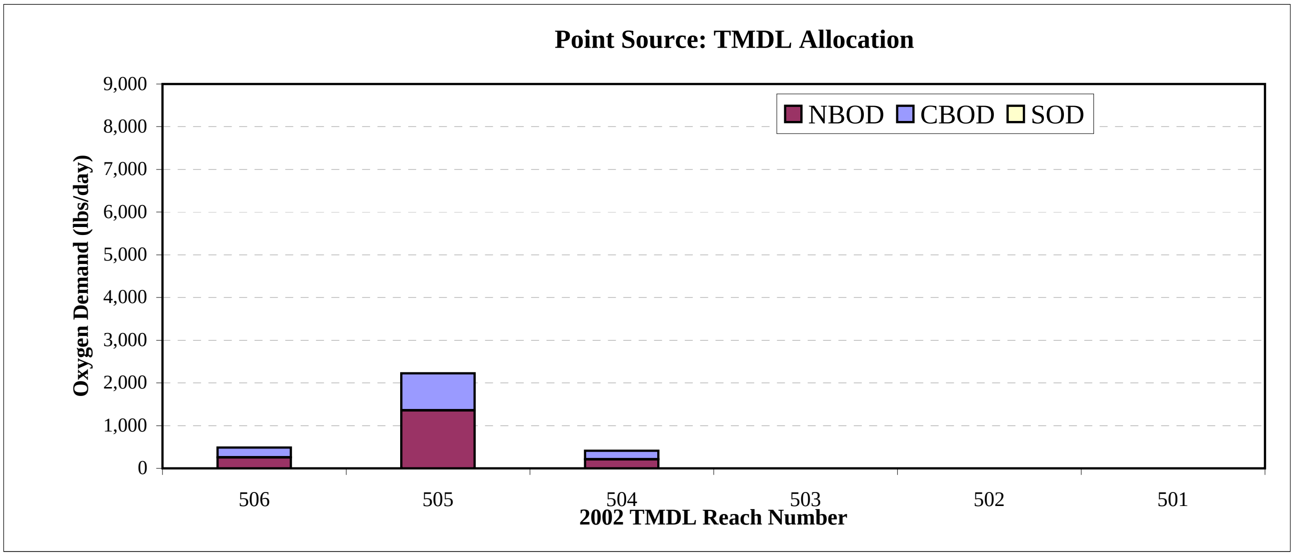


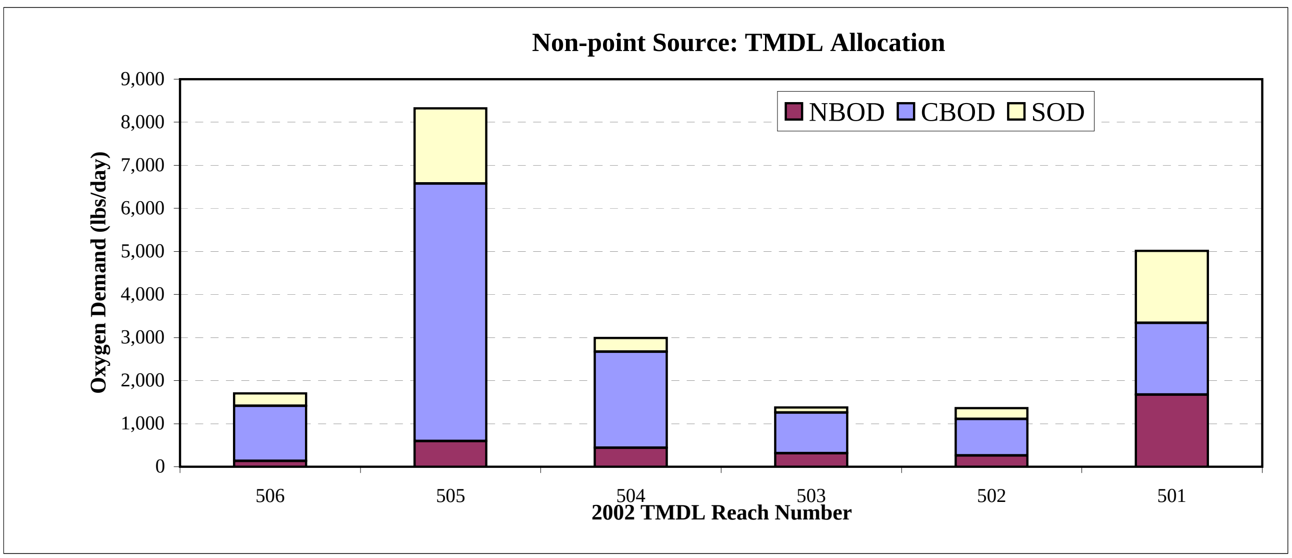


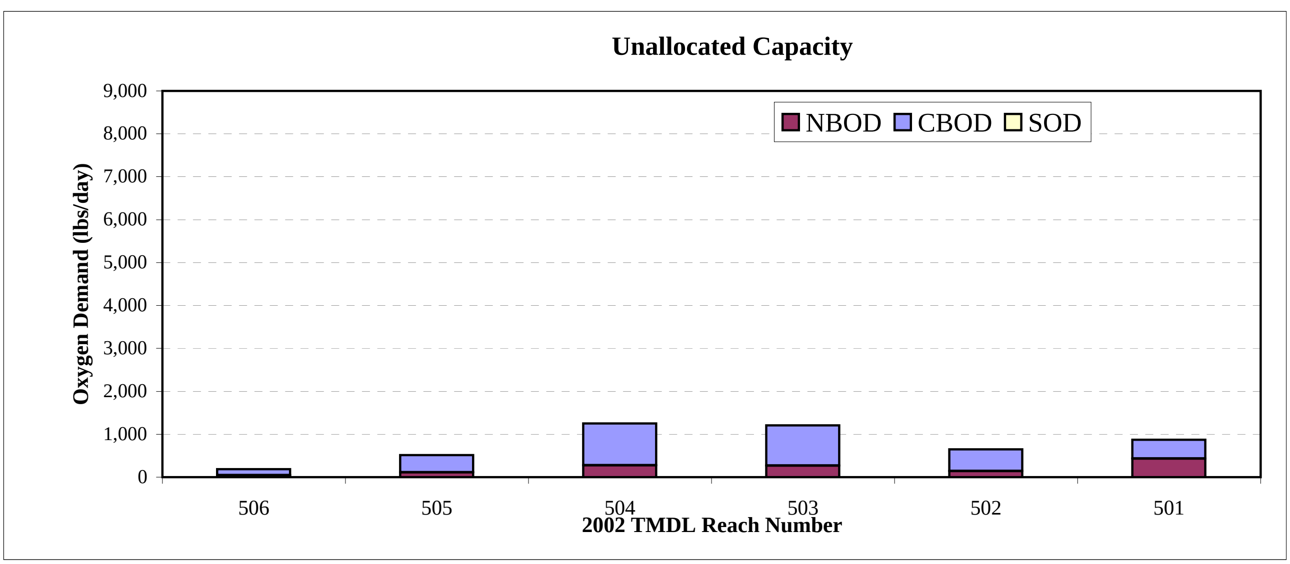
Appendix F, Figure F-14d

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

DO TMDLs for Long Prairie River by Reach and Category





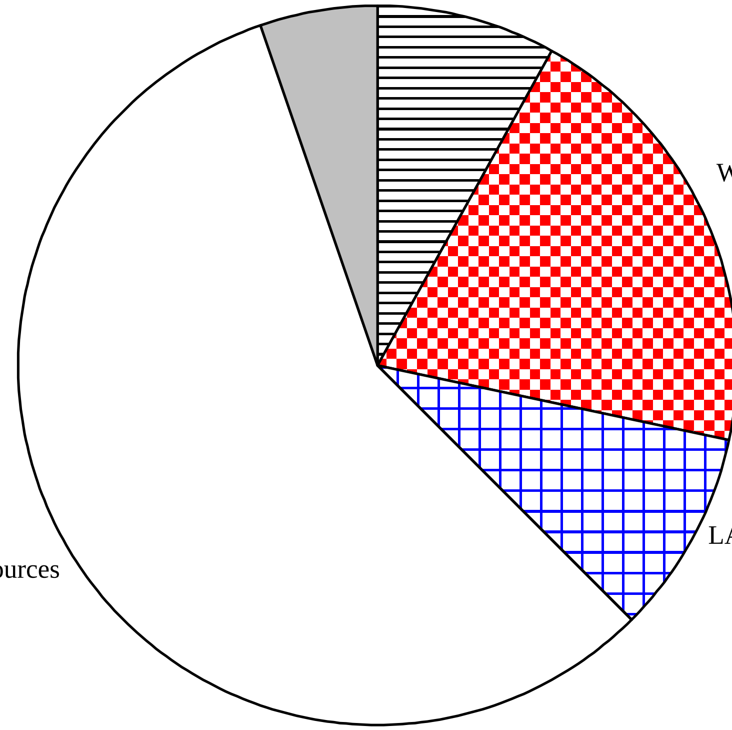


Appendix F, Figure F-14e

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Total Capacity: DO TMDLs for Long Prairie River by Reach

Total Oxygen Demand (lbs/day)
2,380

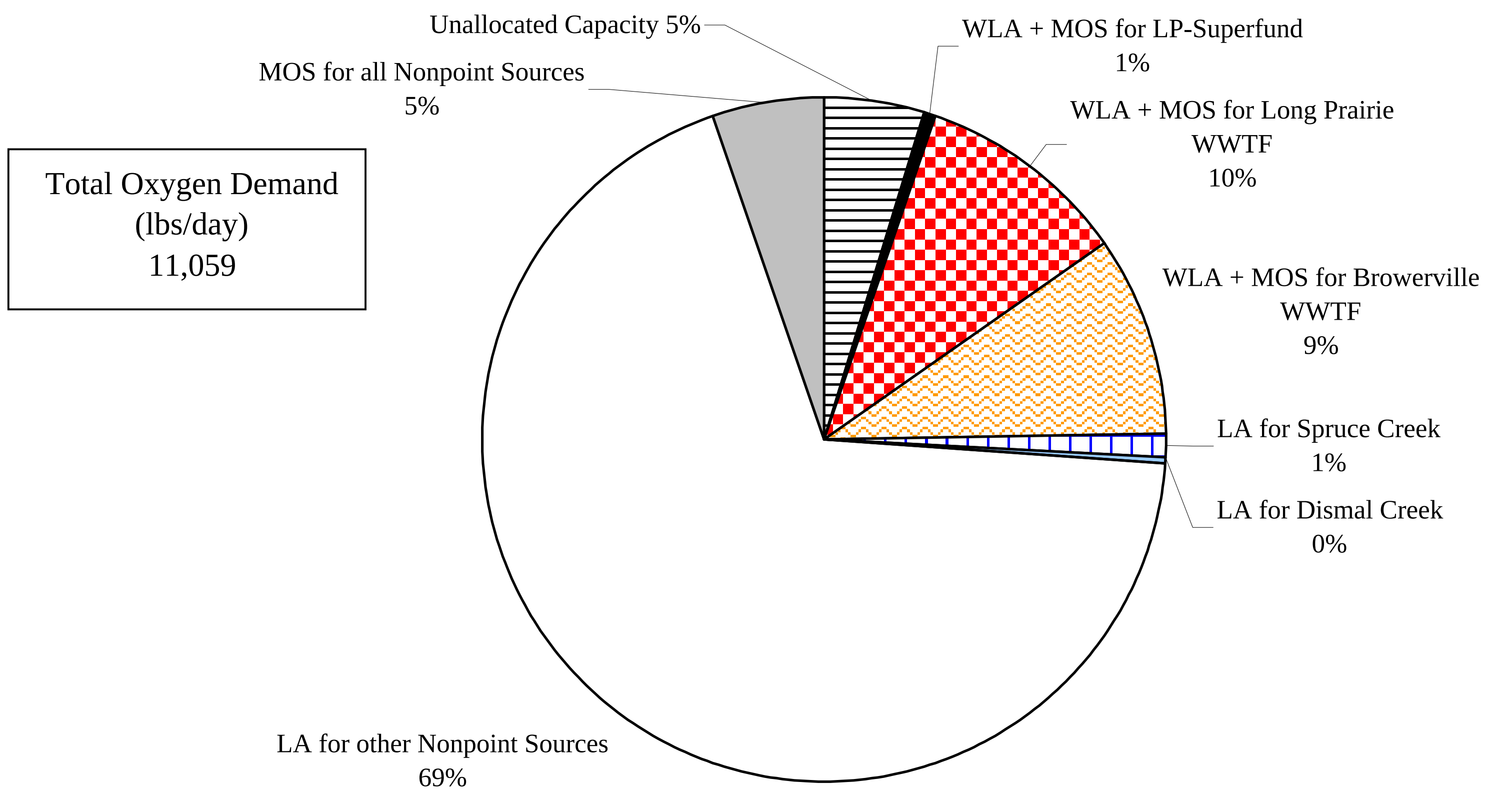


Reach 07010108-506: Long Prairie River Headwaters (Lake Carlos) to Spruce Creek

Appendix F, Figure F-14f

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Total Capacity: DO TMDLs for Long Prairie River by Reach

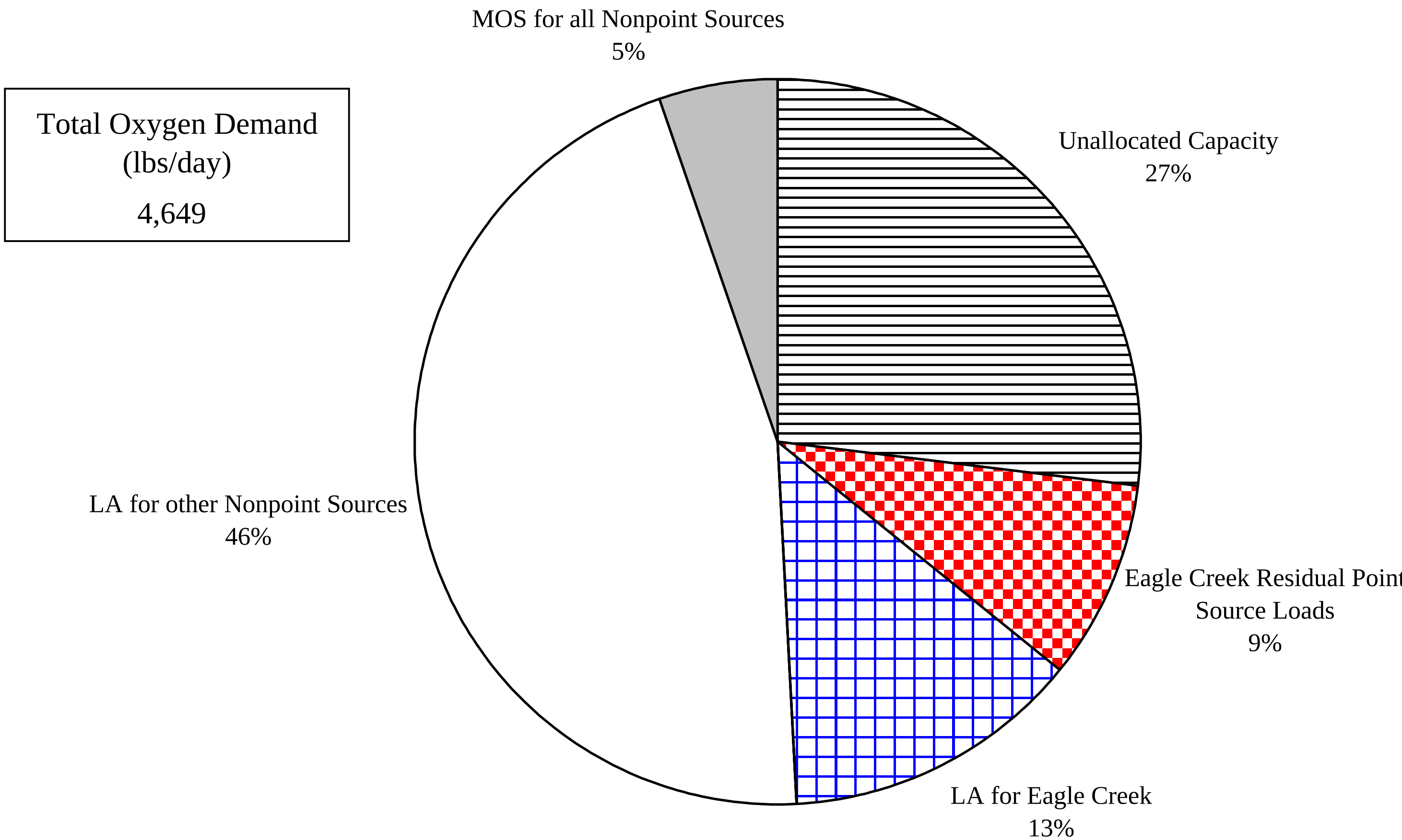


Reach 07010108-505: Spruce Creek to Eagle Creek

Appendix F, Figure F-14g

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Total Capacity: DO TMDLs for Long Prairie River by Reach

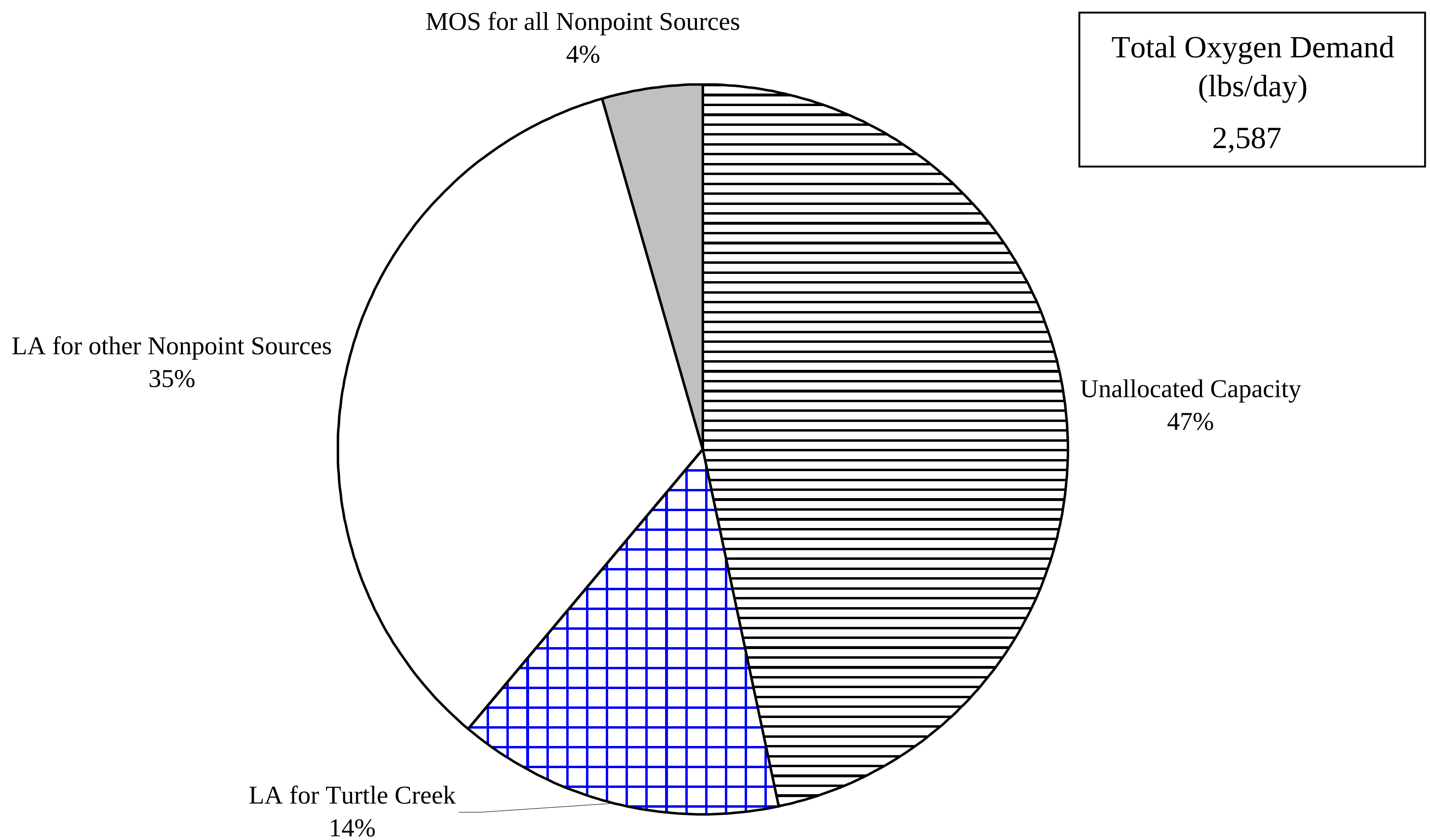


Reach 07010108-504: Eagle Creek to Turtle Creek

Appendix F, Figure F-14h

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Total Capacity: DO TMDLs for Long Prairie River by Reach

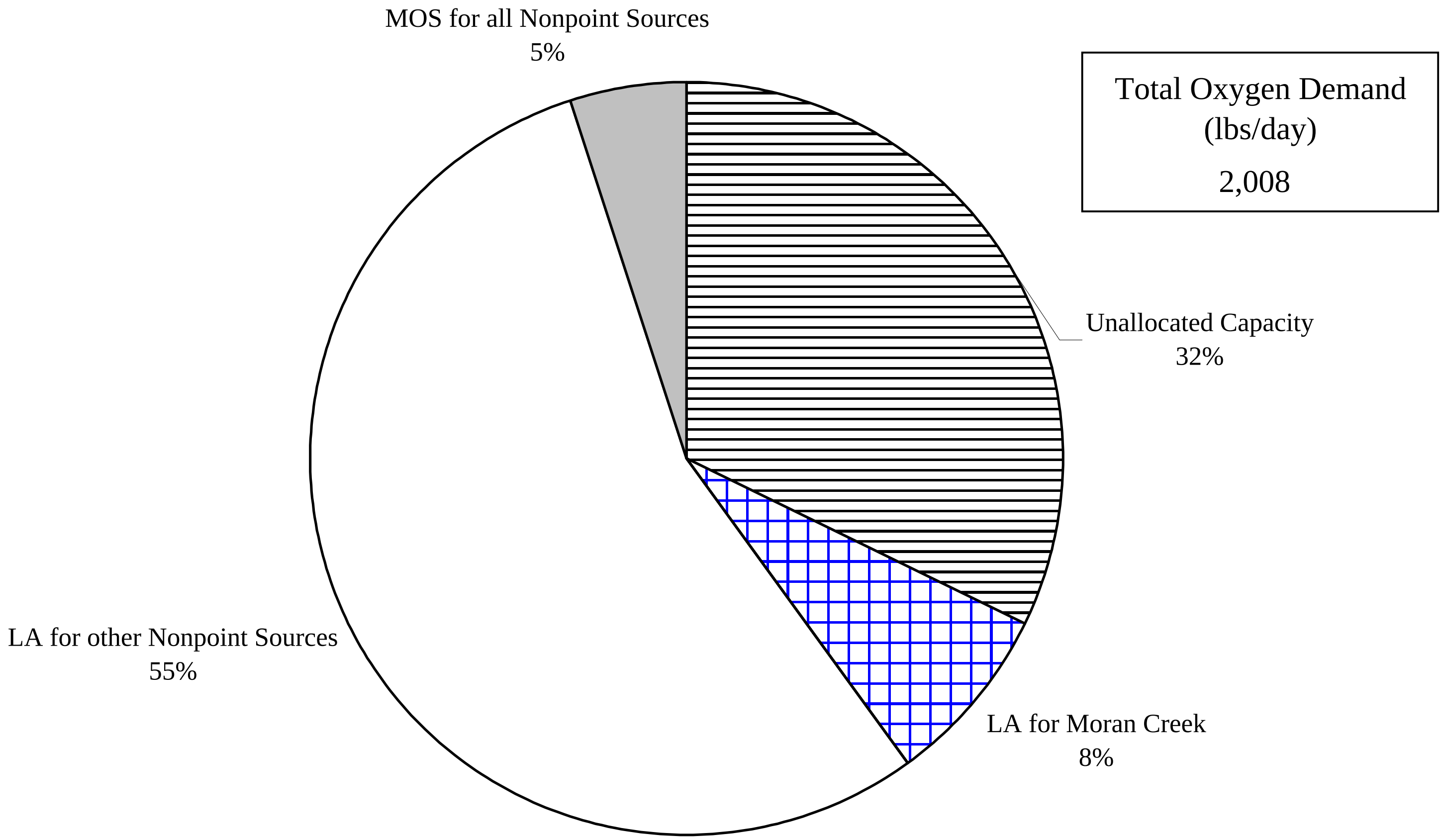


Reach 07010108-503: Turtle Creek To Moran Creek

Appendix F, Figure F-14i

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Total Capacity: DO TMDLs for Long Prairie River by Reach

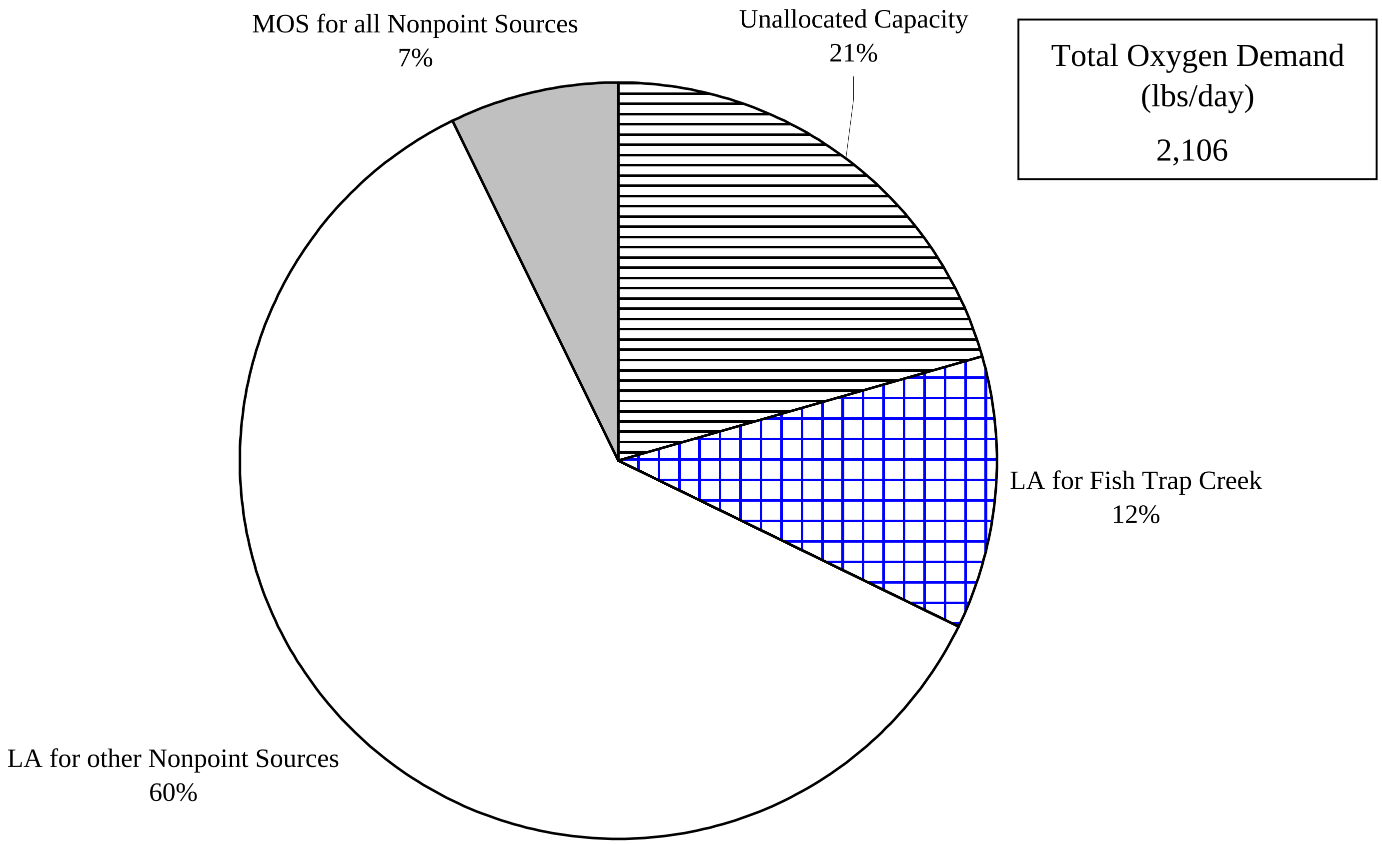


Reach 07010108-502: Moran Creek To Fish Trap Creek

Appendix F, Figure F-14j

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Total Capacity: DO TMDLs for Long Prairie River by Reach



Reach 07010108-501: Fish Trap Creek to Crow Wing River

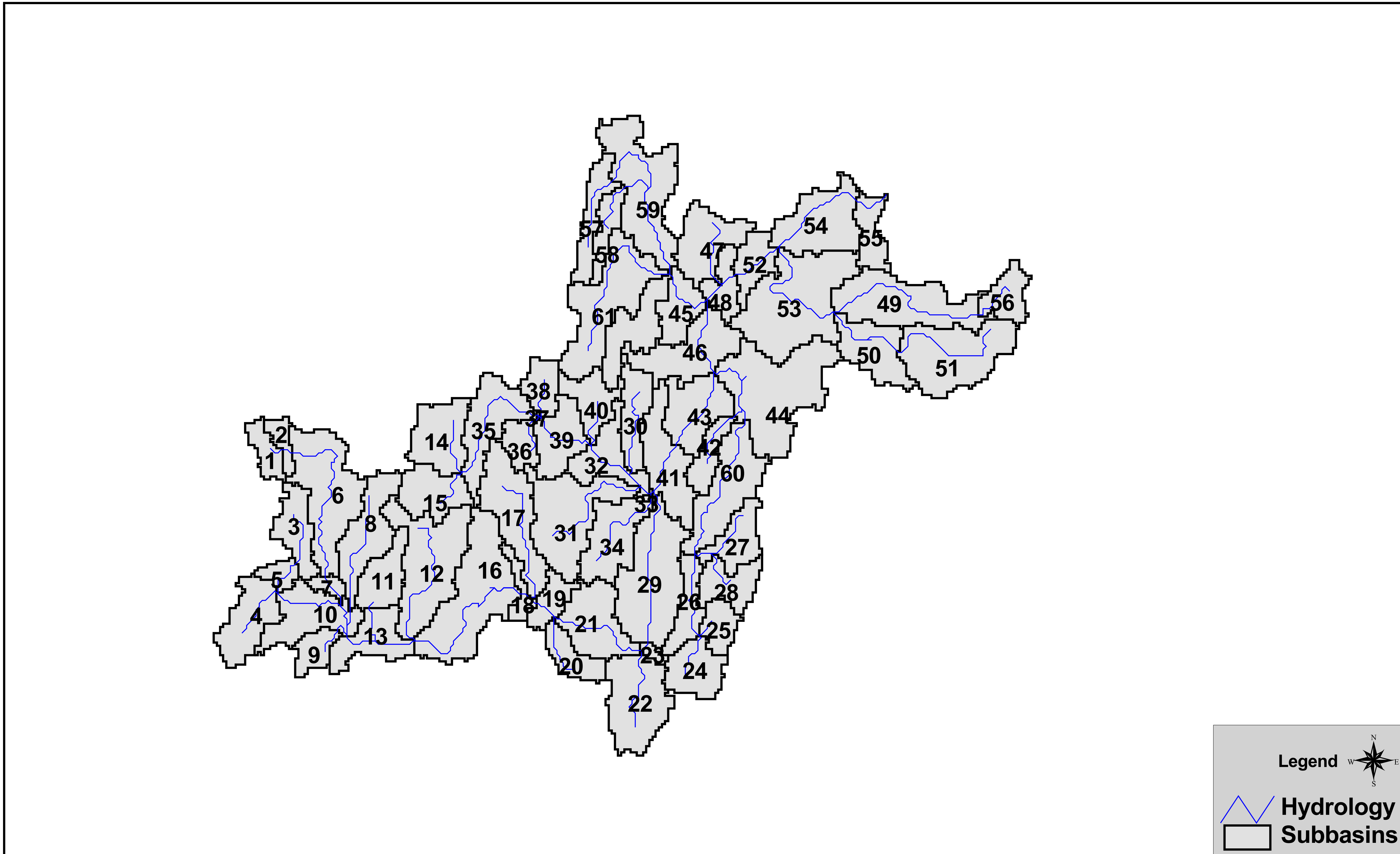


Figure G-1. Map of subbasins used in SWAT model for Long Prairie River Model

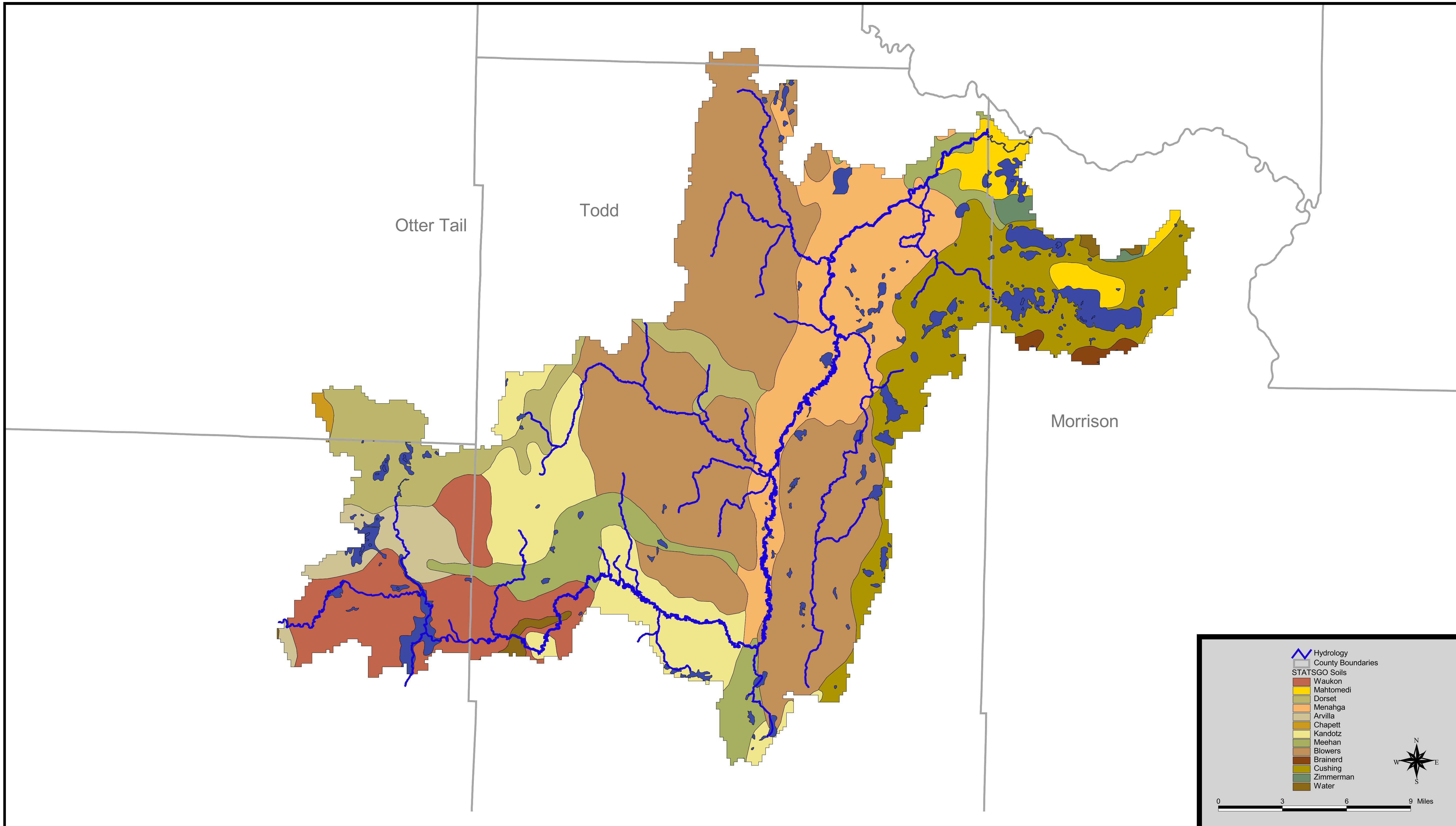


Figure G-2. Map of STATSGO soils in SWAT Model for Long Prairie River Basin.

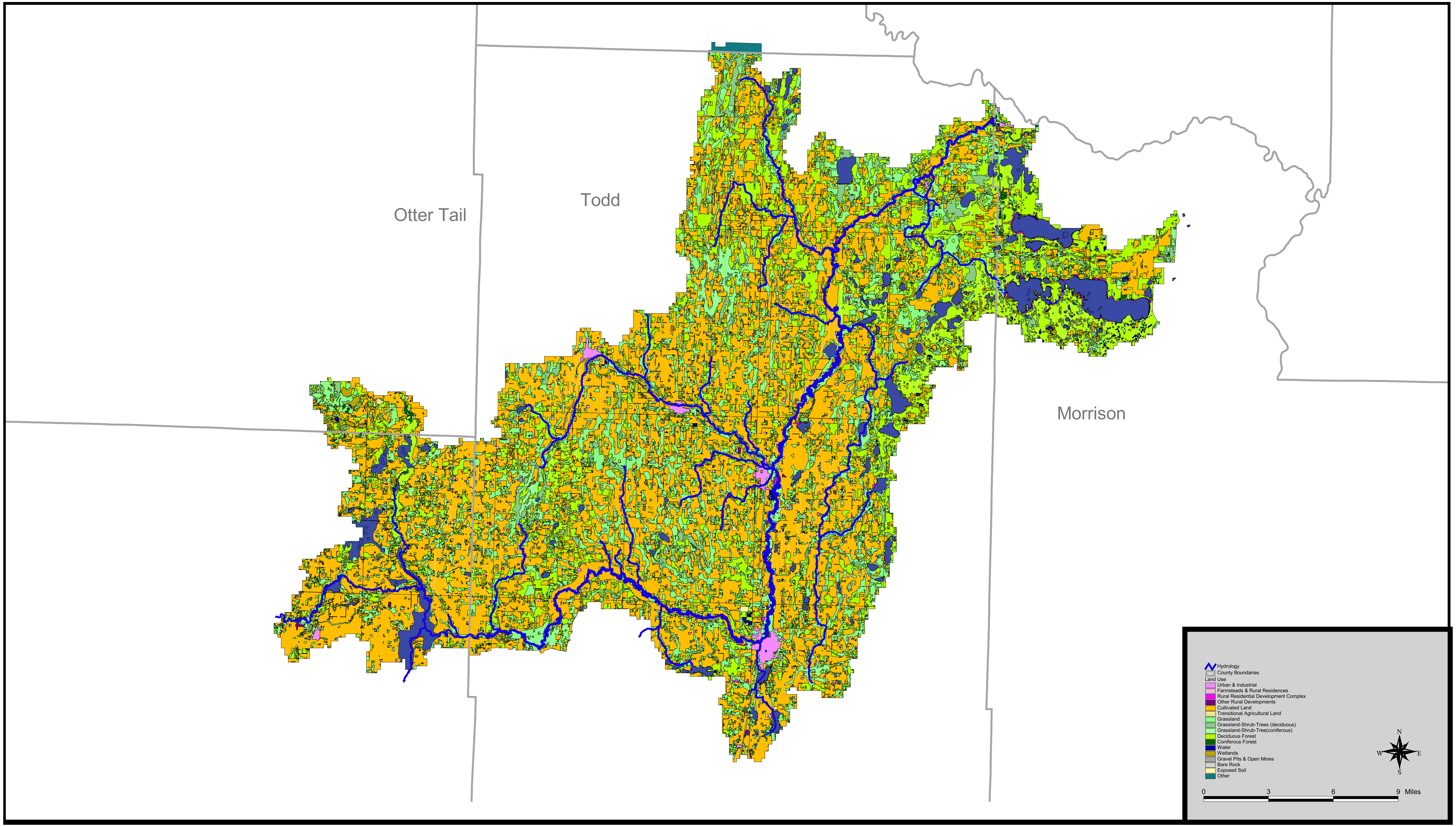


Figure G-3. Map of landuse in SWAT Model for Long Prairie River Basin.

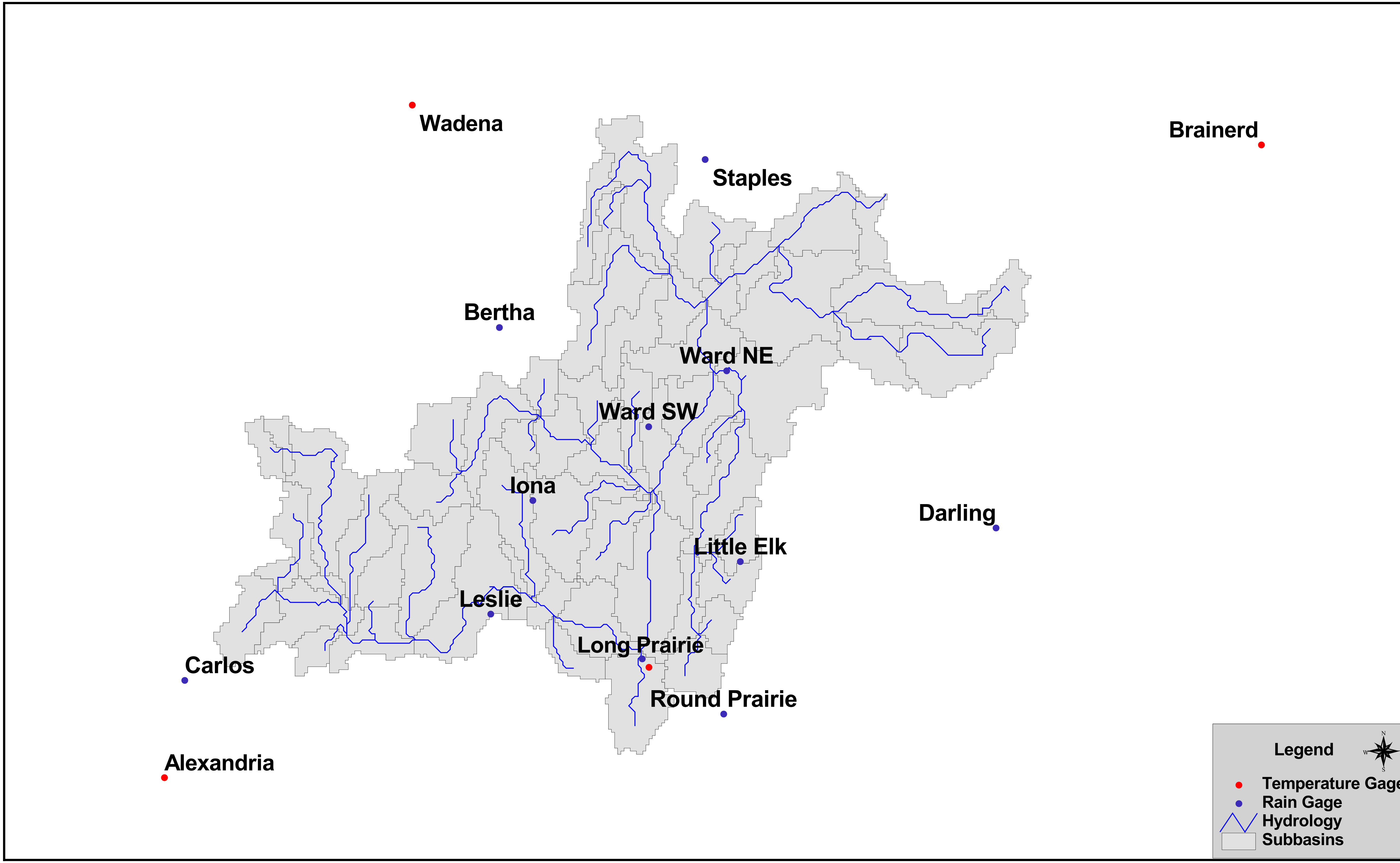


Figure G-4. Map of weather stations used in SWAT model for Long Prairie River Model

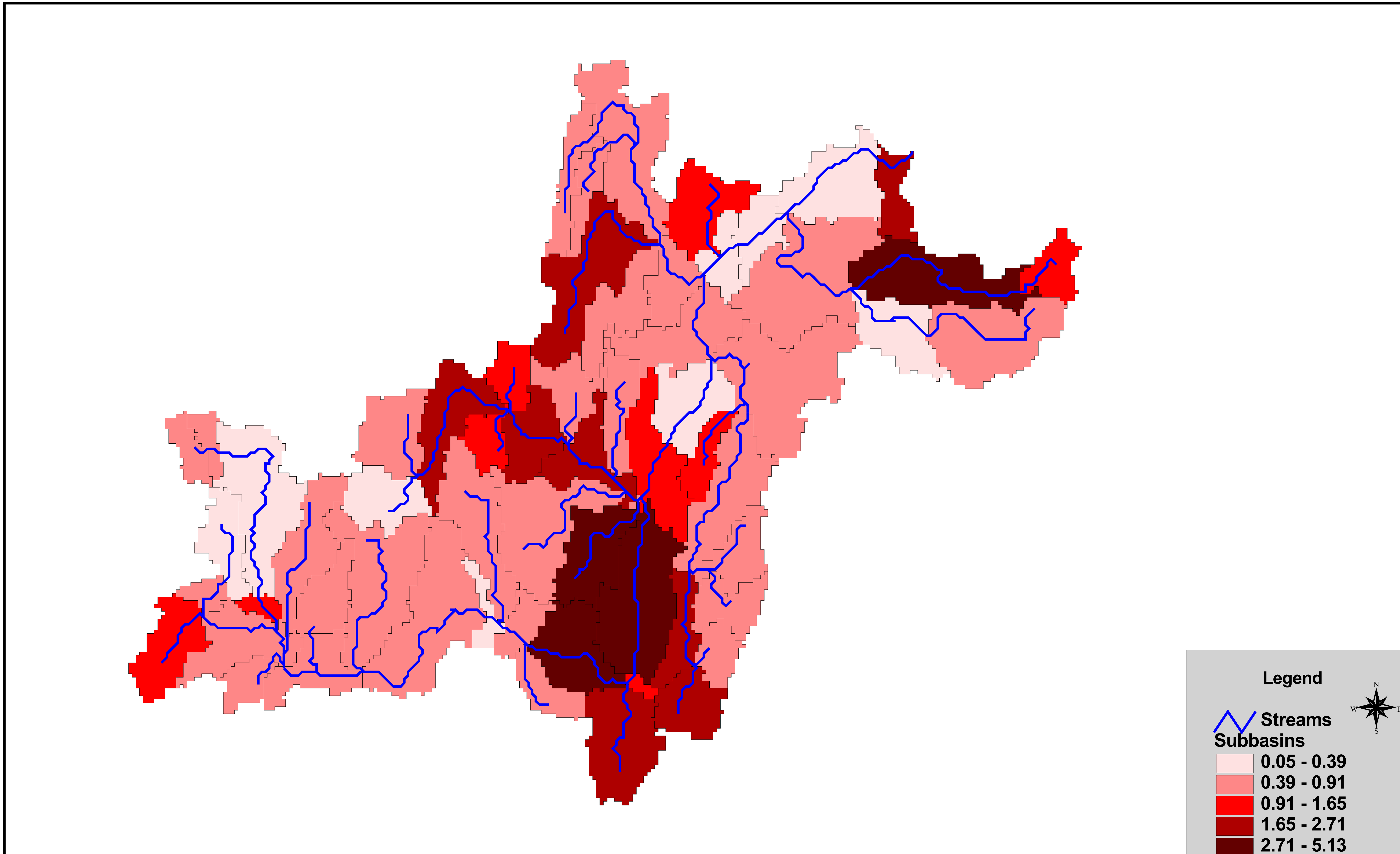


Figure G-5. Map of Sediment yields (tonne/ha) by subbasin from SWAT model for Long Prairie River Model

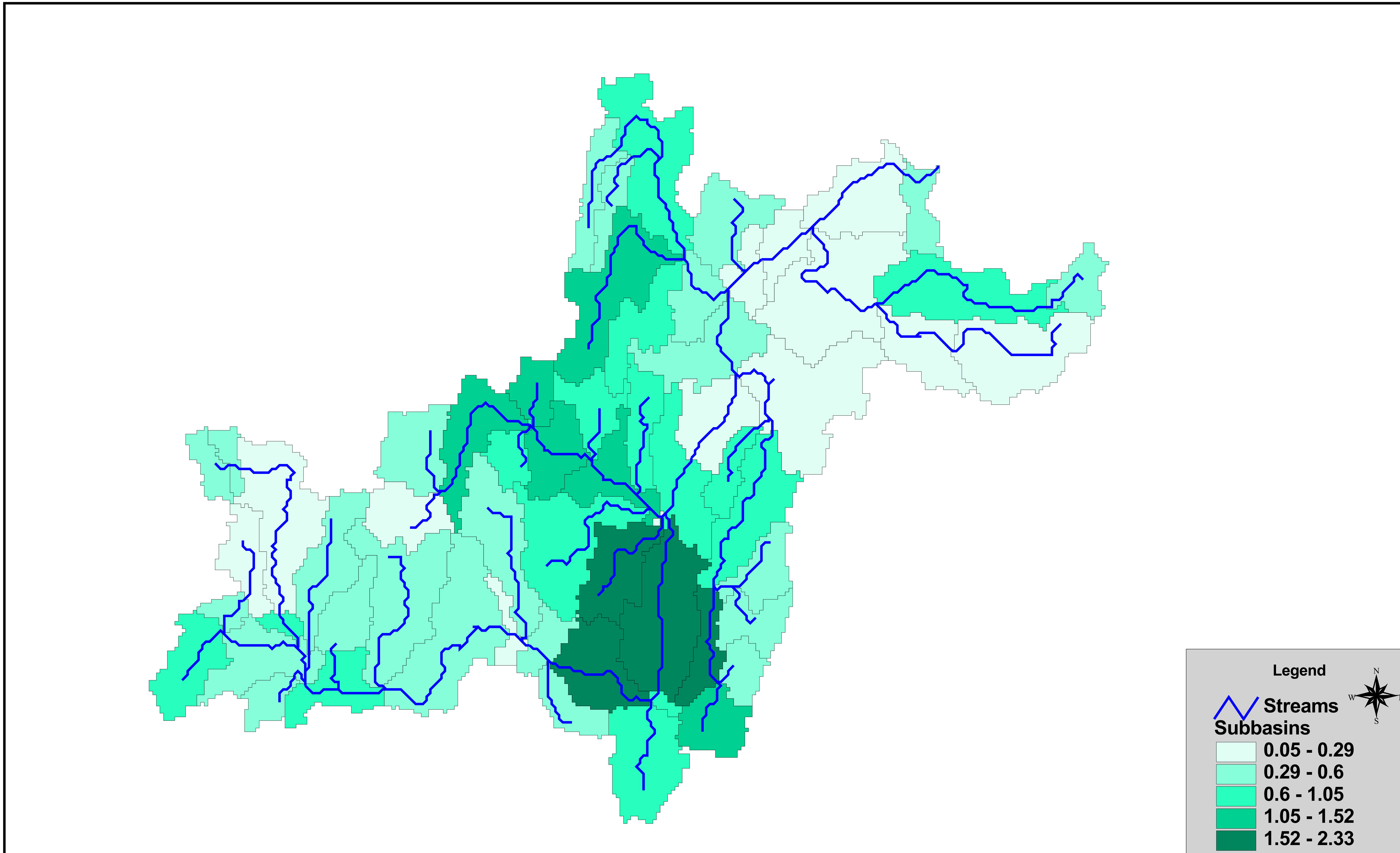


Figure G-6. Map of Phosphorus yields (kg P/ha) by subbasin from SWAT model for Long Prairie River Model

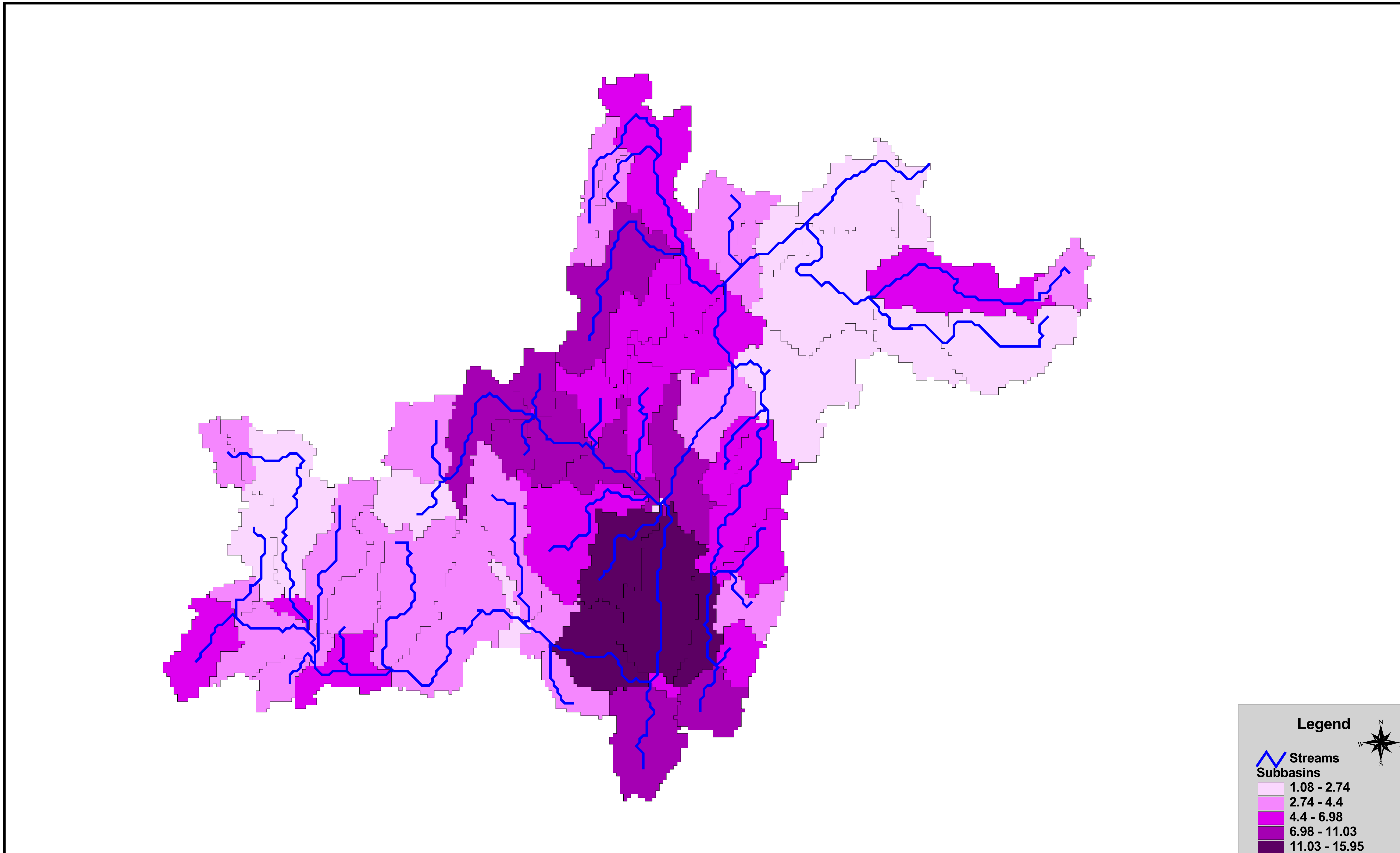
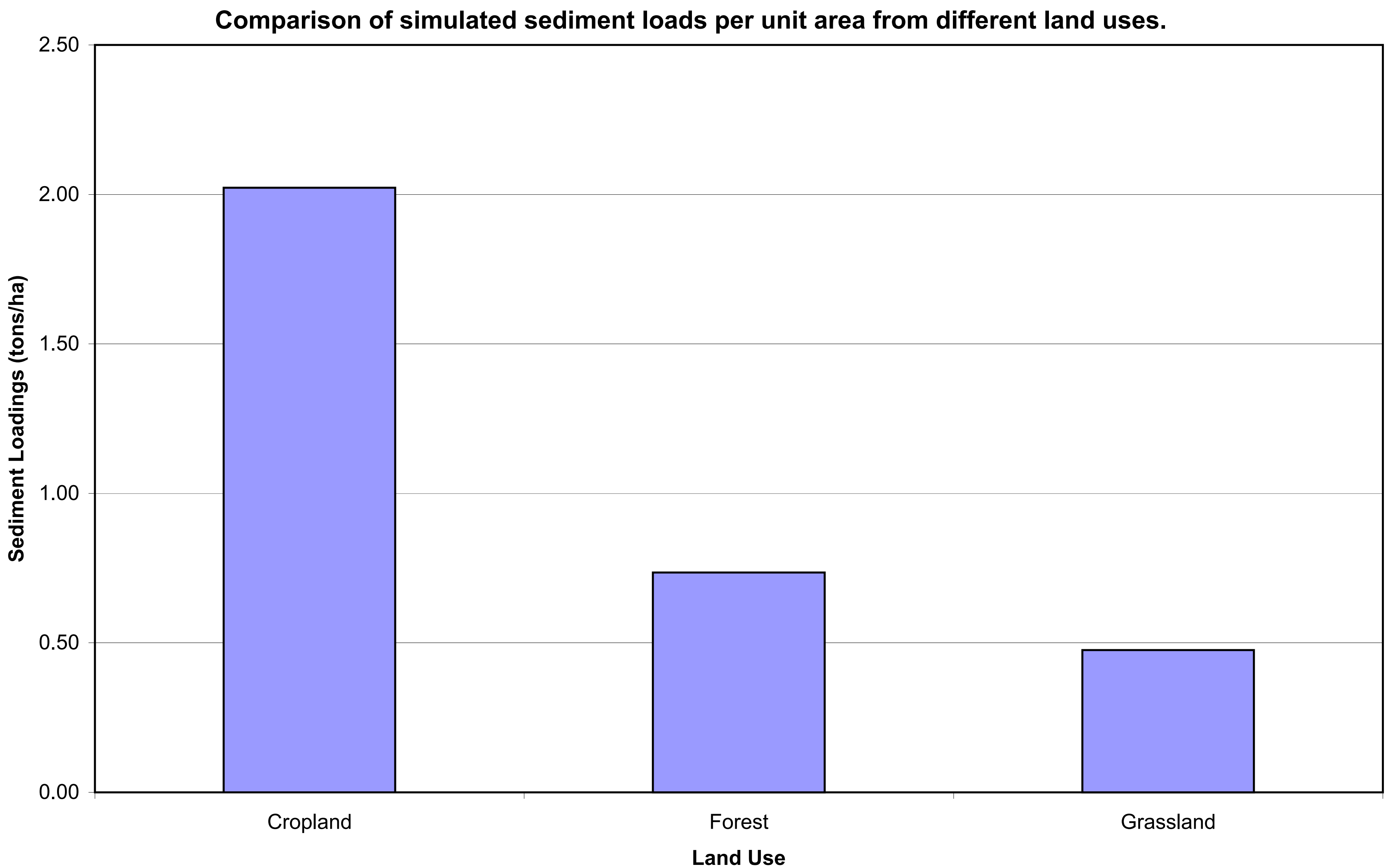


Figure G-7. Map of Total Nitrogen yields (kg N/Ha) by subbasin from SWAT model for Long Prairie River Model

Appendix G, Figure G-8

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report



Appendix G, Figure G-9

Minnesota Pollution Control Agency
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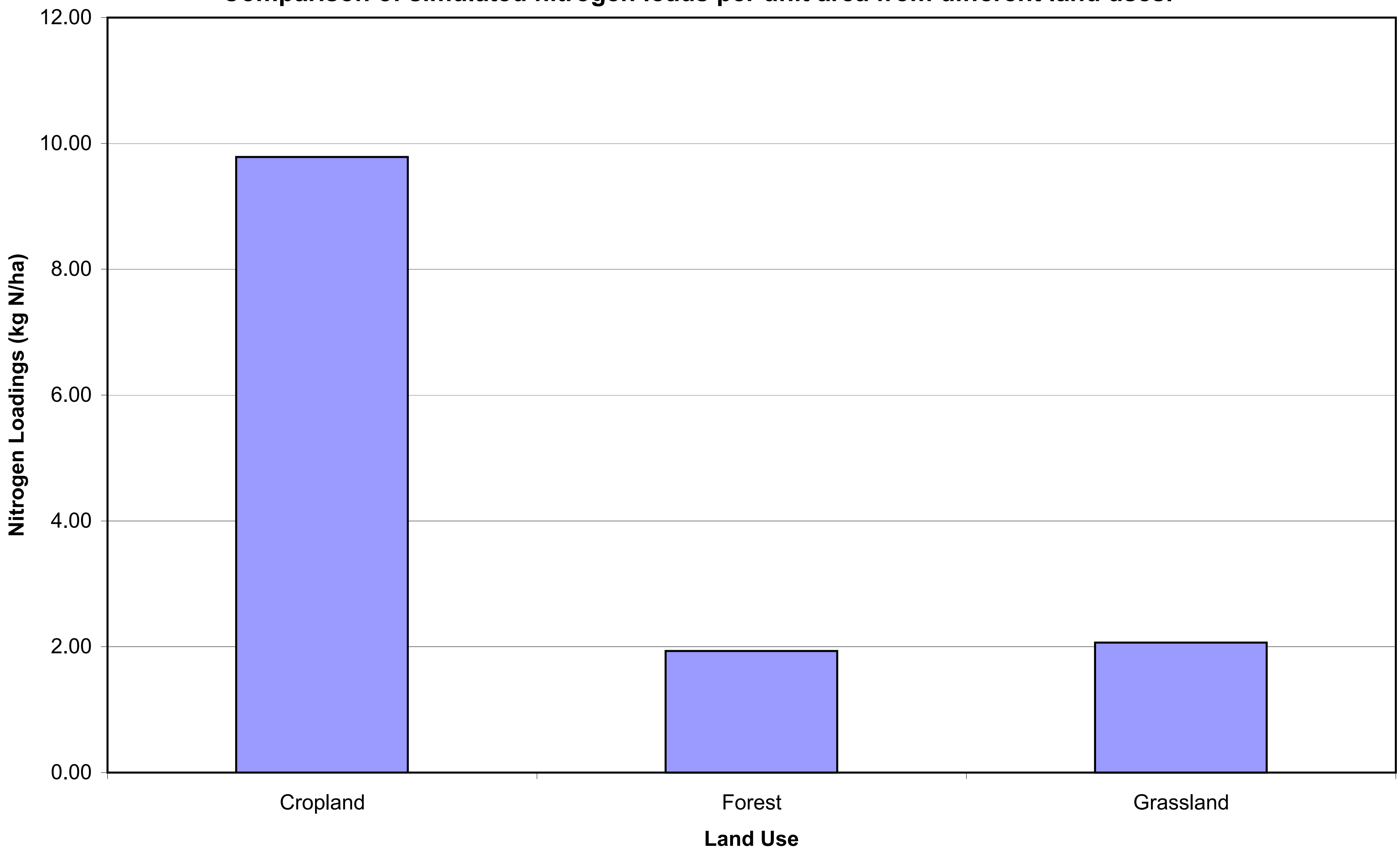
Comparison of simulated nitrogen loads per unit area from different land uses.



Appendix G, Figure G-10

Minnesota Pollution Control Agency
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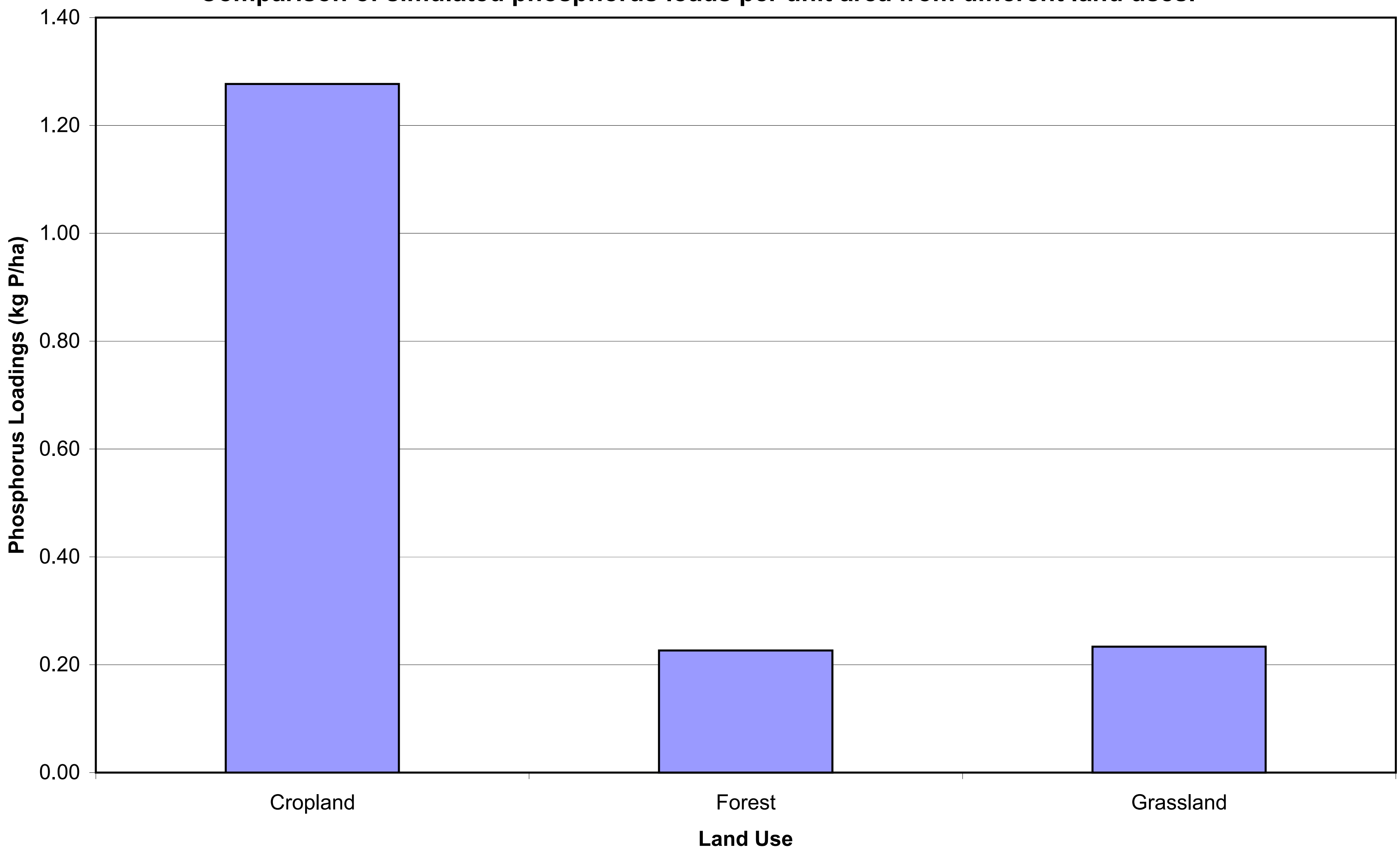
Comparison of simulated phosphorus loads per unit area from different land uses.



Appendix G, Figure G-11

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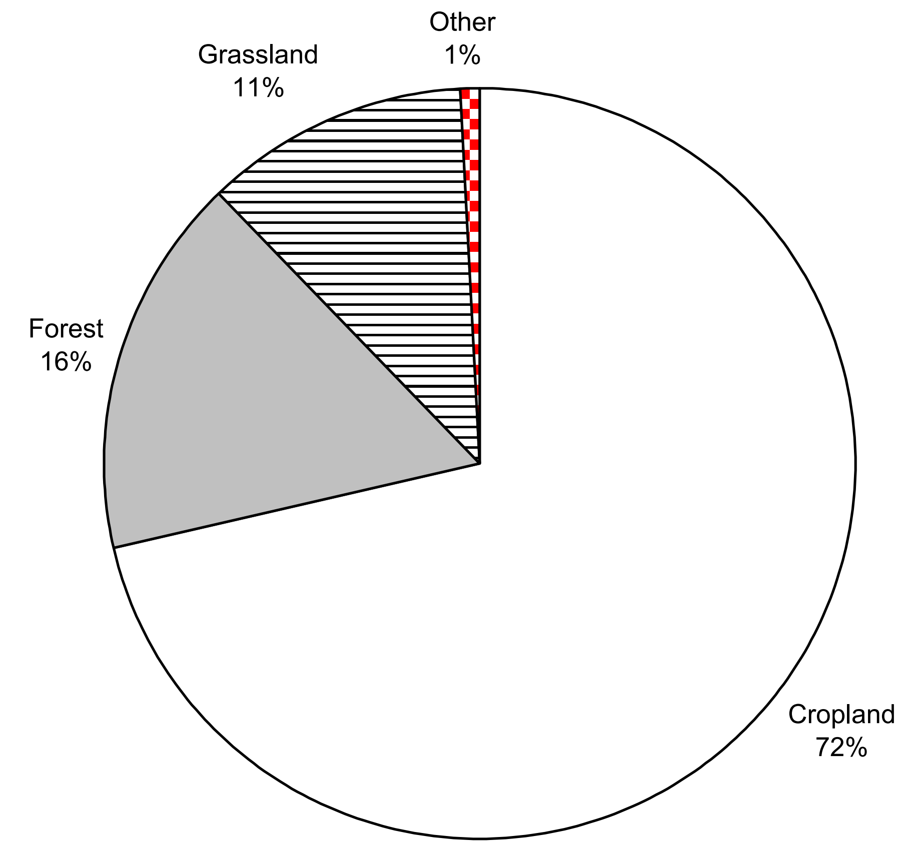
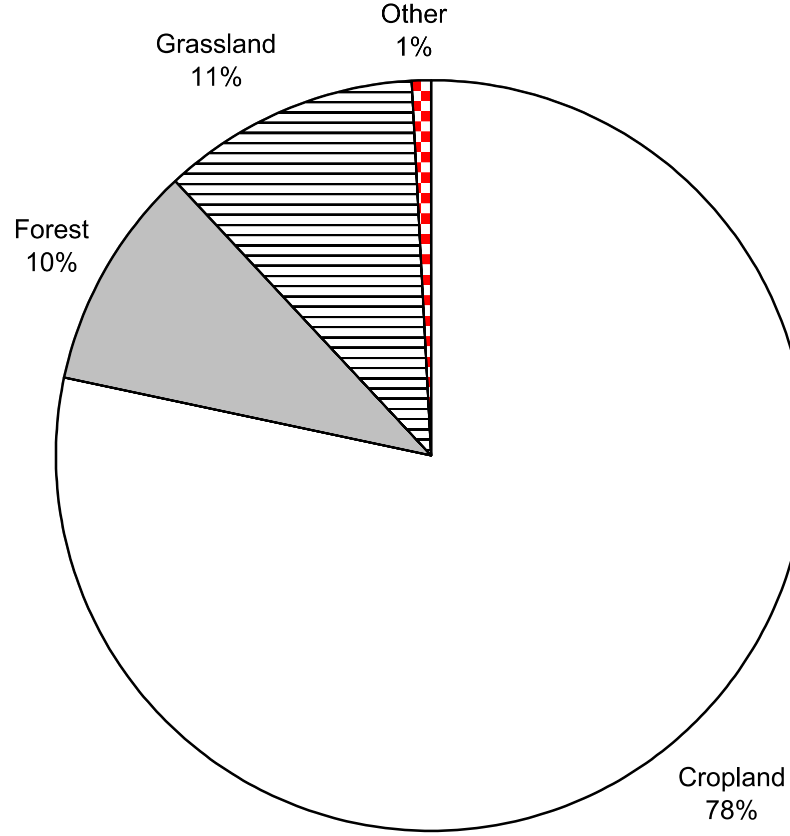
Percentage of total sediment load contributed by each land use.



Appendix G, Figure G-12

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

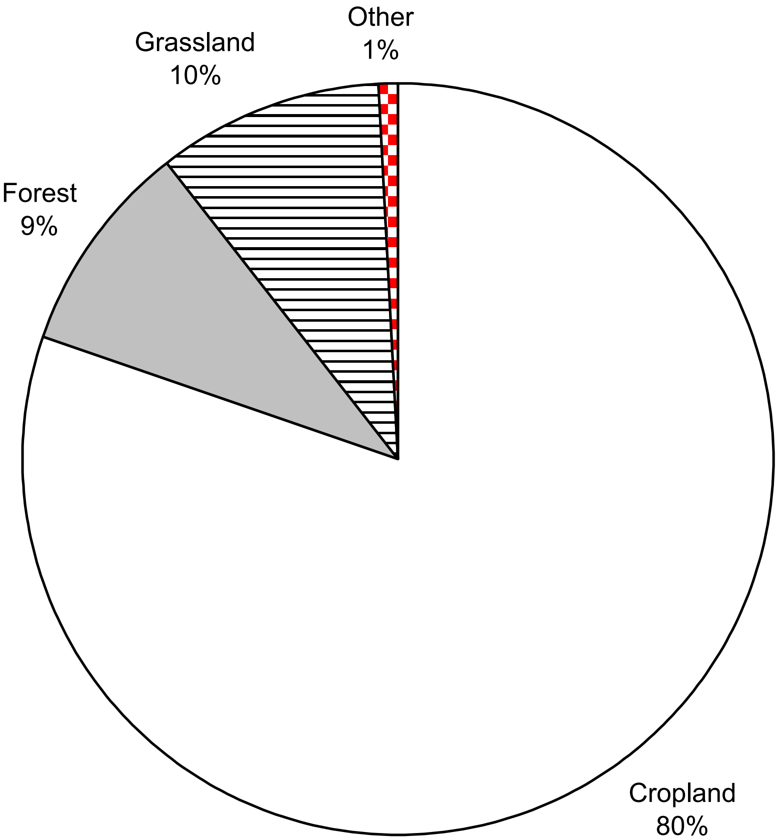
Percentage of total nitrogen load contributed by each land use.



Appendix G, Figure G-13

Minnesota Pollution Control Agency
Long Prairie River Watershed TMDL Final Project Report

Percentage of total phosphorus load contributed by each land use.



Public Meeting Documents

1) Public meetings – May 22 and June 12, 2003
   - News release announcing meetings
   - Local media outlets which received the news release
   - Letter of invitation and mailing lists of individuals who received the letter
   - Report containing agendas for each meeting, comments gathered during public meetings, evaluations of the meeting from participants, list of volunteers for the implementation committee and list of attendees for each meeting.
   - Newspaper coverage of the public meetings. We do not have a clipping service, but attempted to obtain copies of articles about the meetings. There may have been some articles we were not able to obtain.

NEWS RELEASE
Minnesota Pollution Control Agency
www.pca.state.mn.us
Toll-free and TDD 1 (800) 657-3864
Saint Paul • Brainerd • Detroit Lakes • Duluth • Mankato • Marshall • Rochester • Willmar

FOR RELEASE: May 9, 2003
Media Contact: Stephen Mikkelson (218) 855-5001
Technical Contact: Pat Shelito (218) 828-2493
Toll free/TTY: 1-800-657-3864

MPCA TO HOLD PUBLIC MEETINGS IN BROWERVILLE AND CARLOS

Brainerd, Minn. — The Minnesota Pollution Control Agency (MPCA) will be holding public meetings this spring seeking advice on how to reduce adverse impacts to the Long Prairie River. The first meeting will be 12:30 p.m., Thursday, May 22 at the Browerville Community Center in Todd County. The second meeting will be 1:00 p.m., Thursday, June 12 at the Carlos Town Hall in Douglas County. The format of both meetings will be an hour long informal open house, followed by a short presentation on water quality studies of the river. The final 90 minutes will be a facilitated session to provide an opportunity for local citizens, businesses, and local units of government to comment and share their ideas on options for addressing the pollution issues.

The meetings will focus on environmental problems associated with low levels of dissolved oxygen and ammonia toxicity in several portions of the Long Prairie River. Levels of dissolved oxygen which fall below the water quality standard of 5 milligrams per liter (mg/l) can harm fish and aquatic life, and reduce the river's ability to assimilate additional discharges of wastewater or stormwater.

Rivers and lakes can handle certain amounts of pollutants and remain "fishable and swimmable". But many waterways, including sections of the Long Prairie River and tributaries, are overloaded with one or more pollutants including ammonia, nitrogen and phosphorus.

So far in the Long Prairie River Basin, scientists have identified four river reaches with pollution impairments. A single water body or river reach (about 20 miles) can be identified as "impaired" for more than one condition or chemical parameter, but the primary focus in the Long Prairie River is the oxygen depletion and high ammonia levels during low flows. When a river reach is identified as having "pollution impairment" this means the river or lake is not fishable and swimmable.

-more-

Citizens can have a voice in deciding how to remedy the impairments. The public meetings will focus on the dissolved oxygen problem in the Long Prairie River, from Carlos to below Browerville. Low dissolved oxygen can result in fish kills or harm to fish and other aquatic life.

For more information, contact Pat Shelito 218 828 2493 or email at pat.shelito@pca.state.mn.us.

On the Web, visit http://www.pca.state.mn.us/water/basins/mnriver/index.html or www.pca.state.mn.us/water/tmdl.

- ### -

Print and Radio Media Coverage of Long Prairie Meetings

Newspapers

Long Prairie Leader
21 3rd St S
56347

Staples World
224 4th St NE
56479

Clarissa Independent News
310 W Main St
56440

Browerville Blade
609 N Main St
56438

Alexandria Echo Press
225 7th Ave E
PO Box 549
56308

Radio Stations

KEYL Radio
P.O. Box 187
Long Prairie, MN 56347

KXRA Radio
P.O. Box 69
Alexandria, MN 56308

Minnesota Pollution Control Agency

Official File Stamp

File Name

File Number

Page #________ Staff ________

Category

April 30, 2003

«Title» «FirstName» «LastName»
«Representing»
«Address1»
«Address2»
«City_», «State» «PostalCode»

Dear Stakeholder:

The Long Prairie River has been identified as an "impaired water" under the federal Clean Water Act. Parts of the Long Prairie River do not meet the water quality standard for dissolved oxygen during low flow periods. This means the Minnesota Pollution Control Agency (MPCA) is required to develop "load allocations" for the river to make sure that the pollution is adequately assimilated and diluted. Load allocation is the amount of pollution that a particular discharger will be allowed to put into the river. There are several ways in which the load allocations can be implemented. Each alternative poses the potential to impact your community, industry, and natural resources in different ways.

You are invited to attend a public meeting to express your concerns, ideas on solutions, and provide any other input you wish to share. Each meeting will include a short review of the scientific data that has been compiled and a presentation on the different scenarios for load allocation. An open house will occur for an hour prior to each meeting to allow examination of displays that communicate the options being considered. The remainder of the meeting will be used to seek brief answers from community members on the following questions:

- What are your main concerns/problems/issues with the use of the Long Prairie River?
- What are your concerns/issues with the load allocation scenarios and plan?
- What would happen over the next 15 years if you had your say?
- How are you willing to help solve this problem?

The meetings are scheduled for:

Thursday, May 22, 2003 - Browerville Community Center
544 Main Street, Browerville
Open House: 12:30 – 1:30 p.m.
Public Meeting: 1:30 – 4:00 p.m.

Thursday, June 12, 2003 - Carlos City Hall
120 Victoria Street, Carlos
Open House: 1:00 – 2:00 p.m.
Public Meeting: 2:00 – 4:30 p.m.

Both meetings will feature an identical format; you are welcome to attend either one that is convenient for you. So that we can be prepared with adequate handouts and refreshments, we ask that you confirm your attendance in advance by calling the MPCA Brainerd office at (218) 828-2493, or e-mailing at pat.shelito@pca.state.mn.us. Other questions about this process can be addressed to pat.shelito@pca.state.mn.us.

Sincerely,

Patricia Shelito
Project Manager, Community and Area Wide Programs Unit
Brainerd Office
Regional Environmental Management Division

PS:dlp

cc: Reed Larson, Manager, MPCA Brainerd Regional Office, Baxter

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Minnesota Dept. of Natural Resources - Region III
Area Hydrologist - Waters Division
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Little Falls, MN 56345

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Wastewater Treatment Operator - Lamb
Weston/RDO Frozen
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Park Rapids, MN 56470

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Morrison County Courthouse
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Detroit Lakes, MN 56501

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Minnesota State Representative
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St. Paul, MN 55155

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Alexandria, MN 56308

Continental Bridge
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I. Introduction

The Long Prairie River has been identified as an "impaired water" under the Clean Water Act. Parts of the Long Prairie River do not meet the water quality standard for dissolved oxygen. This means that the Minnesota Pollution Control Agency (MPCA) is required to develop "load allocations" for the river to make sure that the pollution is adequately assimilated and diluted. Load allocation is the amount of pollution that a particular discharger will be allowed to put into the river.

As part of the strategy to achieve successful response and implementation of the necessary allocations, the MPCA seeks public engagement and participation regarding their concerns, hopes, and questions regarding the Total Maximum Daily Load (TMDL) program. This report presents the public input received at two meetings presented in the Long Prairie River watershed. Specifically, the meetings were held at:

Browerville Community Center, May 19th, 2003 (Todd County)
Carlos Community Center, June 12, 2003 (Douglas County)

II. Publicity and promotion of event

Publicity for each public meeting was coordinated by MPCA staff, the Todd County Soil and Water Conservation District, Douglas County Water Planner and the Initiative Foundation.

Direct invitations to the event were mailed to approximately 135 stakeholders, including elected officials, representatives of NPDES permit holders, trade associations, and other opinion leaders within the watershed. In addition, public service announcements were distributed to all local newspapers and commercial radio stations.

III. Format and structure of public hearings

Agendas for each of the two hearings are included in Appendix I. Both meetings began with welcoming comments from local representatives of the host County, followed by brief introductions of key personal. The consulting firm of Wenck Associates, Inc. made a PowerPoint presentation on the chemical and biological evaluations that have previously been conducted on the Long Prairie River, followed by their recommendations on an allocation strategy. Following question/answers from the audience, participants were divided into small groups (of 8-12 members each) to encourage facilitated input directed by questions developed by the design team. Responses to these questions are presented in the next section.

A list of individuals suggested for participation on the Citizen Advisory Committee is presented in Appendix II. All participants were offered the opportunity to be added to a mailing (or e-mail) distribution list to maintain communication regarding updates and process on this effort. A compilation of media coverage of the public meetings is presented in Appendix III. A complete list of participants in each event is presented in Appendix IV.

IV. Summary of Public Input Received:

Presented below is a summary of all public input received at both hearings. These inputs are organized according to the location at which they were received, with oral and written comments presented separately. Oral comments were recorded on a large easel as they were spoken to provide the opportunity for the commenter to provide clarification or interpretation if they felt their comment was not heard correctly.

Summary of oral comments made at roundtable discussions in Browerville, May 22, 2003

Common themes:

- Cities concerned about meeting proposed standards; no funding available.
- Some Cities already made WWTP improvements ($ already spent);
- Willing to do treatment improvements if $ is available;
- Not enough monitoring to know if these $ will lead to improvements;
- Upgrade costs are unreasonable/agency is picking on industry;
- Is there data on what costs to cure will be?
- Location citizens aren't aware of ANY pollution on river;
- "We can work with phased-in requirements"
- Don't forget about stormwater and NPS fixes
- People will do the right things but need financial incentives;
- There isn't a problem; this is about regulation and control;
- How frequently do low flow conditions occur/Does MPCA need to use 7Q10 or not?
- What if additional point sources convert to continuous discharge (rather than fall/spring)? Will that worsen summer conditions?
- What's the percentage contribution by NPS; PS and what time of year?
- Non-point sources are easy to pick on -- nutrients are being harvested along with product – natural vegetation may contribute more;
- Need realistic guidelines so industry and agriculture prosper;
- Where are the costs and the lines going to be?
- Not sure we are analyzing the data right.
- Cumulative burden of regulation (wellhead protection, SWMP, phosphorus reduction, ammonia, monitoring) is costly, and the requirements move towards ever more stringent.
- Growth desired by community, but most industries have historically been "wet."
- Need to maintain long tem vision so course doesn't need radical adjustment.
- Some BMPs are already underway, especially with respect to agriculture and feedlot management. Financial carrots need to implement improvements for point sources based on common sense and cost effectiveness.
- Feels progress has been made to make MPCA more "user friendly" but more needed; encourage technical assistance, encourage conversion to forestlands in sensitive areas;
- MPCA needs to consider other environmental benefits of the rendering industry; if discharge requirements are too stringent that waste which is currently converted into a processes product will have to be disposed of in another (more costly) manner.

Solutions:

- Education of John Q. Public is needed;
- Need phased approach to spread the cost out;
- More monitoring of effectiveness of BMPs, etc.
- MPCA works *with* industry rather than an adversary.
- Buffer strips but how do you compensate the landowners?
- WQ standards remain the same;
- Keep the focus on maintaining the river quality;
- Keep doing things like manure management; stay the course;
- $ to easily changed (corrected) sources; don't blame anyone;
- Make sure new technology is available to us
- Control what's coming into the waste stream into POTWs (pre-treatment)
- Consider costs of upgrades to meet the requirements;
- There would be financial assistance;
- Share data from other sources/agencies, such as updated aerial photos
- Build TMDL implementation into County Comprehensive Plan
- Value added industry (MnTAP)
- Consider unintended consequences to not exacerbate costs; we need "balanced and responsible use of natural resources and capital."

How are you willing to help?

- Continue to do the work in a positive manner. Example: manure applications;
- Make sure we follow the law; do what we can and participate.
- Technical (and financial) assistance from academic institutions, nonprofits, agencies, peers.

In addition to these oral comments, eleven individuals submitted written comments at the Browerville meeting. These written comments are presented in full below:

1. **What are your hopes about the TMDL process?**
   - "Come up with good workable, responsible solutions – work with all dischargers"
   - "That the quality be improved to a level that recreational opportunities can be increased."
   - "A reasonable set of guidelines/regulations to meet the needs of the river basin while being economically feasible."
   - "fish (sic) us jobs??"
   - "Restore the vitality of the river"
   - "To preserve the Long Prairie River Basin through cooperative efforts of all parties that impact the river."
   - "I hope that the process stays positive and factual. I do not want to see restrictions placed on the source that cannot defend itself just because that is easy."
   - "To be able to work to meet the limits that are set."
   - "Water quality improvement for both the Long Prairie River and Crow Wing River."
   - Reduce it."

2. **What are your concerns about the DO/ammonia reductions?**
   - Cost of this upgrade for industrial dischargers if necessary to convert from ponds to mechanical systems."
   - Cost to the facilities required to upgrade."
   - Financial liability – a mechanical facility would/will be cost prohibitive"
   - "Data – is this better or worse than last 10 years?"
   - Cost effectiveness"
   - "Ultimate effectiveness: are the procedures supposed to work; is data analysis accurate?"
   - "Preventing low DO levels or high ammonia levels for normal aquatic life."
   - "Are the values of DO that are the goal realistic numbers?"
   - "The cost of doing it."
   - "It is likely that changes to the discharges for the industries in Long Prairie are at the top of the lists."
   - "Where it is coming from?"

3. **What would you do if you had the final say?**
   - "Test rain! That is where all our water comes from. It is much higher in phosphorus than the river water. I have been testing it since 1992 on the East Branch of the Chippewa River in Pope County."
   - "Look at the farm runoff – buffer zones?"
   - Financial Assistance"
   - "Buffer zones of for rivers and lakes" (listed by two responders)
   - "New land use coverage – digital mapping for non-point study"
   - "Add as implementation section to Todd County Comprehensive Plan"
   - More buffer zones; realistic attainable goals"
   - "Implement a plan that would manage the river now and far into the future so that DO levels never become too low or the Ammonia levels become too high."
   - "I would make sure we are making the wise choices that do not need to be redone with new info. or new requirements."
   - "Do the best we can with the rules and regulations."
   - "Long Prairie industrial waste controlled; Municipal waste in Long Prairie, Clarissa and Eagle Bend improved; Address hot spots on Turtle Creek (upper end), Upper Long Prairie Watershed."
   - "Take a look at who is abusing the tributary."

4. **If you had your way, what would the river to look like in 10 – 15 years?**
   - "Should be able to swim, fish and enjoy river."
   - "Clean, fish in it, parks along it, canoe route, discharged DO, Nitrogen, phosphorus decreased to help improve quality. As I understand it, which on the chemical analysis issues is limited."
   - "Maintain river condition for recreational and other public use."
   - "Eventually – like it did 100 years ago."
   - "We would stay the course and the river would continue to improve on the quality."
   - "clean."

- "It would have more of a survivable spring and summer condition for game fish that use the Stream, and improved winter conditions for the Crow Wing River when they migrate their (sic) in the fall."

Summary of oral comments made at roundtable discussions, Carlos, June 12, 2003

1. **Do you think there is a problem with the Long Prairie River? If yes, how would you describe the problem?**

- Part of the problem is man-made, but part is due to natural impacts
- Too many jurisdictions involved; where to you start?
- Total phosphorus wasn't adequately discussed; in determining the problem the MPCA used lake water quality standards instead of ones for rivers.
- No, we need to "work with Mother Nature"
- Point sources are the origins of the problem; The MPCA needs to find out what the actual amount of phosphorus (and ammonia) that is being discharged from the ponds at Grey Eagle and Carlos
- Non-point pollution is likely a significant contributor; fix this before you address point sources like the sewage plant;
- The river is different now; my family has lived on the Long Prairie for five generations, and it used to be clear, with great fishing…now it is difficult to irrigate because the water clogs our irrigation system
- The problem is the changing of the regulations and our ability to implement the regulation, both in costs and in response time. As a commercial operation that treats waste as a business expense we have to completely absorb the costs.
- Point sources are the problem; we need to come up with different solutions (for treating waste) rather than discharging to lakes and rivers.
- No visible problem (near Long Prairie); lack of documented fish kill
- High rain and runoff is the problem; is creates cloudy water in the spring
- Is this potentially a natural phenomenon we are just now detecting? The trend analysis is relatively short-term.
- Smaller agricultural operations and "hobby farms" are likely part of the problem; they tend to use more fertilizer
- The MPCA should target the problem reaches of the river (and associated sources of ammonia, phosphorus, and decreased dissolved oxygen), rather then attempt to improve the entire river.
- Dilution is the solution to pollution.
- I would like to know more about Best Management Practices to reduce Phosphorus runoff and control non-point sources.

2. **What concerns or issues do you have?**

- Concern: location/geography often determines/limits your treatment options (cost vs. payoff/benefit)
- Concern: Treatment limits that would allow us to meet limits; what about natural pH?
- Concern: Test for ammonia in the ponds at Carlos (which hasn't yet been done); you can't do a complete analysis without testing

- Problem: Everyone wants to live by a lake or river; using up the assimilative capacity of surface waters for treating waste.
- Concern: Waste from rendering facilities is becoming more concentrated as other plants shut down; given the volume of waste that is treated at the Long Prairie site can they even technically meet the anticipated standards?
- Infiltration/Intrusion affects ability to discharge at low flows; addressing this problem might actually exacerbate the concentration (and problems associated with discharges) at low flows.
- Comment: is the problem of dissolved oxygen below 5 mg/L during low flows really a problem? The fish are mobile and can move into better oxygenated reaches, later the return.
- Major concern: cost of reaching treatment limits; are grants or other sources of financial assistance available?
- There is a limit to what people (and the regions industries) are willing to pay/can afford to meet the treatment goals
- Some pond wastewater treatment systems may need to convert to year-round mechanical systems
- We want to reach the goal of a clean river, but are concerned about cost; what if we lose businesses due to increased costs of treatment?
- We're concerned that the TMDL listing may restrict development of Douglass County and/or restrict farming
- What impacts will the TMDL listing have on resorts and tourism?

3. What are your thoughts about how to solve the problem?

- Why don't we have a Watershed District (with taxing authority) like the Sauk River Watershed District?
- Investigate the creation of a Joint Powers Board (including representation from both Counties) for implementation direction and funding; it is everyone's watershed!
- There needs to be a compromise between everyone; everyone is tied together economically, socially, and culturally.
- We need to assess innovative/alternative treatment options rather than traditional "big pipe" solutions that discharge to surface waters. These could include bacteria that breakdown the waste, land application on poplar farms so that nutrients are assimilated, etc.
- With respect to buffer zones for agricultural lands, taking more riparian land out of production will be difficult unless tax breaks are provided; more incentives are needed.
- Counties both have a role in implementation; consider how the County Comprehensive Plans, ordinances, and zoning classifications may affect implementation, and how variances or conditional use permits might work against progress.
- Examine development near lakes and rivers to make sure that setbacks and stormwater management are adequate.
- Continue to convene stakeholders – the solutions will come through community involvement.
- Need to focus on the entire watershed, not just on the immediate river area.

In addition to the oral comments recorded, the following eight written comments were submitted at the Carlos public meeting:

1. **Do you think there is a problem with the Long Prairie River? If yes, how would you describe the problem?**
    - I have lived by the upper portion of Long Prairie River (Douglas Co. 65) all my life, we no longer have fish like we once did.
    - Yes, it is a point-source problem with municipal & industrial wastewater discharges
    - Don't know
    - Yes in certain areas; in certain area (Long Prairie) seems to be the biggest problem as far as ammonia.
    - Yes, too many institutions (?) involved, where do you begin? Where is money coming from; ? justify cost of doing!
    - The biggest seems to be the Long Prairie area, although admittedly not the only problem.
    - Yes, Long Prairie industrial discharge.
    - Point source is the problem – as shown

2. **What concerns or issues do you have?**
    - I am concerned about having another treatment facility using the river for its discharge.
    - Alex Central Lakes Sanitation District adding to the impairment with discharge into the Long Prairie River near Carlos. Also uninformed and unregulated dumping of other municipal/industrial ponds into the Long Prairie River.
    - Sewer/costs?
    - Putting our sewer in Long Prairie River from Western Douglas Co. & Chippewa Rivershed
    - Restrictions put on Douglas County could prevent future development or put further restrictions on agriculture with phos. goals.
    - Cost of doing! Land use; better ways of doing sewer treatment.
    - In my memory that has been a problem for over 20 years.
    - Process fairness/reasonable results; 10 year implementation – does this mean future developments are in limbo because the plan is complete without implementation? Implementation plan won't be funded.
    - I believe from the information show, that the major pollutant contributors are the discharges from municipalities, especially emergency discharges. We shouldn't degrade one resource to protect on (our?) cleanup another resource.

3. **What are your thoughts about how to solve the problem?**

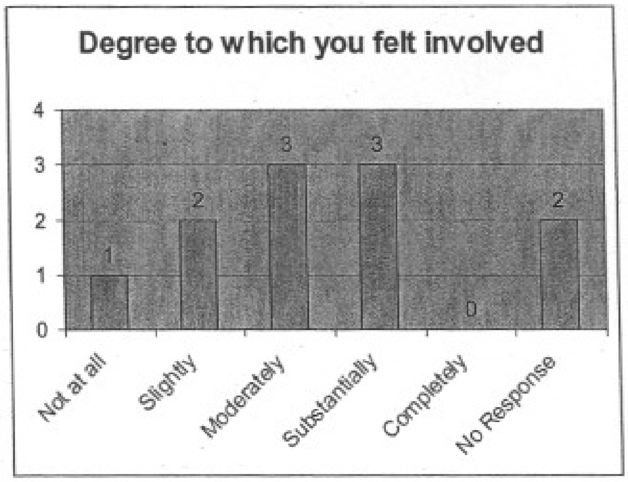
    - I wish I knew!
    - Land application through irrigation systems to grass fields and hybrid poplar plantations.
    - We need to keep our rivers and lakes clean, but without grant monies we cannot afford sewer system for Douglas County Lakes.
    - Douglas & Todd County work together to allowing (sic) existing point sources to continue to operate at legal limits and don't make limits to strict for no possible growth or inputs to the river.

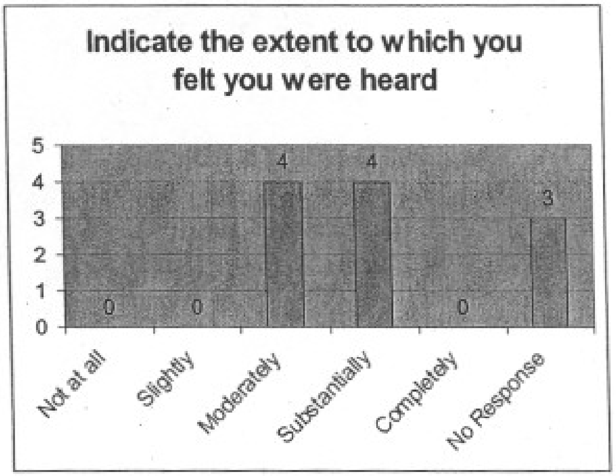
- It is everybody's problem; need to form a watershed district.
- Why hasn't the PCA corrected that area years ago? An individual has only up to 2 years to correct a septic system.
- Additional treatment of Long Prairie industrial discharge.
- There have to be other ways to handle treated discharges rather than outletting into lakes and rivers and existing wetlands. Such as land application – on grassland – hybrid poplar or constructed

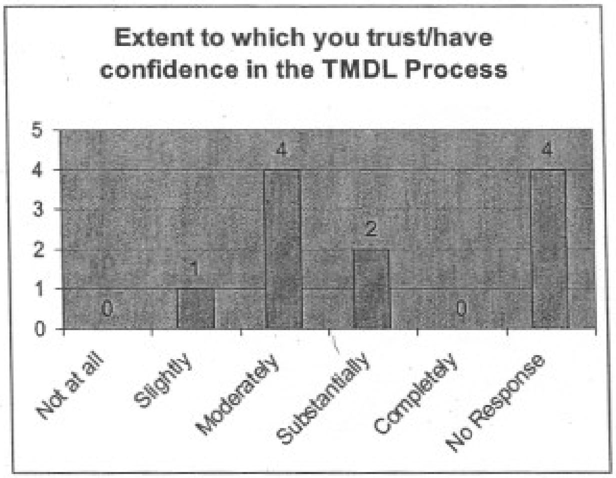
V. Evaluation

All participants were asked to anonymously respond to questions evaluating the two public meetings. At the Browerville meeting eleven of thirty-two participants (34 percent) returned their surveys; at Carlos eight of forty participants (20 percent) submitted evaluations.

Browerville responses:



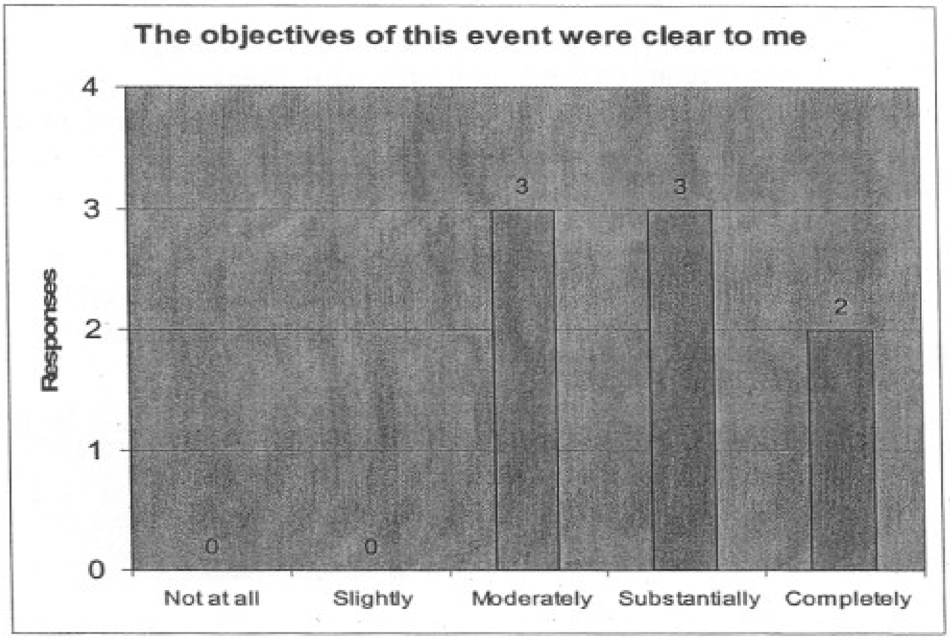


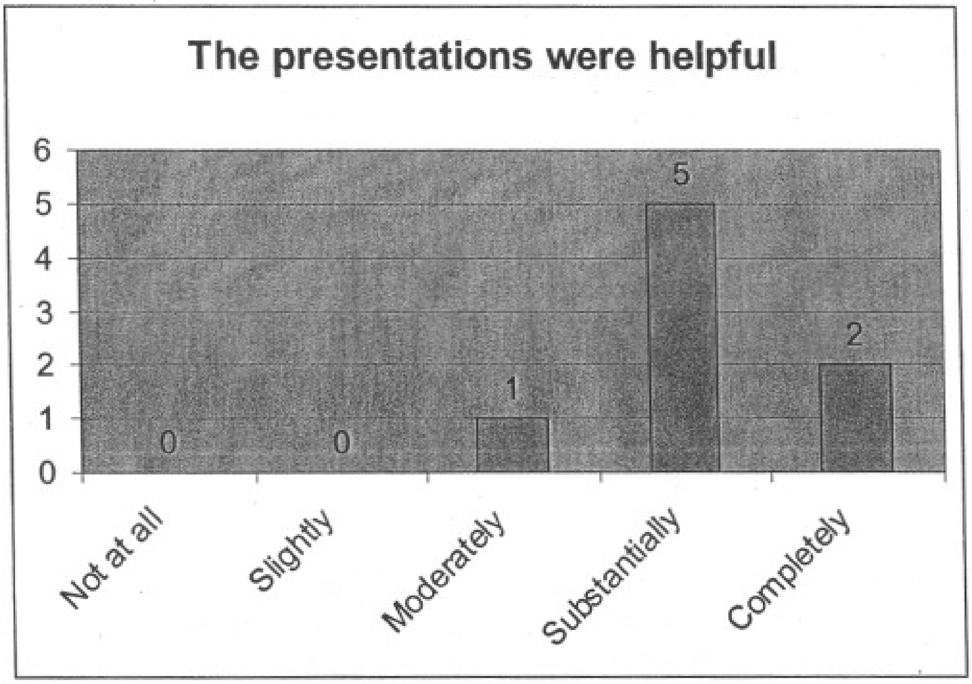


In Browerville, the following general comments were also submitted with the evaluations:

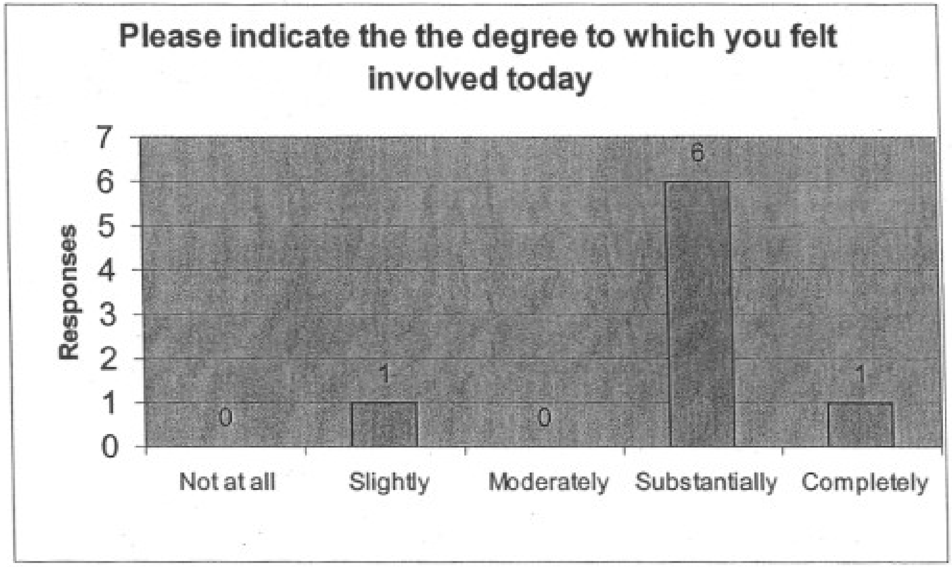
- "In the non-point source section I think that there were a lot of assumptions of where the nutrients come from."
- "Most concern to environmental questions answer(ed). I(t) seems the financial implications intentionally avoided to minimize revolt. Although very informative, it appears more questions generated than answer(ed) at this time."

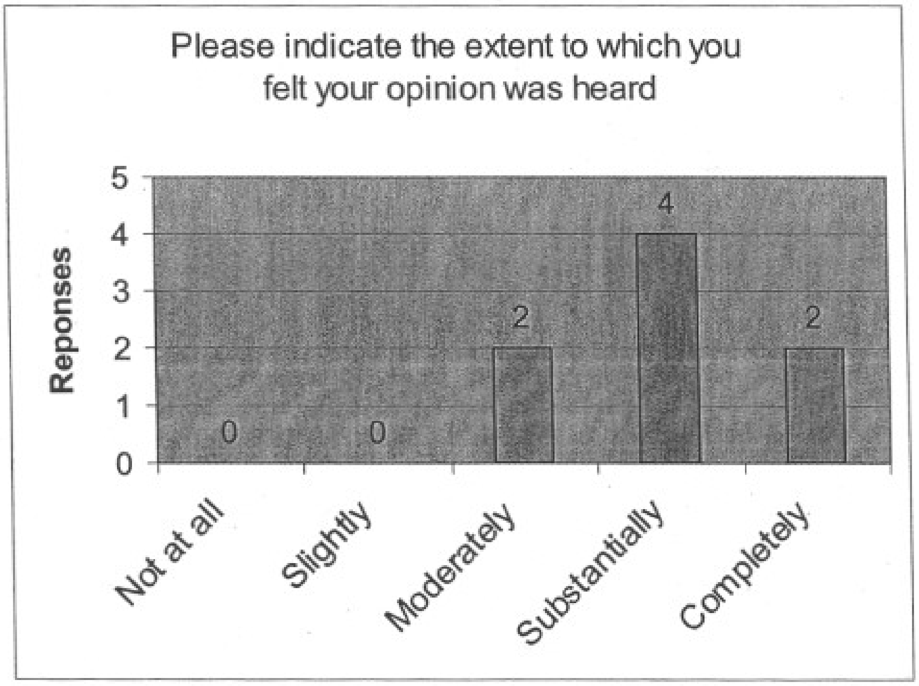
At the Carlos meeting the evaluation questions were slightly altered as shown below:





Carlos Evaluation Responses (continued):





No additional written comments accompanied the Carlos evaluation.

Appendix I
Agendas for the two public meetings
Browerville, MN, May 19, 2003
Carlos, MN, June 12, 2003

Long Prairie Watershed Total Maximum Daily Load
Browerville Public Meeting Process Agenda
May 19, 2003

By the end of today's session participants will:

- Have an understanding of the TMDL regulations and implications for the Long Prairie River Watershed;
- Been provided an opportunity to express concerns and hopes for the river's restoration;
- Learned of the opportunity to continue to participate in planning for this project by receiving additional information and/or activating representing your values, views and expertise on an Implementation Committee.

Agenda:

Welcome, and review of positive changes & relationships in the Watershed (1:30 p.m.)
* Gerry Ruda, Todd County Commissioner

Introductions / Agenda / Short and Long Term Outcomes
* Don Hickman, Initiative Foundation

Assessment and Allocation Scenario Presentation
* Wenck Associates, Inc.

Time Line for Project
* Pat Shelito, MN Pollution Control Agency

Citizen Input:
During the presentations, participants will be asked to fill out a form that includes these questions:

- What are your main concerns/problems/issues with the use of the Long Prairie River?
- What are your concerns/issues with the load allocation plan?
- What would happen over the next 15 years if you had your say?
- How are you willing to help solve this problem?
- How do you want to be informed as we go forward?

Ten Minute Break

"Interest Group" Table Discussions. Goals:

- Individuals state their concerns/interests to those with similar concerns/interests.
- The group explores the different concerns and interests and identifies common themes.
- The group discusses possible solutions to their concerns/interests.

Each group assigns a scribe and a spokesperson to report back to the full group. Each table will have only 2-3 minutes to summarize the group's conversation, although all notes will be incorporated into the report on today's meeting. We will adjourn at 4:30 p.m.

Long Prairie Watershed Total Maximum Daily Load
Public Meeting Agenda
Carlos MN June 12, 2003

By the end of today's session participants will:

- Have an understanding of the TMDL regulations and implications for the Long Prairie River Watershed;
- Been provided an opportunity to express concerns and hopes for the river's restoration;
- Learned of the opportunity to continue to participate in planning for this project by receiving additional information and/or activating representing your values, views and expertise on an Implementation Committee.

<u>Agenda:</u>

Welcome, and review of positive changes & relationships in the Watershed (1:00 p.m.)

* Jerry Haggenmiller, Douglass County Soil and Water Conservation District
* Gerry Ruda, Todd County Commissioner

Introductions / Agenda / Short and Long Term Outcomes (1:15 p.m.)

* Don Hickman, Initiative Foundation

Assessment and Allocation Scenario Presentation (1:30 p.m.)

- Wenck Associates, Inc.

Ten Minute Break (approximately 2:15 p.m.)

Citizen Input:
During the presentations, participants will be asked to fill out a form that includes these questions:

- Do you think there is a problem with the Long Prairie River? If yes, how would you describe the problem?
- What concerns or issues do you have?
- What are your thoughts about how to solve the problem?

"Interest Group" Table Discussions. Goals:

- Individuals state their concerns/interests to those with similar concerns/interests.
- The group explores the different concerns and interests and identifies common themes.
- The group discusses possible solutions to their concerns/interests.

Each group will assign a scribe and a spokesperson to report back to the full group. Each table will have only 2-3 minutes to summarize the group's conversation, although all notes will be incorporated into the report on today's meeting. We will adjourn at 5:00 p.m.

Appendix II
Roster of individuals recommended for the Citizen's Advisory Committee

Browerville

Larry Lemm Mayor, Browerville 544 Main Street South Box 247 Browerville, MN 56438 (320) 594-2201 ctybrow@rea-alp.com	Chuck Buhl City of Browerville 544 Main Street South Box 247 Browerville, MN 56438 (320) 594-6234 pubwks@rea-alp.com	Daryl Brever Box 359 Long Prairie, MN 56347 (320) 732-2819 dbrever@centralbi.com
Ted Reichmar State Cattleman's Association (320) 544-6222 reichmar@runestone.net	Don McCallum P.O. Box 319 Redwood Falls, MN 56283 (507) 637-2838 dmccallum@centralbi.com	Tim King Long Prairie, MN 56347

Carlos

Dick Kuehn 12690 Hermosa Beach Alexandria, MN (320) 852-7588 kuehns@gctel.	Jerry Haggenmiller 900 Robert Street, Suite 102 Alexandria, MN (320) 763-3191 jeome.haggenmiller@mn.usda.gov	Marilyn Bayerl 9083 State Hwy 114 SW Alexandria, MN (320) 283-5891 Bayerl@runestone.net
Mike Sunder Long Prairie Packing 10 Riverside Long Prairie, MN 56347 (320) 732-2171 mike.sunder@longprairiepacking.com	Greg Ostrwsof 35129 County 21 Browerville, MN 56438 (320) 594-0146	Vern Lorung DCLA 863 West Latoka Dr. SW ? (320) 763-3892 vernsung@rea-alp.com
Gerry Rude 315 Second Avenue N. Long Prairie, MN 56347 (320) 732-2437	Jeff Gunderson Box 294 Carlos, MN 56319 852-7647	Rick Zwieg Box 294 Carlos, MN 56319 852-7647
Kevin Hess 108 Main Street Eagle Bend, MN 56446 (218) 738-5982	Dennis Tyrrell 277th Avenue Browerville, MN 56438 (320) 594-6205	

Appendix III
Print and Radio Media Coverage of Long Prairie Meetings

Print and Radio Media Coverage of Long Prairie Meetings

Newspapers

Long Prairie Leader
21 3rd St S
56347

Staples World
224 4th St NE
56479

Clarissa Independent News
310 W Main St
56440

Browerville Blade
609 N Main St
56438

Alexandria Echo Press
225 7th Ave E
PO Box 549
56308

Radio Stations

KEYL Radio
P.O. Box 187
Long Prairie, MN 56347

KXRA Radio
P.O. Box 69
Alexandria, MN 56308

Appendix IV
Roster of participants from both meetings

Browerville Meeting Attendees

Name	Address	City	Zipcode	Phone	Email
Gerry Ronda	315 2nd Avenue North	Long Prairie		320-732-2437	
Kristen Van Anbur		St. Paul		651-296-1251	
Ken Sorenson	17209 - 181st Avenue	Osakis		320-859-2642	
John Sumsy	27516 State 210			218-894-2187	
Janet Goligowski					jgoligowski@yahoo.com
Joe Terwey	24663 Co. 11	Long Prairie		320-732-3638	
Mary Terwey	24663 Co. 11	Long Prairie		320-732-3638	mandj@rea-alp.com
Daryl Brever	P. O. 359	Long Prairie	56347	320-732-2819	dbrever@centralbi.com
John Zinta	25544 Co. 89	Long Prairie	56347	320-732-6868	
Emily Wolf	305 8th Avenue West	Alexandria	56308	320-762-3066	
John Polanski	MNTAP U of M	Minneapolis		612-624-4619	pol001@umn/edu
Jim Lilienthal	16543 Haven Road-DNR Fisheries	Little Falls	56345	320-616-2462	jim/lilienthal@dnr.state.mn.us
Jim Whitlock	2155 South Burgen	Alexandria	56308	320-762-1959	
Jim Hodgson		Brainerd			
Ted Reichman		Villard		320-554-6222	reichman@runestone.net
Yvo Jennoges	29238 - 208 Avenue	Glenwood			
Peter Quirt	RR1 Box 163	Eagle Bend		738-4161	
Bruce Nelson	ALASD 2201 Nevada Street	Alexandria	56308	762-1135	
Gloria Stevenson	Todd County			732-4248	
Chuck Buhl	City of Browerville			594-2201	
Reed Larson	MPCA	Brainerd		218-825-3054	reed.larson@pca.state.mn.us
Larry Lemm	544 Main Street, Box 247	Browerville	56438	320-594-2201	
Jeff Arelueen	721 Wells Stree	Eagle Bend	56448	218-738-6712	
Don Rasmussen	111 Fairview Avenue Northwest	Long Prairie		320-732-6350	don@rea-alp.com
Kevin Hess	108 Main Street West	Eagle Bend		218-738-5982	
Rudy Rush	Daybreak Foods	Long Prairie		320-808-4174	
Rick Roedl	Daybreak Foods P.O. Box 800	Lake Millis, WI	53551	920-648-8341 ext.243	rroedl@daybreakfoods.com
Nancy Potter	LP Lender			320-732-2151	lplnews@rea-alp.com
Ken Robinson	400 2nd Street South	St. Cloud		320-650-2812	
Mark Dittrich				651-296-1482	mark.dittrich@state.mn.us
Sue Cuchna	Box 396	Clarissa		218-756-2125	clarissa@hectel.net
David Venekamp	P.O. Box 389	Long Prairie		320-732-2167	dvenekamp@earthlink.net
Daniel Spicker	P.O. Box 389	Long Prairie		320-732-2167	

Carlos Meeting Attendees

Name	Address	City	Zipcode	Phone	Email
Greg Ostrowski	607 9th St NE	Long Prairie	56347	320-732-2644	
Kitty Tepley	607 9th St NE	Long Prairie	56347	320-732-2644	
Paul Anderson	274 County Rd 44NW	Alexandria	56308	763-3440	
Gerry Ruda	315 2nd Ave N	Long Prairie	56347	320-732-2437	
Rebecca Sternquist	305 8th Ave W	Alexandria	56308	762-3866	
Paula Carpenter	305 8th Ave W	Alexandria	56308	762-3864	
Emily Wolf	305 8th Ave W	Alexandria	56308	762-3066	
Darrin Hungness	305 8th Ave W	Alexandria	56308	762-2903	
Dennis Tyrell	37684 277th Ave	Browerville	56438	594-6205	
Tom Williamson	20805 133rd Ave	Osakis	56360	859-2727	
N. David Schlosser	10051 Met-Car Rd NE	Carlos	56319	852-7885	
Jim Casper	3504 Crestwood	Alexandria	56308	763-4147	
Jerry Haggenmilles	900 Robert St Ste 102	Alexandria	56308	320-763-3191	
Bryan Withers	5128 Co Rd 2	Osakis	56360	320-859-4437	
Cecil Foote		Long Prairie	56347	320-732-2171	
Michael Sunder		Long Prairie	56347	320-732-2171	
Marilyn Bayerl	9083 Sth 1145 W	Alexandria	56308	320-283-5891	
Dean Yohnke	7537 Peaceful Lane	Carlos	56319	320-752-7702	
Jim Bullert	13400 15th Ave S	Plymouth	55447	763-489-3100	
Sam Cossentinie		Eagle Bend	56446	218-738-5982	
Dick Kuehn	12690 Hermosa Beach Rd			320-852-7588	
Orv Hall	12718 Hermosa Beach Rd			320-852-7536	
Bud Nielsen	7264 Sunset Strip			846-0221	
John Davis	13255 R Rohnfeldt Dr			852-7969	jjdavis@REA-ALP.com
Jeff Gunderson	PO Box 294	Carlos	56319	852-7647	
Dan Folsom	610 Fillmore	Alexandria	56308	762-8149	dfolsom@wsn-mn.com
Tim Bayerl	610 Fillmore	Alexandria	56308	762-8149	tbayerl@wsn-mn.com
Vern Lorsung	Lake Latoka	Alexandria	56308	763-3892	vernsung@REA-ALP.com
Joan Quast	Lake Irene	Miltona	56354	218-943-2309	
Ken Quast					JKQ@midwestinfo.net
Denny Breven		Browerville	56438		
Jim Adams	10511 Big Chip Rd	Brandon	56315	834-2920	adamx006etc.umn.edu
Dick Mahacen	10490 Shorewood lane	Brandon	56315	320-524-2629	
Bob Reynolds	12973 Tanglewood Rd NW	Brandon	56315	320-524-2013	
Dan Hildebrandt	501 Normandale Rd	Redwood Falls	56283	507-637-4242	
Jerry Wendlandt	23070 N Lakeshore Dr	Glenwood		320-634-4573	
Paul Scheirer	714 Lake				
Norm Krause	43035 County 21	Staples	56479	218-894-3761	ntkrause@staples.net.com
Judy S. Williams	8255 County Rd 8 NW	Alexandria	56308	320-834-2895	
Kevin Lee	PO Box 195	Miltona	56354	218-943-1501	

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How much is too much for the Long Prairie River?

The Long Prairie River is an important part of our heritage, according to Todd County Commissioner Gerry Ruda. He said the river was the "highway" that pioneers used when settling this region.

Ruda was speaking at a Long Prairie Watershed Total Maximum Daily Load, (TMDL) Public Meeting, held at Browerville on Thursday, May 22nd. The meeting was held to talk about increasing pollution in the river.

There are problems facing our river but it continues to be an important part of our area. It is up to us to clean up the river without drastically effecting the economy of the area.

The Long Prairie River is about 90 miles long and has the distinction of being one of only a few rivers to flow north. It traverses four counties from its head waters at Lake Carlos to Motley, where it drains into the Crow Wing River.

Combining resources with the Initiative Foundation, Todd SWCD, and the Minnesota Pollution Control Agency, many studies have been made over the past 30 years and the results show an increasing depletion of oxygen levels in the river. The studies center on TMDL and the relation of industry and the cities waste water treatment plants. Because Eagle Creek, which serves Eagle Bend and Clarissa enters the system at Browerville those cities are also included in the study.

A group of about 45 people, including four county commissioners, Stan Sumey, Ken Sorenson, Janet Golowisiki and Gerry Ruda were at the meeting.

TMDL is just what it sounds like, how much can we dump into the river and still have fishing and recreation? The major factors are nothing new, waste water from the cities and industries are point placed, and run off from agricultural fields and city streets have no points.

Few conclusions where offered, but those that were, contained the possibility of future growth and the addition of a discharge facility in Long Prairie. Long Prairie has two discharge pipes into the river and with the addition of the Day Break Food Plant, with animal product waste, the problem is getting worse.

Discussion centers around anacronims like B.O.D. to T.M.D.L. but simply put that relates to Biochemical Oxygen Demand or that organic matter takes oxygen to decompose.

Experts from the University of Minnesota working with Wenck Associates, Inc displayed graphic models pin pointing the problem areas with discussion following.

The next meeting will be held June 12th at the Carlos Town Hall.

Long Prairie River Watershed is focus of public meetings

The Minnesota Pollution Control Agency (MPCA) held the first of a series of public meetings seeking input and advice on how to reduce adverse impacts to the Long Prairie River, May 22, at the Browerville Community Center.

The well-attended meeting drew concerned citizens, landowners, city and county administrators, and industry representatives. The next public meeting will be Thursday, June 12, 12:30 p.m., at the Carlos Town Hall, Douglas County.

The goals of the meeting were:

•To explain the Total Maximum Daily Load (TMDL) regulations and implications for the Long Prairie River Watershed.

•To be provided an opportunity to express concerns and hopes for the river's restoration.

•To continue to participate in the project by joining the advisory committee. For more information, or to join the advisory committee, contact Pat Shelito, 1-800-657-3864, or pat.shelito@pca.state.mn.us.

Todd County Commissioner Gerry Ruda opened the meeting with an overview of the current issues concerning the river and the importance of the river to the surrounding communities, industries and agricultural areas.

Representatives from the MPCA, Initiative Foundation and Wenck Associates, made presentations explaining the environmental problems in portions of the Long Prairie River. Hafiz M. Munir, Ph.D., MPCA, provided the following information:

Background and Problem

The Long Prairie River Watershed (LPRW) extends across four county boundaries: Todd, Ottertail, Douglas, and Morrison counties. It covers an area of about 883 square miles and extends from the Alexandria Lake area of Douglas and Ottertail counties through the Philbrook monitoring station located in Todd County.

The dominant land use within the watershed is agricultural (about 41 percent, predominantly row crops and potatoes); grasslands (about 24 percent); forests (about 21 percent); water and wetlands (about 10 percent, with majority occurring in the headwaters); urban (about one percent): rural development (about two percent); and the remaining under other uses.

The Long Prairie River is the major river flowing through the watershed and is about 100 miles long. Beginning as an out flow from Lake Carlos, near Alexandria, the Long Prairie River flows east for about 48 miles to Long Prairie. At this point, it flows north-northeast for about another 40 miles. Upon entering Morrison County, the river bends to the northeast where it joins the Crow Wing River.

After Browerville, the river's main tributary streams–Eagle, Turtle, and Moran Creeks (with similar drainage area of about 71-78 square miles), feed into the river sequentially. Other small creeks also join and feed the river at different places. The average sinuosity value of the river (ratio between the length of the river valley and the length of the river channel) is about 0.7.

The sinuosity value is slightly higher in the lower portions of the watershed as the river approaches the Crow Wing River. The river is very shallow. The greatest depth is less than five feet and occurs in June. The width of the river extends from about 40 feet in the upper portion of the watershed to over 155 feet at Philbrook.

For the purpose of this project the entire LPRW is divided into three sections, namely upper watershed, middle watershed, and lower watershed. Upper watershed included the headwater lakes and the Long Prairie River segment (reach) from Lake Carlos to Spruce Creek and is located entirely in Douglas County. Middle watershed covers the segments from Spruce Creek to Eagle Creek and is located entirely in Todd County.

Lower watershed covers segments from Eagle Creek to Crow Wing River. Nearly three quarters of the lower watershed is in the northern part of Todd County with one quarter in Morrison County where it

River/16A

Long Prairie Leader 6/4/03

River/From 1A

joins the Crow Wing River.

Seven communities along the Long Prairie River (Alexandria Sanitary District/Lake Ida, Carlos, Miltona, Long Prairie, Clarissa, Eagle Bend, and Browerville) discharge their wastewater into the Long Prairie River or its tributaries.

The upper watershed receives treated effluent from the cities of Alexandria (the discharge flows through the Alexandria chain of lakes and Lake Carlos), Carlos, and Miltona.

The middle watershed receives wastewater from the cities of Long Prairie (which has three facilities), Browerville, Clarissa, and Eagle Bend. Additionally, the Long Prairie storm sewer and the Long Prairie Superfund site discharge treated and/or pumpout waters directly into the river.

Over the years several agencies have monitored both flow and the water quality of the river. The U.S. Geological Survey (USGS) operates a gauging station in Long Prairie that records daily average river flows. Records kept from October 1971 to the present indicate an average annual flow of 153.6 cubic feet per second (cfs) at the site. The greatest flow at the site (3270 cfs, which surpassed the 100 year flood limit) occurred in July 1972 and the lowest flow (0.84 cfs) was recorded in January 1977 during the extended drought period.

The Minnesota Pollution Control Agency (MPCA) has been collecting grab samples from the Long Prairie River at the US Highway 10 bridge, south of Motley, since 1974 under the Routine Stream Monitoring Program.

In 1996, through a Clean Water Partnership (CWP) Project, an intensive flow and water quality data gathering effort was undertaken by the MPCA, the Todd County Commissioners, and the Todd County Soil and Water District (SWCD), with help provided by the Douglas County SWCD, the Minnesota Department of Natural Resources (DNR), and the Natural Resource Conservation Service (NRCS).

Under the CWP Project monitoring sites were established throughout the Long Prairie River system. Based on the results of the CWP monitoring, the Todd County SWCD, in 1999, adopted specific management and nutrient reduction goals for the LPRW.

Preliminary analysis of the CWP monitoring has identified two sections of the Long Prairie River, which have exhibited a repeating pattern of low dissolved oxygen (DO) concentrations. The first low DO river section (DO depletion zone) is in the upper watershed area, downstream of the Carlos wastewater treatment plant discharge (ponds).

The second DO depletion zone is located between Browerville and Tyrrell's Bridge area of the Lower Watershed. The zone extends from Eagle Creek to the Crow Wing River.

Levels of DO which fall below the water quality standard of five milligrams per liter can harm fish and aquatic life, and reduce the river's ability to assimilate additional discharges of waste or stormwater.

TMDL objectives

The Long Prairie River TMDL project has seven main objectives:

1. Define the extent (spatial scale), persistence (time scale), and severity (ecological risk or damage) of the DO depletion problem.

2. Define the causes of severe oxygen depletion that occur in the two DO depletion zones.

3. Quantify pollutant sources (point as well as nonpoint) and their contributions to water quality impairments in the Long Prairie River by:

•land use category.

•mainstream river and tributary sub-watershed for targeting priority areas for rehabilitation as well as protection.

4. Allocate the Long Prairie River assimilation capacity to both point and nonpoint sources of pollution and develop safety margins protective of water quality standards.

5. Develop model(s) for evaluating the impact of management practices and rehabilitation alternatives on water quality.

6. Propose corrective actions necessary for minimizing occurrence of severe oxygen depletion zones and meeting DO and all applicable water quality standards.

7. Review and refine the targeted short term and long term nutrient reduction and management goals of each river section developed by the Todd County SWCD in the Phase I Diagnostic Study.

Todd Soil & Water Conservation District
Phone: (320) 732-2644 Fax: (320) 732-2565
607 9th St. NE
Long Prairie, MN 56347

FAX COVER SHEET

TO: Pat Shelito DATE: 6-4-03
MPCA

FROM: Kitty Tepley
Todd SWCD

SUBJECT: TMDL Meeting –
We made The Front Page in
The Long Prairie leader – Good
Article
kt

Total Number Of Pages Sent: 3
Including Cover

Long Prairie River clean-up needs oceans of help

By Stefanie Peterson, Staff Reporter
Wednesday, 6/18/03

The Long Prairie River is in trouble.

High nitrogen content and low dissolved oxygen in the river are ongoing problems that citizens and professionals are ready to tackle.

The Minnesota Pollution Control Agency (MPCA) sponsored a meeting at the Carlos Town Hall on June 12 to discuss citizens' concerns and receive recommendations from Wenck Associates, Inc., consultants for the project.

John Erdmann, principal environmental engineer for Wenck, said the river's water quality has been tested in several phases. Researchers have reviewed existing data, conducted intensive river samples and are developing models and analyzing the load situation.

Five municipalities spanning 90 miles of the river were analyzed, from the outlet of Lake Carlos to the Crow Wing River, he said. Wenck conducted samples in August and September of 2001 and February of 2002.

Dennis Ford, a researcher from Little Rock, Arkansas who has studied the river, said the state of Minnesota required a Total Maximum Daily Load (TMDL) study because the river was in violation of state water quality standards.

Mathematical models were used to pinpoint problem areas on the river, he said.

"We look at point source discharges and non-point source discharges," Ford said. "Then we make determinations on whether the river can handle all those sources of pollution."

Industrial sources account for point source discharges while agricultural sources contribute to non-point discharges, Ford said.

Non-point sources alone met the quality standards but when combined with point sources, the river was in violation, he said.

Erdmann said high nitrogen content creates bad conditions for water life.

"There has to be enough oxygen in the water for fish and other aquatic organisms to be healthy and survive," he said.

Ford said it is common to have higher nitrogen content during the winter months.

"Most [nitrogen] violations are in the winter because of ice," he said. "It prevents oxygen from getting back into the water from the atmosphere."

The spring period is the most critical period because a lot of treatment ponds have high nitrogen content, Ford said.

Wenck concluded the researchers' presentation with recommendations for improving the Long Prairie River's water quality.

These included restricting Carlos, Eagle Bend and Clarissa's spring discharge based on river flow, and upgrading Long Prairje's industrial waste water systems to advanced treatment with ammonia removal.

Another suggestion was to implement the Todd County Soil and Water Conservation District's non-point source reductions of 10 to 20 percent and target sub-basins with high nutrient loading potential.

Finally, modeling new point sources and monitoring water quality to see if the new approaches are working was proposed.

Don Hickman, environmental specialist for the Initiative Foundation in Little Falls, said members of the public provided an additional perspective on the river's problems and needed improvements.

According to a summary of the written and oral comments made during the meeting, citizens' concerns ranged from curiosity about the effect of having another treatment facility using the river for its discharge, to the condition of fishing in the river.

Residents suggested ways to clean the river, such as improving the treatment of Long Prairie's industrial discharge and forming a watershed district.

Researchers said they were impressed that residents realized that improving the river will take cooperation and involvement for many groups.

"For me, the most heartening comments were the frequent recognition that across both political boundaries and economic interests, the participants in the public meeting recognized that the river and its watershed are a shared resource that everyone enjoys...and that solutions to the water quality problems are also likely to require many participants," Hickman said.

One of the most sensitive topics at the meeting came from individuals advocating a centralized sewer for Douglas County lakes.

They are concerned that the impaired status of the river may prevent them from discharging treated water for a new sewer system into the river, Hickman said.

An MPCA senior hydrologist confirmed that the MPCA is not likely to approve new or expanded discharges to the Long Prairie River until the existing problems are corrected, Hickman explained.

Hickman said other treatments that don't involve surface discharges to the river may have to be considered.

Citizens will continue to play an important role in the long-term water quality improvement process, Hickman said.

"The MPCA will continue to seek interested individuals willing to serve on the 'Implementation Advisory Team' of local residents, businesses, and industries to help evaluate alternatives and policies for improving the water quality of the Long Prairie River," he said.

A reworked report based on public comments will be drafted and submitted to the Environmental Protection Agency (EPA) by September 1.

Talk of problems flow on Lo

By Stefanie Peterson
Staff Reporter

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Public Notice Documents

1) Public Notice – July 18-August 18, 2003

- News release announcing public notice of the report.
- Local media outlets which received the news release.
- Public notice document
- Fact Sheet which was sent with the public notice document.
- Mailing lists of individuals who received the public notice and fact sheet
  - Everyone who signed the public meeting roster.
  - Everyone on the statewide TMDL mailing list
  - Everyone who received the invitation to the public meetings
  - Water Planners committee from Douglas County
- Newspaper coverage of the public notice document. There may have been some articles we were not able to obtain.

NEWS RELEASE

Minnesota Pollution Control Agency

www.pca.state.mn.us

Toll-free and TDD 1 (800) 657-3864

Saint Paul • Brainerd • Detroit Lakes • Duluth • Mankato • Marshall • Rochester • Willmar

FOR RELEASE: July 18, 2003

Contact: Patricia Shelito, Project Manager (218 828-2493
Stephen Mikkelson, Information Officer (218) 855-5001
Toll Free (800) 657-3864

MPCA STUDY ANALYZES LOW LEVELS OF DISSOVED OXYGEN IN LONG PRAIRIE RIVER

Brainerd, Minn.- The Minnesota Pollution Control Agency (MPCA) released a report today evaluating problems of low levels of dissolved oxygen in the Long Prairie River in central Minnesota. The agency is requesting the public to comment on the report through August 18, 2003.

The report is one of many more to come in Minnesota under a provision of the federal Clean Water Act called Total Maximum Daily Loads (TMDL). TMDLs determine the maximum pollutant loads that lakes and rivers can tolerate and still meet applicable water quality standards. The studies are used to set pollutant limits and reduction goals.

This study covers the Long Prairie River from the City of Carlos to its confluence with the Crow Wing River near Motley.

Monitoring data shows six sections of the river have regularly violated federal and state water quality standards for dissolved oxygen in recent years. Levels of dissolved oxygen which fall below the water quality standard of 5 milligrams per liter (mg/l) can harm fish and aquatic life, and reduce the river's ability to assimilate additional discharges of wastewater or stormwater.

Rivers and lakes can handle certain amounts of pollutants and remain "fishable and swimmable". But many waterways, including sections of the Long Prairie River and tributaries, are overloaded with one or more pollutants.

-more-

So far in the Long Prairie River watershed, scientists have identified six river reaches with pollution impairments. Four reaches were identified through historical monitoring and two more were added during monitoring in the development of a Total Maximum Daily Load (TMDL) report. A single water body or river reach (about 20 miles) can be identified as "impaired" for more than one condition or chemical parameter, but the primary focus in the Long Prairie River is the oxygen depletion and high ammonia levels during low flows. Low flows occur when the volume of water and the current of the water are less than average. When a river reach is identified as having "pollution impairment" this means the river or lake is not fishable and swimmable.

The report attributes the dissolved oxygen impairment primarily to high levels of ammonia being discharged from municipal and industrial wastewater facilities.

The MPCA report, titled "Long Prairie River Watershed TMDL Project: Final Project Report," calls for a reduction of ammonia, and notes that some efforts aimed at this goal already are underway.

Projects to improve dissolved oxygen and reduce ammonia, will be developed through a local coordinating group called the Implementation Advisory Committee. The projects will be implemented mainly through local governments. Implementation will consist of improving the discharge waters from wastewater facilities as well as improvements to feedlots, pasture management, and crop runoff within the watershed.

Following the public comment period, MPCA will submit the report to the U.S. Environmental Protection Agency for final approval.

The public comment period for the report ends August 18, 2003. The complete report and a fact sheet about it can be viewed on the MPCA's web site at www.pca.state.mn.us/water/tmdl.html

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Print and Radio Media Coverage of Long Prairie Meetings

Newspapers

Long Prairie Leader
21 3rd St S
56347

Staples World
224 4th St NE
56479

Clarissa Independent News
310 W Main St
56440

Browerville Blade
609 N Main St
56438

Alexandria Echo Press
225 7th Ave E
PO Box 549
56308

Radio Stations

KEYL Radio
P.O. Box 187
Long Prairie, MN 56347

KXRA Radio
P.O. Box 69
Alexandria, MN 56308

STATE OF MINNESOTA

Minnesota Pollution Control Agency

REGIONAL ENVIRONMENTAL MANAGEMENT DIVISION
PUBLIC NOTICE OF INTENT TO SUBMIT THE LONG PRAIRIE RIVER
TOTAL MAXIMUM DAILY LOAD STUDY

Public Comment Period Begins: July 18, 2003
Public Comment Period Ends: August 18, 2003

Pollutant or Stressor: Dissolved Oxygen

Description of TMDL Study Watershed and Significant Pollutant Sources:

"Impaired waters" are those streams, rivers and lakes that currently do not meet applicable water-quality standards that are set to protect the state's waters. Section 303(d) of the Clean Water Act requires the states to identify and list impaired waters, determine solutions through Total Maximum Daily Load (TMDL) Studies, and restore them to comply with water quality standards. A TMDL study determines why waters are impaired and the amount by which sources of pollution would need to be reduced for a water body to meet the state's water quality standards.

Six segments of the Long Prairie River addressed in this report are listed for low dissolved oxygen (DO). Segments 07010108-501, 07010108-502, 07010108-503, and 07010108-504, are located on the Long Prairie River between the Eagle Creek Tributary and the Crow Wing River. Segment 07010108-505, is on the Long Prairie River between the city of Long Prairie and the Eagle Creek Tributary. The former segment of concern, 07010108-506, which was included on Minnesota's 303(d) list in 2002, is located between the headwaters at Lake Carlos and the Spruce Creek Tributary. The segments are listed because monitoring data have revealed that DO concentrations at times fall below the five milligram per liter water quality standard. This could impact fisheries and aquatic life. The low dissolved oxygen problem occurs primarily during low-flow conditions. Low-flow conditions occur when the volume of water and current in the river are less than average. Several of the reaches are also listed for biota impairment, but this report did not address the biota impairment. Mitigation of the DO impairment may also eliminate the biota impairment. Future monitoring will help to determine whether there is a need to address the biota impairment.

Water quality impairment of the Long Prairie River and its tributary Eagle Creek is summarized below:

Waterbody	Reach	Assessment Unit ID	Impairment	Pollutants Addressed in TMDL Study
Long Prairie River	Fish Trap Creek to Crow Wing River	07010108-501	Low DO	Oxygen-demanding substances
Long Prairie River	Moran Creek To Fish Trap Creek	07010108-502	Low DO	Oxygen-demanding substances
Long Prairie River	Turtle Creek to Moran Creek	07010108-503	Low DO*	Oxygen-demanding substances
Long Prairie River	Eagle Creek to Turtle Creek	07010108-504	Low DO Impaired biota	Oxygen-demanding substances Ammonia toxicity
Long Prairie River	Spruce Creek to Eagle Creek	07010108-505	Low DO* Impaired biota	Oxygen-demanding substances Ammonia toxicity
Long Prairie River	Lake Carlos to Spruce Creek	07010108-506	Low DO Impaired biota	Oxygen-demanding substances Ammonia toxicity
Eagle Creek	Headwaters to Long Prairie River	07010108-507	Impaired biota	Ammonia toxicity

* In the course of the TMDL study, reaches 07010108-503 and -505, were found impaired due to low DO, and the MPCA is in the process of adding the two reaches to the 2004 CWA 303(d) TMDL List.

The pollutants of concern for low DO are carbonaceous and nitrogenous biochemical oxygen demand (CBOD and NBOD). BOD occurs when organic material decays and consumes dissolved oxygen in the process. CBOD is a general measure of organic materials such as sewage solids, animal wastes, animal and other food processing wastes, and plant litter. NBOD is a general measure of how much oxygen is used to break down nitrogen based pollutants – in this case ammonia. Sediment oxygen demand (SOD) results from the deposition of particulate organic matter in the river channel. The BOD process leaves less oxygen available for aquatic life, which can cause fish kills. The pollutants of concern originate from both point and nonpoint sources in the watershed.

Under contract (and in cooperation) with the Minnesota Pollution Control Agency (MPCA), Wenck Associates, Inc., with its partner FTN Associates, Ltd., conducted the TMDL study and prepared this report. The study was completed in three phases. Phase I was an analysis of existing data. Phase II entailed intensive synoptic water quality surveys of the river system in August and September 2001 (summer and fall warm, relatively low-flow conditions, with and without point-source discharges, respectively) and February 2002 (winter ice conditions). Modeling and TMDL development were conducted in Phase III of the project.

Pollutant sources requiring permits under the National Pollutant Discharge Elimination System (NPDES) include five municipalities with wastewater treatment facilities, and one treated groundwater pumpage from a Superfund site (former dry cleaner) in the city of Long Prairie. Nonpoint sources include runoff from agricultural land use. The main crops are potatoes, corn, soybeans, and alfalfa. Subwatersheds that exhibit high pollutant export have been identified in this study through modeling based on agricultural practices, topography, soil characteristics, climatology, and other factors. The point (wastewater facilities) and nonpoint (agricultural) sources are not equal contributors at any one time or place in the watershed. This is why monitoring and modeling are important in the development of a TMDL.

An overall reduction in BOD from all sources is desirable. However, the BOD loads during low flow conditions are of primary importance because it is during low flow conditions that the dissolved oxygen standard is violated. To solve this problem, wastewater treatment plants will play a major role in overall BOD reduction because their discharges become more significant under conditions of low dilution in the river. Although other sources such as agricultural runoff contributions are less significant **during low flow conditions** due to decreased runoff, it is important to note that runoff sources will also play a role in solving this problem. Even at low flow no source alone can resolve the problem. During high flow conditions, the agricultural sources play a larger role in the dissolved oxygen problem; consequently these sources need to be addressed too. Results from the study indicate that, with BOD (principally NBOD) reductions, it is possible to meet the dissolved oxygen standard in the Long Prairie River during low flow conditions.

The following table represents the proposed waste load allocations (WLA) for the point sources and load allocations (LA) for the non-point sources by reach. MOS is the margin of safety allowed for meeting water quality standards. The map following the table shows the location of each reach.

Reach 07010108-506: Long Prairie River Headwaters (Lake Carlos) to Spruce Creek

Unallocated Load	164	47	n/a	210
WLA + MOS for Carlos WWTF	233	254	n/a	487
LA for LPR Headwaters @ RM89.9	161	55	n/a	216
LA for other Nonpoint Sources	***999****	***68***	291	1,359
MOS for all Nonpoint Sources	116	12	n/a	128
Total Maximum Daily Load	1,673	437	291	**2,401**

Reach 07010108-505: Spruce Creek to Eagle Creek

Unallocated Load	613	175	n/a	788
WLA + MOS for LP-Superfund	48	17	n/a	65
WLA + MOS for Long Prairie WWTF	***275***	***981***	n/a	1,256
WLA + MOS for Browerville WWTF	542	***504***	n/a	1,045
LA for Spruce Creek	***87***	***29***	n/a	116
LA for Dismal Creek	***17***	***30***	n/a	47
LA for other Nonpoint Sources	***5,329***	***484***	1,750	7,563
MOS for all Nonpoint Sources	543	54	n/a	598
Total Maximum Daily Load	7,455	2,274	1,750	**11,478**

Reach 07010108-504: Eagle Creek to Turtle Creek

Unallocated Load	572	164	n/a	736
Eagle Creek Residual Point Source Loads	204	209	n/a	412
LA for Eagle Creek	***587***	***40***	n/a	626
LA for other Nonpoint Sources	***1,442***	***362***	315	2,119
MOS for all Nonpoint Sources	203	40	n/a	243
Total Maximum Daily Load	3,007	814	315	**4,136**

Reach 07010108-503: Turtle Creek To Moran Creek

Unallocated Load	1,056	302	n/a	1,357
LA for Turtle Creek	238	129	n/a	367
LA for other Nonpoint Sources	620	156	120	895
MOS for all Nonpoint Sources	86	28	n/a	114
Total Maximum Daily Load	1,999	615	120	**2,734**

Reach 07010108-502: Moran Creek To Fish Trap Creek

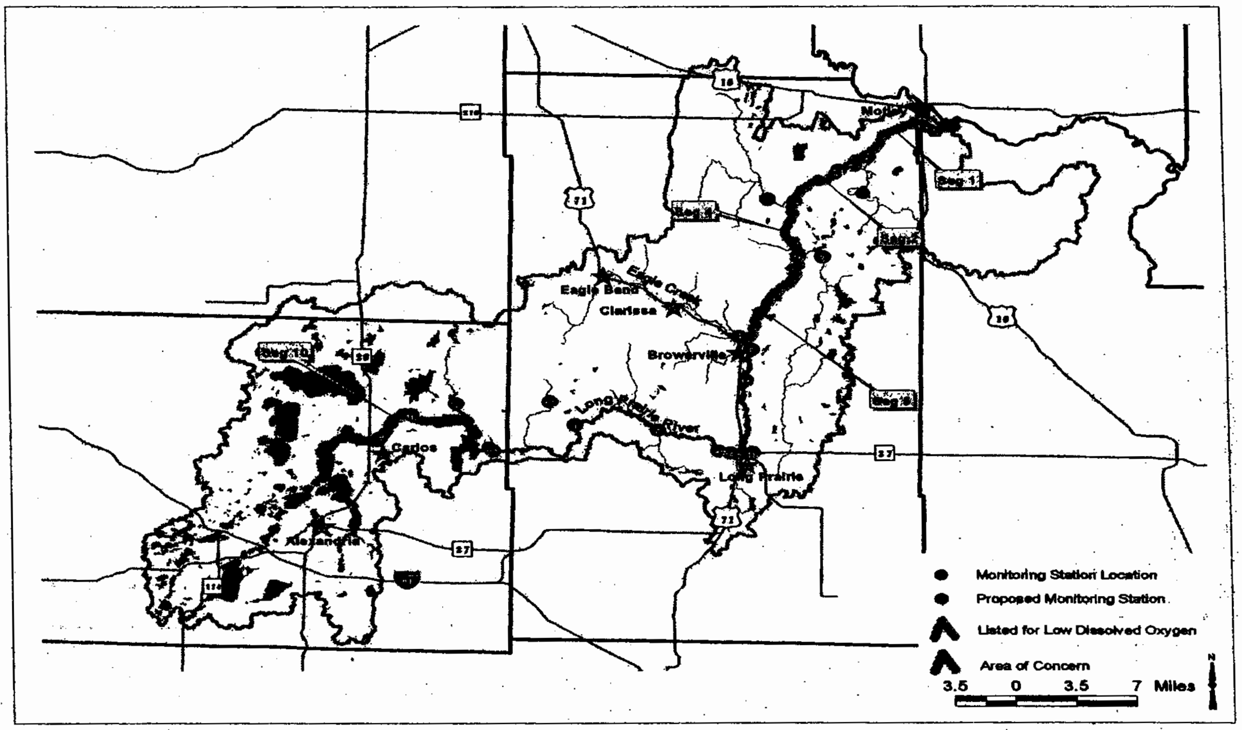
Unallocated Load	739	211	n/a	950
LA for Moran Creek	93	62	n/a	155
LA for other Nonpoint Sources	682	171	252	1104
MOS for all Nonpoint Sources	77	23	n/a	101
Total Maximum Daily Load	1,591	468	252	**2,311**

Reach 07010108-501: Fish Trap Creek to Crow Wing River

Unallocated Load	1,080	308	n/a	1,388
LA for Fish Trap Creek	243	48	n/a	291
LA for other Nonpoint Sources	1,276	320	545	2,142
MOS for all Nonpoint Sources	152	37	n/a	189
Total Maximum Daily Load	2,751	713	545	**4,010**

Notes: ****Bold italic* denotes a load that was reduced to meet DO standard.

Map of Impairments



The MPCA would like input from stakeholders in the Long Prairie River TMDL study and its proposed pollution reductions. The allocations set in the TMDL will be used to guide any effluent limitations or other pollution control measures for permits, as well as pollution prevention measures for nonpoint sources. An implementation plan to achieve the reductions required in the TMDL will be developed with public input. The implementation plan must be submitted within one year of completion of the TMDL study.

From July 18, 2003 until August 18, 2003, people will have the opportunity to comment on the report that has been developed to present the results of monitoring and modeling, as well as proposed solutions. Following the public comment period, on August 18, 2003, a report will be submitted to the U.S. Environmental Protection Agency for approval describing how the problem will be solved.

Preliminary Determination on the Draft TMDL Study:
The MPCA Commissioner has made a preliminary determination to submit this TMDL Study to the U.S. Environmental Protection Agency for final approval. A draft TMDL and fact sheet are available for review at the MPCA office at the address listed below, and at the MPCA web site: **http://www.pca.state.mn.us.** Suggested changes will be considered before the final TMDL is sent to the U.S. Environmental Protection Agency for approval.

Written Comments
You may submit written comments on the conditions of the draft TMDL study or on the Commissioner's preliminary determination.

Written comments must include the following:

1. A statement of your interest in the draft TMDL study;
2. A statement of the action you wish the MPCA to take, including specific references to sections of the draft TMDL that you believe should be changed; and
3. The reasons supporting your position, stated with sufficient specificity as to allow the Commissioner to investigate the merits of your position.

Petition for Public Informational Meeting
You also may request that the MPCA Commissioner hold a public informational meeting. A public informational meeting is an informal meeting that the MPCA may hold to solicit public comment and statements on matters before the MPCA, and to help clarify and resolve issues.

A petition requesting a public informational meeting must include the following information:

1. A statement identifying the matter of concern;
2. The information required under items 1 through 3 of "Written Comments," identified above;
3. A statement of the reasons the MPCA should hold a public informational meeting; and
4. The issues that you would like the MPCA to address at the public informational meeting.

Petition for Contested Case Hearing
You also may submit a petition for a contested case hearing. A contested case hearing is a formal evidentiary hearing before an administrative law judge. In accordance with Minn. R. 7000.1900, the MPCA will grant a petition to hold a contested case hearing if it finds that: (1) there is a material issue of fact in dispute concerning the application or draft TMDL study; (2) the MPCA has the jurisdiction to make a determination on the disputed material issue of fact; and (3) there is a reasonable basis underlying the disputed material issue of fact or facts such that the holding of the contested case hearing would allow the introduction of information that would aid the MPCA in resolving the disputed facts in making a final decision on the draft TMDL study. A material issue of fact means a fact question, as distinguished from a policy question, whose resolution could have a direct bearing on a final MPCA decision.

A petition for a contested case hearing must include the following information:

1. A statement of reasons or proposed findings supporting the MPCA decision to hold a contested case hearing according to the criteria in Minn. R. 7000.1900, as discussed above; and
2. A statement of the issues proposed to be addressed by a contested case hearing and the specific relief requested or resolution of the matter.

In addition and to the extent known, a petition for a contested case hearing should also include the following information:

1. A proposed list of prospective witnesses to be called, including experts, with a brief description of proposed testimony or summary of evidence to be presented at a contested case hearing;
2. A proposed list of publications, references, or studies to be introduced and relied upon at a contested case hearing; and
3. An estimate of time required for you to present the matter at a contested case hearing.

MPCA Decision
You may submit a petition to the Commissioner requesting that the MPCA Citizens' Board consider the TDML study approval. To be considered timely, the petition must be received by the MPCA by 4:30 p.m. on the date the public comment period ends, identified on page 1 of this notice. Under the provisions of Minn. Stat. § 116.02, subd 6(4), the decision whether to issue the permit and, if so, under what terms will be presented to the Board for decision if: (1) the Commissioner grants the petition requesting the matter be presented to the Board; (2) one or more Board members request to hear the matter before the time the Commissioner makes a final decision on the TMDL study; or (3) a timely request for a contested case hearing is pending. You may participate in the activities of the MPCA Board as provided in Minn. R. 7000.0650.

The written comments, requests, and petitions submitted on or before the last day of the public comment period will be considered in the final decision on this TMDL study. If the MPCA does not receive written comments, requests, or petitions during the public comment period, MPCA staff as authorized by the Board, will make the final decision on the draft TMDL study.

Comments, petitions, and/or requests must be submitted in writing on or before the end date of the public comment period identified on page 1 of this notice to:

Patricia Shelito
Minnesota Pollution Control Agency
1800 College Road South
Baxter, Minnesota 56425-7865

Minnesota Pollution Control Agency

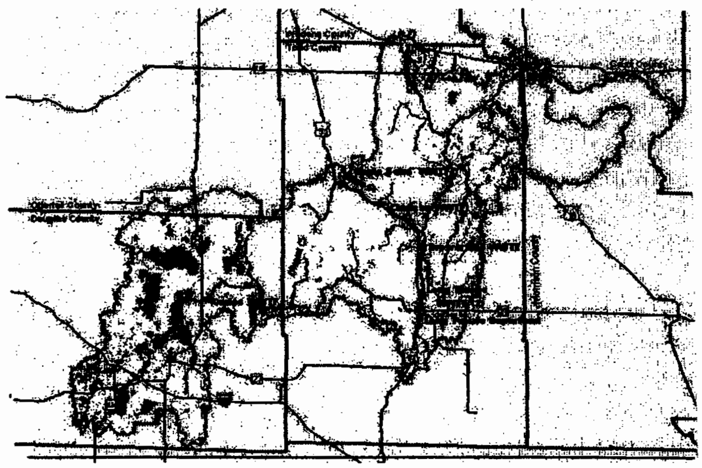
Regional Environmental Management

Impaired Waters Program

Dissolved oxygen problem in the Long Prairie River

July 2003

The Minnesota Pollution Control Agency seeks public input on improving water quality by reducing pollution in the Long Prairie River resulting from excess ammonia. Study results indicate that it is possible to reach the water quality standard for dissolved oxygen, by reducing ammonia levels. This will improve conditions for swimming, fishing and aquatic life.



Long Prairie River Watershed

Introduction

The scenic Long Prairie River flows approximately 100 miles from its Lake Carlos headwaters to its outfall near Motley into the Crow Wing River, and eventually, to the upper Mississippi River. The Todd County Soil and Water Conservation District and a private citizens' group requested and obtained a Clean Water Partnership diagnostic grant in 1997. The study defined areas of prime fish habitat that undergo repeated and severe oxygen depletion due to nutrient loading from urban and agricultural runoff. Because of the oxygen depletion, the river did not meet water quality standards in several areas. The federal Clean Water Act requires States to adopt water quality standards to protect the nation's waters. These standards define how much of a pollutant can be in surface or ground water while still allowing it to meet its designated uses, such as drinking water, fishing, or swimming, among others. The Long Prairie River is among many of the state's water resources that currently do not meet their designated uses.

TMDL study required

For each pollutant that causes a water body to fail state water quality standards, the Clean Water Act requires states to conduct a Total Maximum Daily Load (TMDL) study. The study identifies all the sources of each pollutant in an affected water body. Water quality sampling and computer modeling, together with public input, determine how much each pollutant source must be reduced to assure the standard is met in that water body.

Long Prairie River impairments

Low dissolved oxygen (DO) due to high levels of ammonia impair water quality in the Long Prairie River. The low dissolved oxygen problem occurs primarily during low-flow conditions. Low-flow conditions occur when the volume and current of the water in the river are less than average.

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Rochester area: 507/285-7343
Mankato area: 507/389-5977
Marshall area: 507/537-7146
Willmar area: 320/214-3786
Detroit Lakes area: 218/847-1519
Brainerd area: 218/828-2492
Duluth area: 218/723-4660
Metro area: 651/296-6300
Toll-Free Number: 800/657-3864
Feedlot Service Center: 877/333-3508

The dissolved oxygen problem

The pollutant of concern for low DO are carbonaceous and nitrogenous biochemical oxygen demand (CBOD and NBOD). BOD occurs when organic material decays and consumes dissolved oxygen in the process. CBOD is a general measure of organic materials such as sewage solids, animal wastes, animal and other food processing wastes and plant litter. NBOD is a general measure of how much oxygen is used to break down nitrogen-based pollutants – in this case ammonia. This process leaves less oxygen available for aquatic life, which can cause fish kills.

The pollutants of concern originate from both point and non-point sources in the watershed. Point source refer to a specific discharge point such as a pipe. Non-point refers to overland runoff. Point sources requiring permits under the National Pollutant Discharge Elimination System (NPDES) include five municipalities with wastewater treatment facilities. Non-point sources include runoff from agricultural land. The main crops are potatoes, corn, soybeans, and alfalfa.

Subwatersheds that exhibit high pollutant export have been identified in this study through modeling based on agricultural practices, topography, soil characteristics, climatology, and other factors. The point (wastewater facilities) and nonpoint (agricultural) sources are not equal contributors at any one time or place in the watershed. This is why monitoring and modeling are important in the development of a TMDL.

Model helps identify ammonia reductions

The MPCA hired a consultant (Wenck Associates, Inc.) to complete a modeling study of the Long Prairie River. The model helps to identify the most efficient and practical methods of attaining the ammonia (and resulting BOD) reductions. It also helps to quantify pollutant contributions by tributary, land use, and pollutant source. As a result, targets in each of the modeled watersheds will be established to reduce ammonia loading to the Long Prairie River.

An overall reduction in ammonia from all sources is desirable. However, the ammonia loads during low flow conditions are of primary importance because it is during low flow conditions that the dissolved oxygen standard is violated. To solve this problem, wastewater plants and other direct discharges will need greater reductions because they contribute more ammonia during this time.

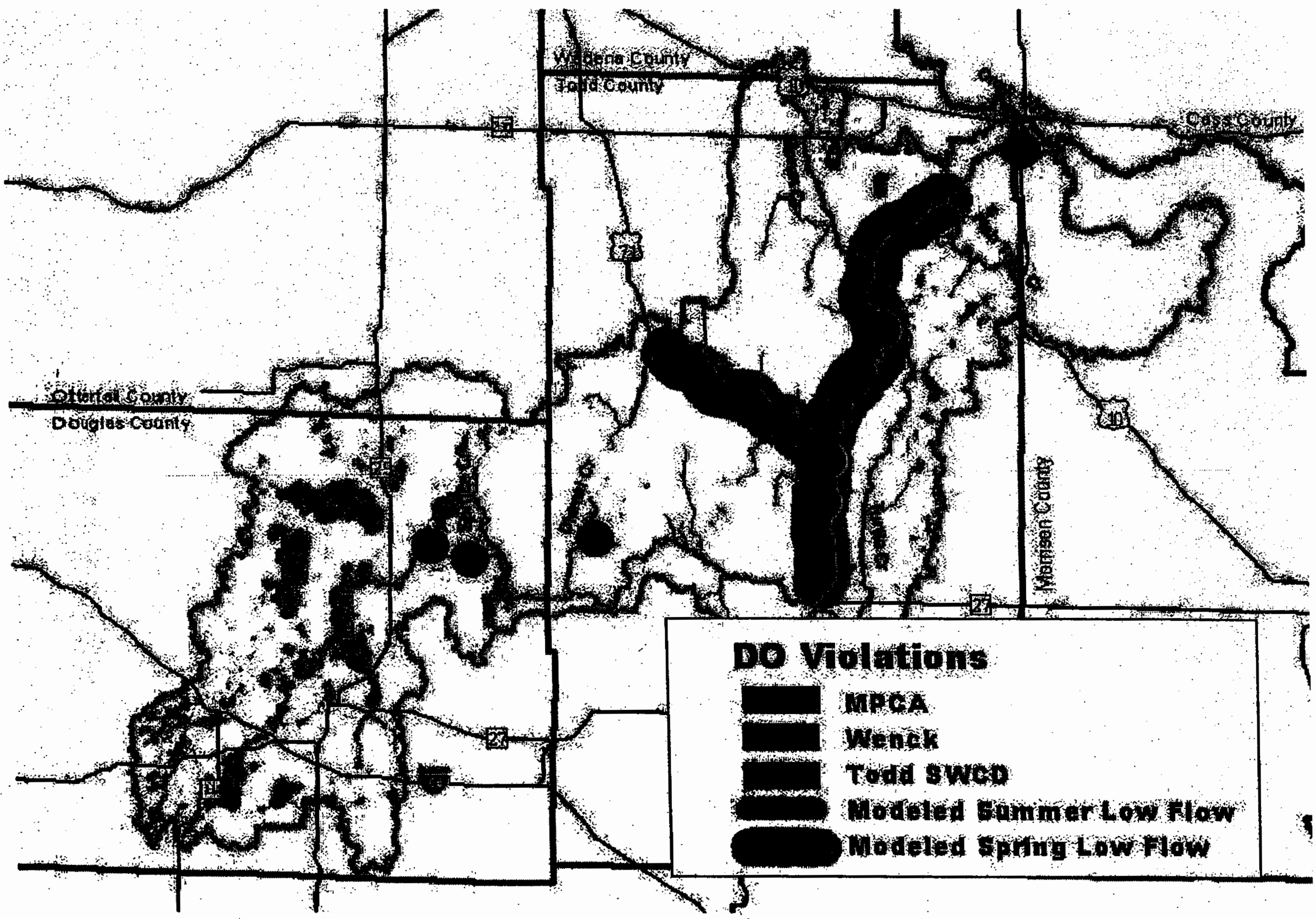
Other sources such as agricultural runoff contributions are limited **during low flow conditions** due to decreased runoff. It is important to note that runoff sources will also play a role in solving this problem, even at low flow, as no source alone can resolve the problem. During high flow conditions, the agricultural sources play a larger role in the dissolved oxygen problem, consequently these sources need to be addressed too.

Solving the problem

Results from the study indicate that, with ammonia reductions, it is possible to meet the dissolved oxygen standard in the Long Prairie River during low flow conditions. The MPCA would like input from stakeholders in the Long Prairie River on how to achieve these reductions. From July 18, 2003 until August 18, 2003, people will have the opportunity to comment on the report that has been developed to present the results of monitoring and modeling, as well as proposed solutions. Following the public comment period, a report will be submitted to the U.S. Environmental Protection Agency, (EPA) on September 1, 2003 for approval. The report is a requirement of EPA, under the Clean Water Act.

For more Information

For more information contact Pat Shelito, 218-828-2493, or Hafiz Munir, 651-296-9286. Toll free: 800 657 3864. On the Web, visit www.pca.state.mn.us/water/tmdl


Wadena County
Todd County
Cass County
Otter Tail County
Douglas County
Morrison County
DO Violations
MPCA
Wenck
Todd SWCD
Modeled Summer Low Flow
Modeled Spring Low Flow

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RUDY RUSH
DAYBREAK FOODS INC
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CECIL FOOTE
LONG PRAIRIE PACKING CO
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Long Prairie River Project
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local list
~60

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Alexandria, MN 56308

Pro-Fab Company
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Continental Bridge
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Long Prairie, Mn 56347

Dan's Prize Foods Inc.
810 1st Street South
Long Prairie, MN 56347

PN

Shelito, Pat

From: Emily Wolf [emily.wolf@mail.co.douglas.mn.us]
Sent: Friday, July 18, 2003 8:55 AM
To: 'Shelito, Pat'
Subject: RE: contacts in douglas cty

The list is just the water plan task force - I could get you a list of some of the affected lake associations - but I thought that might be more than you need. Several of the most active lake associations are already on the Water Plan list. You will find several doubles - between your list and mine - it's a case of the same people volunteering - very active group in some respects. Let me know if you need anything else!

-----Original Message-----
From: Shelito, Pat [mailto:Pat.Shelito@state.mn.us]
Sent: Friday, July 18, 2003 8:55 AM
To: 'Emily Wolf'
Subject: RE: contacts in douglas cty

The attachment works fine. Is this list all folks in douglas county you think you should probably get a notice? or just the water plan people? It looks pretty comprehensive but I want to make sure I know who these guys are. Several of the names are already on my list too.

thanks

-----Original Message-----
From: Emily Wolf [mailto:emily.wolf@mail.co.douglas.mn.us]
Sent: Friday, July 18, 2003 8:33 AM
To: 'Shelito, Pat'
Subject: RE: contacts in douglas cty

Here's my list - I'm still working on the SWCD Board Member - BUT one of them is in the Water Plan Task Force list I'm sending. There are also two more county commissioners on my list, Paul Anderson and John Mingus. Here are the other two:
Dan Olson, 820 Lake Street, Alexandria 56308 AND Harold Jennissen, 11936 County Road 5 NW, Brandon 56315. All five commissioners have part of their district in the watershed. Let me know if the attachment doesn't work!
-Emily

-----Original Message-----
From: Shelito, Pat [mailto:Pat.Shelito@state.mn.us]
Sent: Thursday, July 17, 2003 7:40 AM
To: Emily Wolf (E-mail)
Subject: contacts in douglas cty

Hi Emily

I am almost ready to send the Long Prairie TMDL on public notice. I remember you sent the news release or letter to invite the water plan board to the public meetings. I should probably have those addresses to send the public notice too. Is there anyone else in douglas county I might have missed?

I have the city officials for Miltona, Carlos and Alexandria
the county commissioner (Withers) and planning commission (Gorghuber) rep for Alexandria
a rep for Central lakes sanitary district (Haggenmiller)

Last Name	First Name	Address1	Address2	Address3
AADLAND, DNR WATERS	JULIE	REGIONAL HYDROLOGIST	1221 FIR AVENUE EAST	FERGUS FALLS, MN 56537
ANDERSON	CHARLES	1381 W. LATOKA DR. SW	ALEXANDRIA, MN 56308	
ANDERSON	PAUL	COUNTY COMMISSIONER	274 COUNTY RD 44	ALEXANDRIA, MN 56308
ANDERSON, DITCH/AG INSPECTOR	TOM	PUBLIC WORKS CENTER	509 3RD AVENUE WEST	ALEXANDRIA, MN 56308
APPEL, COUNTY SANITARIAN	TODD	PUBLIC HEALTH	725 ELM ST SUITE 1200	ALEXANDRIA, MN 56308
BAYERL	MARILYN	BAYERL WATER RESOURCES	9083 ST. HWY. 114 SW	ALEXANDRIA, MN 56308
BECK, DNR	DEAN	AREA FISHERIES SUPERVISOR	23070 N LAKESHORE DRIVE	GLENWOOD, MN 56334
BUMP	MIKE	DOUGLAS CO. LAKES ASSOCIATION	222 CARLOS DARLING DR NW	ALEXANDRIA, MN 56308
CADY	JOHN	3633 LAKE ANDREW RD SW	ALEXANDRIA MN 56308	
CASPER	JAMES	3504 CRESTWOOD DR NE	ALEXANDRIA MN 56308	
CARPENTER	PAULA	DOUGLAS CO. LRM	305 8TH AVENUE WEST	ALEXANDRIA, MN 56308
ELLIOT	ROGER	23423 CO. RD. 41 NW	EVANSVILLE, MN 56326	
GLANZER	DEL	5258 STATE HWY 27 W	ALEXANDRIA, MN 56308	
HAGGENMILLER, SWCD	JERRY	900 ROBERT STREET SUITE 102	ALEXANDRIA, MN 56308	
HERMES	ANN	ALEXANDRIA AREA REALTY	1124 BROADWAY	ALEXANDRIA, MN 56308
HILDEBRANDT	BOB	3611 BETSY ROSS RD NW	ALEXANDRIA, MN 56308	
HOPKO, COUNTY SURVEYOR	GARY	PUBLIC WORKS CENTER	509 3RD AVENUE WEST	ALEXANDRIA, MN 56308
HUNGNESS	DARREN	DOUGLAS CO. LRM	305 8TH AVENUE WEST	ALEXANDRIA, MN 56308
JAMES, MPCA	TIM	NW REGIONAL PLAZA	714 LAKE AVENUE SUITE 220	DETROIT LAKES, MN 56501
JEPPESEN	MICHAEL	IDA TOWNSHIP	8968 CO RD 6 NW	GARFIELD, MN 56332
KUEHN	DICK	LAKE MILTONA ASSOCIATION	12690 HERMOSA BCH RD NW	ALEXANDRIA, MN 56308
LORSUNG	VERN	LAKE LATOKA	836 WEST LATOKA DR SW	ALEXANDRIA, MN 56308
MARTIN	WAYNE	LUND TOWNSHIP SUPERVISOR	24093 CO RD 24 NW	EVANSVILLE, MN 56326
MILLER	DENNIS	900 ROBERT ST. SUITE 102	ALEXANDRIA, MN 56308	
MINGUS	JOHN	COUNTY COMMISSIONER	566 PLEASANT VIEW DR NW	ALEXANDRIA, MN 56308
NELSON	LYNN	SAUK RIVER WATERSHED DIST	524 4TH STREET SOUTH	SAUK CENTRE, MN 56378
NELSON, ALASD	BRUCE	2201 NEVADA ST.	ALEXANDRIA, MN 56308	
NIELSEN	BUD	IDA LAKE ASSOCIATION	7264 SUNSET STRIP NW	ALEXANDRIA, MN 56308
PRCHAL	GERALD	HOLMES CITY TOWNSHIP	10323 POCKET LAKE RD SW	LOWRY, MN 56349
PUGH	CHARLES	1020 MORNINGSIDE DR SW	ALEXANDRIA, MN 56308	
REYNOLDS	BOB	DEVILS/LITTLE CHIPPEWA ASSN.	12973 TANGOWOOD RD	BRANDON, MN 56315
ROBLEY, COUNTY ENGINEER	DAVE	PUBLIC WORKS CENTER	509 3RD AVENUE WEST	ALEXANDRIA, MN 56308
ROERS	ROY	700 NORTHSIDE DR NE	ALEXANDRIA, MN 56308	
SAUK RIVER WATERSHED DIST		524 4TH STREET SOUTH	SAUK CENTRE, MN 56378	
SCHEIDERHAN	TONY	LEHOMME DIEU LAKES ASSOCIATION	P.O. BOX 101	ALEXANDRIA, MN 56308
SCOTT	JIM	LATOKA LAKE ASSN.	1601 W LATOKA DR SW	ALEXANDRIA, MN 56308
STONE	JOHN	LOBSTER LAKE ASSOCIATION	11220 TALL TIMBERS RD SW	GARFIELD, MN 56332
THOENNES	GARY	LA GRANDE TOWNSHIP	856 EAST LAKE COWDRY RD NW	ALEXANDRIA, MN 56308
WALLER, BWSR	PETE	C/O NRCS	413 STANTON AVE	FERGUS FALLS MN 56538
WEBER	MIKE	CITY OF ALEXANDRIA	704 BROADWAY	ALEXANDRIA, MN 56308
WENDLANT, DNR FISHERIES	JERRY	23070 N LAKESHORE DRIVE	GLENWOOD, MN 56334	
WEISS	VERNE	LAKE IRENE ASSOCIATION	5102 PARK IRENE DR NE	MILTONA, MN 56354
WILLIAMS	LEROY	EXTENSION	720 FILLMORE ST SUITE B090	ALEXANDRIA, MN 56308
OLSEN	DAN	COUNTY COMMISSIONER	820 LAKE STREET	ALEXANDRIA, MN 56308
JENNISSEN	HAROLD	COUNTY COMMISSIONER	COUNTY ROAD 5 NW	BRANDON, MN 56315

Lake Prairie / JMN / public notice docs/

Study analyzes low levels of oxygen in Long Prairie River

Brainerd, Minn.- The Minnesota Pollution Control Agency (MPCA) released a report recently evaluating problems of low levels of dissolved oxygen in the Long Prairie River in central Minnesota. The agency is requesting the public to comment on the report through August 18, 2003.

The report is one of many more to come in Minnesota under a provision of the federal Clean Water Act called Total Maximum Daily Loads (TMDL). TMDLs determine the maximum pollutant loads that lakes and rivers can tolerate and still meet applicable water quality standards. The studies are used to set pollutant limits and reduction goals.

This study covers the Long Prairie River from the city of Carlos to its confluence with the Crow Wing River near Motley. Monitoring data shows six sections of the river have regularly violated federal and state water quality standards for dissolved oxygen in recent years. Levels of dissolved oxygen which fall below the water quality standard of 5 milligrams per liter (mg/l) can harm fish and aquatic life, and reduce the rivers ability to assimilate additional discharges of wastewater or stormwater.

Rivers and lakes can handle certain amounts of pollutants and remain fishable and swimmable. But many waterways, including sections of the Long Prairie River and tributaries, are overloaded with one or more pollutants.

So far in the Long Prairie River watershed, scientists have identified six river reaches with pollution impairments. Four reaches were identified through historical monitoring and two more were added during monitoring in the development of a Total Maximum Daily Load (TMDL) report. A single water body or river reach (about 20 miles) can be identified as impaired for more than one condition or chemical parameter, but the primary focus in the Long Prairie River is the oxygen depletion and high ammonia levels during low flows. Low flows occur when the volume of water and the current of the water are less than average. When a river reach is identified as having pollution impairment this means the river or lake is not fishable and swimmable.

The report attributes the dissolved oxygen impairment primarily to high levels of ammonia being discharged from municipal and industrial wastewater facilities.

The MPCA report, titled Long Prairie River Watershed TMDL Project: Final Project Report, calls for a reduction of ammonia and notes that some efforts aimed at this goal already are under way. Projects to improve dissolved oxygen and reduce ammonia, will be developed through a local coordinating group called the Implementation Advisory Committee. The projects will be implemented mainly through local governments. Implementation will consist of improving the discharge waters from wastewater facilities as well as improvements to feedlots, pasture management, and crop runoff within the watershed.

Following the public comment period, MPCA will submit the report to the U.S. Environmental Protection Agency for final approval. The public comment period for the report ends August 18, 2003. The complete report and a fact sheet about it can be viewed on the MPCA's web site at www.pca.state.mn.us/water/tmdl.html

Chamber from pg. 1

New location could become

many aren't sure if they can pay for it later. People aren't as secure in their jobs."

Commerce-related activities in town are also suffering.

"There's been some question about whether to continue First Thursdays or not, but the majority say we've got to give it a chance and not cut it off after a couple of years," said Jan Moore from the Osakis Visitor Center.

Osakis isn't accepting a slow economy sitting down. There are local efforts being done to boost business.

"There's less traffic out there due to inquiries about resorts because there are a lot fewer resorts than there used to be."

Carol Mihalchick
Osakis Chamber president

For instance, the O
Visitors Center is consid
moving into the Gordon-
ford buildin
town.

Mihalchick
the visitors c
has been suff
from fewer
fewer custom

"There's
traffic out
due to inqu
about re
because ther
a lot fewer re
than there us
be," she said.

If moved i
more visible location, the
ter could also become a
head for the newly op
Central Lakes Trail.

The trail, which runs

Museum from pg. 1

City denied museum's insura

pipe but it was six feet under the ground and they couldn't know whether it was corroded."

The city also denied insurance claims, stating that pressure from the water tower could not have been great enough to cause the damage, Finseth said.

"At first it was really frustrating but then we decided we were just going to rebuild anyway," she said.

The cost of the project was estimated at an overwhelming $55,000. Luckily, the historical society quickly discovered they were not alone in their quest to preserve the facility.

"People all around the area thought they'd like to see it saved," Finseth said. "We've gotten quite a few donations, a lot of them from former residents of Long Prairie."

The society also rece
four or five grants, a d
tion from the Osakis
itage Center and a par
larly large, $10,000 don
from a Long Prairie busi
firm, among others.

Historical society mem
also responded generous
a solicitation for funds,
seth said.

That money allowed re
struction of the gutted m
um to move forward.

New floors were po
this spring and the i
walls were put up and p
ed by workers and vo
teers.

Grid work for the ce
has been put in and ele
cians are currently wor
on installing the cei
lights.

Flooring and wallpape

Comment Letters from Public Notice Period

- Request for Contested Case Hearing – ALASD
- Request for Contested Case Hearing – Central Lakes ……
- Requested Deletions – ALASD
- Request for amendment to Water Quality….- ALASD
- Douglas County Land and Resource Management
- Douglas Soil and Water Conservation District
- City of Clarissa
- Larson-Peterson & Associates, Inc on behalf of City of Eagle Bend
- City of Carlos
- Orv & Alberta Hall

Phone (320)762-1135
Fax (320)762-1108

ALASD

2201 Nevada Street
Alexandria, MN 56308

August 15, 2003

Pat Shellito, Project Manager
MPCA
1800 College Road South
Baxter, Minnesota, 56425

Re: Request for Contested Case Hearing
Request for MPCA Citizen Board Review
Long Prairie River TMDL Study and Process

Dear Ms. Shellito

In accordance with Minnesota Rule 7000.1800, the Alexandria Lake Area Sanitary District (ALASD) hereby petitions the Agency for a contested case hearing. The ALASD is a stakeholder in the Long Prairie TMDL in that the districts current and future operations may be adversely affected if the TMDL is adopted as proposed.

Following are the issues to be addressed and the desired relief requested.

1) Petitioner believes that rulemaking is necessary to complete a TMDL and establish Waste Load Allocations and Load Allocations. Rulemaking provides the legal authority and assurance of due process for all stakeholders. The MPCA says rulemaking is not necessary for the Long Prairie River TMDL Study.

2) Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets in the Long Prairie River Study will effectively (de facto) establish Phosphorus Water Quality Standards for the Long Prairie River without following the proper process. As such these goals/guidelines/targets should not be included in the TMDL. The MPCA disagrees.

3) The Long Prairie River from the headwaters of Lake Carlos (mile 92.0) to Long Prairie (mile 47.8) should be delisted. According to the TMDL Study the dissolved oxygen impairment is caused by a naturally occurring condition. Therefore, an amended water quality standard should be established for the Long Prairie reflecting this natural condition. The MPCA disagrees.

4) The Long Prairie River from the City of Long Prairie (mile 47.8) to the Crow Wing River (mile 0.2) should be delisted. According to the TMDL Study the cause of the impairment

is point source discharges. Through existing permitting authority WLA should be applied to theses point sources and if necessary WLA should be applied permitted non-point CAFO's. The MPCA disagrees.

5) Lake Carlos is not in the defined TMDL Study area and therefore should not receive a load allocation. In addition, Lake Carlos is not an impaired water body and under the law cannot receive a load allocation for that reason. The MPCA, as a matter of fact, disagrees.

Relief Requested:

A) Require rules be adopted and applied to the Long Prairie River TMDL before submission to the EPA.

B) Remove all references to the Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets from the TMDL.

C) Delist the Long Prairie River from the headwaters at Lake Carlos to the City of Long Prairie.

D) An amended water quality standard for the naturally occurring dissolved oxygen impairment near the headwaters at Lake Carlos should be adopted.

E) The Long Prairie River from the City of Long Prairie to the Crow River should be delisted.

F) The load allocation for Lake Carlos should be removed from the TMDL.

The ALASD will present a list of witnesses and other evidence to be presented should a contested case hearing be granted.

If the request for a contested case hearing is not granted, the ALASD further requests the MPCA Citizen Board review the Long Prairie River TMDL prior to submission to the Environmental Protection Agency.

On August 13, 2002 the ALASD Board of Directors approved and authorized the submission of this letter.

Sincerely,

Bruce A. Nelson

Bruce A. Nelson
Executive Director

CENTRAL LAKES REGION
JOINT POWERS BOARD

RECEIVED

AUG 19 2003

MPCA : Brainerd
Baxter, MN

August 18, 2003

Patricia Shelito
Project Manager MPCA
1800 College Road South
Baxter, Minnesota, 56425

Re: Request for Contested Case Hearing
Request for MPCA Citizen Board Review
Long Prairie River TMDL Study and Process

Dear Ms. Shellito:

The Central Lakes Region Joint Powers Board (CLRJPB) represents 6 Douglas County townships. The CLRJPB was created to investigate the feasibility of providing sanitary sewer collection and treatment for a number of central Douglas County lake residents. The CLRJPB caused the creation of a sanitary district with the passage of legislation in the 2003 session. That district is called the Central Lakes Region Sanitary District (CLRSD). The new district will be formally organized on August 25, 2003. Until the new district is organized, the joint powers board remains the legal entity.

In accordance with Minnesota Rule 7000.1800, the Central Lakes Region Joint Powers Board (CLRJPB) hereby petitions the Agency for a contested case hearing. The CLRJPB as the predecesor of the Central Lakes Region Sanitary District is a stakeholder in the Long Prairie TMDL in that the new districts future operations may be adversely affected if the TMDL is adopted as proposed.

Issues to be addressed

1) Petitioner believes that rulemaking is necessary to complete a TMDL and establish Waste Load Allocations and Load Allocations. Rulemaking provides the legal authority and assurance of due process for all stakeholders. The MPCA says rulemaking is not necessary for the Long Prairie River TMDL Study.

2) Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets in the Long Prairie River Study will effectively (de facto) establish Phosphorus Water Quality Standards for the Long Prairie River without following the proper process. As such these goals/guidelines/targets should not be included in the TMDL. The MPCA disagrees.

3) The Long Prairie River from the headwaters of Lake Carlos (mile 92.0) to Long Prairie (mile 47.8) should be delisted. According to the TMDL Study the dissolved oxygen impairment is caused by a naturally occurring condition. Therefore, an amended water quality standard should be established for the Long Prairie reflecting this natural condition. The MPCA disagrees.

4) The Long Prairie River from the City of Long Prairie (mile 47.8) to the Crow Wing River (mile 0.2) should be delisted. According to the TMDL Study the cause of the impairment is point source discharges. Through existing permitting authority WLA should be applied to theses point sources and if necessary WLA should be applied permitted non-point CAFO's. The MPCA disagrees.

5) Lake Carlos is not in the defined TMDL Study area and therefore should not receive a load allocation. In addition, Lake Carlos is not an impaired water body and under the law cannot receive a load allocation for that reason. The MPCA, as a matter of fact, disagrees,

6) Facility plans previously submitted to the MPCA have proposed a treatment plant on the Long Prairie River. This proposed plant was not included in any modeling done for the TMDL. Petitioner claims such modeling is necessary to for a comprehensive TMDL. The MPCA disagrees.

Relief Requested:

A) Require rules be adopted and applied to the Long Prairie River TMDL before submission to the EPA.

B) Remove all references to the Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets from the TMDL.

C) Delist the Long Prairie River from the headwaters at Lake Carlos to the City of Long Prairie.

D) An amended water quality standard for the naturally occurring dissolved oxygen impairment near the headwaters at Lake Carlos should be adopted.

E) The Long Prairie River from the City of Long Prairie to the Crow River should be delisted.

F) The load allocation for Lake Carlos should be removed from the TMDL.

G) The proposed Central Lakes Region Sanitary District treatment plant proposed for the Long Prairie River should be modeled and included in the TMDL.

The Petitioner will present a list of witnesses and other evidence to be presented should a contested case hearing be granted.

If the request for a contested case hearing is not granted, the Petitioner further requests the MPCA Citizen Board review the Long Prairie River TMDL prior to submission to the Environmental Protection Agency

Sincerely,

Jerome Haggenmiller

Jerome Haggenmiller
CLRJPB Chairman

Phone (320)762-1135 Fax (320)762-1108

ALASD

2201 Nevada Street
Alexandria, MN 56308

August 19, 2003

Pat Shellito, Project Manager
MPCA
1800 College Road South
Baxter, Minnesota, 56425

RECEIVED

AUG 20 2003

MPCA - Brainerd
Baxter, MN

Re: Requested Deletions
LPR TMDL Study

Dear Ms. Shellito

At our meeting on August 12, 2003 we discussed a number of issues regarding the Long Prairie River TMDL. During the meeting one of the members of your staff asked for a listing of proposed deletions resulting from our concerns with phosphorus language in the Study.

Attached is a list of proposed deletions. I have taken the liberty of mailing a copy to Faye Sleeper

Please feel free to contact me if you have any questions or comments.

Sincerely,

Bruce A. Nelson

Bruce A. Nelson
Executive Director

Cc: Fay Sleeper Impaired Waters Manager
MPCA
520 Lafayette Rd. North
St. Paul, Mn. 55155-4194

Long Prairie River TMDL

(Final Study)

Requested deletions from the LPR TMDL Study are as follows:

1) Delete 3rd bullet on page 2-4.

2) Delete Article 3.2.2 on page 3-3.

3) Delete Article 7.3.2 on page 7-5

4) Delete Articles 9.8.4 & 9.8.5 on pages 9-38 thru 9-42.

5) Delete LA for LPR Headwaters@RM89.9 in Table 11-2.

6) Any other reference to phosphorus guidelines, targets, or standards

Phone (320)762-1135
Fax (320)762-1108

2201 Nevada Street
Alexandria, MN 56308

August 15, 2003

Pat Shellito, Project Manager
MPCA
1800 College Road South
Baxter, Minnesota, 56425

Re: Request for Amendment to Water Quality Standard on the Long Prairie River

Dear Ms. Shellito

The Alexandria Lake Area Sanitary District (ALASD) hereby requests an amendment to the Water Quality Standard (WQS) for dissolved oxygen on the Long Prairie River. The specific location to be amended is that area near the City of Carlos (LPR 85.5 to LPR 79.4) that is impaired by a naturally occurring condition originating in a nearby wetland. The WQS should be amended to reflect this natural condition as determined by the Long Prairie River TMDL Study. The evidence and factual data to support this amendment is contained within the Study.

Please feel free to contact me with any questions or comments you may have in this regard..

Sincerely,

Bruce A. Nelson

Bruce A. Nelson
Executive Director

LAND AND RESOURCE MANAGEMENT
Environment, Planning, Water, Solid Waste & Zoning

DIRECTOR:
Paula J. Carpenter

305 8th Ave. W.
Alexandria, MN 56308
(320) 762-3863

RECEIVED
AUG 19 2003
MPCA : Brainerd
Baxter, MN

August 18, 2003

Pat Shelito
Minnesota Pollution Control Agency
1800 College Road South
Baxter, Minnesota 56425-7865

RE: Long Prairie TMDL

To Whom It May Concern:

Douglas County Land and Resource Management is the Local Water Management Plan (LWMP) authority and therefore is concerned with any issues affected the water quality and quantity of the Long Prairie River Watershed.

As a representative of the LWMP, I would like to offer the following suggestion and comment: continue to involve Douglas County throughout the remainder of the TMDL process. As a headwaters area, we realize the effects our actions have downstream and the importance of proper land management to reduce pollution loadings. Communication and inclusion in this planning process is important in realistic goal setting and optimum cooperation in addressing the dissolved oxygen impairment. As the local water management authority, I request that a copy of the TMDL study be provided to the County.

Thank you for the opportunity to comment. As pursuant to the goals of the Douglas County LWMP, we will continue to participate in the TMDL process on the Long Prairie River.

Sincerely,

Emily Wolf

Emily Wolf
Water Plan Technician
320-762-3066

DOUGLAS SOIL AND WATER CONSERVATION DISTRICT

900 Robert St., Suite 102
Alexandria, MN 56308-5079
Phone: 320-763-3191, Ext: 3
Fax: 320-762-5502

MINNESOTA
SOIL AND WATER CONSERVATION DISTRICTS

RECEIVED

AUG 18 2003

MPCA - Brainerd
Baxter, MN

August 15, 2003

Pat Shelito, Project Manager
MPCA
1800 College Rd. S
Brainerd, MN 56425

Comments of Long Prairie River TMDL

Dear Pat:

Enclosed is a resolution from the Douglas SWCD in support of the letters from the Central Lake Region Sanitary District and Alexandria Lakes Area Sanitary District, regarding the Long Prairie River TMDL.

Sincerely,

Jerry Haggenmiller

Jerry Haggenmiller
District Coordinator
Douglas SWCD

cc: Faye Sleeper

DOUGLAS SOIL AND WATER CONSERVATION DISTRICT RESOLUTION NO. _1_

RESOLUTION ENDORSEN AND AFFIRMING CENTRAL LAKE REGION SANITARY DISTRICT LETTER IN REGARD TO LONG PRAIRIE RIVER TMDL

WHEREAS, protection of water resources is important to Douglas County, and

WHEREAS, population growth is occurring, and will continue to occur, on or near water resources within Douglas County, and

WHEREAS, all governmental units are planning for ways to accommodate the population growth, and

WHEREAS, in Douglas County townships of Brandon, Carlos, LaGrand, Leaf Valley, Miltona and Moe formed the Central Lake Region Sanitary District (CLRJPB).

WHEREAS, the MPCA public comment period on the Long Prairie River TMDL closes on August 18, 2003, and

WHEREAS, the CLRJPB mailed a letter commenting on the Long Prairie River TMDL dated June 24, 2003, and

WHEREAS, the Alexandria Lake Area Sanitary District mailed a letter to the MPCA dated July 17, 2003 requesting the Delisting of Lake Winona from the State's Impaired Waters List, and

WHEREAS, the ALASD, the DCLA, the City of Alexandria, and Douglas County have mailed letters to the MPCA in support of the CLRJPB letter of June 24, 2003 and the ALASD letter of July 27, 2003 requesting the Delisting of Lake Winona

NOW THEREFORE BE IT RESOLVED that the Douglas Soil and Water Conservation Distict Board hereby supports and endorses:

a) the recommendations contained in the CLRSD letter dated June 24, 20003.
b) the ALASD letter dated July 14, 2003.

Adopted this 11th day of August, 2003 by Douglas Soil and Water Conservation Board of Supervisors by the following vote:

Yes _Thoennes, Roers, Matejka_

No ______

DOUGLAS SOIL AND WATER CONSERVATION DISTRICT

By Gerhard Thoennes
Its Chair

Attest:

Audrey Kleespies

Box 396
Clarissa, MN 56440
Phone: 218-756-2125
Fax: 218-756-2181
TT/TDD: MN Relay Service 711

City of Clarissa

RECEIVED

AUG 18 2003

MPCA - Brainerd
Baxter, MN

August 13, 2003

Patricia Shelito
Minnesota Pollution Control Agency
1800 College Road South
Baxter, MN 56425-7865

Re: MPCA TMDL Study

Dear Patricia:

We attended the meeting held in May concerning the Long Prairie River water quality. As a municipal entity included in the TMDL study, we have strong interest in the results of the study and proposed remedial procedures.

The information provided in the study has been in the gathering process for some time; however, as a stakeholder in the Long Prairie River TMDL, we have concerns on the data used to prepare the study. In particular, is there data and dates on what sites were tested; location of test sites; to what detail; were the tests repeated at various times and when; and how much impact does our facility have on the water quality of Eagle Creek. We should be provided with such information if it has been gathered for the Eagle Creek tributary, or was information used to prepare the study derived from tests from other locations and state averages. Our wastewater treatment operator recently had tests done on the ammonia and dissolved oxygen level at our treatment system and also at the point of discharge into Eagle Creek for both cities of Clarissa and Eagle Bend. An opportunity to compare test results would be beneficial and important to our community.

We currently treat our community waste water by means of an approved pond system designed and constructed in 1989. The system was designed to meet the capacity needs of the community, provide for acceptable treatment of waste water, and be affordable for the community. The ponds are only discharged semi-annually upon approval; however, capacity design prevents limiting discharge to only the fall season. As small cities face the state budget cuts, limited or lack of resources, and lack of affordable funding; proposed remedial action could be of very major consequence and further burden our rural economy.

Therefore, we request the MPCA provide additional time to allow more complete data information to be provided to ensure our communities that the best interests of the Long Prairie River and also of our communities is considered. Also, we request the MPCA to make recommendations that are feasible and justifiable for each entity that will be impacted by this study.

Sincerely,

Sue Cuchna
Administrator

Sam Cossentine
Waste Water Operator

August 15, 2003

Patricia Shelito
Minnesota Pollution Control Agency
1800 College Road South
Baxter, Minnesota 56425-7865

RECEIVED

18 2003

MPCA - Brainerd
Baxter, MN

To: MINNESOTA POLLUTION CONTROL AGENCY
Re: TMDL STUDY - LONG PRAIRIE RIVER

Comments

My wife and I own land in the Long Prairie River watershed area approximately five miles west of Long Prairie. We have completed a Water/Wetland Project Application Form proposing an impoundment of a gravel pit area. Our project would include a dam (maximum height 15 feet) and pond (approximately 60 acre-feet) that would positively affect the river in some ways. Water going over dam (spillway and/or other) with a 15 ft drop would be well aerated. Sedimentation from the watershed above the pond site would be greatly reduced. Minimal flood control could be obtained if normal impoundment level is below dam overflow level. Water quality going into the river (less than ½ mile from pond site) should be improved.

This project is in very initial stages. We look forward to working with those persons involved in upgrading river quality.

Joseph Terwey

Joseph Terwey

24663 County 11
Long Prairie, MN 56347
320-732-3638

Larson-Peterson & Associates, Inc.

CONSULTING MUNICIPAL ENGINEERS

1115 West River Road
Post Office Box 150
Detroit Lakes, Minnesota 56502-0150

Telephone: 218-847-5607
Fax: 218-847-2791
e-mail: lpassoc@lakesnet.net

August 18, 2003

Ms. Patricia Shelito
Minnesota Pollution Control Agency
1800 College Road South
Baxter, Minnesota 56425-7865

FAX & MAIL: 218-828-2594

RE: Wastewater Treatment Facility Improvements
Eagle Bend, Minnesota

RECEIVED

AUG 19 2003

MPCA - Brainerd
Baxter, MN

Dear Ms. Shelito:

This letter is in response to the Long Prairie Watershed TMDL Final Project Report, July 18 – August 2003 public comment.

We appreciate your timely response to our July 25, 2003 request for the Final Report. The comment period provides minimal review time for our firm and the City of Eagle Bend to review this extensive report. The City has limited resources for a comprehensive review of this subject.

We offer the following comments:

1. Table for Reach 07010108-504: Eagle Creek to Turtle Creek lacks the oxygen demand for the Eagle Creek point source loads for CBOD (204 lbs/day) and NBOD (209 lbs/day).

   Please provide the basis for these values.

2. The paragraph on page 2–4 states:

   Review and refine the targeted short term and long term nutrient reduction and management goals of each river section developed by the Todd SWCD in the CWP study (Tepley, 1999).

   The values and basis for these goals was not available or included in this report.

3. The report infers mechanical plants provide a high quantity of effluent (page 4-4). It is a fair assessment that stabilization ponds also provide a

high quality effluent. The utilization of mechanical plant during the Long Prairie River low flow should be compared to the controlled discharge of the pond system.

Section 11.6 Allowance for Future Growth

The design wastewater for Eagle Bend is 65,000 gallons per day (gpd) or up to 12 million gallons (MG) per seasonal discharge. The balance of the flow is clear water from infiltration/inflow. The infiltration/inflow portion of the design flow ranges from 50,000 to 130,000 gpd. The seasonal discharge of infiltration/inflow would be 9 MG to 23.4 MG.

Section 12.2 Point Sources

The Miltona wastewater treatment facility is considered very small and its discharge is assimilated by a slough before entering the Long Prairie River.

The report states, "The Alexandria Lake Area Sanitary District is included for completeness, though it does not impact the Long Prairie River (it discharges effluent of high quality to a chain of lakes upstream from Lake Carlos)."

The City of Eagle Bend contends its treated effluent will be high quality, have minimal impact on Eagle Creek and the Long Prairie River, and is assimilated by Eagle Creek and the higher spring flows.

The Eagle Bend pond system will not be discharging in the summer during low flows in Eagle Creek and the Long Prairie River. The pond systems are not credited for the ability to control hazardous discharges and are not susceptible to upset conditions.

Restricting spring discharge until periods of higher receiving water flow is not practical for the cities with stabilization ponds.

Section 12.3.1 Carlos Reach

The Carlos stabilization pond was abandoned in 1988/1989. The report states, "It is plausible that lingering effects of Carlos's abandoned stabilization pond do contribute in some small measure to the Carlos reach DO violations. Before the City of Carlos replaced its now abandoned pond, all wastewater that entered it evidently seeped out of it, as the pond reportedly never discharged to the river directly. A remnant plume of polluted groundwater between the abandoned pond and the river channel may still exist." The MPCA study of 1978 - Effects of Wastewater Stabilization Pond Seepage on Groundwater Quality - should be considered prior to the stated assertion in the Long Prairie River TMDL report.

The City of Eagle Bend will be abandoning their pond system and is concerned similar assertions will be made on the existing wastewater treatment facility.

4. Section 12.4 Recommendations

The recommendations restrict the stabilization pond discharge for the small cities and encourage utilization of advanced mechanical plants. If all these cities in the Long Prairie River Watershed District utilized mechanical plants, the continuous discharge flow would be about 4 cubic feet per second (cfs). The Long Prairie River minimum flows would be exceeded the months of December, January, and February. The effluent discharge would approach the July low flow. The 1972 – 1994 statically flow dates is enclosed.

The goal of the study centers around the Long Prairie River's low flow condition. The modeling study of the Long Prairie River was intended to identify the most efficient and practical methods of attaining the ammonia (and resulting BOD) reductions.

The report should have provided recommendations for the cities with stabilization ponds:

A. After spring ice out, when would the ammonia levels decrease?

B. Could a delay in the spring discharge within the April 1 to June 30 discharge window, reduce the ammonia levels?

C. The discharge schedule for pond systems has not been clearly discussed.

The proposed Eagle Bend wastewater treatment facility's wet weather flow is 195,630 gpd. Under this situation, if the wastewater flow was completely discharged (3 series) at 6 inches per day, it would entail 24 days per season. The Long Prairie River flows should be at least 200 – 250 cfs.

D. The dry weather and normal wastewater flow will require 2 series of discharge from the proposed Eagle Bend wastewater treatment facility.

At a discharge rate of 6 inches per day, 16 days of discharge would be necessary.

If the discharge rate was reduced to 4 inches per day the discharge period would be 24 days.

In summary, the controlled discharge from the stabilization ponds is about 32 to 48 days annually. The mechanical plant method suggested in the TMDL report would discharge 365 days per year. The report has not objectively evaluated the advantages of the for Eagle Bend and the other communities stabilization pond system in relation to the Long Prairie water quality and low flow periods.

On behalf of the City of Eagle Bend, I request you consider these matters.

Sincerely,

LARSON-PETERSON & ASSOCIATES, INC.

By: Thomas V. Augustin
Thomas V. Augustin, P.E.

TA:jle

Enclosure

cc: Kevin Hess w/ Enclosure

CROW WING RIVER BASIN

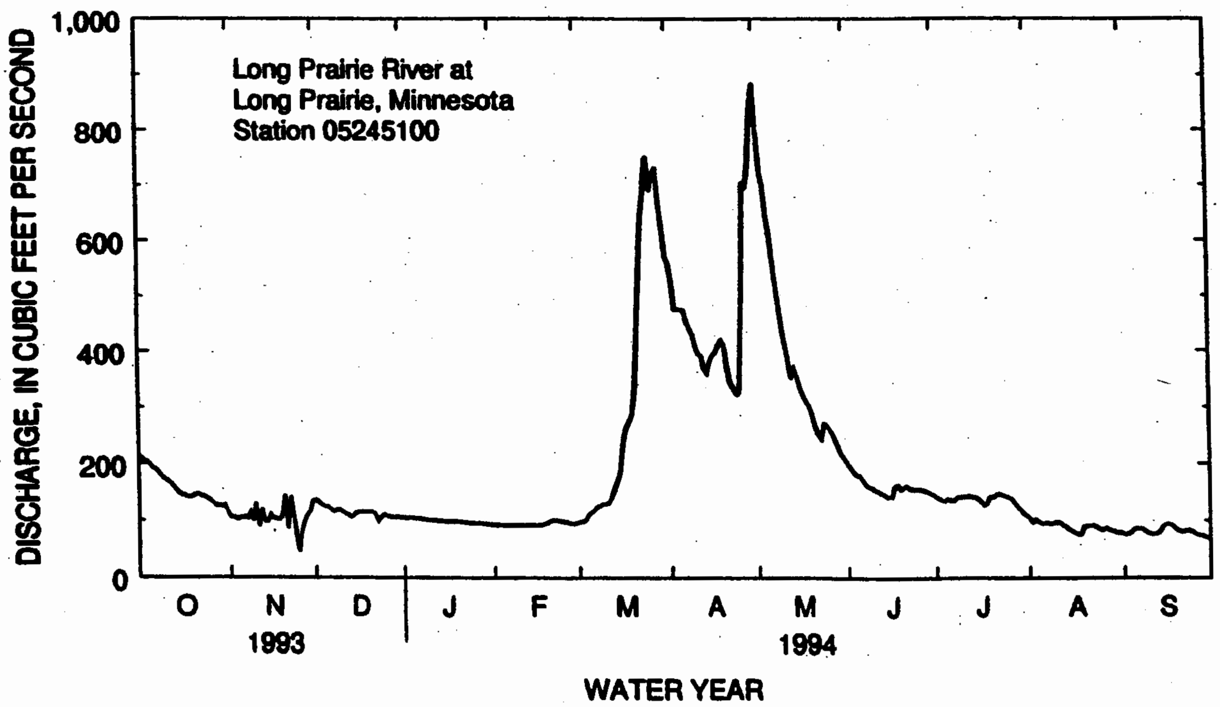
05245100 LONG PRAIRIE RIVER AT LONG PRAIRIE, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1994, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	123	113	72.4	58.3	57.7	170	344	250	206	184	134	120
MAX	512	425	270	217	208	441	748	653	422	777	715	607
(WY)	1987	1972	1987	1987	1987	1985	1986	1986	1985	1972	1972	1986
MIN	13.4	8.69	3.19	1.05	1.62	19.8	71.8	45.5	27.5	4.73	10.0	5.32
(WY)	1977	1977	1977	1977	1977	1989	1977	1977	1988	1988	1989	1976

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR		FOR 1994 WATER YEAR		WATER YEARS 1972 - 1994	
ANNUAL TOTAL	67518		68076			
ANNUAL MEAN	185		187		153	
HIGHEST ANNUAL MEAN					366	1972
LOWEST ANNUAL MEAN					25.2	1977
HIGHEST DAILY MEAN	546	Jul 10	885	May 1	2900	Jul 22 1972
LOWEST DAILY MEAN	24	Jan 1	46	Nov 25	.84	Jan 12 1977
ANNUAL SEVEN-DAY MINIMUM	24	Jan 1	74	Sep 24	.84	Jan 12 1977
INSTANTANEOUS PEAK FLOW			955	May 1	3270	Jul 22 1972
INSTANTANEOUS PEAK STAGE			6.05	Mar 25	9.37	Jul 22 1972
INSTANTANEOUS LOW FLOW			38a	Nov 25	.84	Jan 12 1977
ANNUAL RUNOFF (AC-FT)	133900		135000		110700	
ANNUAL RUNOFF (CFSM)	.43		.43		.35	
10 PERCENT EXCEEDS	374		412		360	
50 PERCENT EXCEEDS	176		123		92	
90 PERCENT EXCEEDS	25		85		22	

a Result of freezeup.



City of Carlos

PO Box 276
Carlos,MN 56319

Phone/Fax 1-320-852-7255

August 18, 2003

Pat Shelito
Project Manager
Brainerd Office
Fax # 1-218-828-2594

Dear Pat,

This letter is in regards to the TMDL process and the meeting that was held on August 14, 2003 in Osakis. Although we are not totally against this TMDL process we would like to see if more testing could be done in our particular area to determine by those samples if the City of Carlos necessarily falls under a load allocation.

The City of Carlos discharges our treated water into a very unique environment which contain approximately a thousand acres of cattails; which contribute to our low DO, high Phosphorus and Ammonia. Even though the discharge of our ponds have not shown to contribute to any problems in the past we can not relay on state averages alone in determining our results.

We would welcome more testing in the City of Carlos to provide us with more data to determine if a load allocation is necessary.

Sincerely,

Jeff Gunderson
Operator

Rick Zwieg
City Counsil

Re: Long Prairie River Watershed Total Minimum Daily Load Study and Final Decision

Dear Pat:

Written comments must include 3 statements as outlined on page 6 of the subject study. I did not include 3 statements in my letter of June 13, 2003, copy attached. I will attempt to cover the 3 statements in numbered paragraphs below:

1 My interest in your draft stems from the fact that I own lake shore property on Lake Miltona and over the years have served the Lake Association.

2 Action I would like to see the MPCA take includes getting approval of other local, state and federal government agencies which have authority to protect and improve local water resources. There are over 18 of these agencies including but not limited to:

Department of Health
Department of Agriculture
Department of Transportation
Department of Natural Resources
Association of Minnesota Counties
Minnesota Water Resources Board
Cities and Townships of Douglas, Todd, Morrison, Ottertail and Wadena Counties
U.S. Army Corps of Engineers
Etc.

3 Reasons for my concern include:

- A. Each governmental agency has its own special interests.
- B. The study does not include the whole watershed.
- C. Problems existing in the excluded part of the watershed include expanding public

Orvin J Hall Orvin J. Hall

CC: Ron Harnack, Executive Director BWSR
Bud Nornes, Representative
Mary Otremba, Representative
Dallas Sams, Senator

Orv & Alberta Hall

Summer	Winter
12718 Hermosa Bch Rd NW Alexandria, Mn. 56308	9101 W Business 83, Lot 62 Harlingen, Tx. 78552
320 852 7536 orvinhall@yahoo.com	956 421 3490 orvinhall@yahoo.com

Pat Shelito, Project Manager
Minnesota Pollution Control Agency
1800 College Road South
Baxter, Mn. 56425

June 13, 2003

Re: Long Prairie River Watershed Total Minimum Daily Load
Public Meeting June 12, 2003

Dear Pat:

I am concerned about the watershed as a whole. To my knowledge there are five counties included in the Long Prairie Watershed, but I believe only two were represented at this meeting.

There are approximately 18 Government Agencies involved with protection and improvement of local water resources. Will they be represented on your implementation committee for your project or will each Agency proceed with its own goals and objectives?

The Watershed includes all or a portion of nine cities which are growing and twenty three lakes, both groups are concerned about Minimum Daily Loads.

I believe that the Board of Water and Soil Resources is the only Agency **experienced** and able to address the multitude of concerns.

Respectfully,

Orvin J Hall
CC: Ron Harnack, Executive Director BWSR
Bud Nornes, Representative
Mary Otremba, Representative
Dallas Sams, Senator

TO: Concerned Citizens of the Long Prairie River Watershed

RE: Public Notice and Comment Period for Long Prairie Total Maximum Daily Load Study

The Minnesota Pollution Control Agency (MPCA) has received and reviewed your comment letter on the Long Prairie River Total Maximum Daily Load study. Thank you for taking the time to respond to the public notice and for expressing your concern.

The comment period extended from July 18, 2003 to August 18, 2003. During this time six letters were received. In addition, Alexandria Lake Area Sanitary District (ALASD), Central Lakes Region Joint Powers Board (CLRJPB) and Douglas county requested a contested case hearing. That decision may be made by the MPCA Citizen Board at their regular meeting on November 25, 2003, in St Paul. That meeting is open to the public.

Long Prairie River Total Maximum Daily Load For Dissolved Oxygen

LIST OF PUBLIC COMMENTS AND MPCA RESPONSES

Letter from Orvin J. Hall - dated July 26, 2003

I would like to see the MPCA get approval of other local, state and federal government agencies which have authority to protect and improve local water resources. There are over 18 of these agencies including but not limited to:

Department of Health
Department of Agriculture
Department of Transportation
Department of Natural Resources
Association of Minnesota Counties
Minnesota Water Resources Board
Cities and Townships of Douglas, Todd, Morrison, Ottertail and Wadena Counties
U.S. Army Corps of Engineers

Response:

The invitation to the public meetings as well as the public notice was mailed to all the above agencies. However, the U. S. Environmental Protection Agency has sole authority for final approval of the study.

Letter from the City of Eagle Bend - dated July 28, 2003
The comment period, July 18, 2003 to August 18, 2003, is insufficient time to review all the data. Especially, as of this date we have not received the total report done by Wenck Associates, Inc.

Response:
Preliminary report results were presented to the public on May 22 and again on June 12. The proposed public noticing of the report was announced at both of those meetings. MPCA believes that two months advance notice that the document would be available for a 30 day comment period is sufficient time for interested parties to plan for review of the document. The public notice was mailed on July 17 and gave the web address where the entire report could be accessed as of July 18. In addition, Eagle Bend's review engineer requested a CD of the report on Thursday, July 24. That CD, containing the entire report, arrived at the engineer's office on Monday, July 28.

Letter from Douglas County Land and Resource Management Office - dated August 18, 2003
Continue to involve Douglas County throughout the remainder of the TMDL process. As a headwaters area, we realize the effects our actions have downstream and the importance of proper land management to reduce pollution loadings. Communication and inclusion in this planning process is important in realistic goal setting and optimum cooperation in addressing the dissolved oxygen impairment. As the local water management authority, I request that a copy of the TMDL study be provided to the county.

Response:
Douglas County is represented on the Citizen's Advisory Implementation Committee by the Douglas County Water Planner and Douglas County Soil and Water Conservation District Manager, who is also chairman of the CLRJPB. This committee will provide oversight for the implementation activities. A copy of the TMDL report on CD was sent to the Douglas County Water Planner on August 21, 2003.

Letter from City of Carlos - dated August 18, 2003
We would like to see if more testing could be done in our particular area to determine by those samples if the city of Carlos necessarily falls under a load allocation.

The city of Carlos discharges our treated water into a very unique environment which contain approximately a thousand acres of cattails; which contribute to our low DO, high phosphorus and ammonia. Even though the discharge of our ponds has not shown to contribute to any problems in the past, we cannot rely on state averages alone in determining our results.

Response:
There will be an ongoing monitoring program of the river during the implementation phase of the TMDL. The monitoring plan can be structured to include sampling from the city of Carlos ponds. In addition, the city of Carlos NPDES permit is up for review in February 2005. Previous to that time, the city could do phosphorus and ammonia sampling to provide data which will be used to determine any need for revised permit limits and/or conditions of discharge. If there are adjustments that need to be made to the TMDL waste load allocations, it would be done during permit review.

Letter from City of Clarissa - dated August 13, 2003

Is there data and dates on what sites were tested; the location of test sites; to what detail; were the tests repeated at various times and when; how much impact does our facility have on the water quality of Eagle Creek. We should be provided with such information if it has been gathered for the Eagle Creek tributary, or was information used to prepare the study derived from tests from other locations and state averages? An opportunity to compare test results on the ammonia and dissolved oxygen level at our treatment system and at the point of discharge into Eagle Creek for both cities of Clarissa and Eagle Bend, would be beneficial to our community.

We currently treat our community waste water by means of an approved pond system designed and constructed in 1989. The system was designed to meet the capacity needs of the community, provide for acceptable treatment of waste water, and be affordable for the community. The ponds are only discharged semi-annually upon approval; however, capacity design prevents limiting discharge to only the fall season. As small cities face the state budget cuts, limited or lack of resources, and lack of affordable funding; proposed remedial action could be of very major consequence and further burden our rural economy.

We request the MPCA provide additional time to allow more complete data information to be provided to ensure our communities that the best interests of the Long Prairie River and also of our communities is considered. Also we request the MPCA to make recommendations that are feasible and justifiable for each entity that will be impacted by this study.

Response:

The city of Clarissa and Eagle Bend do not have waste load allocations because Eagle Creek is not listed as an impaired reach. However, the data Appendix C Table C-4 from sampling at CWP Sampling Site 4 – T LPR 33.6 where Eagle Creek enters the mainstream of the Long Prairie indicates that there may be impairments in Eagle Creek. Therefore, the recommendations in the report on page 12-9 suggest that 1) future monitoring should include a more intensive sampling of Eagle Creek; and 2) that ponds discharge at a particular time. These activities are recommendations for the cities to consider but are not requirements. More complete sampling of Eagle Creek can be undertaken in the Phase II – Implementation of the TMDL. Once the data has been collected and analyzed, it will be possible to make recommendations to the city of Clarissa and Eagle Bend about how to best manage their treatment systems.

Letter from Larson-Peterson & Associates, Inc. on behalf of the city of Eagle Bend - dated August 18, 2003

1. Table for Reach 07010108-504: Eagle Creek to Turtle Creek lacks the oxygen demand for the Eagle Creek point source loads for the CBOD (204 lbs/day) and NBOD (209 lbs/day).
   Please provide the basis for these values.

Response:
The loadings represented in the Table are residual loadings where Eagle Creek enters the Long Prairie River. They are smaller than the actual loads at the facility discharge points because they have been attenuated by Eagle Creek.

2. The paragraph on page 2-4 states:
   Review and refine the targeted short term and long term nutrient reduction and management goals of each river section developed by the Todd SWCD in the CWP study (Tepley, 1999).
   The values and basis for these goals was not available or included in this report.
   Response:
   The short term and long term nutrient reduction and management goals developed by the Todd SWCD were based on three years monitoring and modeling in conjunction with the staff from the MPCA. They were presented in a report titled "Long Prairie River Monitoring Project Report" submitted and approved by MPCA staff in 1999. That report is available from the MPCA office by request and is noted in the references section of the TMDL report.

3. The report infers mechanical plants provide a high quantity (sic) of effluent (page 4-4). It is a fair assessment that stabilization ponds also provide a high quality effluent. The utilization of mechanical plant during the Long Prairie River low flow should be compared to the controlled discharge of the pond system.
   Response:
   The main differences between a mechanical plant discharge and a pond discharge are the rate of discharge and the length of time over which the discharge occurs. A mechanical plant discharges everyday which means that it is loading the river continuously, however, since the rate of discharge and amount of the load is smaller, the stream can process that load without dire consequences to the water quality. A pond discharges during a window of a few days to a few weeks, but it is discharging an accumulated wastewater volume and load at much higher rates; consequently it is more difficult for the stream, especially a small one, to process that load without affecting water quality.

   Section 11.6 Allowance for Future Growth
   The design wastewater for Eagle Bend is 65,000 gallons per day gpd or up to 12 million gallons (MG) per seasonal discharge. The balance of the flow is clear water from infiltration/inflow. The infiltration/inflow portion of the design flow ranges from 50,000 to 130,000 gpd. The seasonal discharge of infiltration/inflow would be 9 MG to 23.4 MG.
   Response:
   The flow used for modeling the Eagle Bend pond was the permitted discharge rate calculated at a maximum drawdown of six inches from the secondary pond. If the actual influent flow is large due to infiltration and inflow; it is important for Eagle Bend to reduce their infiltration/inflow especially if they have any capacity problems.

Section 12.2 Point Sources

The Miltona wastewater treatment facility is considered very small and its discharge is assimilated by a slough before entering the Long Prairie River.

The report states, "The Alexandria Lake Area Sanitary District is included for completeness, though it does not impact the Long Prairie River (it discharges effluent of high quality to a chain of lakes upstream from Lake Carlos)."

The city of Eagle Bend contends its treated effluent will be high quality, have minimal impact on Eagle Creek and the Long Prairie River and is assimilated by Eagle Creek and the higher spring flows.

The Eagle Bend pond system will not be discharging in the summer during low flows in Eagle Creek and the Long Prairie River. The pond systems are not credited for the ability to control hazardous discharges and are not susceptible to upset conditions.

Restricting spring discharge until periods of higher receiving water flow is not practical for the cities with stabilization ponds.

Response:

The recommended minimum instream flow rate for discharge from city of Eagle Bend ponds is 2 cfs. This is a change from 10 cfs which was in the draft report presented at the public meetings. The change was made after discussions with the Eagle Bend pond operator at the public meeting. The change to a less restrictive minimum instream flow resulted from the use of different instream pH and temperature values for the analysis of ammonia toxicity. The draft report (10-cfs minimum) used extreme; essentially worst-case pH and temperature (mean values for June, the warmest month of the spring-season discharge period). At the direction of MPCA staff, the revised report (2-cfs minimum) uses median values representing the entire spring discharge period of April 1 – June 30. The use of median values for the entire period is consistent with the MPCA's past applications of the ammonia toxicity standard.

The TMDL report analyzed the problem and recommended a potential solution that would meet water quality protection objectives. This recommendation was based on one set of key design parameters affecting ammonia toxicity. Other possible solutions exist and will be looked at during the TMDL implementation phase. For example, by monitoring effluent quality and stream flows, pH, and temperature; the discharge permit could be fashioned to provide additional discharge flexibility through better definition of the dilution and ambient water quality conditions affecting ammonia toxicity.

Section 12.3.1 Carlos Reach

The Carlos stabilization pond was abandoned in 1988/1989. The report states; "It is plausible that lingering effects of Carlos' abandoned stabilization pond do contribute in some small measure to the Carlos reach DO violations. Before the city of Carlos replaced its now abandoned pond, all wastewater that entered it evidently seeped out of it, as the pond reportedly never discharged to the river directly. A remnant plume of polluted groundwater between the abandoned pond and the river channel may still exist." The MPCA study of 1978 – Effect's of Wastewater Stabilization Pond Seepage on Groundwater Quality – should be considered prior to the stated assertion in the Long Prairie River TMDL report.

The city of Eagle Bend will be abandoning their pond system and is concerned similar assertions will be made on the existing wastewater treatment facility.

Response:

P 12-7 the first paragraph from which the above quote is taken, ends with "Water quality monitoring results for the Carlos reach have confirmed that the impacts from such a plume cannot be large, as the results failed to indicate substantial upstream-to downstream increases in oxygen-demanding pollutant concentrations." Abandonment of a pond system is considered on a case-by-case basis and what happened in the case of Carlos does not necessarily apply in the case of Eagle Bend.

4. Section 12.4 Recommendations

The recommendations restrict the stabilization pond discharge for the small cities and encourage utilization of advanced mechanical plants. If all these cities in the Long Prairie River Watershed District utilized mechanical plants, the continuous discharge flow would be about four cubic feet per second (cfs). The Long Prairie River minimum flows would be exceeded the months of December, January and February. The effluent discharge would approach the July low flow. The 1972 - 1994 statically flow dates is enclosed.

The goal of the study centers around the Long Prairie River's low flow condition. The modeling study of the Long Prairie River was intended to identify the most efficient and practical methods of attaining the ammonia (and resulting BOD) reductions.

The report should have provided recommendations for the cities with stabilization ponds:

A. After spring ice out, when would the ammonia levels decrease?

B. Could a delay in the spring discharge, within the April 1 to June 30 discharge window, reduce the ammonia levels?

C. The discharge schedule for pond systems has not been clearly discussed. The proposed Eagle Bend wastewater treatment facility's wet weather flow is 195,630 gpd. Under this situation, if the wastewater flow was completely discharged (3 series) at 6 inches per day, it would entail 24 days per season. The Long Prairie River flows should be at least 200 - 250 cfs.

D. The dry weather and normal wastewater flow will require two series of discharge from the proposed Eagle Bend wastewater treatment facility. At a discharge rate of six inches per day, 16 days of discharge would be necessary. If the discharge rate was reduced to four inches per day the discharge period would be 24 days.

In summary, the controlled discharge from the stabilization ponds is about 32 to 48 days annually. The mechanical plant method suggested in the TMDL report would discharge 365 days per year. The report has not objectively evaluated the advantages of the Eagle Bend and the other communities' stabilization pond system in relation to the Long Prairie water quality and low flow periods.

Response:

The recommendations on page 12-9 in the report does not advocate for the use of mechanical plants in general or for the small communities in particular. The only reference it makes to mechanical plants is for the Long Prairie industrial discharges. MPCA staff realize that there is a trade-off between mechanical plants and pond systems in regard to daily impact, loadings and flow amounts. Staff is committed to working with pond facility personnel to develop management strategies for the ammonia toxicity, as much as is reasonably possible.

The Minnesota Pollution Control Agency Citizen Board may be discussing whether or not to grant a contested case hearing on this study. If the hearing is granted, the case will go before an administrative law judge for processing. If the hearing is denied, the study can be submitted to the U. S. Environmental Protection Agency for approval. For information on the Citizen Board Agenda and results of the hearing request go the MPCA Web Page/About MPCA/ Citizen Board or click on http://www.pca.state.mn.us/about/board/index.html.

Sincerely,

Pat Shelito
Project Manager, Community and Area Wide Programs Unit
Brainerd Office
Regional Environmental Management Division

PS:vms

cc: Orv and Alberta Hall, Alexandria
Delvin Slathe, Mayor, City of Eagle Bend, Eagle Bend
Sue Cuchna, Administrator, Clarissa
Sam Cossentine, Waste Water Operator, Clarissa
Bruce Nelson, ALASD, Alexandria
Emily Wolf, Water Plan Technician, Alexandria
Jeff Gunderson, Operator, Carlos
Rick Zwieg, City Council, Carlos
Tom Augustine, Larson-Peterson & Associates, Inc., Detroit Lakes
John Erdmann, Wenck Associates, Inc., Maple Plain
EPA, Chicago, IL

Minnesota Pollution Control Agency

STATE OF MINNESOTA

Minnesota Pollution Control Agency

REGIONAL ENVIRONMENTAL MANAGEMENT DIVISION
PUBLIC NOTICE OF MODIFICATIONS TO THE LONG PRAIRIE RIVER
TOTAL MAXIMUM DAILY LOAD STUDY

Public Comment Period Begins:	July 22, 2004
Public Comment Period Ends:	August 23, 2004

Pollutant or Stressor: Dissolved Oxygen

Description of the Modifications to the Draft TMDL Study:
The dissolved oxygen (DO) total maximum daily loads (TMDLs) for the Long Prairie River have been revised as a result of the discovery and correction of errors in a key model parameter used in one of the seasonal TMDL model simulations. The summer/fall TMDL model simulation was found to have incorrect reaeration rate coefficient (K_a) values. Correction of the K_a values led to a reduction in the waste load allocation for one municipal wastewater treatment facility and modification of the unallocated loads for the six main-stem Long Prairie River reaches.

When the summer/fall TMDL simulation was re-run with the corrected K_a values, the effluent ammonia nitrogen concentration for the city of Long Prairie's industrial wastewater system had to be reduced to 22.1 milligrams per liter to prevent a DO violation. In its current form, the TMDL report (July 2003) specifies an ammonia nitrogen limit of 30 milligrams per liter for this discharge (Long Prairie 004 in the TMDL report). The corresponding reduction in the city of Long Prairie's waste load allocation, which includes both industrial and domestic systems, is 11 percent overall (from 1256 to 1114 lbs/day) and 15 percent specifically for nitrogenous biochemical oxygen demand (BOD) loading (from 981 to 838 lbs/day).

The summer/fall K_a corrections also affected the unallocated loads, represented by hypothetical (or "virtual") point sources located at the heads of the DO-impaired reaches. The unallocated loads required reductions ranging from 10 to 63 percent, with the exception of the unallocated load for reach 504. The unallocated load for reach 504, which extends from Eagle Creek to Turtle Creek, actually increased as a result of the ammonia reduction at the city of Long Prairie, some 11 miles upstream from Eagle Creek.

Table 1, an updated version of Table 11-2 from the current TMDL report, presents revised DO TMDLs based on the corrected K_a values. In the final TMDL report to be submitted to the Environmental Protection Agency (EPA), the information in Table 1 will replace that in the current version of Table 11-2.

Table 2 directly compares the revised TMDLs (Table 1) with the original TMDLs (Table 11-2 from the July 2003 TMDL report). Reach 505 is the only reach with both a revised waste load allocation (city of Long Prairie) and revised unallocated load. The revised TMDL for reach 505 is 4 percent smaller than the original TMDL. The revised TMDLs for the other reaches, which reflect revisions only to the unallocated loads, range from 21 percent smaller than the original TMDL (reach 501) to 12 percent larger (reach 504).

TABLE 1 REVISED LONG PRAIRIE RIVER DO TMDLS (MAY 2004)

Reach 07010108-506: Long Prairie River Headwaters (Lake Carlos) to Spruce Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	147	42	n/a	189
WLA + MOS for Carlos WWTF	233	254	n/a	487
LA for LPR Headwaters @ RM89.9	161	55	n/a	216
LA for other Nonpoint Sources	***999***	***68***	291	1,359
MOS for all Nonpoint Sources	116	12	n/a	128
Total Maximum Daily Load	1,657	432	291	**2,380**

Reach 07010108-505: Spruce Creek to Eagle Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	397	114	n/a	511
WLA + MOS for LP-Superfund	48	17	n/a	65
WLA + MOS for Long Prairie WWTF	***275***	***838***	n/a	1,114
WLA + MOS for Browerville WWTF	542	***504***	n/a	1,045
LA for Spruce Creek	***87***	***29***	n/a	116
LA for Dismal Creek	***17***	***30***	n/a	47
LA for other Nonpoint Sources	***5,329***	***484***	1,750	7,563
MOS for all Nonpoint Sources	543	54	n/a	598
Total Maximum Daily Load	7,239	2,070	1,750	**11,059**

Reach 07010108-504: Eagle Creek to Turtle Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	971	278	n/a	1,249
Eagle Creek Residual Point Source Loads	204	209	n/a	412
LA for Eagle Creek	***587***	***40***	n/a	626
LA for other Nonpoint Sources	***1,442***	***362***	315	2,119
MOS for all Nonpoint Sources	203	40	n/a	243
Total Maximum Daily Load	3,406	928	315	**4,649**

TABLE 1 (Cont.)
Reach 07010108-503: Turtle Creek To Moran Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	941	269	n/a	1,210
LA for Turtle Creek	238	129	n/a	367
LA for other Nonpoint Sources	620	156	120	895
MOS for all Nonpoint Sources	86	28	n/a	114
Total Maximum Daily Load	1,884	582	120	**2,587**

Reach 07010108-502: Moran Creek To Fish Trap Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	504	144	n/a	648
LA for Moran Creek	93	62	n/a	155
LA for other Nonpoint Sources	682	171	252	1104
MOS for all Nonpoint Sources	77	23	n/a	101
Total Maximum Daily Load	1,356	401	252	**2,008**

Reach 07010108-501: Fish Trap Creek to Crow Wing River

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	435	124	n/a	559
LA for Fish Trap Creek	243	48	n/a	291
LA for other Nonpoint Sources	1,276	320	545	2,142
MOS for all Nonpoint Sources	152	37	n/a	189
Total Maximum Daily Load	2,106	529	545	**3,180**

Notes:

Bold italic denotes a load that was reduced to meet DO standard

TABLE 2

Reach 07010108-506: Long Prairie River Headwaters (Lake Carlos) to Spruce Creek	Revised TMDL (5/24/04): Oxygen Demand (lbs/day) from:				Original TMDL (Report 7/03): Oxygen Demand (lbs/day) from:				Difference Revised - Original: Oxygen Demand from:			
	CBOD	NBOD	SOD	Total (lbs/day)	CBOD	NBOD	SOD	Total (lbs/day)	CBOD	NBOD	SOD	Total
Unallocated Load	147	42	n/a	189	164	47	n/a	210	-16	-5	n/a	-21
WLA + MOS for Carlos WWTF	233	254	n/a	487	233	254	n/a	487	0	0	n/a	0
LA for LPR Headwaters @ RM89.9	161	55	n/a	216	161	55	n/a	216	0	0	n/a	0
LA for other Nonpoint Sources	***999***	***68***	291	1,359	***999***	***68***	291	1,359	0	0	0	0
MOS for all Nonpoint Sources	116	12	n/a	128	116	12	n/a	128	0	0	n/a	0
Total Maximum Daily Load	1,657	432	291	**2,380**	1,673	437	291	**2,401**	-16	-5	0	**-21**

Reach 07010108-505: Spruce Creek to Eagle Creek	Revised TMDL (5/24/04): Oxygen Demand (lbs/day) from:				Original TMDL (Report 7/03): Oxygen Demand (lbs/day) from:				Difference Revised - Original: Oxygen Demand from:			
	CBOD	NBOD	SOD	Total (lbs/day)	CBOD	NBOD	SOD	Total (lbs/day)	CBOD	NBOD	SOD	Total
Unallocated Load	397	114	n/a	511	613	175	n/a	788	-216	-62	n/a	-278
WLA + MOS for LP-Superfund	48	17	n/a	65	48	17	n/a	65	0	0	n/a	0
WLA + MOS for Long Prairie WWTF	***275***	***838***	n/a	1,114	***275***	***981***	n/a	1,256	0	-142	n/a	-142
WLA + MOS for Browerville WWTF	542	***504***	n/a	1,045	542	***504***	n/a	1,045	0	0	n/a	0
LA for Spruce Creek	***87***	***29***	n/a	116	***87***	***29***	n/a	116	0	0	n/a	0
LA for Dismal Creek	***17***	***30***	n/a	47	***17***	***30***	n/a	47	0	0	n/a	0
LA for other Nonpoint Sources	***5,329***	***484***	1,750	7,563	***5,329***	***484***	1,750	7,563	0	0	0	0
MOS for all Nonpoint Sources	543	54	n/a	598	543	54	n/a	598	0	0	n/a	0
Total Maximum Daily Load	7,239	2,070	1,750	**11,059**	7,455	2,274	1,750	**11,478**	-216	-204	0	**-420**

TABLE 2 (Cont.)

Reach 07010108-504: Eagle Creek to Turtle Creek

	Oxygen Demand (lbs/day) from:			Total (lbs/day)	Oxygen Demand (lbs/day) from:			Total (lbs/day)	Oxygen Demand from:			Total
	CBOD	NBOD	SOD		CBOD	NBOD	SOD		CBOD	NBOD	SOD	
Unallocated Load	971	278	n/a	1,249	572	164	n/a	736	399	114	n/a	513
Eagle Creek Residual Point Source Loads	204	209	n/a	412	204	209	n/a	412	0	0	n/a	0
LA for Eagle Creek	***587***	***40***	n/a	626	***587***	***40***	n/a	626	0	0	n/a	0
LA for other Nonpoint Sources	***1,442***	***362***	315	2,119	***1,442***	***362***	315	2,119	0	0	0	0
MOS for all Nonpoint Sources	203	40	n/a	243	203	40	n/a	243	0	0	n/a	0
Total Maximum Daily Load	3,406	928	315	**4,649**	3,007	814	315	**4,136**	399	114	0	**513**

Reach 07010108-503: Turtle Creek To Moran Creek

	Oxygen Demand (lbs/day) from:			Total (lbs/day)	Oxygen Demand (lbs/day) from:			Total (lbs/day)	Oxygen Demand from:			Total
	CBOD	NBOD	SOD		CBOD	NBOD	SOD		CBOD	NBOD	SOD	
Unallocated Load	941	269	n/a	1,210	1,056	302	n/a	1,357	-114	-33	n/a	-147
LA for Turtle Creek	238	129	n/a	367	238	129	n/a	367	0	0	n/a	0
LA for other Nonpoint Sources	620	156	120	895	620	156	120	895	0	0	0	0
MOS for all Nonpoint Sources	86	28	n/a	114	86	28	n/a	114	0	0	n/a	0
Total Maximum Daily Load	1,884	582	120	**2,587**	1,999	615	120	**2,734**	-114	-33	0	**-147**

Reach 07010108-502: Moran Creek To Fish Trap Creek

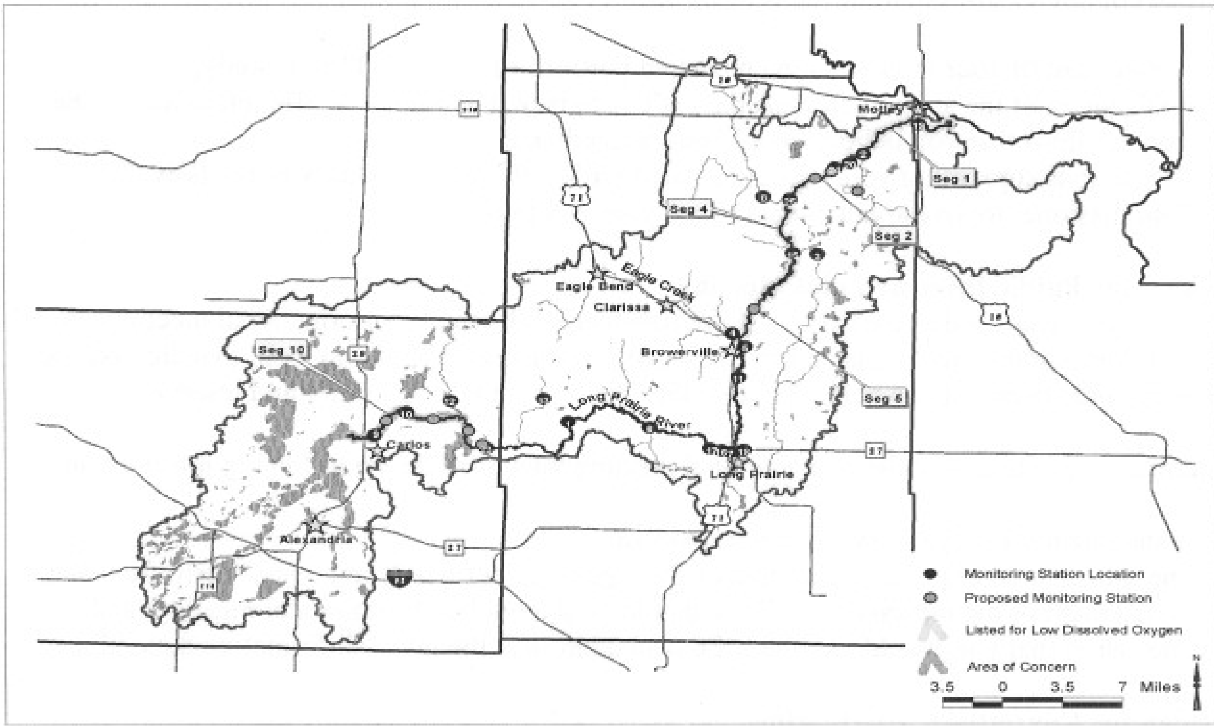
	Oxygen Demand (lbs/day) from:			Total (lbs/day)	Oxygen Demand (lbs/day) from:			Total (lbs/day)	Oxygen Demand from:			Total
	CBOD	NBOD	SOD		CBOD	NBOD	SOD		CBOD	NBOD	SOD	
Unallocated Load	504	144	n/a	648	739	211	n/a	950	-235	-67	n/a	-303
LA for Moran Creek	93	62	n/a	155	93	62	n/a	155	0	0	n/a	0
LA for other Nonpoint Sources	682	171	252	1104	682	171	252	1104	0	0	0	0
MOS for all Nonpoint Sources	77	23	n/a	101	77	23	n/a	101	0	0	n/a	0
Total Maximum Daily Load	1,356	401	252	**2,008**	1,591	468	252	**2,311**	-235	-67	0	**-303**

TABLE 2 (Cont.) Reach 07010108-501: Fish Trap Creek to Crow Wing River	Oxygen Demand (lbs/day) from:			Total (lbs/day)	Oxygen Demand (lbs/day) from:			Total (lbs/day)	Oxygen Demand from:			Total
	CBOD	NBOD	SOD		CBOD	NBOD	SOD		CBOD	NBOD	SOD	
Unallocated Load	435	124	n/a	559	1,080	308	n/a	1,388	-645	-184	n/a	-829
LA for Fish Trap Creek	243	48	n/a	291	243	48	n/a	291	0	0	n/a	0
LA for other Nonpoint Sources	1,276	320	545	2,142	1,276	320	545	2,142	0	0	0	0
MOS for all Nonpoint Sources	152	37	n/a	189	152	37	n/a	189	0	0	n/a	0
Total Maximum Daily Load	2,106	529	545	**3,180**	2,751	713	545	**4,010**	-645	-184	0	**-829**

Notes:

Bold italic denotes a load that was reduced to meet DO standard

Map of Impairments



The MPCA would like input from stakeholders in the Long Prairie River TMDL study and its proposed pollution reductions. The allocations set in the TMDL will be used to guide any effluent limitations or other pollution control measures for permits, as well as pollution prevention measures for nonpoint sources. An implementation plan to achieve the reductions required in the TMDL will be developed with public input. The implementation plan must be submitted within one year of completion of the TMDL study.

From July 22, 2004, until August 23, 2004, people will have the opportunity to comment on these modifications to the draft TMDL report. Following the public comment period, on September 1, 2004, the revised report will be submitted to the U.S. Environmental Protection Agency for approval describing how the problem will be solved.

Preliminary Determination on the Draft TMDL Study:
The MPCA Commissioner has made a preliminary determination to submit this TMDL study to the U.S. Environmental Protection Agency for final approval. A draft TMDL and fact sheet are available for review at the MPCA office at the address listed below, and at the MPCA web site: **http://www.pca.state.mn.us/water/tmdl.html#drafttmdl**. Suggested changes will be considered before the final TMDL is sent to the U.S. Environmental Protection Agency for approval.

Written Comments
Only comments or petitions concerning the proposed modified portions of the draft TMDL study, which are outlined in Tables 1 and 2 of this notice, will be considered.

Written comments must include the following:

1. A statement of your interest in the modified portions of the draft TMDL study;
2. A statement of the action you wish the MPCA to take, including specific references to the modifications that you believe should be changed; and
3. The reasons supporting your position, stated with sufficient specificity as to allow the Commissioner to investigate the merits of your position.

Petition for Public Informational Meeting
You also may request that the MPCA Commissioner hold a public informational meeting. A public informational meeting is an informal meeting that the MPCA may hold to solicit public comment and statements on matters before the MPCA, and to help clarify and resolve issues.

A petition requesting a public informational meeting must include the following information:

1. A statement identifying the matter of concern;
2. The information required under items 1 through 3 of "Written Comments," identified above;
3. A statement of the reasons the MPCA should hold a public informational meeting; and
4. The issues that you would like the MPCA to address at the public informational meeting.

Petition for Contested Case Hearing
You also may submit a petition for a contested case hearing. A contested case hearing is a formal evidentiary hearing before an administrative law judge. In accordance with Minn. R. 7000.1900, the MPCA will grant a petition to hold a contested case hearing if it finds that: (1) there is a material issue of fact in dispute concerning the application or modified portions of the draft TMDL study; (2) the MPCA has the jurisdiction to make a determination on the disputed material issue of fact; and (3) there is a reasonable basis underlying the disputed material issue of fact or facts such that the holding of the contested case hearing would allow the introduction of information that would aid the MPCA in resolving the disputed facts in making a final decision on the modified portions of the draft TMDL study. A material issue of fact means a fact question, as distinguished from a policy question, whose resolution could have a direct bearing on a final MPCA decision.

A petition for a contested case hearing must include the following information:

1. A statement of reasons or proposed findings supporting the MPCA decision to hold a contested case hearing according to the criteria in Minn. R. 7000.1900, as discussed above; and
2. A statement of the issues proposed to be addressed by a contested case hearing and the specific relief requested or resolution of the matter.

In addition and to the extent known, a petition for a contested case hearing should also include the following information:

1. A proposed list of prospective witnesses to be called, including experts, with a brief description of proposed testimony or summary of evidence to be presented at a contested case hearing;
2. A proposed list of publications, references, or studies to be introduced and relied upon at a contested case hearing; and
3. An estimate of time required for you to present the matter at a contested case hearing.

MPCA Decision
You may submit a petition to the Commissioner requesting that the MPCA Citizens' Board consider the modified portions of the TDML study approval. To be considered timely, the petition must be received by the MPCA by 4:30 p.m. on the date the public comment period ends, identified on page 1 of this notice. Under the provisions of Minn. Stat. § 116.02, subd. 6(4), the decision whether to issue the permit and, if so, under what terms will be presented to the Board for decision if: (1) the Commissioner grants the petition requesting the matter be presented to the Board; (2) one or more Board members request to hear the matter before the time the Commissioner makes a final decision on the modified portions of the TMDL study; or (3) a timely request for a contested case hearing is pending. You may participate in the activities of the MPCA Board as provided in Minn. R. 7000.0650.

The written comments, requests, and petitions submitted on or before the last day of the public comment period will be considered in the final decision on these modified portions of the TMDL study. If the MPCA does not receive written comments, requests, or petitions during the public comment period, MPCA staff as authorized by the Board, will make the final decision on the modified portions of the draft TMDL study.

Comments, petitions, and/or requests must be submitted in writing on or before the end date of the public comment period identified on page 1 of this notice to:

Patricia Shelito
Minnesota Pollution Control Agency
7678 College Road, Suite 105
Baxter, Minnesota 56425-7865

Print and Radio Media Coverage of Long Prairie Meetings

Newspapers

Long Prairie Leader
21 3rd St S
56347

Staples World
224 4th St NE
56479

Clarissa Independent News
310 W Main St
56440

Browerville Blade
609 N Main St
56438

Alexandria Echo Press
225 7th Ave E
PO Box 549
56308

Radio Stations

KEYL Radio
P.O. Box 187
Long Prairie, MN 56347

KXRA Radio
P.O. Box 69
Alexandria, MN 56308

NEWS RELEASE

Minnesota Pollution Control Agency

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FOR RELEASE: July 18, 2003

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MPCA STUDY ANALYZES LOW LEVELS OF DISSOLVED OXYGEN IN LONG PRAIRIE RIVER

Brainerd, Minn.- The Minnesota Pollution Control Agency (MPCA) released a report today evaluating problems of low levels of dissolved oxygen in the Long Prairie River in central Minnesota. The agency is requesting the public to comment on the report through August 18, 2003.

The report is one of many more to come in Minnesota under a provision of the federal Clean Water Act called Total Maximum Daily Loads (TMDL). TMDLs determine the maximum pollutant loads that lakes and rivers can tolerate and still meet applicable water quality standards. The studies are used to set pollutant limits and reduction goals.

This study covers the Long Prairie River from the City of Carlos to its confluence with the Crow Wing River near Motley.

Monitoring data shows six sections of the river have regularly violated federal and state water quality standards for dissolved oxygen in recent years. Levels of dissolved oxygen which fall below the water quality standard of 5 milligrams per liter (mg/l) can harm fish and aquatic life, and reduce the river's ability to assimilate additional discharges of wastewater or stormwater.

Rivers and lakes can handle certain amounts of pollutants and remain "fishable and swimmable". But many waterways, including sections of the Long Prairie River and tributaries, are overloaded with one or more pollutants.

-more-

So far in the Long Prairie River watershed, scientists have identified six river reaches with pollution impairments. Four reaches were identified through historical monitoring and two more were added during monitoring in the development of a Total Maximum Daily Load (TMDL) report. A single water body or river reach (about 20 miles) can be identified as "impaired" for more than one condition or chemical parameter, but the primary focus in the Long Prairie River is the oxygen depletion and high ammonia levels during low flows. Low flows occur when the volume of water and the current of the water are less than average. When a river reach is identified as having "pollution impairment" this means the river or lake is not fishable and swimmable.

The report attributes the dissolved oxygen impairment primarily to high levels of ammonia being discharged from municipal and industrial wastewater facilities.

The MPCA report, titled "Long Prairie River Watershed TMDL Project: Final Project Report," calls for a reduction of ammonia, and notes that some efforts aimed at this goal already are underway.

Projects to improve dissolved oxygen and reduce ammonia, will be developed through a local coordinating group called the Implementation Advisory Committee. The projects will be implemented mainly through local governments. Implementation will consist of improving the discharge waters from wastewater facilities as well as improvements to feedlots, pasture management, and crop runoff within the watershed.

Following the public comment period, MPCA will submit the report to the U.S. Environmental Protection Agency for final approval.

The public comment period for the report ends August 18, 2003. The complete report and a fact sheet about it can be viewed on the MPCA's web site at www.pca.state.mn.us/water/tmdl.html

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Minnesota Pollution Control Agency

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Category

July 22, 2004

Editor
Long Prairie Leader
21 - 3rd Street South
Long Prairie, MN 56347

RE: Public Notice of Modifications to the Long Prairie River Total Maximum Daily Load Study

Dear Editor:

Enclosed is a public notice for a facility in your circulation area. This notice is for informational use only. You may publish this information in your newspaper; however, the Minnesota Pollution Control Agency will not approve payment of the publication.

If you have any questions regarding this notice, please call the staff member listed within the notice.

Sincerely,

DeAnne Pierzinski

DeAnne Pierzinski
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Regional Environmental Management Division

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Shelito, Pat

From: Jim Lilienthal [jim.lilienthal@dnr.state.mn.us]
Sent: Wednesday, August 11, 2004 11:19 AM
To: Pat.Shelito@state.mn.us
Cc: Dirk Peterson
Subject: Long Prairie River revised TMDL study

Little Falls Area Fisheries Office has fish management responsibility for the Long Prairie River. We strongly support the findings of the revised TMDL study and would like to see the development of an implementation plan as soon as possibile. Implementation of the TMDL's should lower the frequency of fishkills due to low dissolved oxygen levels documented by Fisheries in the past. This has taken away fishing opportunities for anglers on the Long Prairie and Crow Wing Rivers. Thankyou - Jim Lilienthal -Fisheries Area Supervisor - Little Falls Fisheries Office

Minnesota Pollution Control Agency

June 13, 2005

Mr. Jerome Haggenmiller
Chairman
Central Lakes Region Sanitary District
11643 Moe Hall Road NW
Garfield, MN 56332

Dear Mr. Haggenmiller:

Thank you for your May 23, 2005, letter withdrawing the request for a Contested Case Hearing on the Long Prairie River Total Maximum Daily Load (TMDL). The process of resolving the issues has been long, and at times may have seemed arduous. I appreciate your patience and willingness to work with the Minnesota Pollution Control Agency during this negotiation process. Through this process, we have learned quite a bit, and have a better understanding of not only the impaired reaches of the Long Prairie River, but also some of the finer decisions involved in these TMDLs with complex watershed issues.

We hope to send the TMDL to the (U.S.) Environmental Protection Agency (EPA) within the next two weeks. The EPA has 30 days to approve the TMDL. The cover letter submitting the TMDL to EPA will reference the August 3, 2004, memorandum and the February 10, 2005, memorandum from Ron Jacobson regarding the proposed discharge. While these memorandums are not part of the TMDL, they will be included in an appendix of the TMDL that contains all the formal public information documents. In addition, these two memorandums will be attached to the cover letter submitting the TMDL to EPA.

The North Central Minnesota Pollution Control Agency office in Brainerd will take the lead in implementing the TMDL, working with local partners. Please contact Jim Hodgson at (218) 828-6065, with questions regarding the implementation that will follow approval of the TMDL.

Again, I appreciate your working with us to resolve the issues you raised regarding the Long Prairie River TMDL. Feel free to contact me regarding questions about this letter, the TMDL or the process to obtain final approval for the TMDL.

Sincerely,

Faye E. Sleeper

Faye E. Sleeper, Manager
Watershed Section
Regional Division

FEY:jal

cc: Mr. Steve Nyhus, Attorney

Minnesota Pollution Control Agency

June 13, 2005

Mr. Bruce A. Nelson
Executive Director
Alexandria Lake Area Sanitary District
2201 Nevada Street
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Dear Mr. Nelson:

Thank you for your April 8, 2005, letter withdrawing the request for a Contested Case Hearing on the Long Prairie River Total Maximum Daily Load (TMDL). The process of resolving the issues has been long, and at times may have seemed arduous. I appreciate your patience and willingness to work with the Minnesota Pollution Control Agency during this negotiation process. Through this process, we have learned quite a bit, and have a better understanding of not only the impaired reaches of the Long Prairie River, but also some of the finer decisions involved in these TMDLs with complex watershed issues.

We hope to send the TMDL to the (U.S.) Environmental Protection Agency (EPA) within the next two weeks. The EPA has 30 days to approve the TMDL. The cover letter submitting the TMDL to EPA will reference the August 3, 2004, memorandum and the February 10, 2005, memorandum from Ron Jacobson regarding the proposed discharge. While these memorandums are not part of the TMDL, they will be included in an appendix of the TMDL that contains all the formal public information documents. In addition, these two memorandums will be attached to the cover letter submitting the TMDL to EPA.

The North Central Minnesota Pollution Control Agency office in Brainerd will take the lead in implementing the TMDL, working with local partners. Please contact Jim Hodgson at (218) 828-6065 with questions regarding the implementation that will follow approval of the TMDL.

Again, I appreciate your working with us to resolve the issues you raised regarding the Long Prairie River TMDL. Feel free to contact me regarding questions about this letter, the TMDL or the process to obtain final approval for the TMDL.

Sincerely,

Faye E. Sleeper

Faye E. Sleeper, Manager
Watershed Section
Regional Division

FEY:jal

cc: Mr. Steve Nyhus, Attorney

May 23, 2005

RECEIVED

MAY 26 2005

Faye Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Re: Long Prairie River Total Maximum Daily Load (TMDL) Petition for Contested Case Hearing by Central Lakes Region Sanitary District (CLRSD)

Dear Ms. Sleeper:

Thank you for your letter to Mr. Nyhus of February 18, 2005, attaching the memoranda from Ron Jacobson to Hafiz Munir dated August 3, 2004 and February 10, 2005, respectively. Our counsel and consultants have reviewed these documents. On March 3, 2005, the CLRSD Board voted to withdraw its August 15, 2003 request for a contested case hearing on the Long Prairie River TMDL. The specific items in that request are addressed as follows:

Issue 1: *Petitioner believes that rulemaking is necessary to complete a TMDL and establish Wasteload Allocations and Load Allocations. Rulemaking provides the legal authority and assurance of due process for all stakeholders. The MPCA says rulemaking is not necessary for the Long Prairie River TMDL Study.*

The CLRSD withdraws its contested case hearing request on this issue.

Issue 2: *Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets in the Long Prairie River Study will effectively (de facto) establish Phosphorus Water Quality Standards for the Long Prairie River without following the proper process. As such these goals/guidelines/targets should not be included in the TMDL. The MPCA disagrees.*

The CLRSD has confirmed that the objectionable provisions in the TMDL report, which you identified as being deleted in your letter to Mr. Nyhus of May 20, 2004, have in fact been deleted. Therefore, CLRSD withdraws its request for a contested case hearing on this issue.

Issue 3: *The Long Prairie River from the headwaters of Lake Carlos (mile 92.0) to Long Prairie (mile 47.8) should be delisted. According to the TMDL Study the dissolved oxygen impairment is* *caused by a naturally occurring condition. Therefore, an amended water quality standard should be established for the Long Prairie reflecting this natural condition. The MPCA disagrees.*

As the Alexandria Lake Area Sanitary District (ALASD) and the MPCA have discussed over the past several months, modeling has been developed and reviewed by the parties to confirm that, despite the compliance of the ALASD's current discharge and hypothetical new discharge with Long Prairie River TMDL wasteload allocations under low-flow (7Q10) conditions, the influx of low-DO waters from adjacent riparian wetlands during high flow conditions may nevertheless result in dissolved oxygen sags.

The CLRSD believes that Mr. Jacobson's March 10, 2005 memorandum addresses this concern:

> Under these conditions the background level of dissolved oxygen in the river becomes the water quality standard that is not to be lowered by the addition of oxygen demanding pollutants from a new discharge. The modeling predictions indicate that the addition of a hypothetical new discharge under such conditions results in an imperceptible impact on the stream dissolved oxygen concentration, effectively demonstrating the dominating influence of wetland interaction on downstream water quality.

Based of this analysis, the CLRSD withdraws its contested case hearing request on this issue. Although the CLRSD would prefer to see this analysis included in the TMDL report itself, it is our understanding that ALASD correspondence and the March 10, 2005 memorandum will be submitted to the EPA along with the TMDL report and will therefore become part of the official TMDL record.

Issue 4: *The Long Prairie River from the City of Long Prairie (mile 47.8) to the Crow Wing River (mile 0.2) should be delisted. According to the TMDL Study the cause of the impairment is point source discharges. Through existing permitting authority WLA should be applied to these point sources and if necessary WLA should be applied permitted non-point CAFO's. The MPCA disagrees.*

The CLRSD withdraws its contested case hearing request on this issue.

Issue 5: *Lake Carlos is not in the defined TMDL Study area and therefore should not receive a load allocation. In addition, Lake Carlos is not an impaired water body and under the law cannot receive a load allocation for that reason. The MPCA, as a matter of fact, disagrees.*
The CLRSD withdraws its contested case hearing request on this issue.

<u>Issue 6</u>: *Facility plans previously submitted to the MPCA have proposed a treatment plant on the Long Prairie River. This proposed plant was not included in any modeling done for the TMDL. Petitioner claims such modeling is necessary to for a comprehensive TMDL. The MPCA disagrees.*

The modeling issue for the new discharge was addressed in Issue 3, above. Therefore, the CLRSD withdraws its contested case hearing request on this issue.

If you have any questions, please feel free to contact me at 218-943-1841.

Yours truly,

Jerome Haggenmiller

Jerome Haggenmiller, Chairman
Central Lakes Area Sanitary District (CLRSD)

cc: Bruce Nelson, Alexandria Lake Area Sanitary District (ALASD)
Dan Folsom, WSN

RECEIVED
APR 8 2005

Phone (320)762-1135 Fax (320)762-1108

2201 Nevada Street
Alexandria, MN 56308

April 8, 2005

Faye Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

BY U.S. MAIL

**Re: Long Prairie River Total Maximum Daily Load (TMDL)
Petition for Contested Case Hearing by Alexandria Lake Area Sanitary District (ALASD)**

Dear Ms. Sleeper:

Thank you for your letter to Mr. Nyhus of February 18, 2005, attaching the memoranda from Ron Jacobson to Hafiz Munir dated August 3, 2004 and February 10, 2005, respectively. Our counsel and consultants have reviewed these documents. On March 9, 2005, the ALASD Board voted to withdraw its August 15, 2003 request for a contested case hearing on the Long Prairie River TMDL. The specific items in that request are addressed as follows:

Issue 1: *Petitioner believes that rulemaking is necessary to complete a TMDL and establish Wasteload Allocations and Load Allocations. Rulemaking provides the legal authority and assurance of due process for all stakeholders. The MPCA says rulemaking is not necessary for the Long Prairie River TMDL Study.*

The ALASD withdraws its contested case hearing request on this issue.

Issue 2: *Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets in the Long Prairie River Study will effectively (de facto) establish Phosphorus Water Quality Standards for the Long Prairie River without following the proper process. As such these goals/guidelines/targets should not be included in the TMDL. The MPCA disagrees.*

The ALASD has confirmed that the objectionable provisions in the TMDL report, which you identified as being deleted in your letter to Mr. Nyhus of May 20, 2004, have in fact been deleted. Therefore, ALASD withdraws its request for a contested case hearing on this issue.

Issue 3: *The Long Prairie River from the headwaters of Lake Carlos (mile 92.0) to Long Prairie (mile 47.8) should be delisted. According to the TMDL Study the dissolved oxygen impairment is* *caused by a naturally occurring condition. Therefore, an amended water quality standard should be established for the Long Prairie reflecting this natural condition. The MPCA disagrees.*

As the ALASD and the MPCA have discussed over the past several months, modeling has been developed and reviewed by the parties to confirm that, despite the compliance of the ALASD's current discharge and hypothetical new discharge with Long Prairie River TMDL wasteload allocations under low-flow (7Q10) conditions, the influx of low-DO waters from adjacent riparian wetlands during high flow conditions may nevertheless result in dissolved oxygen sags.

The ALASD believes that Mr. Jacobson's March 10, 2005 memorandum addresses this concern:

> Under these conditions the background level of dissolved oxygen in the river becomes the water quality standard that is not to be lowered by the addition of oxygen demanding pollutants from a new discharge. The modeling predictions indicate that the addition of a hypothetical new discharge under such conditions results in an imperceptible impact on the stream dissolved oxygen concentration, effectively demonstrating the dominating influence of wetland interaction on downstream water quality.

Based of this analysis, the ALASD withdraws its contested case hearing request on this issue. Although the ALASD would prefer to see this analysis included in the TMDL report itself, it is our understanding that our correspondence and the March 10, 2005 memorandum will be submitted to the EPA along with the TMDL report and will therefore become part of the official TMDL record.

Issue 4: *The Long Prairie River from the City of Long Prairie (mile 47.8) to the Crow Wing River (mile 0.2) should be delisted. According to the TMDL Study the cause of the impairment is point source discharges. Through existing permitting authority WLA should be applied to these point sources and if necessary WLA should be applied permitted non-point CAFO's. The MPCA disagrees.*

The ALASD withdraws its contested case hearing request on this issue.

Issue 5: *Lake Carlos is not in the defined TMDL Study area and therefore should not receive a load allocation. In addition, Lake Carlos is not an impaired water body and under the law cannot receive a load allocation for that reason. The MPCA, as a matter of fact, disagrees.*

The ALASD withdraws its contested case hearing request on this issue.

Issue 6: *Facility plans previously submitted to the MPCA have proposed a treatment plant on the Long Prairie River. This proposed plant was not included in any modeling done for the TMDL. Petitioner claims such modeling is necessary to for a comprehensive TMDL. The MPCA disagrees.*

The modeling issue for the new discharge was addressed in Issue 3, above. Therefore, the ALASD withdraws its contested case hearing request on this issue.

If you have any questions, please feel free to contact me at 320-762-1135.

Yours truly,

Bruce A. Nelson

Bruce A. Nelson, Executive Director
Alexandria Lake Area Sanitary District (ALASD)

cc: Jerry Haggenmiller, Chairman, Central Lakes Regional Sanitary District (CLRSD)
Steven W. Nyhus, Flaherty & Hood, P.A.
John C. Hall, Hall & Associates
John Erdmann, Wenck Associates

Minnesota Pollution Control Agency

February 18, 2005

Mr. Steve Nyhus, Attorney
Flaherty & Hood
444 Cedar Street, Suite 1200
St. Paul, Minnesota 55101

Re: Long Prairie River Total Maximum Daily Load (TMDL) Petition for Contested Case Hearing by Alexandria Lakes Area Sanitary District

Dear Mr. Nyhus:

The remaining unresolved issue raised by the Alexandria Lakes Area Sanitary District (ALASD) and the Central Lakes Region Sanitary District(CLRSD) on the Long Prairie River TMDL is the potential for discharge from a new wastewater treatment facility. We had agreed that additional modeling would be completed in order to more clearly determine what the potential for a discharge. Initial modeling was completed, reviewed and addressed in an August 3, 2004 memorandum from Ron Jacobson to Hafiz Munir, both of the Minnesota Pollution Control Agency (MPCA). I reviewed the memorandum and decided not to forward it to you at that time, as I believed that with some additional information/modeling, we could provide a more definitive response to this final issue. We have received the additional information, and Ron Jacobson has reviewed it. I am attaching his memorandum to me, dated February 10, 2005, which summarizes the results of his review, along with the August 3, 2004 memorandum.

I have mentioned to you that these memorandums are not part of the official TMDL, as this work is more in line with the implementation of the TMDL. However, we will include both of these memorandums in our official file for the Long Prairie River TMDL and will submit them along with the TMDL to the United States Environmental Protection Agency (U.S.EPA) so that it becomes part of the public record. We will also submit to U.S.EPA the correspondence regarding the request for the Contested Case Hearing and all correspondence related to the request as part of the public record.

Should you feel that these memorandums and the course of action proposed satisfies the remaining issue in the Contested Case Hearing request, we must have letters from both parties withdrawing their request for a Contested Case Hearing.

I look forward to your reply. Feel free to contact me at (651) 297-3365 with any questions or concerns.

Sincerely,

Faye E. Sleeper

Faye E. Sleeper, Manager
Watershed Section
Regional Division

FES/kb

cc: Bruce A. Nelson, Executive Director, ALASD
Jerry Haggenmiller, Chairman, Central Lake Region Sanitary District
John C. Hall, Hall & Associates

Enclosure

SF-00006-05(4/86)

DEPARTMENT : POLLUTION CONTROL AGENCY

STATE OF MINNESOTA

Office Memorandum

DATE : February 10, 2005

TO : Faye Sleeper, Manager
Watershed Section
Regional Division

FROM : Ron Jacobson
Water Standards Unit
Environmental Outcomes Division

PHONE : (651) 296-7252

SUBJECT : Review for Proposed New Discharge, CLRSD to Long Prairie River

This memorandum should be considered in concert with my earlier memorandum of August 3, 2004, relating to the feasibility of siting a new wastewater treatment plant within an impaired reach of the Long Prairie River near Carlos. The Central Lakes Regional Sanitary District (CLRSD) hired Wenck Associates, Inc., to conduct a water quality feasibility study for a new treatment plant using the river model that Wenck had developed for the Long Prairie TMDL project. Wenck simulated the water quality response predicted by the model for a hypothetical 800,000 gallons per day treatment plant discharging on a continuous basis at two possible sites to the Long Prairie River: one at the existing Carlos municipal wastewater treatment facility (WWTF) location and the other located approximately four miles downstream at the County Road 65 bridge. It was assumed that a new mechanical facility would include treatment for the Carlos wastewater so there would be no discharge from the existing Carlos pond system. Wenck derived sets of possible effluent requirements to demonstrate the feasibility of such a facility protecting water quality standards in the river under both low flow (7Q10) and high flow conditions for typical spring, summer/fall, and winter seasons. The modeling suggests that an advanced wastewater treatment plant with enhanced CBOD5 removal and fully nitrified effluent would be protective of the Long Prairie River dissolved oxygen and ammonia standards that are critical to aquatic life. In comparison with the waste load allocated to the existing Carlos WWTF ponds in the TMDL study, the proposed continuous discharge would have a smaller daily loading rate of total oxygen demand to the river. In addition, the unallocated load of 189 lbs/day of total oxygen demand assigned to this reach in the TMDL will remain as a reserve for future allocation as may be needed.

Wenck documented the modeling work performed for CLRSD in a November, 2004, report[1] that was supplemented by a January 28, 2005, letter report of additional modeling results as requested by the MPCA. The detailed documentation and supporting files that Wenck made available demonstrated sound application of water quality modeling principles and the use of justifiable assumptions, as appropriate, throughout the analysis. With the focus being protection of dissolved oxygen and ammonia standards in the river, MPCA concurs that the water quality modeling completed by Wenck presents a strong technical basis for consideration of siting a treatment plant within this reach. Under low flow 7Q10 conditions, stringent wastewater treatment requirements are obviously needed to protect water quality. Under higher flow conditions when the river engulfs the extensive riparian wetlands near Carlos, interaction with

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[1] *Water Quality Modeling Study of Possible New Regional WWTF on the Upper Long Prairie River*. Wenck Associates, Inc. November, 2004.

the poorly oxygenated water within the wetland environment creates a natural dissolved oxygen sag in the river. Under these conditions the background level of dissolved oxygen in the river becomes the water quality standard that is not to be lowered by the addition of oxygen demanding pollutants from a new discharge.[2] The modeling predictions indicate that the addition of a hypothetical new discharge under such conditions results in an imperceptible impact on the stream dissolved oxygen concentration, effectively demonstrating the dominating influence of wetland interaction on downstream water quality.

While this modeling analysis addresses the technical feasibility of designing a treatment plant capable of meeting currently applicable water quality standards for the Long Prairie River, it also illustrated that a continuously discharging facility would increase the levels of nutrients such as phosphorus and nitrogen in the river on a year-round basis. Currently, numerical stream standards for nutrients do not exist but will be addressed in a future rule revision in four to five years. New stream standards for nutrients would directly impact future TMDL development, potentially resulting in the need for additional point source and nonpoint source controls.

Before a new point source discharge could be permitted, other regulatory and watershed management concerns relative to nondegradation and impaired waters issues demand attention:

Nondegradation

At 800,000 gallons per day design flow, the proposed new discharge would be considered significant and therefore subject to nondegradation review.[3] Nondegradation generally refers to the concept of maintaining water quality at its existing condition when the quality is better than applicable standards. MPCA would consider what additional control measures beyond those needed to comply with all effluent and water quality standards could reasonably be taken to minimize impacts of a new discharge on the receiving water. The CLRSD would need to demonstrate why potentially adverse water quality impacts from a new discharge are necessary to accommodate important economic and social development. The nondegradation rule lists factors to be considered that will allow the MPCA to make an informed, public decision that reasonably balances additional treatment costs, if recommended, against the adverse impact on the environment posed by the new discharge.

Impaired Waters

The current Long Prairie River Watershed TMDL addresses water quality impairments from oxygen-demanding pollutants. It was not designed to address the other listed Long Prairie River impairments for low fisheries IBI (index of biotic integrity) and mercury contamination which are scheduled for TMDL completion within 7 to 10 years from now.[4]

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[2] See discussion in August 3, 2004 memorandum. *Natural Water Quality: Long Prairie River (Lake Carlos to Spruce Creek)*

[3] Minn. Rules Part 7050.0185, *Nondegradation for All Waters*.

[4] Clean Water Act Section 303d TMDL List of Impaired Waters. MPCA 2004.

Federal Regulation 40 C.F.R. 122.4(i) prohibits the issuance of a NPDES permit to a new source or a new discharger if the discharge from its construction or operation will cause or contribute to a numeric or narrative water quality standard violation, and 40 C.F.R. 122.44(d)(1) requires effluent limits in permits to ensure the discharge does not cause, have a reasonable potential to cause, or contribute to an excursion above a water quality standard, including narrative standards.

"MPCA staff believe that the appropriate interpretation of these federal regulations as they apply to NPDES permit issuance is to ensure that the water quality of the impaired water body is not worsened before a TMDL is completed. ...... We believe that this is a reasonable approach to take which will allow the issuance of NPDES permits to existing, expanding and new discharges. Some of the considerations that can be made when permitting discharges to impaired waters include:

- Whether the pollutant causing the water impairment is contained in the proposed discharge.
- Whether the effluent limit is at or below the water quality standard.
- Whether there is a net reduction of the pollutant causing the water impairment within a watershed even with new or expanding discharges.
- Whether the point source discharge is an insignificant source or contributing a de minimus amount of the pollutant for which the water body is impaired."[5]

The tool for restoring impaired waters are completed and approved TMDLs, which identify the point and nonpoint sources of the pollutant causing the impairment and the reductions needed from all sources to restore the water body. The development and implementation of TMDLs that address the low dissolved oxygen, fish IBI, and mercury impairments are the final safety net which assures that water quality standards and designated uses will be met in the Long Prairie River.

In summary, the technical feasibility concept of siting a new discharge to the Long Prairie River near Carlos is well documented by the modeling analysis performed by Wenck Associates, Inc. A waste load re-allocation to accommodate a new discharge that would result in a net reduction in waste loading appears to be consistent with the Long Prairie River TMDL. All existing and any new discharge in the Carlos reach will be subject to potential additional controls imposed through future TMDL development to address the biota and mercury impairments. This review does not represent any expressed endorsement of the discharge alternative proposed, nor should it preclude the CLRSD from considering other feasible treatment and disposal alternatives that may have less impact on our valuable water resources.

Cc: Hafiz Munir
Pat Shelito
Greg Gross

---

[5] Board Item Issue Statement: *National Pollutant Discharge Elimination System (NPDES) Permitting and Federal Regulations Relating to Discharges to Impaired Waters.* MPCA, Environmental Outcomes Division, September 28, 2004.

SF-00006-05(4/86)

DEPARTMENT : POLLUTION CONTROL AGENCY

STATE OF MINNESOTA

Office Memorandum

DATE : August 3, 2004

TO : Hafiz Munir
Watershed Technical Assistance & Planning
Regional Environmental Management Division

FROM : Ron Jacobson
Water Standards Unit RMJ
Environmental Outcomes Division

PHONE : (651) 296-7252

SUBJECT : Natural Water Quality: Long Prairie River (Lake Carlos to Spruce Creek)

Background

The headwaters reach of the Long Prairie River, from the outlet of Lake Carlos to the Spruce Creek confluence, is included in the 2004 Impaired Waters List due to low dissolved oxygen concentrations, a low IBI score for fish, and a fish consumption advisory for mercury. A TMDL study that addresses dissolved oxygen impairments for the entire Long Prairie River is currently undergoing final public review prior to state and federal approval. TMDLs to address the fish IBI and mercury issues are currently targeted for completion during the 2005-2015 time frame.

The dissolved oxygen TMDL includes recommended allocations for both point and nonpoint sources of potential oxygen demanding loads to the river. After providing for a margin of safety, any unallocated capacity is specifically identified. The headwaters reach of the Long Prairie River has a small, unallocated capacity for additional oxygen-demanding loads under the low-flow design conditions specified in the TMDL. However, under relatively high flow conditions, the TMDL study revealed that dissolved oxygen concentrations monitored in the headwater reach have fallen below the required 5 mg/L water quality standard in the absence of any discharging point sources. Under these higher flow conditions, the low dissolved oxygen in the river is believed to result from its natural interaction with the riparian wetland near Carlos, a prominent feature of the upper Long Prairie River. "The apparent mechanism is sediment oxygen demand occurring over large riparian wetland areas that exchange flow with the main channel."[1]

The newly-formed Central Lake Region Sanitary District (CLRSD), with plans to provide a centralized sewer and treatment system for area lake residents, is investigating the option of a new discharge of treated wastewater to the Long Prairie River near Carlos that would utilize the unallocated load set aside in the TMDL allocation.

Discussion

If a new wastewater discharge could be shown to fall within the unallocated oxygen demand loading of TDML allocations, which are designed to maintain the stream dissolved oxygen under the critical low-flow conditions of the TMDL, can the MPCA authorize a new discharge to the

---

[1] *Long Prairie River Watershed TMDL Project: Final Project Report.* July 2004. Prepared for Minnesota Pollution Control Agency by Wenck Associates, Inc. and FTN Associates, Ltd.

Carlos reach that may be unable to maintain its 5 mg/L water quality standard under higher flow conditions when natural wetland interactions with the river may lower the background dissolved oxygen concentrations?

Where natural "background levels exceed applicable standards, the background levels may be used as the standards for controlling the addition of the same pollutants from point or nonpoint source discharges in place of the standards" (Minn. R. Part 7050.0170). In a situation where the background dissolved oxygen concentration falls below the assigned beneficial use standard, the background concentration then becomes the new standard. Consequently, the addition of any oxygen demanding pollutants must be controlled to protect the background concentration. Furthermore, "natural conditions exist where there is no discernible impact from point or nonpoint source pollutants attributable to human activity or from a physical alteration of wetlands." Historically, the riparian wetlands at Carlos have undoubtedly received some man-induced loadings from past stormwater and wastewater discharges. As stated in the TMDL report, "it is possible that lingering effects of Carlos's abandoned stabilization pond do contribute in some small measure to the Carlos reach DO violations". However, the TMDL study does not support any pursuit of actions to remediate these pre-existing conditions such as isolating the river from the wetland, excavating the old pond site, or implementing a groundwater pump-out scheme. The ecological disruption of these riparian wetlands for a questionable degree of water quality improvement during specific hydrological conditions does not appear reasonable.

It would be our expectation that a treatment plant designed to provide a high level of treatment, as required to meet the dissolved oxygen standard under critical low flow conditions, would not create a measurable sag in the background dissolved oxygen concentration during higher flow conditions in the river. However, additional modeling of the proposed CLRSD discharge under design conditions of higher flow is needed to back up this expectation. If the City of Carlos plans to retain their currently permitted controlled discharge, then the modeling analysis must incorporate the projected flow and loadings from this pond system.

Minnesota Pollution Control Agency

May 20, 2004

Mr. Steve Nyhus
Flaherty & Hood, P.A.
444 Cedar Street, Suite 1200
St. Paul, Minnesota 55101

Dear Mr. Nyhus:

Thank you for your patience as we work through the issues on the Long Prairie Total Maximum Daily Load (TMDL). I appreciate your summary of our conference call on Thursday, March 25, 2004, to which I am now responding.

We have now received the results from the additional modeling that was completed by Wenck Associates, Inc (Wenck). The modeling indicates that the option to replace the existing City of Carlos Wastewater Treatment Facility discharge with a facility, with a continuous discharge that includes additional flow from the area served by the Central Lakes Regional Sanitary District (CLRSD), may be technically feasible to protect applicable water quality standards. We can not tell you specifically what the effluent limits would be without a permit application with details, but as we have discussed in the past, we believe that the discharge would have to be a high quality effluent. As you stated in your letter, we agree that the permit fact sheet will note that under higher flow conditions, other factors unrelated to the facility (the riparian wetland) cause downstream waters to fail in meeting applicable Dissolved Oxygen standards. This segment is still listed in Category 5 on Minnesota's 2004 303(d) list as we discussed.

The second remaining issue is your requested deletions from the Long Prairie River TMDL. We will make the following deletions:

1) Delete 3rd bullet on page 2-4
2) Delete Article 3.2.2 on page 3-3
3) Delete Article 7.3.2 on page 7-5
4) Delete Articles 9.8.4 & 9.8.5 on pages 9-38 thru 9-42

We can not honor your request to Delete LA for LPR Headwaters@RM89.9 in Table 11-2, as this pertains to the spring low flow and the actual listing.

We have asked Wenck to go through the report and delete "any reference to phosphorus guidelines, targets, or standards", once we know that those are the final changes you are requesting. Wenck will submit a revised draft that will be submitted to United States Environmental Protection Agency (EPA).

Finally, when Wenck did this additional modeling, they discovered some additional information that changes the allocation slightly. Because of the change in allocation, we are required to re-public notice that portion of the TMDL. We are working with our attorney on this, and hope to do this quickly. We believe that we are close to resolving all the issues that you and the CLRSD raised either by the conclusion of the public notice period, so that we can submit this TMDL to the EPA at that time, if we receive no other requests for contested case hearing.

I will be out of the office through June 11, so please feel free to contact Hafiz Munir at (651-296-9286) or Pat Shelito at (218-828-2493) in my absence. As soon as we receive your concurrence on the changes, we can move ahead to make those changes.

Sincerely,

Faye E. Sleeper

Faye E. Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division

FES:kt

cc: Jerry Haggenmiller, Chairman, Central Lake Region Sanitary District
Bruce A. Nelson, Executive Director, ALASD
John C. Hall, Hall & Associates

HALL & ASSOCIATES
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***Web site:* http://www.hall-associates.com**

MEMORANDUM

TO: John Hall

FROM: Steve Shermer

DATE: October 21, 2003

RE: Long Prairie River: 303(d) lists for waters impaired solely by natural or background sources; Process for de-listing waters improperly listed

Issue 1: **Where a waterbody does not meet numeric water quality standards solely by reason of natural or background levels of pollution, should this necessarily be considered a violation of water quality standards for purposes of CWA §303(d)?**

Analysis

A. Statutory Provisions

Section 303(d) of the Clean Water Act sets forth the basis of the TMDL (total maximum daily load) program. It states that:

> [e]ach state shall identify those waters within its boundaries for which the ***effluent limitations*** required by section 1311(b)(1)(A) and section 1311(b)(1)(B) of this title ***are not stringent enough to implement any water quality standard applicable to such waters***.

33 U.S.C. 1313(d)(1)(A) (emphasis added). For each water body identified:

> [e]ach State shall establish…the total maximum daily load, for those pollutants which the Administrator identifies under section 1314(a)(2) of this title as suitable for such calculation.

33 U.S.C. 1313(d)(1)(C).

This statutory provision has two prerequisites for determining when a TMDL is required: 1) effluent limits cannot ensure compliance with water quality standards, and 2) water quality exceedances exist. Given the section's reference to "effluent limitations", there is an ongoing debate over whether the 303(d) statutory language requires the listing of waterbodies impaired solely as a result of nonpoint source pollution, as opposed to point source pollution. By definition, effluent limitations only apply to point sources of pollution under the Clean Water Act. 33 U.S.C. 1362(11). Therefore, if there are no point sources on a waterbody, there are no sources for which effluent limits would apply. Consequently, if the statutory language regarding effluent limits was deemed to be the listing process "trigger", 303(d) would be inapplicable for such waterbodies. The statutory language does not clearly address this issue, and EPA has interpreted this provision more broadly. The TMDL implementing regulations direct that "TMDL's shall be established for ***all*** pollutants preventing or expected to prevent attainment of water quality standards as identified pursuant to paragraph (b)(1) of this section." 40 CFR 130.7(c)(1)(ii) (emphasis added).

Consistent with EPA's interpretation, the case of Pronsolino v. Nastri held that waterbodies impaired solely by non-point sources are subject to the listing process. Pronsolino v. Nastri, 291 F.3d 1123 (9^{th} Cir. 2002). As explained by the court: "the phrase "not stringent enough" triggers the identification requirement…[even] for waters as to which effluent limitations do not apply at all to the pollution sources impairing the water." Id. at 1126. It should be noted that there was no distinction discussed by the Pronsolino court between waters impaired solely by reason of natural conditions and waters impaired solely by nonpoint sources. Whether natural conditions can violate water quality standards is largely dictated by state law.

B. Regulatory Provisions

Several of the distinctions made in the definitions of the TMDL regulations suggest that "man-made" or "man-induced" and natural/background sources pollution should be treated differently under the TMDL process. 130.2(c) defines "pollution" as "[t]he man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water." The distinction between man-induced and natural background sources in the regulatory definition of "pollution", and in the categories of pollutant loading, indicate that these sources are not similarly subject to the listing process. This is because no TMDL is developed for a "natural condition".[1] 40 CFR 130.7 states:

> Each State shall identify those water quality-limited segments still requiring TMDLs within its boundaries for which:
>
> (i) Technology-based effluent limitations required by sections 301(b), 306, 307, or other sections of the Act;
>
> (ii) More stringent effluent limitations (including prohibitions) required by either State or local authority preserved by section 510 of the Act, or Federal authority (law, regulation, or treaty); and
>
> (iii) Other ***pollution*** control requirements (e.g., best management practices) required by local, State, or Federal authority ***are not stringent enough to implement any water quality standards (WQS) applicable to such waters.***

40 CFR 130.7(b) (emphasis added). Each of these subsections refer to either effluent limitations, which are applicable only to point sources, or "other pollution control

[1] 40 CFR 130.2(e) defines "Load" or "loading" as "...either man-caused (pollutant loading) or natural (natural background loading)." In addition, the definition of "Load Allocation" states that, "[w]herever possible, natural and nonpoint source loads should be distinguished." 40 CFR 130.2. Thus, one only regulates, via a TMDL, the man-induced load. The natural conditions are assessed as a given, preexisting condition which must be considered in calculating the acceptable TMDL.

requirements". Since "pollution" is defined as only "man-induced" or "man-made", natural or background sources of "pollutants" apparently are not included in the categories of water quality impaired segments required to be listed under 130.7(b) or for which a TMDL calculation is needed.[2]

C. State Law Does Not Allow Natural Conditions To Be Classified As A Water Quality Standard Violation

Minnesota state law further supports that waterbodies impaired solely by natural or background sources of pollution should not be subject to 303(d) listing.[3] Section 7050.0170 of the Minnesota Administrative Code recognizes that:

> The waters of the state may, in a natural condition, have water quality characteristics or chemical concentrations approaching or exceeding the water quality standards. Natural conditions exist where there is no discernible impact from point or nonpoint source pollutants attributable to human activity or from a physical alteration of wetlands.

The provision goes on to state that:

> Where background levels exceed applicable standards, ***the background levels may be used as the standards*** for controlling the addition of the same pollutants from point or nonpoint source discharges ***in place of the standards***.

MN ADC 7050.0170 (emphasis added). This provision indicates that where background levels of pollutants exceed applicable numeric water quality standards, the background levels, <u>not</u> the numeric criteria, should be used as the relevant standard for determining whether impairment is occurring. Therefore, where "impairment" is due to natural

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[2] In addition, while the CWA definition of "pollution" only pertains to man-induced degradation, the definition of "pollutant" makes no such qualification. <u>See</u>, CWA §502(6). To the extent that impairments not caused by "pollutants" must be caused by "pollution", since "pollution" is defined as being "man-made", natural sources would not fit within the definition of "pollution". Therefore, natural sources of impairment would not trigger the listing requirements under this theory as well.

[3] Use of state law to address situations where impairment of water quality was due solely to natural levels of pollutants was confirmed by Michael Haire, EPA Office of Wetlands, Oceans, and Watersheds, in an October 15, 2003 telephone conversation. Haire was involved with drafting the 2004 Guidance for 303(d) lists and assessments.

conditions, no water quality exceedance exists, and such waters should not be subject to 303(d) listing requirement.[4]

D. EPA Guidance Supports Separate Consideration of Naturally "Impaired" Waters

EPA's July 21, 2003 *Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act* (hereinafter "EPA's Guidance") raises additional issues with respect to whether waters impaired solely by natural or background pollution need to be listed under 303(d). EPA is currently recommending that States combine their 305(b) reports and 303(d) lists into one 5-part "Integrated Report". EPA Guidance at 1. All of a State's waters are to be placed into one of 5 categories representing different levels of water quality attainment. *Id.* The Integrated Report provides for a comprehensive description of the status of all waters within a State. *Id.* at 2. Of most relevance are Categories 4 and 5. Category 4 represent waters which are impaired or threatened, but are not listed under 303(d) and no TMDL needs to be determined. *Id.* Category 5 waters are impaired or threatened and for which a TMDL is needed. "This category constitutes the Section 303(d) list that EPA will approve or disapprove under the CWA." *Id.* at 8. Consequently, this guidance suggests that there are categories of impaired waters which do not need to be listed.

The Minnesota Pollution Control Agency ("MPCA") has created an additional Category 4 sub-category which properly classifies the Long Prairie River. States can create additional sub-categories to their water quality lists. *Id.* at 3. Accordingly, MPCA has created sub-category 4D under the list of water quality assessment categories.

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[4] See also, 40 CFR 130.3 (stating that water quality standards serve the dual purpose of establishing the water quality goals for a specific water body and serving as the regulatory basis for establishment of water quality-related treatment controls and strategies beyond the technology-based levels of treatment).

Assessment category 4D pertains to waters which are "[i]mpaired or threatened but do [not] require a TMDL because impairment [is] caused by natural conditions." The Long Prairie River qualifies under MPCA's own Assessment Categories as a Category 4D water which does not need to be listed under 303(d).

Conclusion

Whether waterbodies impaired solely due to natural or background sources of pollution must be listed under 303(d) is a matter of state law. Section 7050.0170 of the Minnesota Administrate Code provides that where background water quality conditions exceed applicable water quality standards, the background conditions may be used in place of the fixed water quality standards. Therefore, whether a waterbody is impaired should be determined in reference to the background water quality of the waterbody in question. Since the Long Prairie River is "impaired" solely by reason of natural conditions, it does not violate applicable water quality standards and was improperly listed under 303(d).

The qualification in the regulatory definition of "pollution" as being only "man-made" or "man-induced" provides additional evidence against requiring the listing of such waters. 130.7(b)(1) discusses listing waters for which effluent limits or other "pollution controls" are insufficient to meet water quality standards. By definition, these categories do not include naturally impaired waters. Therefore, listing such waterbodies should not be required and no TMDL needs to be developed.

Triggering the TMDL process for naturally impaired waterbodies would be pointless since there are no sources to which to allocate the impairing pollutant load and no way to remove what is already in the water (as opposed to limiting what would be discharged). In general, the CWA does not regulate natural conditions. Consequently, the Minnesota state water quality provision which allows natural water quality to substitute for otherwise applicable numeric standards in determining whether a waterbody is impaired is consistent with the purposes of the Clean Water Act.

Issue 2: What level of data quality must be demonstrated in order to modify the impaired waters list, and once satisfied, what is the process for de-listing waters improperly listed?

Analysis:

The level of data quality required for developing 303(d) lists of impaired waters is largely spelled out in the implementing regulations. 130.7(b)(5) provides that:

> Each State shall assemble and evaluate ***all existing and readily available water quality-related data and information*** to develop the list required by 130.7(b)(1) and 130.7(b)(2). At a minimum "all existing and readily available water quality-related data and information" includes but is not limited to all of the existing and readily available data and information about the following categories of waters:
>
> (i) Waters identified by the State in its most recent section 305(b) report as "partially meeting" or "not meeting" designated uses or as "threatened";
>
> (ii) Waters for which dilution calculations or predictive models indicate nonattainment of applicable water quality standards;
>
> (iii) Waters for which water quality problems have been reported by local, state, or federal agencies; members of the public; or academic institutions. These organizations and groups should be actively solicited for research they may be conducting or reporting. For example, university researchers, the United States Department of Agriculture, the National Oceanic and Atmospheric Administration, the United States Geological Survey, and the United States Fish and Wildlife Service are good sources of field data; and
>
> (iv) Waters identified by the State as impaired or threatened in a nonpoint assessment submitted to EPA under section 319 of the CWA or in any updates of the assessment.

40 CFR 130.7(b)(5) (emphasis added).[5] EPA guidance confirms this.[6] While a 1999 proposed rule by EPA indicated that "the best available data and information for each waterbody" should

[5] 130.7(d)(2) provides that "[t]he Regional Administrator shall approve a list developed under 130.7(b)...only if it meets the requirements of 130.7(b)."

be used and that "listing decisions…be based on high quality data that meets state procedures and will, if necessary stand up to legal challenge", this rule was never finalized. 64 Fed. Reg. 46018 – 19 (Aug. 23, 1999). To the extent that existing, readily available data is "the best available" and "high quality", the two standards are consistent.

Other provisions of the TMDL regulations provide additional avenues to offer more current and accurate information during the listing process or in order to revise a prior listing decision. 130.7(b)(6) requires the submission of documentation in support of a State's decision to list or not list a water. 40 CFR 130.7(b)(6). These lists are to include at a minimum:

> (i) A description of the methodology used to develop the list; and
>
> (ii) A description of the data and information used to identify waters, including a description of the data and information used by the State as required by § 130.7(b)(5); and
>
> (iii) A rationale for any decision to not use any existing and readily available data and information for any one of the categories of waters as described in § 130.7(b)(5); and
>
> (iv) Any other reasonable information requested by the Regional Administrator. ***Upon request by the Regional Administrator, each State must demonstrate good cause for not including a water or waters on the list. Good cause includes, but is not limited to, more recent or accurate data; more sophisticated water quality modeling; flaws in the original analysis that led to the water being listed in the categories in § 130.7(b)(5); or changes in conditions***, e.g., new control equipment, or elimination of discharges.

40 CFR 130.7(b)(6) (emphasis added). Section (iv) of this provision allows for the submission of more recent, accurate, or sophisticated data, or analyses which would indicate flaws in the original listing process.

Additionally, EPA's Guidance, along with 130.25, indicates that some form of QA/QC procedures are proper for 303(d) data. EPA's Guidance states that:

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[6] EPA's Guidance states that the categorization of state water bodies into one of 5 categories "should be based on consideration of all existing and readily available data and information consistent with the State's assessment methodology and this guidance." EPA Guidance at 1, 20, 25.

> it is reasonable to expect that the State may not view all data and information in the same manner. States should include in its assessment determinations, all relevant data that are consistent with the States' previously articulated quality assurance/quality control (QA/QC) requirements/Data Quality Objectives (DQO).

EPA Guidance at 24. As a result, data that does not meet DQO's or QA/QC procedures should not be used in the listing process. In addition, such data requirements could possibly be used to discredit data used to improperly list a specific waterbody.

The process for de-listing or modifying an impaired water body list is also largely spelled out by the implementing regulations. However, the main regulation discussing modification, 130.29, was withdrawn by 68 Fed. Reg. 13608. 130.29 states:

> [y]ou may modify your list at times other than those required by 130.30 [pertaining to required submissions of lists every 4 years], in accordance with this section. If you modify your list and prioritized schedule, you must submit your list as a modification to your list under this section and follow the public participation requirements of 130.36...

This section further states: "[y]ou must keep each impaired waterbody on your list for a particular pollutant until it is attaining and maintaining applicable water quality standards for that pollutant." 40 CFR 130.29(b). The standard for applying to modify a 303(d) list are simply stated: "You may remove a listed waterbody for a particular pollutant if new data or information indicate that the waterbody is attaining and maintaining the applicable water quality standards for that pollutant." 130.29(c). Given the Minnesota Administrative Code section regarding natural water quality, the applicable water quality standard to be satisfied under 130.29(c) may incorporate the effects of natural or background sources of pollution. In order to complete the modification process "EPA must issue an order approving or disapproving the modification of your list or prioritized schedule in accordance with 130.29(b)." 130.29(f).

EPA Guidance indicates that the data or information submitted in support of a delisting need not be collected after the date of the previous list in order to properly be considered as "new" under 130.29(c):

> There are some situations where a previously listed segment may be delisted without relying on data and information collected after the date of the previous list. For example, if the State evaluates the pre-existing data and information using a methodology that EPA has determined to be technically reasonable, and the results of that evaluation provide a "good cause" basis for not including the segment on the 2004 list, the segment would no longer need to be included in Category 5. However, the delisting should only occur if it is determined by EPA that the new methodology is technically sound, consistent with the State's WQS, and is deemed statistically reasonable.

EPA Guidance at 11. Thus, the decision to revise the listing may be based upon the Long Prairie River TMDL conclusion that the standard exceedance was caused by natural conditions.

Conclusion:

The key phrase regarding the data to be used in the listing and TMDL process is "all existing and readily available water quality-related data and information". In addition, listing data must meet DQO's and QA/QC assurance. There are avenues to submit more current data or data which indicates errors were made in a prior listing determination. These procedures appear to be either at the request of the Regional Administrator, or through the modification/delisting process. The modification or delisting process is set forth in 40 CFR 130.29. Although this provision was withdrawn, it did not establish new requirements and only generally described how to delist waters under the existing rules.

Consequently, additional data could be submitted to indicate that, in light of section 7050.0120, the Long Prairie River should be delisted as it is meeting applicable water quality standards. As discussed above, section 7050.0120 considers natural water quality in determining whether or not water quality standards are being impaired. A listed impaired waterbody is only to be kept on the list until it is attaining and maintaining applicable water quality standards. Since the Long Prairie River is not exceeding water quality standards pursuant to 7050.0120, delisting would be proper.

Minnesota Pollution Control Agency

September 26, 2003

Mr. Jerome Haggenmiller, Chairman
Central Lakes Region Joint Powers Board
900 Robert Street, Suite 102
Alexandria, MN 56308-5077

Dear Mr. Haggenmiller:

This letter will provide documentation of our phone conversation of September 17, 2003, regarding your August 15, 2003, request for a Contested Case Hearing and for Minnesota Pollution Control Agency (MPCA) Citizen Board Review of the Long Prairie Total Maximum Daily Load (TMDL) study and process.

Upon staff recommendation, the MPCA Deputy Commissioner has decided that the Draft Long Prairie TMDL issue will be presented to the MPCA Citizen's Board in October 2003. The following lists the schedule that the MPCA staff must follow:

October 14, 2003	Board Items Due in the Commissioner's Office
October 17, 2003	Mailing of all Board Items
October 27, 2003	Committee Meetings (may be moved to the morning of October 28, 2003)
October 28, 2003	MPCA Citizen's Board Meeting

Information regarding written submittals to the Citizen's Board, presentations to the Citizen's Board, and other information may be found on the MPCA web site at http://www.pca.state.mn.us/about/board/index.html.

You have listed six issues which we discussed. Should you feel after receiving this letter that the MPCA is satisfactorily resolving these issues, you may withdraw those issues by sending a letter stating that you are withdrawing that issue for discussion at the MPCA Citizen's Board meeting. We are unclear of the intent of Item 1 regarding your belief that rulemaking is necessary to complete a TMDL and establish Waste Load Allocations (WLAs) and Load Allocations (LAs). Could you please clarify in writing if you are stating your belief that rulemaking for the program needs to be completed prior to completing TMDLs that include WLAs and LAs or are you stating your belief that rulemaking needs to be completed for each TMDL that includes WLAs and LAs.

520 Lafayette Rd. N.; St. Paul, MN 55155-4194; (651) 296-6300 (Voice); (651) 282-5332 (TTY)
St. Paul • Brainerd • Detroit Lakes • Duluth • Mankato • Marshall • Rochester • Willmar; www.pca.state.mn.us

In Item 2 you state that the Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets should not be included in the Long Prairie TMDL study. We will remove this from the body of the TMDL and place it in the appendix. The first page of that appendix will include a statement that this appendix is for information only, and is not part of the TMDL study.

You request delisting and an amended water quality standard for mile 92.0 to mile 47.8 of the Long Prairie River because you believe the low dissolved oxygen condition is caused by a naturally occurring condition in Item 3. The TMDL study must first be completed and approved by U.S. Environmental Protection Agency (EPA) before potentially delisting the reach or moving the impairment to another category in the integrated list.

In Item 4 you request delisting the Long Prairie River from river mile 47.8 through river mile 0.2, because the cause of impairment is due to point source discharges.

Again, the TMDL study must first be completed and approved by the EPA before potentially delisting the reach or moving the reach to another category in the integrated list. Further, the new integrated listing requires that if any impairments remain for a particular reach that have not been studied, the reach must remain in the category of need for further study.

Finally changing a water quality standard would need to be done through a rule making proceeding. MPCA's rules regarding contested case hearings, Minn. R. 7000.1800 and Minn. R. 7000.1900 do not apply to rulemaking hearings. Instead, requests for rulemaking hearings are governed by the Minnesota Administrative Procedures Act. The Minnesota Administrative Procedures Act establishes the process for requesting a rulemaking hearing. Such requests are submitted via Minn. R. 1400.2040. However, we will treat your request as though you did request this through Minn. R. 1400.2040. In the case of an impaired listing, this can only be done after the TMDL study has been completed and approved by the EPA.

In Item 5, you state that Lake Carlos should not receive a load allocation because it is not impaired. There is no load allocation for Lake Carlos. There is an allocation for water entering the river at river mile 89.9 which is the beginning of the first impaired reach in the TMDL. We must assess water entering an impaired stretch to identify sources contributing to an impaired reach in order to determine the sources. We have not stated that Lake Carlos contributes to the impairment in the TMDL study.

You request that we include the proposed plant for the Central Lakes Region Joint Powers Board in the TMDL because facility plans previously submitted to the MPCA have proposed a treatment plant that discharges to the Long Prairie River. The MPCA is aware that this is one of several options, and because a final decision has not been made regarding the discharge, this will not be specifically modeled in the TMDL. We have included future growth in the allocation and an unallocated capacity was calculated. We include actual existing discharges or ones that have submitted a request for a permit to the MPCA in the actual TMDL. We have offered to either provide the model or to run the model with this proposed discharge so that you have the information, even if it is not included in the TMDL submitted to the EPA. This offer still stands.

I look forward to receiving your response to these issues. I also am very willing to meet with you over the next month, if you feel we can resolve these issues prior to the MPCA citizen's board meeting. Feel free to contact me regarding this letter or other issues at (651) 297-3365.

Sincerely,

for Faye E. Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division

FES:ry

September 25, 2003

Mr. Bruce Nelson, Executive Director
Alexandria Lakes Area Sanitary District
2201 Nevada Street
Alexandria, MN 56308

Dear Mr. Nelson:

This letter will provide documentation of our telephone conversation of September 2, 2003, regarding your August 15, 2003, request for a Contested Case Hearing and for Minnesota Pollution Control Agency (MPCA) Citizen Board Review of the Long Prairie Total Maximum Daily Load (TMDL) study and process. I will also respond to a number of other letters that you have sent in the past two months during which time we have been in conversation about issues related to this and other TMDLs.

Upon staff recommendation, the MPCA Deputy Commissioner has decided that the Draft Long Prairie TMDL issue will be presented to the MPCA Citizen's Board in October 2003. The following lists the schedule that the MPCA staff must follow:

October 14, 2003	Board Items Due in the Commissioner's Office
October 17, 2003	Mailing of all Board Items
October 27, 2003	Committee Meetings (may be moved to the morning of October 28, 2003)
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You have listed five issues which we discussed. Should you feel after receiving this letter that the MPCA is satisfactorily resolving these issues, you may withdraw those issues by sending a letter stating that you are withdrawing that issue for discussion at the MPCA Citizen's Board meeting. We are unclear of the intent of Item 1 regarding your belief that rulemaking is necessary to complete a TMDL and establish Waste Load Allocations (WLAs) and Load Allocations (LAs). Could you please clarify in writing if you are stating your belief that rulemaking for the program needs to be completed prior to completing TMDLs that include WLAs and LAs or are you stating your belief that rulemaking needs to be completed for each TMDL that includes WLAs and LAs.

In Item 2 you state that the Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets should not be included in the Long Prairie TMDL study. We will remove this from the body of the TMDL and place it in the appendix. The first page of that appendix will include a statement that this appendix is for information only, and is not part of the TMDL study.

You request delisting and an amended water quality standard for mile 92.0 to mile 47.8 of the Long Prairie River because you believe the low dissolved oxygen condition is caused by a naturally occurring condition in Item 3. The TMDL study must first be completed and approved by U.S. Environmental Protection Agency (EPA) before potentially delisting the reach or moving the impairment to another category in the integrated list.

In Item 4 you request delisting the Long Prairie River from river mile 47.8 through river mile 0.2, because the cause of impairment is due to point source discharges.

Again, the TMDL study must first be completed and approved by the EPA before potentially delisting the reach or moving the reach to another category in the integrated list. Further, the new integrated listing requires that if any impairments remain for a particular reach that have not been studied, the reach must remain in the category of need for further study.

Finally changing a water quality standard would need to be done through a rule making proceeding. The MPCA's rules regarding contested case hearings, Minn. R. 7000.1800 and Minn. R. 7000.1900 do not apply to rulemaking hearings. Instead, requests for rulemaking hearings are governed by the Minnesota Administrative Procedures Act. The Minnesota Administrative Procedures Act establishes the process for requesting a rulemaking hearing. Such requests are submitted via Minn. R. 1400.2040. However, we will treat your request as though you did request this through Minn. R. 1400.2040. In the case of an impaired listing, this can only be done after the TMDL study has been completed and approved by the EPA.

In Item 5, you state that Lake Carlos should not receive a load allocation because it is not impaired. There is no load allocation for Lake Carlos. There is an allocation for water entering the river at river mile 89.9 which is the beginning of the first impaired reach in the TMDL. We must assess water entering an impaired stretch to identify sources contributing to an impaired reach in order to determine the sources. We have not stated that Lake Carlos contributes to the impairment in the TMDL study.

You have submitted letters to me on July 16, 2003, July 17, 2003, and August 21, 2003, requesting that Lake Winona (21-0081-00) be delisted and have provided supporting information. As we have discussed, I don't believe we can delist it without completion of a TMDL study. However, I will discuss options with our staff regarding using existing information to complete the TMDL study, and other options. I will be in contact with you regarding this issue, as promised.

I look forward to receiving your response to these issues. I also am very willing to meet with you over the next month, if you feel we can resolve these issues prior to the MPCA citizen's board meeting.

Sincerely,

Glen Sletten for

Faye E. Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division

FES:ry

FLAHERTY & HOOD

Professional Association

January 5, 2004

Faye Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

BY FAX AND U.S. MAIL

**Re: Long Prairie River Total Maximum Daily Load (TMDL)
Petition for Contested Case Hearing by Alexandria Lake Area Sanitary District (ALASD)**

Dear Ms. Sleeper:

Thank you for meeting with Mr. Nelson, Mr. Hall and myself on November 5, 2003, and for your December 5, 2003 letter summarizing the status of the above-referenced matter. After review and discussion with Mr. Nelson and Mr. Hall, the following issues must be addressed before a settlement can be reached:

Issue 2: *Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets in the Long Prairie River Study will effectively (de facto) establish Phosphorus Water Quality Standards for the Long Prairie River without following the proper process. As such these goals/guidelines/targets should not be included in the TMDL.*

Mr. Nelson visited the weblink identified in your December 5 letter, but found that none of the text he identified has been removed from the TMDL document. For your convenience, I have attached Mr. Nelson's list of items that must be removed from the TMDL document in order to resolve this issue.

Issue 3: *The Long Prairie River from the headwaters of Lake Carlos (mile 92.0) to Long Prairie (mile 47.8) should be delisted. According to the TMDL Study the dissolved oxygen impairment is caused by a naturally occurring condition. Therefore, an amended water quality standard should be established for the Long Prairie River reflecting this natural condition.*

We appreciate the MPCA's willingness to place the stretch from river mile 85.5 to river mile 89.0 into category 4D, defined as "no TMDL required due to naturally occurring condition." However, we are concerned about the MPCA's next statement, "This category is actually very restrictive, as water bodies in category 4D cannot receive new or expanded discharges." This simply cannot be the case where (as here) the anticipated discharge will actually be of a *higher* quality than the receiving water, and therefore the discharge would result in a net improvement in water quality.

As the MPCA investigates this issue, please identify in your response the federal or state legal provision(s) restricting new or expanded discharges in the type of waters now classified as 4D.

444 Cedar Street ♦ Suite 1200 ♦ St. Paul, MN 55101 ♦ (651) 225-8840 ♦ Fax (651) 225-9088

Resolution of the remaining four issues will remain conditional on the resolution of these items. I look forward to the MPCA's written response. If you wish to discuss any of these items, please give me a call at **651-225-8840**.

Yours very truly,

FLAHERTY & HOOD, P.A.

Steven W. Nyhus
Attorney for the Alexandria Lake Area Sanitary District (ALASD)

SWN:slc

enclosure

cc: Bruce A. Nelson, Executive Director, ALASD
Jerry Haggenmiller, Chairman, CLRSD
John C. Hall, Hall & Associates

FLAHERTY & HOOD

Professional Association

April 14, 2004

APR 15

Faye Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

BY U.S. MAIL

**Re: Long Prairie River Total Maximum Daily Load (TMDL)
Petition for Contested Case Hearing by Alexandria Lake Area Sanitary District (ALASD)**

Dear Ms. Sleeper:

Thank you for the MPCA's participation in our conference call of Thursday, March 25, and I apologize for not getting this to you sooner. We had agreed in that discussion that Mr. Hall would provide the MPCA with a proposed approach to resolving the Carlos facility discharge issue, vis-à-vis the Long Prairie River TMDL. Mr. Hall's analysis follows:

"Based upon our discussion with MPCA and EPA's actions on similar TMDL's, the following should be an acceptable means for resolving the question of how to address the Carlos facility. First, it should be noted that the available information indicates that under 7Q10 low-flow conditions, the receiving water meets applicable water quality standards. It is only under higher flow conditions that the riparian wetland areas influence the dissolved oxygen (DO) regime and cause periodic very low DO levels to occur. The Carlos facility discharge, however, does not cause or contribute to these conditions. If anything, the highly treated wastewater serves to lessen the low DO occurrences as a result of the increased dilution of the effluent and the oxygen balance to the segment resulting from the discharge.

"Under these circumstances, the following may occur. (1) MPCA may issue a permit allowing a discharge into this area based upon a wasteload allocation (WLA) that ensures standards compliance under the low-flow condition when water quality otherwise attains applicable standards. (2) The WLA and permit fact sheet will note that under higher flow conditions, other factors unrelated to the facility cause downstream waters to fail to meet applicable DO standards. These conditions appear to be naturally occurring. The WLA should conclude that the Carlos facility does not cause or contribute to these conditions, and the adopted water quality based limits are sufficient to regulate oxygen-demanding pollutants from this discharge.

"This set of conclusions will be sufficient to address 40 C.F.R. § 122.41(d) as no 'reasonable potential' to cause a WQS violation is present, as well as the provisions of 40 C.F.R. § 122.4 (i) because the Carlos facility, once meeting the water quality based limits, will not be causing or contributing to the residual condition. This approach also avoids the need to further examine the 'natural conditions' question because there is no other source that requires the relief afforded by state law for such conditions."

It is my understanding that you will consult with the other relevant MPCA staff as to the acceptability of this resolution. If the parties are in agreement, ALASD would then withdraw its request for re-classification of the "Carlos reach" into Category 4 and allow it to remain in Category 5 on the 303(d) impaired waters list. It is also my understanding that once this agreement has been reached, the MPCA will then request permission from the EPA to re-categorize the reach as needed to reflect that the necessary TMDL work has been completed.

Prior to ALASD's withdrawal of its contested case hearing request on the Long Prairie River TMDL, there is also the issue of certain language within the TMDL report that ALASD would like to see removed. As we have discussed this previously I will just make note of it here, and suggest that MPCA's response on the Carlos facility issue may want to touch upon this language issue as well. I look forward to the MPCA's written response on the Carlos facility proposal, or if necessary we can also schedule an additional conference call. If you wish to discuss this proposal further, please give me a call at **651-225-8840**.

Yours very truly,

FLAHERTY & HOOD, P.A.

Steven W. Nyhus
Attorney for the Alexandria Lake Area Sanitary District (ALASD)

SWN:slc

enclosure

cc: Bruce A. Nelson, Executive Director, ALASD
Jerry Haggenmiller, Chairman, CLRSD
John C. Hall, Hall & Associates

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

RECEIVED
MAR 16 2004

REPLY TO THE ATTENTION OF:

WW-16J

10 MAR 2004

Faye E. Sleeper, Manager
Regional Environmental Management Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Re: Natural Water Quality Standards and TMDLs

Dear Ms. Sleeper:

During the development of TMDLs in Minnesota the cause of nonattainment for some waters has been identified to be natural conditions. The specific situations currently under TMDL development that you have raised involve waters that are not meeting the State's dissolved oxygen standard. You have asked how these situations can be addressed when establishing the TMDL.

The Federal TMDL regulations at 40 CFR 130.7(c) state that a TMDL shall be established at levels necessary to attain and maintain the applicable narrative and numeric water quality standards. In this case, the applicable standard can be one of three different options. Minnesota's default numeric criterion for warmwater streams is 5 mg/L as a daily minimum (see Minn. Rules 7050.0220). Minnesota's rules also allow for development of site-specific criteria for dissolved oxygen in which case the criterion can be no less stringent than 5 mg/L as a daily average and 4 mg/L as a minimum. Finally, Minnesota's rules also have a provision through which a water quality criterion can be set equal to background when the background level of a parameter does not attain the applicable numeric criterion and the background level is not influenced by point source or nonpoint source impacts (see Minn. Rules 7050.0170). If the State can demonstrate that there are no discernible impacts from point or nonpoint source pollution attributable to human activity or physical alternation of wetlands then, the TMDL can be established at the background level as provided for in the natural water quality provision.

In the discussion of the applicable water quality standards in the TMDL, the State should include a discussion on why the natural water quality provision is applicable. The State should include information to document that natural conditions are the cause of nonattainment and that no discernible human impact or physical alteration of a wetland contributes to the nonattainment.

Additionally, the State should include information to document the background level which is being identified as the applicable water quality standard.

If the State is establishing a TMDL on Class 2D waters the Minnesota Rules provide an exception to the general water quality standard for dissolved oxygen. The exception states "If background is less than 5.0 mg/l as a daily minimum, maintain background". (See Minn. Rule 7050.0222, Subp.6) The rules goes on to define maintain background as "the concentration of the water quality substance or characteristic shall not deviate from the range of natural background concentrations or conditions such that there is a potential significant adverse impact to the designated uses." Therefore, if a TMDL is being established on a Class 2D water the applicable water quality standard in the TMDL can be natural background levels. The discussion of applicable water quality standards in the TMDL should identify the water as a Class 2D water and state that background levels are less than 5.0 mg/l as a daily minimum. The TMDL should also provide documentation to support the natural background levels.

If you have any other questions regarding this matter feel free to contact Julianne Socha of my staff.

Sincerely,

Kevin Pierard, Chief
Watersheds & Wetlands Branch

cc: Jeff Risberg, REM, MPCA
Dave Pfiefer, WQB, R5

Phone (320)762-1135
Fax (320)762-1108

ALASD
SANITARY DISTRICT

2201 Nevada Street
Alexandria, MN 56308

August 19, 2003

RECEIVED
AUG 25 2003

Pat Shellito, Project Manager
MPCA
1800 College Road South
Baxter, Minnesota, 56425

Re: Requested Deletions
LPR TMDL Study

Dear Ms. Shellito

At our meeting on August 12, 2003 we discussed a number of issues regarding the Long Prairie River TMDL. During the meeting one of the members of your staff asked for a listing of proposed deletions resulting from our concerns with phosphorus language in the Study.

Attached is a list of proposed deletions. I have taken the liberty of mailing a copy to Faye Sleeper

Please feel free to contact me if you have any questions or comments.

Sincerely,

Bruce A. Nelson

Bruce A. Nelson
Executive Director

Cc: Fay Sleeper Impaired Waters Manager
MPCA
520 Lafayette Rd. North
St. Paul, Mn. 55155-4194

Long Prairie River TMDL

(Final Study)

Requested deletions from the LPR TMDL Study are as follows:

1) Delete 3rd bullet on page 2-4.
2) Delete Article 3.2.2 on page 3-3.
3) Delete Article 7.3.2 on page 7-5
4) Delete Articles 9.8.4 & 9.8.5 on pages 9-38 thru 9-42.
5) Delete LA for LPR Headwaters@RM89.9 in Table 11-2.
6) Any other reference to phosphorus guidelines, targets, or standards

CENTRAL LAKES REGION
JOINT POWERS BOARD

RECEIVED
AUG 19 2003
MPCA - Brainerd
Baxter, MN

August 18, 2003

Patricia Shelito
Project Manager MPCA
1800 College Road South
Baxter, Minnesota, 56425

Re: Request for Contested Case Hearing
Request for MPCA Citizen Board Review
Long Prairie River TMDL Study and Process

Dear Ms. Shellito:

The Central Lakes Region Joint Powers Board (CLRJPB) represents 6 Douglas County townships. The CLRJPB was created to investigate the feasibility of providing sanitary sewer collection and treatment for a number of central Douglas County lake residents. The CLRJPB caused the creation of a sanitary district with the passage of legislation in the 2003 session. That district is called the Central Lakes Region Sanitary District (CLRSD). The new district will be formally organized on August 25, 2003. Until the new district is organized, the joint powers board remains the legal entity.

In accordance with Minnesota Rule 7000.1800, the Central Lakes Region Joint Powers Board (CLRJPB) hereby petitions the Agency for a contested case hearing. The CLRJPB as the predecesor of the Central Lakes Region Sanitary District is a stakeholder in the Long Prairie TMDL in that the new districts future operations may be adversely affected if the TMDL is adopted as proposed.

Issues to be addressed

1) Petitioner believes that rulemaking is necessary to complete a TMDL and establish Waste Load Allocations and Load Allocations. Rulemaking provides the legal authority and assurance of due process for all stakeholders. The MPCA says rulemaking is not necessary for the Long Prairie River TMDL Study.

2) Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets in the Long Prairie River Study will effectively (de facto) establish Phosphorus Water Quality Standards for the Long Prairie River without following the proper process. As such these goals/guidelines/targets should not be included in the TMDL. The MPCA disagrees.

3) The Long Prairie River from the headwaters of Lake Carlos (mile 92.0) to Long Prairie (mile 47.8) should be delisted. According to the TMDL Study the dissolved oxygen impairment is caused by a naturally occurring condition. Therefore, an amended water quality standard should be established for the Long Prairie reflecting this natural condition. The MPCA disagrees.

4) The Long Prairie River from the City of Long Prairie (mile 47.8) to the Crow Wing River (mile 0.2) should be delisted. According to the TMDL Study the cause of the impairment is point source discharges. Through existing permitting authority WLA should be applied to theses point sources and if necessary WLA should be applied permitted non-point CAFO's. The MPCA disagrees.

5) Lake Carlos is not in the defined TMDL Study area and therefore should not receive a load allocation. In addition, Lake Carlos is not an impaired water body and under the law cannot receive a load allocation for that reason. The MPCA, as a matter of fact, disagrees,

6) Facility plans previously submitted to the MPCA have proposed a treatment plant on the Long Prairie River. This proposed plant was not included in any modeling done for the TMDL. Petitioner claims such modeling is necessary to for a comprehensive TMDL. The MPCA disagrees.

Relief Requested:

A) Require rules be adopted and applied to the Long Prairie River TMDL before submission to the EPA.

B) Remove all references to the Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets from the TMDL.

C) Delist the Long Prairie River from the headwaters at Lake Carlos to the City of Long Prairie.

D) An amended water quality standard for the naturally occurring dissolved oxygen impairment near the headwaters at Lake Carlos should be adopted.

E) The Long Prairie River from the City of Long Prairie to the Crow River should be delisted.

F) The load allocation for Lake Carlos should be removed from the TMDL.

G) The proposed Central Lakes Region Sanitary District treatment plant proposed for the Long Prairie River should be modeled and included in the TMDL.

The Petitioner will present a list of witnesses and other evidence to be presented should a contested case hearing be granted.

If the request for a contested case hearing is not granted, the Petitioner further requests the MPCA Citizen Board review the Long Prairie River TMDL prior to submission to the Environmental Protection Agency

Sincerely,

Jerome Haggenmiller

Jerome Haggenmiller
CLRJPB Chairman

Phone (320)762-1135
Fax (320)762-1108

2201 Nevada Street
Alexandria, MN 56308

August 15, 2003

RECEIVED
AUG 18 2003
MPCA - Brainerd
Baxter, MN

Pat Shellito, Project Manager
MPCA
1800 College Road South
Baxter, Minnesota, 56425

Re: Request for Contested Case Hearing
Request for MPCA Citizen Board Review
Long Prairie River TMDL Study and Process

Dear Ms. Shellito

In accordance with Minnesota Rule 7000.1800, the Alexandria Lake Area Sanitary District (ALASD) hereby petitions the Agency for a contested case hearing. The ALASD is a stakeholder in the Long Prairie TMDL in that the districts current and future operations may be adversely affected if the TMDL is adopted as proposed.

Following are the issues to be addressed and the desired relief requested.

intent

1) Petitioner believes that rulemaking is necessary to complete a TMDL and establish Waste Load Allocations and Load Allocations. Rulemaking provides the legal authority and assurance of due process for all stakeholders. The MPCA says rulemaking is not necessary for the Long Prairie River TMDL Study.

2) Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets in the Long Prairie River Study will effectively (de facto) establish Phosphorus Water Quality Standards for the Long Prairie River without following the proper process. As such these goals/guidelines/targets should not be included in the TMDL. The MPCA disagrees.

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is point source discharges. Through existing permitting authority WLA should be applied to theses point sources and if necessary WLA should be applied permitted non-point CAFO's. The MPCA disagrees.

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E) The Long Prairie River from the City of Long Prairie to the Crow River should be delisted.

F) The load allocation for Lake Carlos should be removed from the TMDL.

The ALASD will present a list of witnesses and other evidence to be presented should a contested case hearing be granted.

If the request for a contested case hearing is not granted, the ALASD further requests the MPCA Citizen Board review the Long Prairie River TMDL prior to submission to the Environmental Protection Agency.

On August 13, 2002 the ALASD Board of Directors approved and authorized the submission of this letter.

Sincerely,

Bruce A. Nelson

Bruce A. Nelson
Executive Director

CENTRAL LAKES REGION
JOINT POWERS BOARD

RECEIVED

AUG 19 2003

MPCA - Brainerd
Baxter, MN

August 18, 2003

Patricia Shelito
Project Manager MPCA
1800 College Road South
Baxter, Minnesota, 56425

Re: Request for Contested Case Hearing
Request for MPCA Citizen Board Review
Long Prairie River TMDL Study and Process

Dear Ms. Shellito:

The Central Lakes Region Joint Powers Board (CLRJPB) represents 6 Douglas County townships. The CLRJPB was created to investigate the feasibility of providing sanitary sewer collection and treatment for a number of central Douglas County lake residents. The CLRJPB caused the creation of a sanitary district with the passage of legislation in the 2003 session. That district is called the Central Lakes Region Sanitary District (CLRSD). The new district will be formally organized on August 25, 2003. Until the new district is organized, the joint powers board remains the legal entity.

In accordance with Minnesota Rule 7000.1800, the Central Lakes Region Joint Powers Board (CLRJPB) hereby petitions the Agency for a contested case hearing. The CLRJPB as the predecesor of the Central Lakes Region Sanitary District is a stakeholder in the Long Prairie TMDL in that the new districts future operations may be adversely affected if the TMDL is adopted as proposed.

Issues to be addressed

1) Petitioner believes that rulemaking is necessary to complete a TMDL and establish Waste Load Allocations and Load Allocations. Rulemaking provides the legal authority and assurance of due process for all stakeholders. The MPCA says rulemaking is not necessary for the Long Prairie River TMDL Study.

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G) The proposed Central Lakes Region Sanitary District treatment plant proposed for the Long Prairie River should be modeled and included in the TMDL.

The Petitioner will present a list of witnesses and other evidence to be presented should a contested case hearing be granted.

If the request for a contested case hearing is not granted, the Petitioner further requests the MPCA Citizen Board review the Long Prairie River TMDL prior to submission to the Environmental Protection Agency

Sincerely,

Jerome Haggenmiller

Jerome Haggenmiller
CLRJPB Chairman

Phone (320)762-1135 Fax (320)762-1108

2201 Nevada Street
Alexandria, MN 56308

ALASD

RECEIVED
3 2003
MPCA - Brainerd
Baxter, MN

August 15, 2003

Pat Shellito, Project Manager
MPCA
1800 College Road South
Baxter, Minnesota, 56425

Re: Request for Amendment to Water Quality Standard on the Long Prairie River

Dear Ms. Shellito

The Alexandria Lake Area Sanitary District (ALASD) hereby requests an amendment to the Water Quality Standard (WQS) for dissolved oxygen on the Long Prairie River. The specific location to be amended is that area near the City of Carlos (LPR 85.5 to LPR 79.4) that is impaired by a naturally occurring condition originating in a nearby wetland. The WQS should be amended to reflect this natural condition as determined by the Long Prairie River TMDL Study. The evidence and factual data to support this amendment is contained within the Study.

Please feel free to contact me with any questions or comments you may have in this regard..

Sincerely,

Bruce A. Nelson

Bruce A. Nelson
Executive Director

DOUGLAS SOIL AND WATER CONSERVATION DISTRICT

900 Robert St., Suite 102
Alexandria, MN 56308-5079
Phone: 320-763-3191, Ext: 3
Fax: 320-762-5502

MINNESOTA
SOIL AND WATER CONSERVATION DISTRICTS

Jerome.Haggenmiller@MN.USDA.GOV

August 15, 2003

Pat Shelito, Project Manager
MPCA
1800 College Rd. S
Brainerd, MN 56425

Comments of Long Prairie River TMDL

Dear Pat:

Enclosed is a resolution from the Douglas SWCD in support of the letters from the Central Lake Region Sanitary District and Alexandria Lakes Area Sanitary District, regarding the Long Prairie River TMDL.

Sincerely,

Jerry Haggenmiller

Jerry Haggenmiller
District Coordinator
Douglas SWCD

cc: Faye Sleeper

DOUGLAS COUNTY BOARD RESOLUTION NO. 03-72

AUG 12

RESOLUTION ENDORSEN AND AFFIRMING CENTRAL LAKE REGION SANITARY DISTRICT LETTER IN REGARD TO LONG PRAIRIE RIVER TMDL

WHEREAS, protection of water resources is important to Douglas County, and

WHEREAS, population growth is occurring, and will continue to occur, on or near water resources within Douglas County, and

WHEREAS, all governmental units are planning for ways to accommodate the population growth, and

WHEREAS, in Douglas County townships of Brandon, Carlos, LaGrand, Leaf Valley, and Miltona formed the Central Lake Region Sanitary District (CLRJPB).

WHEREAS, the MPCA public comment period on the Long Prairie River TMDL closes on August 18, 2003, and

WHEREAS, the CLRJPB mailed a letter commenting on the Long Prairie River TMDL dated June 24, 2003, and

WHEREAS, the Alexandria Lake Area Sanitary District mailed a letter to the MPCA dated July 17, 2003 requesting the Delisting of Lake Winona from the State's Impaired Waters List, and

WHEREAS, the ALASD, the DCLA, the City of Alexandria have mailed letters to the MPCA in support of the CLRJPB letter of June 24, 2003 and the ALASD letter of July 27, 2003 requesting the Delisting of Lake Winona

NOW THEREFORE BE IT RESOLVED that these board's hereby supports and endorses:

a) the recommendations contained in the CLRSD letter dated June 24, 20003.
b) the ALASD letter dated July 14, 2003.

BE IT FURTHER RESOLVED THAT the Douglas County Administrator shall mail separate copies off this resolution to Pat Shellito and Faye Sleeper of the MPCA by no later than August 17, 2003.

Adopted this 4th day of August, 2003 by Douglas County Board of Commissioners by the following vote:

Yes Anderson, Jennissen, Olson, Withers

No ______ Mingus - absent

DOUGLAS COUNTY BOARD OF COMMISSIOERS

By Bryan L. Withers
Its Chair

Attest:
William B. Schalow

STATE OF MINNESOTA

Minnesota Pollution Control Agency

REGIONAL ENVIRONMENTAL MANAGEMENT DIVISION
PUBLIC NOTICE OF INTENT TO SUBMIT THE LONG PRAIRIE RIVER
TOTAL MAXIMUM DAILY LOAD STUDY

Public Comment Period Begins: July 18, 2003
Public Comment Period Ends: August 18, 2003

Pollutant or Stressor: Dissolved Oxygen

Description of TMDL Study Watershed and Significant Pollutant Sources:

"Impaired waters" are those streams, rivers and lakes that currently do not meet applicable water-quality standards that are set to protect the state's waters. Section 303(d) of the Clean Water Act requires the states to identify and list impaired waters, determine solutions through Total Maximum Daily Load (TMDL) Studies, and restore them to comply with water quality standards. A TMDL study determines why waters are impaired and the amount by which sources of pollution would need to be reduced for a water body to meet the state's water quality standards.

DO ✓
biota

Six segments of the Long Prairie River addressed in this report are listed for low dissolved oxygen (DO). Segments 07010108-501, 07010108-502, 07010108-503, and 07010108-504, are located on the Long Prairie River between the Eagle Creek Tributary and the Crow Wing River. Segment 07010108-505, is on the Long Prairie River between the city of Long Prairie and the Eagle Creek Tributary. The former segment of concern, 07010108-506, which was included on Minnesota's 303(d) list in 2002, is located between the headwaters at Lake Carlos and the Spruce Creek Tributary. The segments are listed because monitoring data have revealed that DO concentrations at times fall below the five milligram per liter water quality standard. This could impact fisheries and aquatic life. The low dissolved oxygen problem occurs primarily during low-flow conditions. Low-flow conditions occur when the volume of water and current in the river are less than average. Several of the reaches are also listed for biota impairment, but this report did not address the biota impairment. Mitigation of the DO impairment may also eliminate the biota impairment. Future monitoring will help to determine whether there is a need to address the biota impairment.

Water quality impairment of the Long Prairie River and its tributary Eagle Creek is summarized below:

Waterbody	Reach	Assessment Unit ID	Impairment		Pollutants Addressed in TMDL Study
Long Prairie River	Fish Trap Creek to Crow Wing River	07010108-501	Low DO		Oxygen-demanding substances
Long Prairie River	Moran Creek To Fish Trap Creek	07010108-502	Low DO		Oxygen-demanding substances
Long Prairie River	Turtle Creek to Moran Creek	07010108-503	Low DO*		Oxygen-demanding substances
Long Prairie River	Eagle Creek to Turtle Creek	07010108-504	Low DO Impaired biota		Oxygen-demanding substances Ammonia toxicity
Long Prairie River	Spruce Creek to Eagle Creek	07010108-505	Low DO* Impaired biota		Oxygen-demanding substances Ammonia toxicity
Long Prairie River	Lake Carlos to Spruce Creek	07010108-506	Low DO Impaired biota		Oxygen-demanding substances Ammonia toxicity
Eagle Creek	Headwaters to Long Prairie River	07010108-507	Impaired biota		Ammonia toxicity

* In the course of the TMDL study, reaches 07010108-503 and -505, were found impaired due to low DO, and the MPCA is in the process of adding the two reaches to the 2004 CWA 303(d) TMDL List.

The pollutants of concern for low DO are carbonaceous and nitrogenous biochemical oxygen demand (CBOD and NBOD). BOD occurs when organic material decays and consumes dissolved oxygen in the process. CBOD is a general measure of organic materials such as sewage solids, animal wastes, animal and other food processing wastes, and plant litter. NBOD is a general measure of how much oxygen is used to break down nitrogen based pollutants – in this case ammonia. Sediment oxygen demand (SOD) results from the deposition of particulate organic matter in the river channel. The BOD process leaves less oxygen available for aquatic life, which can cause fish kills. The pollutants of concern originate from both point and nonpoint sources in the watershed.

Under contract (and in cooperation) with the Minnesota Pollution Control Agency (MPCA), Wenck Associates, Inc., with its partner FTN Associates, Ltd., conducted the TMDL study and prepared this report. The study was completed in three phases. Phase I was an analysis of existing data. Phase II entailed intensive synoptic water quality surveys of the river system in August and September 2001 (summer and fall warm, relatively low-flow conditions, with and without point-source discharges, respectively) and February 2002 (winter ice conditions). Modeling and TMDL development were conducted in Phase III of the project.

Pollutant sources requiring permits under the National Pollutant Discharge Elimination System (NPDES) include five municipalities with wastewater treatment facilities, and one treated groundwater pumpage from a Superfund site (former dry cleaner) in the city of Long Prairie. Nonpoint sources include runoff from agricultural land use. The main crops are potatoes, corn, soybeans, and alfalfa. Subwatersheds that exhibit high pollutant export have been identified in this study through modeling based on agricultural practices, topography, soil characteristics, climatology, and other factors. The point (wastewater facilities) and nonpoint (agricultural) sources are not equal contributors at any one time or place in the watershed. This is why monitoring and modeling are important in the development of a TMDL.

An overall reduction in BOD from all sources is desirable. However, the BOD loads during low flow conditions are of primary importance because it is during low flow conditions that the dissolved oxygen standard is violated. To solve this problem, wastewater treatment plants will play a major role in overall BOD reduction because their discharges become more significant under conditions of low dilution in the river. Although other sources such as agricultural runoff contributions are less significant **during low flow conditions** due to decreased runoff, it is important to note that runoff sources will also play a role in solving this problem. Even at low flow no source alone can resolve the problem. During high flow conditions, the agricultural sources play a larger role in the dissolved oxygen problem; consequently these sources need to be addressed too. Results from the study indicate that, with BOD (principally NBOD) reductions, it is possible to meet the dissolved oxygen standard in the Long Prairie River during low flow conditions.

The following table represents the proposed waste load allocations (WLA) for the point sources and load allocations (LA) for the non-point sources by reach. MOS is the margin of safety allowed for meeting water quality standards. The map following the table shows the location of each reach.

control when secondary or tertiary

Reach 07010108-506: Long Prairie River Headwaters (Lake Carlos) to Spruce Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	164	47	n/a	210
WLA + MOS for Carlos WWTF	233	254	n/a	487
LA for LPR Headwaters @ RM89.9	161	55	n/a	216
LA for other Nonpoint Sources	***999****	***68***	291	1,359
MOS for all Nonpoint Sources	116	12	n/a	128
Total Maximum Daily Load	1,673	437	291	**2,401**

how violated? plug in? Is these capacity? ass.m. new flow 7Q10

Reach 07010108-505: Spruce Creek to Eagle Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	613	175	n/a	788
WLA + MOS for LP-Superfund	48	17	n/a	65
WLA + MOS for Long Prairie WWTF	***275***	***981***	n/a	1,256
WLA + MOS for Browerville WWTF	542	***504***	n/a	1,045
LA for Spruce Creek	***87***	***29***	n/a	116
LA for Dismal Creek	***17***	***30***	n/a	47
LA for other Nonpoint Sources	***5,329***	***484***	1,750	7,563
MOS for all Nonpoint Sources	543	54	n/a	598
Total Maximum Daily Load	7,455	2,274	1,750	**11,478**

Reach 07010108-504: Eagle Creek to Turtle Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	572	164	n/a	736
Eagle Creek Residual Point Source Loads	204	209	n/a	412
LA for Eagle Creek	***587***	***40***	n/a	626
LA for other Nonpoint Sources	***1,442***	***362***	315	2,119
MOS for all Nonpoint Sources	203	40	n/a	243
Total Maximum Daily Load	**3,007**	**814**	**315**	**4,136**

Reach 07010108-503: Turtle Creek To Moran Creek

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	1,056	302	n/a	1,357
LA for Turtle Creek	238	129	n/a	367
LA for other Nonpoint Sources	620	156	120	895
MOS for all Nonpoint Sources	86	28	n/a	114
Total Maximum Daily Load	1,999	615	120	**2,734**

Reach 07010108-502: Moran Creek To Fish Trap Creek

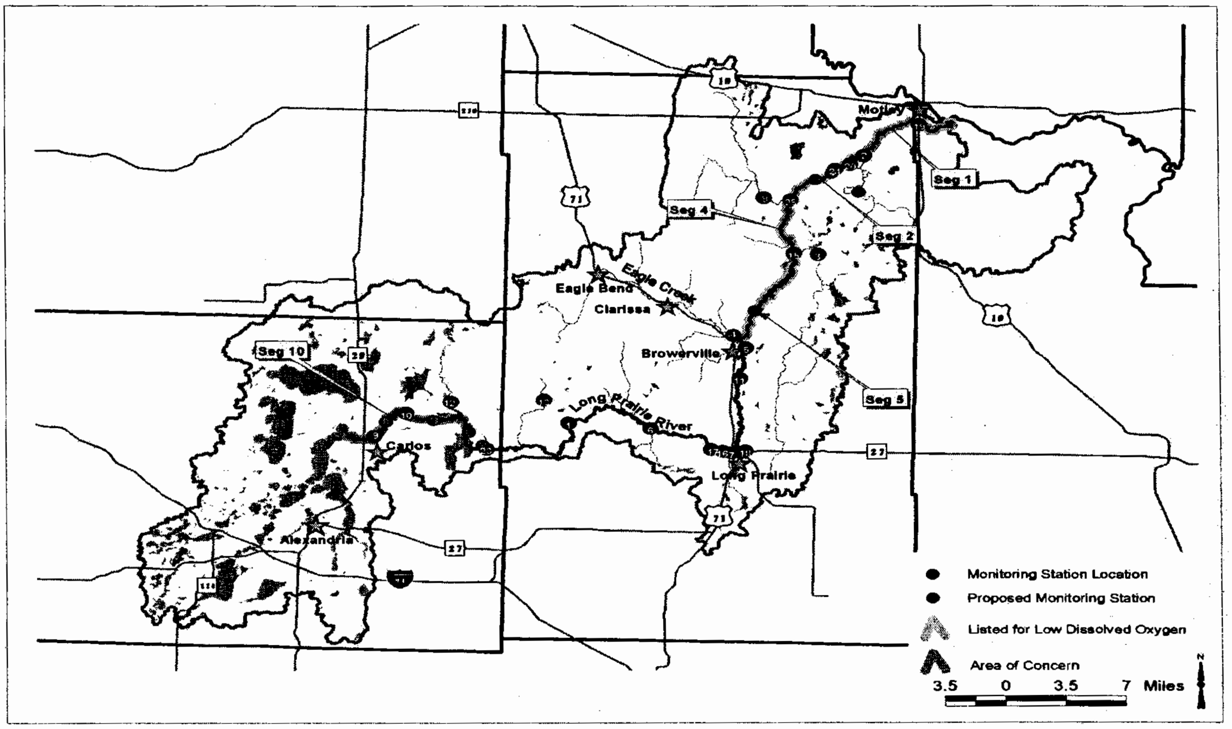
	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	739	211	n/a	950
LA for Moran Creek	93	62	n/a	155
LA for other Nonpoint Sources	682	171	252	1104
MOS for all Nonpoint Sources	77	23	n/a	101
Total Maximum Daily Load	1,591	468	252	**2,311**

Reach 07010108-501: Fish Trap Creek to Crow Wing River

	Oxygen Demand (lbs/day) from:			Total Oxygen Demand (lbs/day)
	CBOD	NBOD	SOD	
Unallocated Load	1,080	308	n/a	1,388
LA for Fish Trap Creek	243	48	n/a	291
LA for other Nonpoint Sources	1,276	320	545	2,142
MOS for all Nonpoint Sources	152	37	n/a	189
Total Maximum Daily Load	2,751	713	545	**4,010**

Notes: ****Bold italic*** denotes a load that was reduced to meet DO standard.

Map of Impairments



The MPCA would like input from stakeholders in the Long Prairie River TMDL study and its proposed pollution reductions. The allocations set in the TMDL will be used to guide any effluent limitations or other pollution control measures for permits, as well as pollution prevention measures for nonpoint sources. An implementation plan to achieve the reductions required in the TMDL will be developed with public input. The implementation plan must be submitted within one year of completion of the TMDL study.

From July 18, 2003 until August 18, 2003, people will have the opportunity to comment on the report that has been developed to present the results of monitoring and modeling, as well as proposed solutions. Following the public comment period, on August 18, 2003, a report will be submitted to the U.S. Environmental Protection Agency for approval describing how the problem will be solved.

Preliminary Determination on the Draft TMDL Study:
The MPCA Commissioner has made a preliminary determination to submit this TMDL Study to the U.S. Environmental Protection Agency for final approval. A draft TMDL and fact sheet are available for review at the MPCA office at the address listed below, and at the MPCA web site: **http://www.pca.state.mn.us.** Suggested changes will be considered before the final TMDL is sent to the U.S. Environmental Protection Agency for approval.

Written Comments
You may submit written comments on the conditions of the draft TMDL study or on the Commissioner's preliminary determination.

Written comments must include the following:

1. A statement of your interest in the draft TMDL study;
2. A statement of the action you wish the MPCA to take, including specific references to sections of the draft TMDL that you believe should be changed; and
3. The reasons supporting your position, stated with sufficient specificity as to allow the Commissioner to investigate the merits of your position.

Petition for Public Informational Meeting
You also may request that the MPCA Commissioner hold a public informational meeting. A public informational meeting is an informal meeting that the MPCA may hold to solicit public comment and statements on matters before the MPCA, and to help clarify and resolve issues.

A petition requesting a public informational meeting must include the following information:

1. A statement identifying the matter of concern;
2. The information required under items 1 through 3 of "Written Comments," identified above;
3. A statement of the reasons the MPCA should hold a public informational meeting; and
4. The issues that you would like the MPCA to address at the public informational meeting.

Petition for Contested Case Hearing
You also may submit a petition for a contested case hearing. A contested case hearing is a formal evidentiary hearing before an administrative law judge. In accordance with Minn. R. 7000.1900, the MPCA will grant a petition to hold a contested case hearing if it finds that: (1) there is a material issue of fact in dispute concerning the application or draft TMDL study; (2) the MPCA has the jurisdiction to make a determination on the disputed material issue of fact; and (3) there is a reasonable basis underlying the disputed material issue of fact or facts such that the holding of the contested case hearing would allow the introduction of information that would aid the MPCA in resolving the disputed facts in making a final decision on the draft TMDL study. A material issue of fact means a fact question, as distinguished from a policy question, whose resolution could have a direct bearing on a final MPCA decision.

A petition for a contested case hearing must include the following information:

1. A statement of reasons or proposed findings supporting the MPCA decision to hold a contested case hearing according to the criteria in Minn. R. 7000.1900, as discussed above; and
2. A statement of the issues proposed to be addressed by a contested case hearing and the specific relief requested or resolution of the matter.

In addition and to the extent known, a petition for a contested case hearing should also include the following information:

1. A proposed list of prospective witnesses to be called, including experts, with a brief description of proposed testimony or summary of evidence to be presented at a contested case hearing;
2. A proposed list of publications, references, or studies to be introduced and relied upon at a contested case hearing; and
3. An estimate of time required for you to present the matter at a contested case hearing.

MPCA Decision
You may submit a petition to the Commissioner requesting that the MPCA Citizens' Board consider the TDML study approval. To be considered timely, the petition must be received by the MPCA by 4:30 p.m. on the date the public comment period ends, identified on page 1 of this notice. Under the provisions of Minn. Stat. § 116.02, subd 6(4), the decision whether to issue the permit and, if so, under what terms will be presented to the Board for decision if: (1) the Commissioner grants the petition requesting the matter be presented to the Board; (2) one or more Board members request to hear the matter before the time the Commissioner makes a final decision on the TMDL study; or (3) a timely request for a contested case hearing is pending. You may participate in the activities of the MPCA Board as provided in Minn. R. 7000.0650.

The written comments, requests, and petitions submitted on or before the last day of the public comment period will be considered in the final decision on this TMDL study. If the MPCA does not receive written comments, requests, or petitions during the public comment period, MPCA staff as authorized by the Board, will make the final decision on the draft TMDL study.

Comments, petitions, and/or requests must be submitted in writing on or before the end date of the public comment period identified on page 1 of this notice to:

Patricia Shelito
Minnesota Pollution Control Agency
1800 College Road South
Baxter, Minnesota 56425-7865

ALEXANDRIA
Easy To Get To ♥ Hard To Leave.

H. DAN NESS, Mayor

COUNCIL MEMBERS:

DALE F. KALPIN, *First Ward*
CAROL RADIL, *Second Ward*
HARVEY G. WEISEL, *Third Ward*
DAVID J. BENSON, *Fourth Ward*
ELROY E. FRANK, *Fifth Ward*

JAMES P. TADDEI, *Administrator*
LARRY S. JOHNSON, *Assessor*
JOHN C. LERVICK, *Attorney*
BRUCE A. JASPERSEN, *Building Official*
TIM SCHOONHOVEN, *Engineer*
DENNIS L. STARK, *Fire Marshal*
CAROL H. LANIGAN, *Liquor Store Manager*
GARY D. MARTIN, *Park Superintendent*
MICHAEL J. WEBER, *Planner*
CHARLES R. NETTESTAD, *Chief of Police*
DAVID W. BOITZ, *RCC Manager*
TRUMAN E. HANSON, *Street Commissioner*

704 Broadway
Alexandria, MN 56308
(320) 763-6678
Fax (320) 763-3511
Internet Website:
www.alexandria.mn.us

RECEIVED
JUL 31 2003

July 30, 2003

Fay Sleeper, Impaired Waters Manager
MPCA
520 Lafayette Rd North
St. Paul MN 55155-4194

RE: Impaired Waters List 2002-Lake Winona-21-0081-00

Dear Ms. Sleeper:

On July 28th the Alexandria City Council took action supporting the position to delete Lake Winona from the State of Minnesota's Impaired Waters list. This position is outlined in a letter presented to you from Bruce Nelson, Executive Director of the Alexandria Lakes Area Sanitary Sewer District, a copy of which is attached to this letter.

Sincerely,

Jim Taddei

James P. Taddei
City Administrator

JPT/rk

Enc.

Re: Impaired Waters List 2002 - Lake Winona - 21-0081-00 – Delisting

Dear Ms. Sleeper,

The Alexandria Lake Area Sanitary District hereby requests the delisting of Lake Winona from the State of Minnesota's Impaired Water List. This request for delisting Lake Winona is supported by the City of Alexandria, the Douglas County Lake Association, the Lake Winona Association, and the Central Lake Region Sanitary District. (Confirming letters and resolutions are available upon request)

In our opinion this lake is not impaired for swimming due to nutrients. Impairment for swimming is due to natural conditions and not from external nutrient loading. Under state law a water body cannot be listed for impairment due to natural conditions, nor can it be listed for a use that has never been available for reasons unrelated to pollutants or pollution as defined by state statute.

As you know, Lake Winona's average depth is 4 feet. Weeds are not currently present. The largest source of phosphorus to the lake is from internal recycling. During the drought of the 30's this lake was dry. Without the flow of treated effluent the average depth of the lake would be less than 4 feet. All components of the Implementation Plan from the Clean Lake Project Study of 1992 have been implemented, with the exception of several items that were not technically feasible, or are no longer necessary.

For your information the schedule for starting the Lake Winona TMDL in 2005 with completion in 2010 is unacceptable.

We are available to meet with you at your convenience to discuss the delisting of Lake Winona.

Sincerely,

Bruce A. Nelson
Executive Director

DOUGLAS SOIL AND WATER CONSERVATION DISTRICT RESOLUTION NO. 1

RESOLUTION ENDORSEN AND AFFIRMING CENTRAL LAKE REGION SANITARY DISTRICT LETTER IN REGARD TO LONG PRAIRIE RIVER TMDL

WHEREAS, protection of water resources is important to Douglas County, and

WHEREAS, population growth is occurring, and will continue to occur, on or near water resources within Douglas County, and

WHEREAS, all governmental units are planning for ways to accommodate the population growth, and

WHEREAS, in Douglas County townships of Brandon, Carlos, LaGrand, Leaf Valley, Miltona and Moe formed the Central Lake Region Sanitary District (CLRJPB).

WHEREAS, the MPCA public comment period on the Long Prairie River TMDL closes on August 18, 2003, and

WHEREAS, the CLRJPB mailed a letter commenting on the Long Prairie River TMDL dated June 24, 2003, and

WHEREAS, the Alexandria Lake Area Sanitary District mailed a letter to the MPCA dated July 17, 2003 requesting the Delisting of Lake Winona from the State's Impaired Waters List, and

WHEREAS, the ALASD, the DCLA, the City of Alexandria, and Douglas County have mailed letters to the MPCA in support of the CLRJPB letter of June 24, 2003 and the ALASD letter of July 27, 2003 requesting the Delisting of Lake Winona

NOW THEREFORE BE IT RESOLVED that the Douglas Soil and Water Conservation Distict Board hereby supports and endorses:

a) the recommendations contained in the CLRSD letter dated June 24, 20003.
b) the ALASD letter dated July 14, 2003.

Adopted this 11th day of August, 2003 by Douglas Soil and Water Conservation Board of Supervisors by the following vote:

Yes Thoennes, Roers, Matejka

No ______

DOUGLAS SOIL AND WATER CONSERVATION DISTRICT

By Richard Thoennes
Its Chair

Attest:

Audrey Kleespies

June 24, 2003

RECEIVED

JUN 26 2003

MPCA - Brainerd
Baxter, MN

Minnesota Pollution Control Agency
1800 College Road South
Baxter, MN 56425

Attention: Pat Shelito, Project Manager

Subject: Long Prairie River Total Maximum Daily Load (TMDL)

Regarding: Comment from the Central Lake Region Joint Powers Board (Comprised of the Douglas County Townships of Brandon, Carlos, LaGrand, Leaf Valley, and Miltona)

Dear Ms. Shellito,

The Central Lake Region Joint Powers Board (CLRJPB) has serious concerns about the Long Prairie River Total Maximum Daily Load (TMDL) process and draft report presented at the June 12, 2003 meeting at the City of Carlos. We feel strongly that the years of hard work to protect and preserve water quality within Douglas County have been ignored and that proper consideration must be given to our community.

The CLRJPB was formed to investigate the feasibility of expanding central sewer to lake areas within six Douglas County townships as growth and development in our county reaches out to more and more lakes in Douglas County. In March, 2002 the CLRJPB submitted a Facility Plan to the Minnesota Pollution Control Agency (MPCA) to provide central collection, interceptor sewer and wastewater treatment for designated lakes within these six townships. The Facility Plan outlines a new mechanical wastewater treatment facility with discharge to the Long Prairie River.

The CLRJPB was instrumental in gaining legislation which last month created the Central Lake Region Sanitary District (CLRSD). This new district continues the effort of lakes areas within Douglas County to protect and preserve the water resources that make Douglas County an attractive area to visit, live, and work. The results of these efforts can be seen in the high water quality of the Long Prairie River as it leaves Lake Carlos. This water quality is maintained even though the most significant development has occurred in the upper reaches of the watershed that feed the Long Prairie River.

In the early 1970s the City of Alexandria and surrounding townships formed the Alexandria Lake Area Sanitary District (ALASD) to protect water resources from failing septic systems. Formation of the ALASD was a visionary concept that established water resource protection and preservation as an absolute priority. This vision and priority is fundamental to the CLRJPB and CLRSD. The thirty-year track record of the ALASD, and the high quality of water resources that have been maintained throughout heavy development pressure, is a legacy for Douglas County, the City of Alexandria, the ALASD, and the townships that make up the CLRJPB.

The CLRJPB has neither hidden nor wavered from its plan to consider a new point discharge to the Long Prairie River. The MPCA is aware of these plans as evidenced by the attached MPCA effluent limits for a continuous discharge to the Long Prairie River. John Erdmann of Wenck and Associates, the consultant performing the Long Prairie River TMDL, acknowledged that a new point source was being considered in the Long Prairie River. In an attempt to be included in the TMDL process, an offer was made to Ms. Tepley of the Todd County Soil and Water

Conservation District to form a partnership between Todd County, Douglas County, and the CLRJPB to develop a partnership to balance growth with protection of water resources (see attached letter from October of 2002). The TMDL process should have provided the platform for this partnership. To date we have not received a response from either Todd County SWCD or the MPCA.

The Long Prairie River TMDL provided an opportunity to collaborate and take a watershed based approach to water quality concerns. Instead the process appears to have been commandeered by the Todd County SWCD to promote an agenda that precludes a new point discharge without any sound scientific support or a solid understanding of the technology we are proposing. We believe the attached letter from Todd County SWCD and resolution from Todd County support this assertion.

We are very interested in working with the MPCA and your consultants to provide the capacity of the proposed plant and the desired location of the discharge. As stated at the TMDL public hearing in the City of Carlos, this point source can be easily inserted into the model to determine if a new point source is feasible and, if so, where it should be located. What a wonderful opportunity to combine forces, make the best use of taxpayer money, and solve environmental issues with a watershed approach based on science and technology. The CLRJPB believes that this is the spirit of the TMDL process and agrees with the TMDL process based on this spirit. Every effort should be made to maintain the purity of this process.

CLRJPB Recommendations:

Based on the above points the CLRJPB would like to make the following requests:

1. Stop the Long Prairie River TMDL process and allow input from stakeholders that have been excluded. It is our understanding that Douglas County, the ALASD, the City of Alexandria, the City of Carlos, and the Douglas County Lake Association have also been excluded from this process but yet are clearly stakeholders. These entities, as well as the CLRSD, should be included.
2. Model a new point discharge to determine the most suitable location, technology, etc. Since the CLRJPB Facility Plan and effluent limit request was submitted prior to the initiation of the Long Prairie River TMDL process, the feasibility of a new point discharge to the Long Prairie River should have been considered in the TMDL process.
3. Delist the Long Prairie River stretch from the City of Long Prairie to the mouth at Lake Carlos. Graphs presented at the City of Carlos public hearing show that dissolved oxygen attainment occurs in this stretch with or without the inclusion of point discharges and at periods of low flow.
4. Have another round of public hearings after a more complete stakeholder group has been assembled. Prior to these public hearings make the entire report available either on-line or by request.
5. Expedite the implementation of measures to remediate the excessive point source pollution at the City of Long Prairie. It is inexcusable that local units of government and the MPCA have allowed this level of pollution to take place for this long. It is arguable that if proper treatment would have occurred years ago to solve the point discharge problems at Long Prairie the Long Prairie River TMDL would not have been necessary. The graphs presented at the City of Carlos TMDL public hearing clearly show that dissolved oxygen attainment can be accomplished for the entire river stretch with proper treatment from point sources at Long Prairie.
6. Remove all reference to phosphorous goals in the final Long Prairie River Dissolved Oxygen TMDL report to the Environmental Protection Agency (EPA). Phosphorous was not linked to the Dissolved Oxygen impairment so any reference to phosphorous goals

undermine the TMDL process and heighten concerns that this process is about environmental activism rather than protection of water resources.

7. Remove all references to Todd County SWCD goals in the final report to the EPA. Todd County SWCD's and Todd County's motives are clearly outlined in the attached letter and resolution. These types of motives, bias, and emotion undermine the scientific TMDL process.
8. Remove Todd County SWCD as the sponsoring entity for the TMDL. To have Todd County SWCD as the sole sponsoring entity runs the risk of their interests being furthered at the expense of other stakeholders.
9. Eliminate flow restriction recommendations for the City of Carlos wastewater treatment system. As stated in the City of Carlos TMDL public hearing, this restriction is based on ammonia toxicity that was assumed to occur according to assumed values. Actual samples should be obtained from the City of Carlos to determine the impact to the Long Prairie River. In addition, this is a Dissolved Oxygen TMDL and any ammonia toxicity recommendations should be referred to the affect aquatic life TMDL.

ALASD Relationship and Lake Winona:

When the Long Prairie River was listed on the impaired waters list, the CLRJPB began pursuing other wastewater treatment options to make sure that the most cost effective, technically feasible, and environmentally sensitive solution is found. Discussions were initiated between the CLRJPB and the Alexandria Lake Area Sanitary District (ALASD). These discussions culminated in a resolution passed by the ALASD allowing the CLRJPB to name connection to the ALASD as the selected treatment alternative in the Facility Plan (see attached resolution). The resolution qualified this stance by stating that this does not commit the ALASD to accept wastewater generated from member townships of the CLRJPB. The primary reason for this qualification is that the water body that ALASD discharges to, Lake Winona, is also on the impaired waters list with the impairment listed as swimming. Lake Winona has an average depth of 3 feet, a maximum depth of 9 feet and a typical secchi disk reading of less than a foot. Our opinion is that this water was naturally impaired for swimming and therefore should be removed from the impaired waters list. The president of the Lake Winona Association has stated that the water quality is the best he has seen in the fifteen years and supports the removal of Lake Winona from the impaired waters list.

In addition, the Douglas County Lake Association (which includes members from Lake Winona, LeHomme Dieu, and Carlos), in the attached resolution, supports the efforts of the CLRJPB even if expansion of the ALASD treatment plant is required. Douglas County and the ALASD have also shown support for the CLRJPB in forming the CLRSD to protect our lake resources by constructing central sewer to replace septic systems (see attached resolution).

The CLRJPB requests that the MPCA ~~investigate the option of removing Lake Winona from~~ the impaired waters list. By considering the removal of Lake Winona from the impaired waters list, as well as the requests regarding the Long Prairie River TMDL, a partnering approach can be taken between the CLRSD, the ALASD and the MPCA to solve the need for additional wastewater treatment capacity in our region. Residents in our townships appear to stand ready to finance the collection, interceptor, and treatment systems without grant money. This willingness continues the vision that this region has for balancing growth with protection and preservation of water resources. We look forward to a partnering relationship with the MPCA to accomplish this vision. We believe our approach can be an example to other areas in Minnesota that are facing similar challenges.

We look forward to your reply. If you have any questions, don't hesitate to contact the Central Lake Region Joint Powers Board Chairman, Jerome Haggenmiller at (320) 763-3191 ext. 3.

Sincerely,
CENTRAL LAKE REGION JOINT POWERS BOARD

Ray Wood, Brandon Township

Bill Krivanek – Carlos Township

Judy Williams – LaGrand Township

Jay Baldwin – Leaf Valley Township

Jerome Haggenmiller – Miltona Township

c: Brian Withers – Chairman; Douglas County Board of Commissioners
Paul Nelson – Chairman; Alexandria Lake Area Sanitary District Board
Dan Ness – Mayor; City of Alexandria
Pete Hoefer – Mayor; City of Carlos
Mike Bump – President; Douglas County Lake Association
Dallas Sams – State Senator; District 11
Torrey Westrom – State Representative; District 11A
Mary Ellen Otremba – State Representative; District 11B
Kathleen Holland-Hanson – MPCA
Eudale Mathiason - MPCA

470H696 - 0200

Minnesota Pollution Control Agency

RECEIVED
JUL 2002
Widseth Smith Nolting & Associates, Inc.
Alexandria

July 29, 2002

Daniel J. Folsom, P.E.
Widseth Smith Nolting
610 Fillmore St.
P.O. Box 1028
Alexandria, MN 56308-1028

RE: Brandon, Leaf Valley, Miltona, and Moe Townships
(Proposed Wastewater Treatment Facility Alternatives)

Dear Mr. Folsom:

This letter is in response to your request for preliminary effluent limitations for a surface discharge of treated wastewater from a proposed new facility serving parts of Brandon, Leaf Valley, Milton, and Moe townships in Douglas County. For purposes of this preliminary review, the new discharge will be evaluated at a design flow of 613,225 gallons per day (gpd). You requested an evaluation for three alternatives listed below and as shown on the enclosed maps:

A. a stabilization pond facility with a controlled discharge to County Ditch 23, tributary to Lake Ida;
B. a mechanical treatment plant with a continuous discharge to the Chippewa River, and
C. a treatment plant with a continuous or controlled discharge to the Long Prairie River.

The Chippewa River, County Ditch 23, and Long Prairie River at the proposed treatment plant sites have been assigned use classifications of 2B, 3B, 4A, 4B, 5 and 6 as unlisted waters under Minnesota Pollution Control Agency (MPCA) rules, chapter 7050. These multiple classifications include consideration for aquatic life and recreation, industrial consumption, agriculture and wildlife, aesthetic enjoyment and navigation, and other beneficial uses not specifically listed.

The following tables list the applicable stream design flows and preliminary effluent limitations for both a continuous and a controlled discharge of treated wastewater to the respective receiving waters.

The stream low flow estimates for the Chippewa River at the mechanical plant site were developed from a drainage area adjustment of seasonal flow statistics derived at the partial record station on the Chippewa River near Evansville [U.S. Geological Survey (USGS) gage 05301802, drainage area 172.5 square miles]. Low flow estimates for the Long Prairie River near Carlos were developed from a partial flow record station (USGS gage 05244852) near Carlos correlated to the continuos flow record station (USGS gage 05245100) at Long Prairie.

Preliminary Effluent Limits for a Design Discharge of 0.613 MGD (0.949 CFS) To Long Prairie River, Douglas County

	Limitation or Range	
	(C1) Mech. Plant to Long Prairie R.	***(C2) Ponds to Long Prairie R.***
Parameter	* *Continuous Discharge*	* *Controlled Discharge* (1)
CBOD5	15 mg/L	25 mg/L
Total Suspended Solids	30 mg/L	45 mg/L
Ammonia (as Nitrogen):		
▪ *Apr-May (spring)*	NA	NA
▪ *Jun-Sep (summer)*	7.4 mg/L	NA
▪ *Oct-Nov (fall)*	NA	NA
▪ *Dec-Mar (winter)*	NA	NA
Fecal Coliform	200 org./100 ml (2)	200 org./100 ml (2)
***pH Range** – Standard Units*	6.0 - 9.0	6.0 - 9.0
Dissolved Oxygen	6.0 mg/L	NA
Total Residual Chlorine	0.038 mg/L (2)	NA
Total Phosphorus (4)	1.0 mg/L	1.0 mg/L

* Discharge and limitations are subject to change pending completion of the Total Maximum Daily Load (TMDL) for the Long Prairie River (see below).

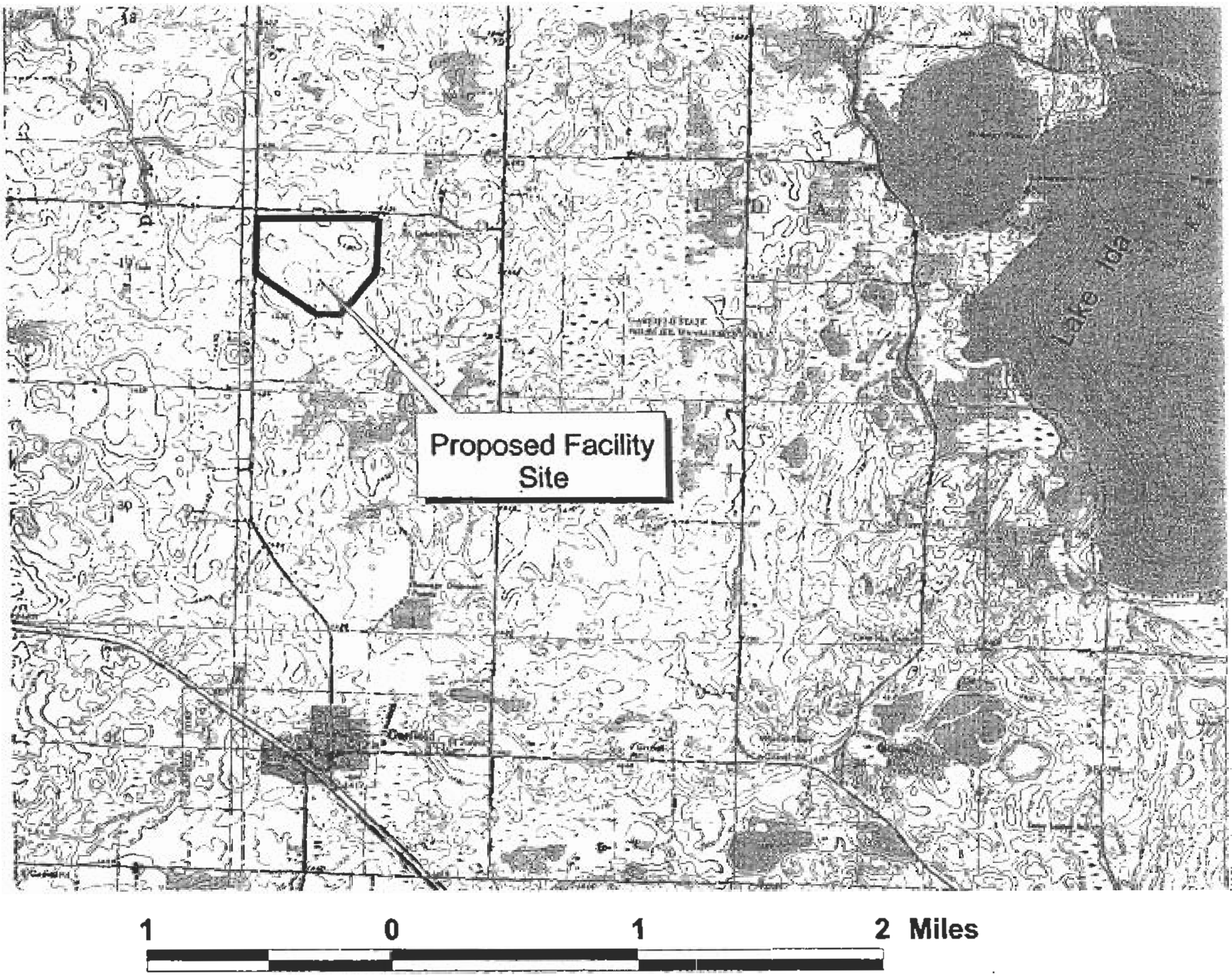
(1) Discharge permitted during pre-defined periods in the spring and fall. For northern Minnesota (MPCA North District) these periods are April 1 – June 30 and September 1 – December 15.

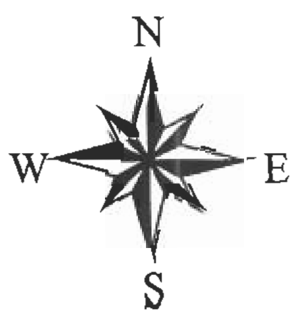
(2) Applicable April 1 through October 31. If chlorine is used to achieve the effluent limitation for fecal coliform group organisms, then dechlorination must also be provided.

(3) For both sites, a phosphorus limit is required under Part 7050.0211, subp. 1a because the discharge of effluent is directly to or affects a lake. If additional review establishes that more protection is warranted to protect lake quality, a limit less than 1.0 mg/L may be required.

(4) Phosphorus loads from point and nonpoint sources to the Long Prairie River contribute to eutrophication problems and possible occurrences of low dissolved oxygen in the river. Preliminary indications are that phosphorus reduction will be required for a new discharge to the Long Prairie River. Consider the 1.0 mg/L as a tentative upper limit, pending completion of the TMDL study and formal review by MPCA staff. Phosphorus has been identified as a pollutant of concern in all basins where the MPCA has initiated basin planning efforts. In some basins, such as the Minnesota and St. Croix, planning and goal setting efforts have called for dramatic reductions in basin-wide phosphorus loading to help meet a TMDL (lower Minnesota River) or "no net increase in phosphorus loading" to protect current water quality (Lake St. Croix). As other basins progress in their planning and goal setting efforts we anticipate similar recommendations. These recommendations will be used to help determine whether phosphorus limits may be required in future permits. In addition, methodology is being developed to allow for the listing of nutrient-impaired waters on the Clean Water Act Section 303(d) [TMDL] list and ambient nutrient criteria are under development for lakes and rivers as a part of nationwide efforts to reduce nutrient loading to surface waters. This suggests that it is increasingly likely that facilities that do not currently have phosphorus limits in their current permits will have them included in future permits.

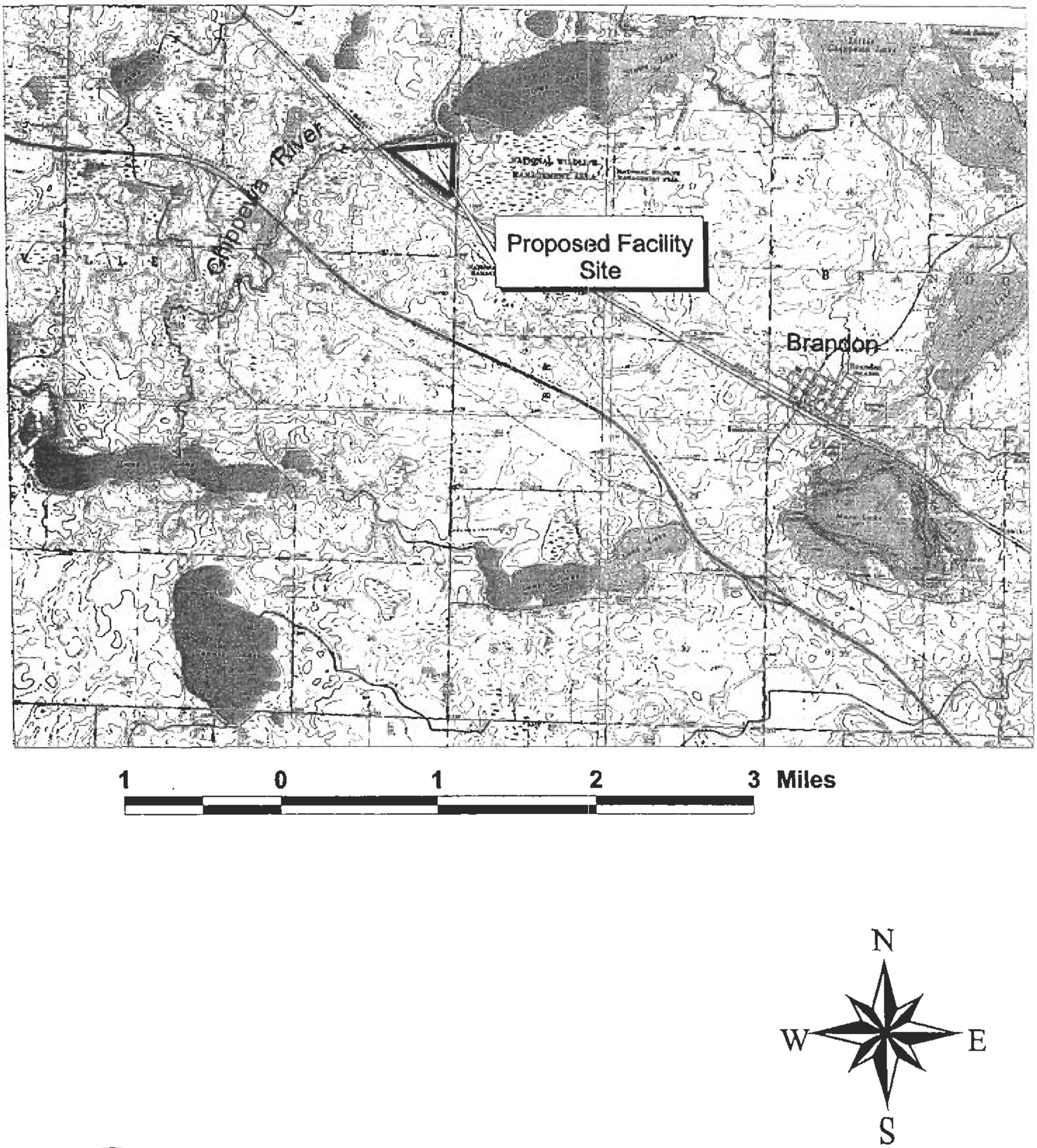
Discharge Alternative A
County Ditch 23 to Lake Ida





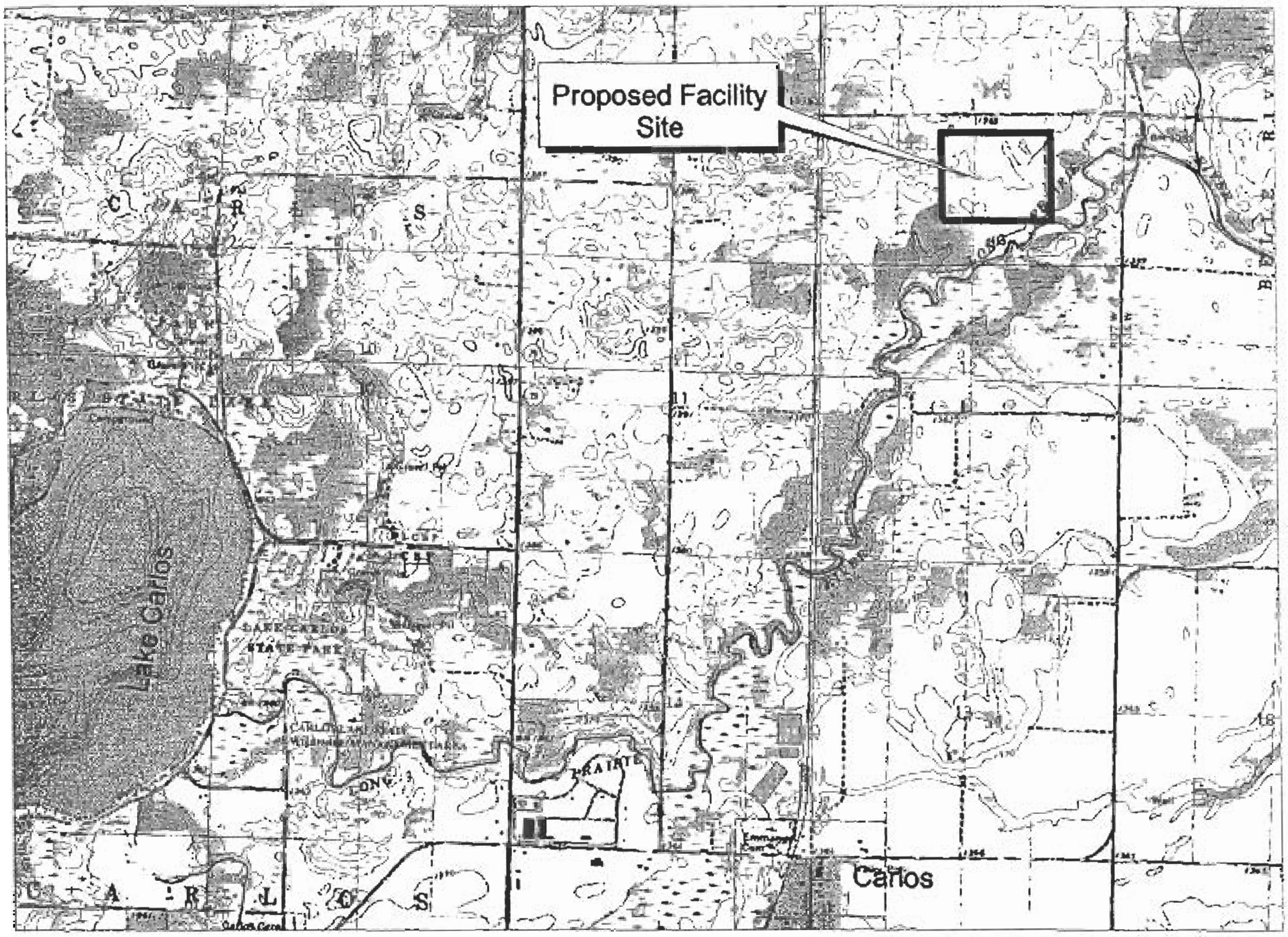
Minnesota Pollution Control Agency

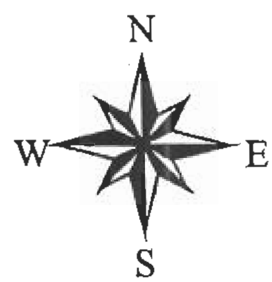
Discharge Alternative B
Chippewa River



Minnesota Pollution Control Agency

Discharge Alternative C
Long Prairie River





Minnesota Pollution Control Agency

470A696-0300

October 28, 2002

Todd County Soil & Water Conservation District
607 9th Street NE
Long Prairie, MN 56347

Attention: Kitty Tepley – Comprehensive Local Water Plan Coordinator

Subject: Central Lake Region Joint Powers Board

Regarding: Proposed Regional Wastewater Project

Reference: September 5, 2002 Todd County Soil & Water Conservation District Letter with Todd County Board of Commissioners Resolution and Todd County Soil and Water Conservation District Resolution

Dear Ms. Tepley:

The Central Lake Region Joint Powers Board is comprised of representatives from Brandon, Carlos, Leaf Valley, and Miltona Townships. This joint powers board is formed to plan for sanitary sewer service for areas within our townships. This joint powers board is the latest in a series of efforts to protect water resources from failing septic systems by providing central collection and treatment of sanitary sewer. These efforts were initiated in the early 1970's with the formation of the Alexandria Lake Area Sanitary District (ALASD) and have continued to the 2001-2002 Lake Ida project. During this period there have been tens of millions of dollars spent to protect lakes that are upstream of the Long Prairie River.

The proposed plan calls for wastewater service to be provided to the lake areas of Miltona, Irene, Chippewa, Whiskey, and Devils Lakes. The current plan calls for a gravity collection system, pressurized interceptor sewer, and a mechanical treatment facility with discharge to the Long Prairie River. The proposed treatment plant will provide a similar quality effluent to that of the Alexandria Lake Area Sanitary District's (ALASD) treatment plant.

We recognize the value of the Long Prairie River and share in your desire to protect this resource. We also recognize that the Long Prairie River is on the Impaired Waters List and that there is a Total Maximum Daily Load (TMDL) process currently underway on the Long Prairie River. We look forward to having the input that these processes, as well as the environmental and permitting processes, will provide. From this input and the current technology available we will be able to determine the most environmentally sound, technically feasible, and cost effective alternative for wastewater treatment.

We all know the growth that is occurring in this area and that one of the main reasons for this growth are the water resources. The Central Lake Region Joint Powers Board recognizes the challenges that this growth brings and feels that that by establishing partnerships we can find the balance between growth and protection of water resources. By this joint powers board working in conjunction with Todd and Douglas Counties a powerful partnership can be created that could resolve some of the current problems with the Long Prairie River as well as assure that it is protected into the future. We hope that you will be receptive to such a partnership.

If you have any questions, don't hesitate to contact anyone of the joint powers board members listed below or Dan Folsom of Widseth Smith Nolting in Alexandria at (320) 762-8149.

Sincerely,

Don Buse

Don Buse – Brandon Township

Bill Krivanek

Bill Krivanek – Carlos Township

Jay Baldwin

Jay Baldwin – Leaf Valley Township

Jerome Haggenmiller

Jerome Haggenmiller – Miltona Township

c: Douglas County Commissioners
Todd County Commissioners

Y 10 H 646-0300

Todd Soil & Water Conservation District

Phone: (320) 732-2644 Fax: (320) 732-2565

607 9th St. NE
Long Prairie, MN 56347

September 5, 2002

TO: Township Officers Potentially Involved in the Proposed New Sewer District

FROM: Kitty Tepley, Comprehensive Local Water Plan Coordinator

SUBJECT: Discharge Location for Proposed New Wastewater Facility

The Todd Soil & Water Conservation District has been a participant in the Clean Water Partnership program since 1997, and has completed very successful projects for Phase One and most of Phase Two, on the Long Prairie River, totaling close to $800,000 in CWP and matching funds. In addition, we have been tentatively approved for a Continuation Grant, the amount of which, will be determined by the current budget constraints. Needless to say, after making so much progress in maintaining and improving the water quality in the river and its tributaries, we were shocked to learn that a new wastewater facility is proposing to discharge into the Long Prairie River, with the potential to degrade everything we have accomplished.

On August 12, 2002 I attended the meeting, where the four townships located in Douglas County formed a joint powers board for the purpose of establishing this new sewer district. Three possible locations for the facility and discharge points have been proposed. All three are located outside the preliminary boundaries of the sewer district.. The first into the Chippewa River in Evansville Township, the second into ditch 23 that flows into Lake Ida in Ida Township and the third into the Long Prairie River located in Carlos Township, in an area not served by the proposed sewer district. The solution to take the water quality problems from the lakes and give them to someone else, is not a solution at all. The proposed discharge to the Long Prairie River is apparently the most inexpensive and seems to be the one that the cost estimates are based on, for the landowners involved.

To complicate matters further, the proposed discharge point on the Long Prairie River is located in an area of the river, below the City of Carlos, that is experiencing Dissolved Oxygen levels low enough to place it on the impaired waters list.

In response to this proposed new discharge, the Todd County Soil & Water Conservation District Board of Supervisors, at their regular August 15th board meeting, approved and adopted attachment one, a resolution in opposition to this discharge. In addition, at their regular board meeting on September 3, 2002, the Todd County Board of Commissioners approved and adopted attachment two, also a resolution in opposition to this proposed discharge and in it, have made recommendations to the Minnesota Pollution Control Agency as to the handling of any future requests for permits to discharge to the Long Prairie River.

Its not that we don't support the effort to improve the water quality in the lakes located in the area of the proposed sewer district, we just can not understand how it can be justified to damage another equally important natural resource.

There must ~~be land application alternatives that~~ would benefit from this potentially nutrient rich water, instead of just dumping into another water body where it will do more harm.

In their attached resolution, the Todd County Commissioners request that the Minnesota Pollution Control Agency evaluate all future discharges in the Long Prairie River Watershed, using methodologies in conformance with the TMDL that is being developed, and that all other "feasible and prudent" alternatives be investigated, using guidelines in place for Outstanding Resource Value Waters.

In the draft copy of the Crow Wing, Long Prairie and Red Eye Rivers portion of the Upper Mississippi Basin Plan, the committee has approved language that reads, in part, "As valuable resources, efforts should be undertaken to protect, maintain or enhance the existing water quality of these surface water resources with no further degradation acceptable".

In the past it has been convenient and relatively inexpensive to discharge to surface waters in Minnesota, simply because we do have an abundance. However, we can not continue this method and ever hope to restore and maintain the water quality we have all been working so hard to achieve.

I sincerely encourage you to investigate new and innovative methods of wastewater disposal that do not include discharges to other water bodies.

Thank you

Sincerely

Kitty Tepley

Kitty Tepley
Comprehensive Local Water Plan Coordinator
Todd Soil & Water Conservation District

CC: Douglas County Commissioners
Widseth, Smith & Nolting
Emily Wolf, Douglas County Water Planner
Ida Township
Evansville Township
Chippewa River CWP

Attachment # 1

TODD SOIL & WATER CONSERVATION DISTRICT RESOLUTION

RESOLUTION IN OPPOSITION TO PROPOSED, NEW WASTEWATER FACILITY DISCHARGE TO THE LONG PRAIRIE RIVER

Resolution of the Todd County Soil & Water Conservation District Board

WHEREAS: The Long Prairie River is listed on the EPA's Clean Water Act 303(d) impaired waters list for Minnesota, and is in the process of completing the required Total Maximum Daily Load (TMDL) study, and

WHEREAS: Over $391,000 in Minnesota tax dollars and an equal matching amount of local, state and federal funding have been spent to improve and preserve the water quality of the Long Prairie River; and

WHEREAS: The Long Prairie River watershed already contains twelve (12) wastewater facilities that require a National Pollutant Discharge Elimination System (MPDES) permit, that could have their discharge limits affected by any additional discharges; and

WHEREAS: The Long Prairie River has been extensively monitored in the last 5 years for nutrient levels; has proven to be very susceptible to serious water quality problems by changes in the nutrient levels; and the monitoring data has shown that the majority of the water quality problems are due to point source discharges, that include wastewater facility discharges; and

WHEREAS: Although Todd County Soil & Water Conservation District Board supports the effort to improve the water quality of the lakes involved in the proposed new sewer district, located in Douglas County, we can not condone the damage that would be incurred by discharging to an equally important natural resource.

THEREFORE BE IT RESOLVED: That the Todd County Soil & Water Conservation District Board is strongly opposed to any new wastewater facility discharges to the Long Prairie River.

BE IT FURTHER RESOLVED: That the Todd County Soil & Water Conservation District Board encourages the proposed sewer district to investigate and pursue new and innovative methods of wastewater disposal that do not include discharges to water bodies.

WHEREUPON the above resolution was adopted at the August 15, 2002 Regular Board Meeting.

Wayne W. Wendel
Wayne Wendel, Chairman

Tom Williamson
Tom Williamson, Vice Chairman

Leland Buchholz
Leland Buchholz, Secretary

Dale Kattermagen
Dale Kattermagen, Treasurer

Norman Krause
Norman Krause, Member

Attachment # 2

TODD COUNTY BOARD OF COMMISSIONERS RESOLUTION

RESOLUTION IN OPPOSITION TO PROPOSED, NEW WASTEWATER FACILITY DISCHARGE TO THE LONG PRAIRIE RIVER

Resolution of the Todd County Board of Commissioners

WHEREAS: The Long Prairie River is listed on the EPA's Clean Water Act 303(d) impaired waters list for Minnesota, and is in the process of completing the required Total Maximum Daily Load (TMDL) study, and
WHEREAS: Over $391,000 in Minnesota tax dollars and an equal matching amount of local, state and federal funding have been spent to improve and preserve the water quality of the Long Prairie River, and a similar Continuation Grant has been approved for the years 2004-2006; and
WHEREAS: The Long Prairie River watershed already contains twelve (12) wastewater facilities that require a National Pollutant Discharge Elimination System (MPDES) permit, that could have their discharge limits affected by any additional discharges; and
WHEREAS: The Long Prairie River has been extensively monitored in the last 5 years for nutrient levels. Has proven to be very susceptible to serious water quality problems by changes in the nutrient levels; and the monitoring data has shown that the majority of the water quality problems are due to point source discharges, that include wastewater facility discharges; and
WHEREAS: Although Todd County Board of Commissioners support the effort to improve the water quality of the lakes involved in the proposed new sewer district, located in Douglas County, we can not condone the damage that would be incurred by discharging to an equally important natural resource, the Long Prairie River.

THEREFORE BE IT RESOLVED: That the Todd County Board of Commissioners is strongly opposed to any new wastewater facility discharges to the Long Prairie River.

BE IT FURTHER RESOLVED: That the Todd County Board of Commissioners encourages the proposed sewer district to investigate and pursue new and innovative methods of wastewater disposal that do not include discharges to water bodies.

BE IT FURTHER RESOLVED: That the Todd County Board of Commissioners requests the Minnesota Pollution Control Agency to evaluate all future discharges to the Long Prairie River using methodologies in conformance with TMDL's that are being developed and that all other "feasible and prudent" alternatives are investigated, using guidelines in place for Outstanding Resource Value Waters.

WHEREUPON the above resolution was adopted at the September 3, 2002 Regular Board Meeting.

H. Dan Anyney 9-3-02

Todd County Board Chairman | Date

Karen Busch 9-3-02

Todd County Auditor/Treasurer | Date

1

RESOLUTION NO. 03-14

RESOLUTION GRANTING PERMISSION FOR THE ALASD TO BE NAMED AS THE SELECTED TREATMENT ALTERNATIVE FOR THE BRANDON TOWNSHIP, CARLOS/LEAF VALLEY/MILTONA TOWNSHIPS, AND LAGRAND/MOE TOWNSHIPS WASTEWATER FACILITY PLANS

WHEREAS, the purpose of the ALASD is for the protection of the public health, safety and welfare of the area, for the preservation and best use of waters and other natural resources of the state, and

WHEREAS, population growth is occurring, and will continue to occur, on or nearby water resources within the ALASD as well as in local government units adjacent to the ALASD, and

WHEREAS, there are serious problems with disposal of sewage on or near water resources within Brandon, Carlos, LaGrand, Leaf Valley, Miltona, and Moe Townships which cannot be effectively or economically dealt with by existing government units under existing laws, and

WHEREAS, the Douglas County townships of Brandon, Carlos, LaGrand, Leaf Valley, and Miltona have entered into a joint powers agreement to form the Central Lake Region Sanitary District (CLRSD), and

WHEREAS, Wastewater Facility Plans have been submitted to the Minnesota Pollution Control Agency (MPCA) on behalf of Brandon Township, Carlos/Leaf Valley/Miltona Townships, and LaGrand/Moe Townships to address the problems of continued growth and proper disposal of sewage, and

WHEREAS, it appears the most technically feasible and cost effective wastewater treatment alternative for the Brandon Township, Carlos/Leaf Valley/Miltona Townships, and LaGrand/Moe Townships Wastewater Facility Plans would be to contract with the ALASD for treatment services under the auspices of the Central Lake Region Sanitary District.

WHEREAS, the ALASD has an exemplary twenty-five year record of collecting and treating wastewater, and,

WHEREAS, the aforementioned townships have requested permission to list the ALASD as the selected treatment alternative by letter dated March 24, 2003.

NOW THEREFORE BE IT RESOLVED BY THE BOARD OF THE ALEXANDRIA LAKE AREA SANITARY DISTRICT that Brandon Township, Carlos/Leaf Valley/Miltona Townships, and LaGrand/Moe Townships may name connection to the ALASD as the selected treatment alternative in their respective Wastewater Facility Plans contingent upon the townships passing a resolution adopting the Central Lake Region Sanitary District Special Legislation.

BE IT FURTHER RESOLVED that connection to the ALASD system by Brandon, Leaf Valley, Miltona, and Moe Townships shall not occur without prior ALASD Board approval and written agreement.

BE IT FURTHER RESOLVED that in approving this resolution the ALASD Board is in no way committing the ALASD to accept for treatment waste water from the Central Lake Regions Sanitary District, or any of it's members.

Adopted this 9th day of April, 2003 by the following vote:

Yes: Clasen, Eldevik, Flesner, Hildebrandt, Jensen, Johnson, Nelson, Nolting, Thalman, Waldorf

No:

Paul Nelson
Paul Nelson, Chairman

Don Nolting
Don Nolting, Secretary

DOUGLAS COUNTY LAKES ASSOCIATION RESOLUTION

The purpose of this resolution is to support the continuing effort of individual Lake Association members from Brandon, Carlos, LaGrand, Leaf Valley and Miltona Townships as they work with Douglas County and the Alexandria Lakes Area Sanitary District in constructing wastewater treatment capacity to handle the central treatment needs of the new Central Lakes Region Sanitary District.

RESOLUTION

WHEREAS, protection of water resources is an important priority for the Douglas County Lakes Association and its members.

WHEREAS, population growth is occurring, and will continue to occur, in areas on or near Douglas County water resources.

WHEREAS, there are serious problems with disposal of sewage on or near water resources which cannot be effectively or economically dealt with by existing government units under existing laws.

WHEREAS, Douglas County has adopted a resolution supporting central wastewater treatment as the preferred method of treatment.

WHEREAS, the Douglas County townships of Brandon, Carlos, LaGrand, Leaf Valley and Miltona have formed the Central Lakes Region Joint Powers Board (CLRJPB) and have submitted a request to the Minnesota State Legislature to form the Central Lakes Region Sanitary District (CLRSD).

WHEREAS, the CLRSD intends to provide sanitary sewer service to portions of Douglas County that are within the CLRJPB member townships but outside the Alexandria Lakes Area Sanitary District (ALASD) boundary.

WHEREAS, the ALASD has over thirty years of sanitary sewer planning experience and is evaluating the potential expansion of the existing ALASD central wastewater treatment facility to handle future needs.

NOW THEREFORE, BE IT RESOLVED BY THE DOUGLAS COUNTY LAKE ASSOCIATION THAT THIS BOARD SUPPORTS THE EFFORTS OF THE CLRJPB IN FORMING THE CLRSD AND THE RELATED PROPOSED ALASD TREATMENT PLANT EXPANSION TO CENTRALLY TREAT WASTEWATER GENERATED FROM CLRSD.

Mike Bump, president — Dated this day

Mike Bump — 3-12-03

DOUGLAS COUNTY
LAKES ASSOCIATION
P.O. Box 1121 • Alexandria, MN 56308-1121

Douglas County Lakes Association
Board of Directors Meeting
Wednesday, March 12, 2003 – 4:30 p.m.
Douglas County Public Works Building, Alexandria, MN

President Bump called the meeting to order at 4:30 p.m. with the following people present: Mike Bump - Darling, John Davis - Miltona, Nancy Exley - Smith, Josh Zimmerman- Douglas County Land and Resource, Dan Ness – Vermont, Verne Weiss - Lake Irene, John Stone- Lobster, Dennis Cin- L'HommeDieu, Patti McMahon- L'HommeDieu,Vern Lorsung – Latoka, Dick Kuehn – Miltona, Bud Nielsen – Ida, Arlan Kakac, Chuck Pugh – Winona, Clarence Wolf – Mary, Virgil Nelson – Victoria, Frank Koplin – Geneva, Morrie Haugee – Latoka, Dick Mohagen – Chippewa, Bob Reynolds – Devils/Little Chip, Jane Landman – Darling, John Mingus - Cowdry and Executive Secretary Dorothy Klemann.

Motion by Chuck Pugh, second by Bob Reynolds to approve the February 2003 minutes with the following change: Scott Anderson, not Johnston, was retained by the county. Motion carried.

Treasurer Merrill Pedersen was not present.

John Davis spoke to the group regarding a resolution to support the construction of a wastewater treatment capacity to handle the central treatment needs of the new Central Lakes Region Sanitary District. Verne Weise moved and ~~John Davis~~ DICK KUEHN seconded endorsing this resolution. Carried.

John Davis spoke of the effort to save the Girt Scout Camp at Smoky Timbers. He urged the area lakes and individuals to consider making a contribution.

John also talked about the Jr Sportsmen and the loon nesting platforms. He had brochures for anyone interested.

Patti McMahon and Dennis Cin of Lake L'HommeDieu spoke of the Kluver Landfill permit request for a demolition landfill. The ground water flow is

CENTRAL LAKE REGION JOINT POWERS BOARD RESOLUTION NO. ______

ALEXANDRIA LAKE AREA SANITARY DISTRICT BOARD RESOLUTION NO. ______

DOUGLAS COUNTY BOARD RESOLUTION NO. ______

RESOLUTION OF THE BOARDS OF THE CENTRAL LAKE REGION JOINT POWERS, THE ALEXANDRIA LAKE AREA SANITARY DISTRICT, AND DOUGLAS COUNTY ENDORSING THE FORMATION OF THE CENTRAL LAKE REGION SANITARY DISTRICT AND SUPPORT SANITARY SEWER PLANNING

WHEREAS, protection of water resources is important to all government units.

WHEREAS, population growth is occurring, and will continue to occur, on or near water resources within the jurisdiction of the government units.

WHEREAS, the government units are planning for ways to accommodate the population growth.

WHEREAS, there are serious problems with disposal of sewage on or near water resources which cannot be effectively or economically dealt with by existing government units under existing laws.

WHEREAS, the Douglas County townships of Brandon, Carlos, LaGrand, Leaf Valley, and Miltona have entered into a joint powers agreement to form the Central Lake Region Sanitary District (CLRSD).

WHEREAS, the Alexandria Lake Area Sanitary District has over thirty years of sanitary sewer planning experience.

WHEREAS, growth is occurring within Douglas County, and outside the townships represented by ALASD and CLRSD.

WHEREAS, sanitary sewer planning will be best served by a collective effort of government units.

WHEREAS, the government units will be unified when discussing sanitary sewer planning with regulatory agencies.

NOW THEREFORE BE IT RESOLVED that these board's hereby support and endorse:
a) "the formation of the Central Lake Region Sanitary District."
b) "the proposed legislation creating a sanitary sewer district."
c) "the CLRSD Advisory Council and will appoint members to serve on the Advisory Council.

BE IT FURTHER RESOLVED that these board's will attempt to provide and maintain uniform and consistent positions on local environmental issues.

CENTRAL LAKE REGION JOINT POWERS

Adopted this ___________day of _______________, 2002 by the following vote:

Yes ____

No ____

Central Lake Region Joint Powers Board

By ___________________________
Its Chair

Attest:

____

ALEXANDRIA LAKE AREA SANITARY DISTRICT

Adopted this __________day of ______________, 2002 by the following vote:

Yes ____

No ____

Alexandria Lake Area Sanitary District

By _________________________
Its Chair

Attest:

____

DOUGLAS COUNTY

Adopted this __________day of ______________, 2002 by the following vote:

Yes ____

No ____

Douglas County

By _________________________
Its Chair

Attest:

____

FLAHERTY & HOOD

Professional Association

NOV 3 2003

October 31, 2003

Faye Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

BY FAX AND U.S. MAIL

Re: Long Prairie River Total Maximum Daily Load (TMDL)
Petition for Contested Case Hearing by Alexandria Lake Area Sanitary District (ALASD)

Dear Ms. Sleeper:

I have received your October 23, 2003 letter notifying Mr. Nelson and myself of the delay in consideration of the above matter until the November meeting of the MPCA Citizens' Board. Thank you for making that accommodation.

From conversations with you and with Mr. Nelson, my understanding is that the two of you have been discussing a possible settlement that may result in the withdrawal of the contested case petition filed by Mr. Nelson on behalf of the ALASD on August 15, 2003. The following is a description of the terms upon which the ALASD is willing to withdraw its request for a contested case hearing on the Long Prairie River TMDL. It should be noted that, in the event the Environmental Protection Agency (EPA) denies permission for the MPCA to establish a 4D use classification, this offer is null and void and ALASD reserves the right to continue with its contested case hearing request on any or all of the issues addressed below.

Issue 1: *Petitioner believes that rulemaking is necessary to complete a TMDL and establish Wasteload Allocations and Load Allocations. Rulemaking provides the legal authority and assurance of due process for all stakeholders. The MPCA says rulemaking is not necessary for the Long Prairie River TMDL Study.*

ALASD is willing to withdraw its contested case hearing request on this issue, conditional upon acceptable resolution of Issues 2 and 3, below.

Issue 2: *Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets in the Long Prairie River Study will effectively (de facto) establish Phosphorus Water Quality Standards for the Long Prairie River without following the proper process. As such these goals/guidelines/targets should not be included in the TMDL. The MPCA disagrees.*

ALASD provided a non-exclusive list of references to these items in correspondence to you and Pat Shelito, dated August 19, 2003. In your letter of September 25, 2003, you indicated that the above items will be removed from the body of the TMDL document and instead be placed in the appendix, with a statement that the appendix is for information purposes only, and is not part of the TMDL study. Pending this action, and conditional upon acceptable resolution of Issue 3, below, ALASD is willing to withdraw its contested case hearing request on this issue.

Issue 3: *The Long Prairie River from the headwaters of Lake Carlos (mile 92.0) to Long Prairie (mile 47.8) should be delisted. According to the TMDL Study the dissolved oxygen impairment is caused by a naturally occurring condition. Therefore, an amended water quality standard should be established for the Long Prairie reflecting this natural condition. The MPCA disagrees.*

The ALASD submits that the stretch of the Long Prairie River from Lake Carlos to Spruce Creek, ID # 07010108-506, should be de-listed because the impairment due to low dissolved oxygen levels and ammonia toxicity is caused by natural conditions, not by point or nonpoint source discharges.

The enclosed memorandum from Steve Shermer, dated October 21, 2003, analyzes the legal basis for de-listing where a water body is shown to be impaired by natural conditions. As noted on page 4 of that memorandum, Minn. R. 7050.0170 provides for the use of background levels of pollutants in place of water quality standards for purposes of controlling the addition of the same pollutants to those waters. In this particular stretch, no reductions in oxygen-demanding substances are prescribed for any point sources. The TMDL study itself, therefore, provides the information justifying the reclassification of this stretch to a new category, 4D, for impaired waters that will not receive TMDL's because the impairment is caused by natural conditions.

My understanding is that the MPCA is in contact with the EPA for clearance to create the 4D classification, which would then be applied to this stretch of river. Upon adequate written confirmation from the EPA of this clearance, and appropriate official action by the MPCA to re-classify the use of this stretch of river to 4D and remove it from the 2004 303(d) Impaired Waters list, ALASD is willing to withdraw its contested case hearing request on this issue.

Issue 4: *The Long Prairie River from the City of Long Prairie (mile 47.8) to the Crow Wing River (mile 0.2) should be delisted. According to the TMDL Study the cause of the impairment is point source discharges. Through existing permitting authority WLA should be applied to these point sources and if necessary WLA should be applied permitted non-point CAFO's. The MPCA disagrees.*

ALASD is willing to withdraw its contested case hearing request on this issue, conditional upon acceptable resolution of Issues 2 and 3, above.

Issue 5: *Lake Carlos is not in the defined TMDL Study area and therefore should not receive a load allocation. In addition, Lake Carlos is not an impaired water body and under the law cannot receive a load allocation for that reason. The MPCA, as a matter of fact, disagrees.*

ALASD is willing to withdraw its contested case hearing request on this issue, conditional upon acceptable resolution of Issues 2 and 3, above.

Issue 6: *Facility plans previously submitted to the MPCA have proposed a treatment plant on the Long Prairie River. This proposed plant was not included in any modeling done for the TMDL. Petitioner claims such modeling is necessary to for a comprehensive TMDL. The MPCA disagrees.*

In your letter of September 25, 2003, the MPCA offered to conduct modeling of the new facility, but not to include the model in the TMDL study. ALASD agrees with this decision. If MPCA provides the results of the stand-alone modeling to the ALASD within 60 days, or such other reasonable time agreed to by the parties, ALASD is willing to withdraw its contested case hearing request on this issue, conditional upon acceptable resolution of Issues 2 and 3, above.

Conclusion

Based on the foregoing and the attached memorandum by Mr. Shermer, the ALASD respectfully requests that the MPCA initiate the appropriate process to reclassify the stretch of the Long Prairie River from Lake Carlos to Spruce Creek, identified as 07010108-506, to Category 4D for impairment caused by natural conditions, and to remove this stretch from the 2004 303(d) Impaired Waters list.

The ALASD also respectfully requests that the Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets included in the TMDL study be removed from the body of the study itself and instead included as an appendix.

With proper written confirmation of the resolution of these issues, the ALASD would then request withdrawal of its contested case hearing request on the Long Prairie River TMDL. As we have previously discussed, I have scheduled a meeting among ALASD, MPCA, and John Hall and myself for Wednesday, November 5th at 4:00 PM in Conference Room 6-2 at the MPCA offices.

If you wish to discuss any of these items in advance of that meeting, please give me a call at **651-225-8840**.

Yours very truly,

FLAHERTY & HOOD, P.A.

Steven W. Nyhus
Attorney for the Alexandria Lake Area Sanitary District (ALASD)

SWN:slc

cc: Bruce A. Nelson, Executive Director, ALASD
Jerry Haggenmiller, Chairman, CLRSD
John C. Hall, Hall & Associates

FLAHERTY & HOOD, P.A.

444 Cedar Street, Suite 1200
St. Paul, MN 55101
(651) 225-8840
(651) 225-9088 (Fax)

TO: Faye Sleeper, Water Policy and Coordination Section Manager
Minnesota Pollution Control Agency

FAX: 1-651-297-8676

DATE: October 31, 2003

FROM: Steven W. Nyhus

SUBJECT: Long Prairie River Total Maximum Daily Load
Petition for Contested Case Hearing by Alexandria Lake Area Sanitary District (ALASD)

TRANSMISSION BY FACSIMILE

NUMBER OF PAGES (including cover page): 16

COMMENTS:

FOR TRANSMISSION PROBLEMS, PLEASE CALL: Shelly Czech @ (651) 225-8840

FLAHERTY & HOOD

Professional Association

October 31, 2003

Faye Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

BY FAX AND U.S. MAIL

**Re: Long Prairie River Total Maximum Daily Load (TMDL)
Petition for Contested Case Hearing by Alexandria Lake Area Sanitary District (ALASD)**

Dear Ms. Sleeper:

I have received your October 23, 2003 letter notifying Mr. Nelson and myself of the delay in consideration of the above matter until the November meeting of the MPCA Citizens' Board. Thank you for making that accommodation.

From conversations with you and with Mr. Nelson, my understanding is that the two of you have been discussing a possible settlement that may result in the withdrawal of the contested case petition filed by Mr. Nelson on behalf of the ALASD on August 15, 2003. The following is a description of the terms upon which the ALASD is willing to withdraw its request for a contested case hearing on the Long Prairie River TMDL. It should be noted that, in the event the Environmental Protection Agency (EPA) denies permission for the MPCA to establish a 4D use classification, this offer is null and void and ALASD reserves the right to continue with its contested case hearing request on any or all of the issues addressed below.

Issue 1: *Petitioner believes that rulemaking is necessary to complete a TMDL and establish Wasteload Allocations and Load Allocations. Rulemaking provides the legal authority and assurance of due process for all stakeholders. The MPCA says rulemaking is not necessary for the Long Prairie River TMDL Study.*

ALASD is willing to withdraw its contested case hearing request on this issue, conditional upon acceptable resolution of Issues 2 and 3, below.

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The ALASD submits that the stretch of the Long Prairie River from Lake Carlos to Spruce Creek, ID # 07010108-506, should be de-listed because the impairment due to low dissolved oxygen levels and ammonia toxicity is caused by natural conditions, not by point or nonpoint source discharges.

The enclosed memorandum from Steve Shermer, dated October 21, 2003, analyzes the legal basis for de-listing where a water body is shown to be impaired by natural conditions. As noted on page 4 of that memorandum, Minn. R. 7050.0170 provides for the use of background levels of pollutants in place of water quality standards for purposes of controlling the addition of the same pollutants to those waters. In this particular stretch, no reductions in oxygen-demanding substances are prescribed for any point sources. The TMDL study itself, therefore, provides the information justifying the reclassification of this stretch to a new category, 4D, for impaired waters that will not receive TMDL's because the impairment is caused by natural conditions.

My understanding is that the MPCA is in contact with the EPA for clearance to create the 4D classification, which would then be applied to this stretch of river. Upon adequate written confirmation from the EPA of this clearance, and appropriate official action by the MPCA to re-classify the use of this stretch of river to 4D and remove it from the 2004 303(d) Impaired Waters list, ALASD is willing to withdraw its contested case hearing request on this issue.

Issue 4: *The Long Prairie River from the City of Long Prairie (mile 47.8) to the Crow Wing River (mile 0.2) should be delisted. According to the TMDL Study the cause of the impairment is point source discharges. Through existing permitting authority WLA should be applied to these point sources and if necessary WLA should be applied permitted non-point CAFO's. The MPCA disagrees.*

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Issue 5: *Lake Carlos is not in the defined TMDL Study area and therefore should not receive a load allocation. In addition, Lake Carlos is not an impaired water body and under the law cannot receive a load allocation for that reason. The MPCA, as a matter of fact, disagrees.*

ALASD is willing to withdraw its contested case hearing request on this issue, conditional upon acceptable resolution of Issues 2 and 3, above.

Issue 6: *Facility plans previously submitted to the MPCA have proposed a treatment plant on the Long Prairie River. This proposed plant was not included in any modeling done for the TMDL. Petitioner claims such modeling is necessary to for a comprehensive TMDL. The MPCA disagrees.*

US or provide 3 wks

In your letter of September 25, 2003, the MPCA offered to conduct modeling of the new facility, but not to include the model in the TMDL study. ALASD agrees with this decision. If MPCA provides the results of the stand-alone modeling to the ALASD within 60 days, or such other reasonable time agreed to by the parties, ALASD is willing to withdraw its contested case hearing request on this issue, conditional upon acceptable resolution of Issues 2 and 3, above.

US — contract w/ [illegible] we will need 3 yrs Growth

Conclusion

Based on the foregoing and the attached memorandum by Mr. Shermer, the ALASD respectfully requests that the MPCA initiate the appropriate process to reclassify the stretch of the Long Prairie River from Lake Carlos to Spruce Creek, identified as 07010108-506, to Category 4D for impairment caused by natural conditions, and to remove this stretch from the 2004 303(d) Impaired Waters list.

The ALASD also respectfully requests that the Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets included in the TMDL study be removed from the body of the study itself and instead included as an appendix.

With proper written confirmation of the resolution of these issues, the ALASD would then request withdrawal of its contested case hearing request on the Long Prairie River TMDL. As we have previously discussed, I have scheduled a meeting among ALASD, MPCA, and John Hall and myself for Wednesday, November 5th at 4:00 PM in Conference Room 6-2 at the MPCA offices.

If you wish to discuss any of these items in advance of that meeting, please give me a call at **651-225-8840**.

Yours very truly,

FLAHERTY & HOOD, P.A.

Steven W. Nyhus
Attorney for the Alexandria Lake Area Sanitary District (ALASD)

SWN:slc

cc: Bruce A. Nelson, Executive Director, ALASD
Jerry Haggenmiller, Chairman, CLRSD
John C. Hall, Hall & Associates

HALL & ASSOCIATES
1101 FIFTEENTH STREET NW
SUITE 203
WASHINGTON, DC 20005

Telephone: (202) 463-1166 *Facsimile: (202) 463-4207*

E-mail: hallanda@erols.com
Web site: http://www.hall-associates.com

MEMORANDUM

TO: John Hall

FROM: Steve Shermer

DATE: October 21, 2003

RE: Long Prairie River: 303(d) lists for waters impaired solely by natural or background sources; Process for de-listing waters improperly listed

Issue 1: **Where a waterbody does not meet numeric water quality standards solely by reason of natural or background levels of pollution, should this necessarily be considered a violation of water quality standards for purposes of CWA §303(d)?**

Analysis

A. Statutory Provisions

Section 303(d) of the Clean Water Act sets forth the basis of the TMDL (total maximum daily load) program. It states that:

> [e]ach state shall identify those waters within its boundaries for which the ***effluent limitations*** required by section 1311(b)(1)(A) and section 1311(b)(1)(B) of this title ***are not stringent enough to implement any water quality standard applicable to such waters***.

33 U.S.C. 1313(d)(1)(A) (emphasis added). For each water body identified:

> [e]ach State shall establish...the total maximum daily load, for those pollutants which the Administrator identifies under section 1314(a)(2) of this title as suitable for such calculation.

33 U.S.C. 1313(d)(1)(C).

This statutory provision has two prerequisites for determining when a TMDL is required: 1) effluent limits cannot ensure compliance with water quality standards, and 2) water quality exceedances exist. Given the section's reference to "effluent limitations", there is an ongoing debate over whether the 303(d) statutory language requires the listing of waterbodies impaired solely as a result of nonpoint source pollution, as opposed to point source pollution. By definition, effluent limitations only apply to point sources of pollution under the Clean Water Act. 33 U.S.C. 1362(11). Therefore, if there are no point sources on a waterbody, there are no sources for which effluent limits would apply. Consequently, if the statutory language regarding effluent limits was deemed to be the listing process "trigger", 303(d) would be inapplicable for such waterbodies. The statutory language does not clearly address this issue, and EPA has interpreted this provision more broadly. The TMDL implementing regulations direct that "TMDL's shall be established for ***all*** pollutants preventing or expected to prevent attainment of water quality standards as identified pursuant to paragraph (b)(1) of this section." 40 CFR 130.7(c)(1)(ii) (emphasis added).

Consistent with EPA's interpretation, the case of Pronsolino v. Nastri held that waterbodies impaired solely by non-point sources are subject to the listing process. Pronsolino v. Nastri, 291 F.3d 1123 (9th Cir. 2002). As explained by the court: "the phrase "not stringent enough" triggers the identification requirement...[even] for waters as to which effluent limitations do not apply at all to the pollution sources impairing the water." Id. at 1126. It should be noted that there was no distinction discussed by the Pronsolino court between waters impaired solely by reason of natural conditions and waters impaired solely by nonpoint sources. Whether natural conditions can violate water quality standards is largely dictated by state law.

B. Regulatory Provisions

Several of the distinctions made in the definitions of the TMDL regulations suggest that "man-made" or "man-induced" and natural/background sources pollution should be treated differently under the TMDL process. 130.2(c) defines "pollution" as "[t]he man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water." The distinction between man-induced and natural background sources in the regulatory definition of "pollution", and in the categories of pollutant loading, indicate that these sources are not similarly subject to the listing process. This is because no TMDL is developed for a "natural condition".[1] 40 CFR 130.7 states:

> Each State shall identify those water quality-limited segments still requiring TMDLs within its boundaries for which:
>
> (i) Technology-based effluent limitations required by sections 301(b), 306, 307, or other sections of the Act;
>
> (ii) More stringent effluent limitations (including prohibitions) required by either State or local authority preserved by section 510 of the Act, or Federal authority (law, regulation, or treaty); and
>
> (iii) Other ***pollution*** control requirements (e.g., best management practices) required by local, State, or Federal authority ***are not stringent enough to implement any water quality standards (WQS) applicable to such waters.***

40 CFR 130.7(b) (emphasis added). Each of these subsections refer to either effluent limitations, which are applicable only to point sources, or "other pollution control

[1] 40 CFR 130.2(e) defines "Load" or "loading" as "...either man-caused (pollutant loading) or natural (natural background loading)." In addition, the definition of "Load Allocation" states that, "[w]herever possible, natural and nonpoint source loads should be distinguished." 40 CFR 130.2. Thus, one only regulates, via a TMDL, the man-induced load. The natural conditions are assessed as a given, preexisting condition which must be considered in calculating the acceptable TMDL.

requirements". Since "pollution" is defined as only "man-induced" or "man-made", natural or background sources of "pollutants" apparently are not included in the categories of water quality impaired segments required to be listed under 130.7(b) or for which a TMDL calculation is needed.[2]

C. State Law Does Not Allow Natural Conditions To Be Classified As A Water Quality Standard Violation

Minnesota state law further supports that waterbodies impaired solely by natural or background sources of pollution should not be subject to 303(d) listing.[3] Section 7050.0170 of the Minnesota Administrative Code recognizes that:

> The waters of the state may, in a natural condition, have water quality characteristics or chemical concentrations approaching or exceeding the water quality standards. Natural conditions exist where there is no discernible impact from point or nonpoint source pollutants attributable to human activity or from a physical alteration of wetlands.

The provision goes on to state that:

> Where background levels exceed applicable standards, ***the background levels may be used as the standards*** for controlling the addition of the same pollutants from point or nonpoint source discharges ***in place of the standards***.

MN ADC 7050.0170 (emphasis added). This provision indicates that where background levels of pollutants exceed applicable numeric water quality standards, the background levels, not the numeric criteria, should be used as the relevant standard for determining whether impairment is occurring. Therefore, where "impairment" is due to natural

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[2] In addition, while the CWA definition of "pollution" only pertains to man-induced degradation, the definition of "pollutant" makes no such qualification. See, CWA §502(6). To the extent that impairments not caused by "pollutants" must be caused by "pollution", since "pollution" is defined as being "man-made", natural sources would not fit within the definition of "pollution". Therefore, natural sources of impairment would not trigger the listing requirements under this theory as well.

[3] Use of state law to address situations where impairment of water quality was due solely to natural levels of pollutants was confirmed by Michael Haire, EPA Office of Wetlands, Oceans, and Watersheds, in an October 15, 2003 telephone conversation. Haire was involved with drafting the 2004 Guidance for 303(d) lists and assessments.

conditions, no water quality exceedance exists, and such waters should not be subject to 303(d) listing requirement.[4]

D. EPA Guidance Supports Separate Consideration of Naturally "Impaired" Waters

EPA's July 21, 2003 *Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act* (hereinafter "EPA's Guidance") raises additional issues with respect to whether waters impaired solely by natural or background pollution need to be listed under 303(d). EPA is currently recommending that States combine their 305(b) reports and 303(d) lists into one 5-part "Integrated Report". EPA Guidance at 1. All of a State's waters are to be placed into one of 5 categories representing different levels of water quality attainment. *Id*. The Integrated Report provides for a comprehensive description of the status of all waters within a State. *Id*. at 2. Of most relevance are Categories 4 and 5. Category 4 represent waters which are impaired or threatened, but are not listed under 303(d) and no TMDL needs to be determined. *Id*. Category 5 waters are impaired or threatened and for which a TMDL is needed. "This category constitutes the Section 303(d) list that EPA will approve or disapprove under the CWA." *Id*. at 8. Consequently, this guidance suggests that there are categories of impaired waters which do not need to be listed.

The Minnesota Pollution Control Agency ("MPCA") has created an additional Category 4 sub-category which properly classifies the Long Prairie River. States can create additional sub-categories to their water quality lists. *Id*. at 3. Accordingly, MPCA has created sub-category 4D under the list of water quality assessment categories.

[4] See also, 40 CFR 130.3 (stating that water quality standards serve the dual purpose of establishing the water quality goals for a specific water body and serving as the regulatory basis for establishment of water quality-related treatment controls and strategies beyond the technology-based levels of treatment).

Assessment category 4D pertains to waters which are "[i]mpaired or threatened but do [not] require a TMDL because impairment [is] caused by natural conditions." The Long Prairie River qualifies under MPCA's own Assessment Categories as a Category 4D water which does not need to be listed under 303(d).

Conclusion

Whether waterbodies impaired solely due to natural or background sources of pollution must be listed under 303(d) is a matter of state law. Section 7050.0170 of the Minnesota Administrate Code provides that where background water quality conditions exceed applicable water quality standards, the background conditions may be used in place of the fixed water quality standards. Therefore, whether a waterbody is impaired should be determined in reference to the background water quality of the waterbody in question. Since the Long Prairie River is "impaired" solely by reason of natural conditions, it does not violate applicable water quality standards and was improperly listed under 303(d).

The qualification in the regulatory definition of "pollution" as being only "man-made" or "man-induced" provides additional evidence against requiring the listing of such waters. 130.7(b)(1) discusses listing waters for which effluent limits or other "pollution controls" are insufficient to meet water quality standards. By definition, these categories do not include naturally impaired waters. Therefore, listing such waterbodies should not be required and no TMDL needs to be developed.

Triggering the TMDL process for naturally impaired waterbodies would be pointless since there are no sources to which to allocate the impairing pollutant load and no way to remove what is already in the water (as opposed to limiting what would be discharged). In general, the CWA does not regulate natural conditions. Consequently, the Minnesota state water quality provision which allows natural water quality to substitute for otherwise applicable numeric standards in determining whether a waterbody is impaired is consistent with the purposes of the Clean Water Act.

Issue 2: What level of data quality must be demonstrated in order to modify the impaired waters list, and once satisfied, what is the process for de-listing waters improperly listed?

Analysis:

The level of data quality required for developing 303(d) lists of impaired waters is largely spelled out in the implementing regulations. 130.7(b)(5) provides that:

> Each State shall assemble and evaluate ***all existing and readily available water quality-related data and information*** to develop the list required by 130.7(b)(1) and 130.7(b)(2). At a minimum "all existing and readily available water quality-related data and information" includes but is not limited to all of the existing and readily available data and information about the following categories of waters:
>
> (i) Waters identified by the State in its most recent section 305(b) report as "partially meeting" or "not meeting" designated uses or as "threatened";
>
> (ii) Waters for which dilution calculations or predictive models indicate nonattainment of applicable water quality standards;
>
> (iii) Waters for which water quality problems have been reported by local, state, or federal agencies; members of the public; or academic institutions. These organizations and groups should be actively solicited for research they may be conducting or reporting. For example, university researchers, the United States Department of Agriculture, the National Oceanic and Atmospheric Administration, the United States Geological Survey, and the United States Fish and Wildlife Service are good sources of field data; and
>
> (iv) Waters identified by the State as impaired or threatened in a nonpoint assessment submitted to EPA under section 319 of the CWA or in any updates of the assessment.

40 CFR 130.7(b)(5) (emphasis added).[5] EPA guidance confirms this.[6] While a 1999 proposed rule by EPA indicated that "the best available data and information for each waterbody" should

[5] 130.7(d)(2) provides that "[t]he Regional Administrator shall approve a list developed under 130.7(b)...only if it meets the requirements of 130.7(b)."

be used and that "listing decisions...be based on high quality data that meets state procedures and will, if necessary stand up to legal challenge", this rule was never finalized. 64 Fed. Reg. 46018 – 19 (Aug. 23, 1999). To the extent that existing, readily available data is "the best available" and "high quality", the two standards are consistent.

Other provisions of the TMDL regulations provide additional avenues to offer more current and accurate information during the listing process or in order to revise a prior listing decision. 130.7(b)(6) requires the submission of documentation in support of a State's decision to list or not list a water. 40 CFR 130.7(b)(6). These lists are to include at a minimum:

> (i) A description of the methodology used to develop the list; and
>
> (ii) A description of the data and information used to identify waters, including a description of the data and information used by the State as required by § 130.7(b)(5); and
>
> (iii) A rationale for any decision to not use any existing and readily available data and information for any one of the categories of waters as described in § 130.7(b)(5); and
>
> (iv) Any other reasonable information requested by the Regional Administrator. ***Upon request by the Regional Administrator, each State must demonstrate good cause for not including a water or waters on the list. Good cause includes, but is not limited to, more recent or accurate data; more sophisticated water quality modeling; flaws in the original analysis that led to the water being listed in the categories in § 130.7(b)(5); or changes in conditions***, e.g., new control equipment, or elimination of discharges.

40 CFR 130.7(b)(6) (emphasis added). Section (iv) of this provision allows for the submission of more recent, accurate, or sophisticated data, or analyses which would indicate flaws in the original listing process.

Additionally, EPA's Guidance, along with 130.25, indicates that some form of QA/QC procedures are proper for 303(d) data. EPA's Guidance states that:

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[6] EPA's Guidance states that the categorization of state water bodies into one of 5 categories "should be based on consideration of all existing and readily available data and information consistent with the State's assessment methodology and this guidance." EPA Guidance at 1, 20, 25.

130.29, was withdrawn by 68 Fed. Reg. 13608. 130.29 states:

> [y]ou may modify your list at times other than those required by 130.30 [pertaining to required submissions of lists every 4 years], in accordance with this section. If you modify your list and prioritized schedule, you must submit your list as a modification to your list under this section and follow the public participation requirements of 130.36…

This section further states: "[y]ou must keep each impaired waterbody on your list for a particular pollutant until it is attaining and maintaining applicable water quality standards for that pollutant." 40 CFR 130.29(b). The standard for applying to modify a 303(d) list are simply stated: "You may remove a listed waterbody for a particular pollutant if new data or information indicate that the waterbody is attaining and maintaining the applicable water quality standards for that pollutant." 130.29(c). Given the Minnesota Administrative Code section regarding natural water quality, the applicable water quality standard to be satisfied under 130.29(c) may incorporate the effects of natural or background sources of pollution. In order to complete the modification process "EPA must issue an order approving or disapproving the modification of your list or prioritized schedule in accordance with 130.29(b)." 130.29(f).

EPA Guidance indicates that the data or information submitted in support of a delisting need not be collected after the date of the previous list in order to properly be considered as "new" under 130.29(c):

> There are some situations where a previously listed segment may be delisted without relying on data and information collected after the date of the previous list. For example, if the State evaluates the pre-existing data and information using a methodology that EPA has determined to be technically reasonable, and the results of that evaluation provide a "good cause" basis for not including the segment on the 2004 list, the segment would no longer need to be included in Category 5. However, the delisting should only occur if it is determined by EPA that the new methodology is technically sound, consistent with the State's WQS, and is deemed statistically reasonable.

EPA Guidance at 11. Thus, the decision to revise the listing may be based upon the Long Prairie River TMDL conclusion that the standard exceedance was caused by natural conditions.

Conclusion:

The key phrase regarding the data to be used in the listing and TMDL process is "all existing and readily available water quality-related data and information". In addition, listing data must meet DQO's and QA/QC assurance. There are avenues to submit more current data or data which indicates errors were made in a prior listing determination. These procedures appear to be either at the request of the Regional Administrator, or through the modification/delisting process. The modification or delisting process is set forth in 40 CFR 130.29. Although this provision was withdrawn, it did not establish new requirements and only generally described how to delist waters under the existing rules.

Consequently, additional data could be submitted to indicate that, in light of section 7050.0120, the Long Prairie River should be delisted as it is meeting applicable water quality standards. As discussed above, section 7050.0120 considers natural water quality in determining whether or not water quality standards are being impaired. A listed impaired waterbody is only

Minnesota Pollution Control Agency

October 17, 2003

Central Lake Region Joint Powers Board
c/o Douglas County SWCD
Jerome Haggenmiller - Coordinator
900 Robert Street, Suite 102
Alexandria, MN 56308-5079

Dear Board Members:

Thank you for your letter of June 24, 2003. At your request, we have delayed our response to your letter in order to allow it to be a part of the comments received during the public notice period for the Long Prairie Total Maximum Daily Load (TMDL) study. The Minnesota Pollution Control Agency (MPCA) encourages all stakeholders to comment on the Long Prairie River TMDL study. We welcome the opportunity to provide you with some explanation and clarification of the issues associated with the Long Prairie TMDL study and report.

Staff from the MPCA has been working with the consultant, Wenck and Associates, Inc., for the past two years to gather data, conduct modeling, and assign allocations in the TMDL study. There have been no other participants in development of the report except staff from the Todd Soil and Water Conservation District (SWCD). Their participation was limited to giving us the monitoring data that the Todd SWCD collected in the watershed for the past five years as a part of their monitoring program. Also, for the past three years, Todd SWCD has been extremely active in implementing Best Management Practices (BMP's) to address nonpoint sources, through the Long Prairie River Clean Water Partnership project. Approximately 70 percent of the impaired watershed is in Todd county. This includes 73 miles (out of a total of 90 miles) of the riparian zone of the river that can potentially receive direct runoff from nonpoint pollution sources, as well as seven of the eight permitted wastewater point sources. Therefore, it was logical to have Todd SWCD fulfill the role of local liaison, especially for nonpoint issues. No one at Todd SWCD was in a decision making role for the development of the TMDL report or load allocations. This is ultimately the responsibility of the MPCA.

The impaired reaches in the Long Prairie River TMDL begin at the city of Carlos and do not include the lakes that receive the ALASD discharge. The upstream waters are not technically considered a part of this TMDL report, and the EPA cannot and will not review or approve a TMDL for those parts of the river that are not impaired. However, the MPCA has chosen to use a "watershed approach" to TMDL study and implement this

TMDL. Therefore, the entire watershed has been included in the TMDL study report that will be submitted to the MPCA.

Since recommendations 2, 3, 5, and 7 have also been listed in the contested case hearing request you submitted on August 18, 2003, those issues will be discussed at the MPCA board meeting on November 25, 2003. Correspondence regarding that meeting will be mailed under separate cover.

In response to the CLRJPB recommendations 1, 4, 6, 8, 9:

1. We do not believe that there have been stakeholders excluded from the TMDL process. The stakeholder process began with the May 22, 2003, public meeting in Browerville, Todd County, and the June 12, 2003, meeting in Carlos, Douglas County. Representatives from Douglas County, ALASD, city of Alexandria, city of Carlos and Douglas County Lake Association and CLRSD were at one or both of these meetings. Jerome Haggenmiller, Miltona Township, Douglas County, a member of the CLRJPB and Chairman of CLRSD was one of the introductory speakers at the Carlos meeting. Emily Wolf, Douglas County Water Planner, was involved in planning both meetings. The draft document was public noticed on July 18, 2003, for 30 days. All stakeholders were encouraged to comment in writing during that time.

4. We have solicited public participation for the TMDL process by holding the meetings in Browerville and Carlos. All stakeholders have had an opportunity to view the draft report at that time, comment on it, and visit with the consultants and MPCA staff. Changes have been made to the report in response to the input received at the meetings. Stakeholders had another opportunity to comment during the public notice period from July 18, 2003 - August 18, 2003. The entire report is available on the MPCA web site www.pca.state.mn/water/tmdl.

6. Implementation of remediation measures in the city of Long Prairie will be accomplished as soon as reasonably possible.

8. No one has been assigned as the sponsoring entity for the TMDL. The TMDL load allocations will be implemented by the stakeholders who volunteer to be on the Implementation Advisory Committee. Todd County is already involved in doing implementation on nonpoint sources through the Clean Water Partnership, and their involvement will continue during the TMDL implementation phase.

9. The restriction tying the city of Carlos wastewater treatment pond discharge to the river flow rate was based on an ammonia toxicity issue that may be associated with the biotic impairments in the receiving water. The TMDL report analyzed the problem and recommended a potential solution that would meet water quality protection objectives. This recommendation was based on one set of key design parameters affecting ammonia toxicity. Other possible solutions exist and will be

looked at during the TMDL implementation phase. For example, by monitoring effluent quality and stream flows, pH, and temperature; the discharge permit could be fashioned to provide additional discharge flexibility through better definition of the dilution and ambient water quality conditions affecting ammonia toxicity.

Thank you for your questions and comments. I hope this letter has clarified some of the issues at hand.

Sincerely,

Pat Shelito

Pat Shelito
Project Manager, Community and Area Wide Programs Unit
Brainerd Office
Regional Environmental Management Division

PS:vms

cc: Bruce Nelson, ALASD, Alexandria
Bryan Withers, Chairman, Douglas County Board of Commissioners, Osakis
Paul Nelson, Chairman, Alexandria Lake Area Sanitary District, Alexandria
Dan Ness, Mayor, City of Alexandria, Alexandria
Pete Hoefer, Mayor, City of Carlos, Carlos
Mike Bump, President, Douglas County Lake Association, Alexandria
Dallas Sams, State Senator, St Paul
Torrey Westrom, State Representative, St Paul
Mary Ellen Otremba, State Representative, St Paul
John Erdmann, Wenck Associates, Inc., Maple Plain
Faye Sleeper, MPCA Manager, St. Paul

Minnesota Pollution Control Agency

October 17, 2003

TO: Concerned Citizens of the Long Prairie River Watershed

RE: Public Notice and Comment Period for Long Prairie Total Maximum Daily Load Study

The Minnesota Pollution Control Agency (MPCA) has received and reviewed your comment letter on the Long Prairie River Total Maximum Daily Load study. Thank you for taking the time to respond to the public notice and for expressing your concern.

The comment period extended from July 18, 2003 to August 18, 2003. During this time six letters were received. In addition, Alexandria Lake Area Sanitary District (ALASD), Central Lakes Region Joint Powers Board (CLRJPB) and Douglas county requested a contested case hearing. That decision may be made by the MPCA Citizen Board at their regular meeting on November 25, 2003, in St Paul. That meeting is open to the public.

Long Prairie River Total Maximum Daily Load For Dissolved Oxygen

LIST OF PUBLIC COMMENTS AND MPCA RESPONSES

Letter from Orvin J. Hall - dated July 26, 2003

I would like to see the MPCA get approval of other local, state and federal government agencies which have authority to protect and improve local water resources. There are over 18 of these agencies including but not limited to:

Department of Health
Department of Agriculture
Department of Transportation
Department of Natural Resources
Association of Minnesota Counties
Minnesota Water Resources Board
Cities and Townships of Douglas, Todd, Morrison, Ottertail and Wadena Counties
U.S. Army Corps of Engineers

Response:

The invitation to the public meetings as well as the public notice was mailed to all the above agencies. However, the U. S. Environmental Protection Agency has sole authority for final approval of the study.

to be kept on the list until it is attaining and maintaining applicable water quality standards. Since the Long Prairie River is not exceeding water quality standards pursuant to 7050.0120, delisting would be proper.

Letter from the City of Eagle Bend - dated July 28, 2003

The comment period, July 18, 2003 to August 18, 2003, is insufficient time to review all the data. Especially, as of this date we have not received the total report done by Wenck Associates, Inc.

Response:

Preliminary report results were presented to the public on May 22 and again on June 12. The proposed public noticing of the report was announced at both of those meetings. MPCA believes that two months advance notice that the document would be available for a 30 day comment period is sufficient time for interested parties to plan for review of the document. The public notice was mailed on July 17 and gave the web address where the entire report could be accessed as of July 18. In addition, Eagle Bend's review engineer requested a CD of the report on Thursday, July 24. That CD, containing the entire report, arrived at the engineer's office on Monday, July 28.

Letter from Douglas County Land and Resource Management Office - dated August 18, 2003

Continue to involve Douglas County throughout the remainder of the TMDL process. As a headwaters area, we realize the effects our actions have downstream and the importance of proper land management to reduce pollution loadings. Communication and inclusion in this planning process is important in realistic goal setting and optimum cooperation in addressing the dissolved oxygen impairment. As the local water management authority, I request that a copy of the TMDL study be provided to the county.

Response:

Douglas County is represented on the Citizen's Advisory Implementation Committee by the Douglas County Water Planner and Douglas County Soil and Water Conservation District Manager, who is also chairman of the CLRJPB. This committee will provide oversight for the implementation activities. A copy of the TMDL report on CD was sent to the Douglas County Water Planner on August 21, 2003.

Letter from City of Carlos - dated August 18, 2003

We would like to see if more testing could be done in our particular area to determine by those samples if the city of Carlos necessarily falls under a load allocation.

The city of Carlos discharges our treated water into a very unique environment which contain approximately a thousand acres of cattails; which contribute to our low DO, high phosphorus and ammonia. Even though the discharge of our ponds has not shown to contribute to any problems in the past, we cannot rely on state averages alone in determining our results.

Response:

There will be an ongoing monitoring program of the river during the implementation phase of the TMDL. The monitoring plan can be structured to include sampling from the city of Carlos ponds. In addition, the city of Carlos NPDES permit is up for review in February 2005. Previous to that time, the city could do phosphorus and ammonia sampling to provide data which will be used to determine any need for revised permit limits and/or conditions of discharge. If there are adjustments that need to be made to the TMDL waste load allocations, it would be done during permit review.

Letter from City of Clarissa - dated August 13, 2003

Is there data and dates on what sites were tested; the location of test sites; to what detail; were the tests repeated at various times and when; how much impact does our facility have on the water quality of Eagle Creek. We should be provided with such information if it has been gathered for the Eagle Creek tributary, or was information used to prepare the study derived from tests from other locations and state averages? An opportunity to compare test results on the ammonia and dissolved oxygen level at our treatment system and at the point of discharge into Eagle Creek for both cities of Clarissa and Eagle Bend, would be beneficial to our community.

We currently treat our community waste water by means of an approved pond system designed and constructed in 1989. The system was designed to meet the capacity needs of the community, provide for acceptable treatment of waste water, and be affordable for the community. The ponds are only discharged semi-annually upon approval; however, capacity design prevents limiting discharge to only the fall season. As small cities face the state budget cuts, limited or lack of resources, and lack of affordable funding; proposed remedial action could be of very major consequence and further burden our rural economy.

We request the MPCA provide additional time to allow more complete data information to be provided to ensure our communities that the best interests of the Long Prairie River and also of our communities is considered. Also we request the MPCA to make recommendations that are feasible and justifiable for each entity that will be impacted by this study.

Response:

The city of Clarissa and Eagle Bend do not have waste load allocations because Eagle Creek is not listed as an impaired reach. However, the data Appendix C Table C-4 from sampling at CWP Sampling Site 4 – T LPR 33.6 where Eagle Creek enters the mainstream of the Long Prairie indicates that there may be impairments in Eagle Creek. Therefore, the recommendations in the report on page 12-9 suggest that 1) future monitoring should include a more intensive sampling of Eagle Creek; and 2) that ponds discharge at a particular time. These activities are recommendations for the cities to consider but are not requirements. More complete sampling of Eagle Creek can be undertaken in the Phase II – Implementation of the TMDL. Once the data has been collected and analyzed, it will be possible to make recommendations to the city of Clarissa and Eagle Bend about how to best manage their treatment systems.

Letter from Larson-Peterson & Associates, Inc. on behalf of the city of Eagle Bend - dated August 18, 2003

1. Table for Reach 07010108-504: Eagle Creek to Turtle Creek lacks the oxygen demand for the Eagle Creek point source loads for the CBOD (204 lbs/day) and NBOD (209 lbs/day).
   Please provide the basis for these values.

Response:
The loadings represented in the Table are residual loadings where Eagle Creek enters the Long Prairie River. They are smaller than the actual loads at the facility discharge points because they have been attenuated by Eagle Creek.

2. The paragraph on page 2-4 states:
   Review and refine the targeted short term and long term nutrient reduction and management goals of each river section developed by the Todd SWCD in the CWP study (Tepley, 1999).
   The values and basis for these goals was not available or included in this report.
   Response:
   The short term and long term nutrient reduction and management goals developed by the Todd SWCD were based on three years monitoring and modeling in conjunction with the staff from the MPCA. They were presented in a report titled "Long Prairie River Monitoring Project Report" submitted and approved by MPCA staff in 1999. That report is available from the MPCA office by request and is noted in the references section of the TMDL report.

3. The report infers mechanical plants provide a high quantity (sic) of effluent (page 4-4). It is a fair assessment that stabilization ponds also provide a high quality effluent. The utilization of mechanical plant during the Long Prairie River low flow should be compared to the controlled discharge of the pond system.
   Response:
   The main differences between a mechanical plant discharge and a pond discharge are the rate of discharge and the length of time over which the discharge occurs. A mechanical plant discharges everyday which means that it is loading the river continuously, however, since the rate of discharge and amount of the load is smaller, the stream can process that load without dire consequences to the water quality. A pond discharges during a window of a few days to a few weeks, but it is discharging an accumulated wastewater volume and load at much higher rates; consequently it is more difficult for the stream, especially a small one, to process that load without affecting water quality.

   Section 11.6 Allowance for Future Growth
   The design wastewater for Eagle Bend is 65,000 gallons per day gpd or up to 12 million gallons (MG) per seasonal discharge. The balance of the flow is clear water from infiltration/inflow. The infiltration/inflow portion of the design flow ranges from 50,000 to 130,000 gpd. The seasonal discharge of infiltration/inflow would be 9 MG to 23.4 MG.
   Response:
   The flow used for modeling the Eagle Bend pond was the permitted discharge rate calculated at a maximum drawdown of six inches from the secondary pond. If the actual influent flow is large due to infiltration and inflow; it is important for Eagle Bend to reduce their infiltration/inflow especially if they have any capacity problems.

Section 12.2 Point Sources
The Miltona wastewater treatment facility is considered very small and its discharge is assimilated by a slough before entering the Long Prairie River.

The report states, "The Alexandria Lake Area Sanitary District is included for completeness, though it does not impact the Long Prairie River (it discharges effluent of high quality to a chain of lakes upstream from Lake Carlos)."

The city of Eagle Bend contends its treated effluent will be high quality, have minimal impact on Eagle Creek and the Long Prairie River and is assimilated by Eagle Creek and the higher spring flows.

The Eagle Bend pond system will not be discharging in the summer during low flows in Eagle Creek and the Long Prairie River. The pond systems are not credited for the ability to control hazardous discharges and are not susceptible to upset conditions.

Restricting spring discharge until periods of higher receiving water flow is not practical for the cities with stabilization ponds.
Response:
The recommended minimum instream flow rate for discharge from city of Eagle Bend ponds is 2 cfs. This is a change from 10 cfs which was in the draft report presented at the public meetings. The change was made after discussions with the Eagle Bend pond operator at the public meeting. The change to a less restrictive minimum instream flow resulted from the use of different instream pH and temperature values for the analysis of ammonia toxicity. The draft report (10-cfs minimum) used extreme; essentially worst-case pH and temperature (mean values for June, the warmest month of the spring-season discharge period). At the direction of MPCA staff, the revised report (2-cfs minimum) uses median values representing the entire spring discharge period of April 1 – June 30. The use of median values for the entire period is consistent with the MPCA's past applications of the ammonia toxicity standard.

The TMDL report analyzed the problem and recommended a potential solution that would meet water quality protection objectives. This recommendation was based on one set of key design parameters affecting ammonia toxicity. Other possible solutions exist and will be looked at during the TMDL implementation phase. For example, by monitoring effluent quality and stream flows, pH, and temperature; the discharge permit could be fashioned to provide additional discharge flexibility through better definition of the dilution and ambient water quality conditions affecting ammonia toxicity.

Section 12.3.1 Carlos Reach
The Carlos stabilization pond was abandoned in 1988/1989. The report states; "It is plausible that lingering effects of Carlos' abandoned stabilization pond do contribute in some small measure to the Carlos reach DO violations. Before the city of Carlos replaced its now abandoned pond, all wastewater that entered it evidently seeped out

of it, as the pond reportedly never discharged to the river directly. A remnant plume of polluted groundwater between the abandoned pond and the river channel may still exist." The MPCA study of 1978 – Effect's of Wastewater Stabilization Pond Seepage on Groundwater Quality – should be considered prior to the stated assertion in the Long Prairie River TMDL report.

The city of Eagle Bend will be abandoning their pond system and is concerned similar assertions will be made on the existing wastewater treatment facility.

Response:

P 12-7 the first paragraph from which the above quote is taken, ends with "Water quality monitoring results for the Carlos reach have confirmed that the impacts from such a plume cannot be large, as the results failed to indicate substantial upstream-to downstream increases in oxygen-demanding pollutant concentrations." Abandonment of a pond system is considered on a case-by-case basis and what happened in the case of Carlos does not necessarily apply in the case of Eagle Bend.

4. Section 12.4 Recommendations

The recommendations restrict the stabilization pond discharge for the small cities and encourage utilization of advanced mechanical plants. If all these cities in the Long Prairie River Watershed District utilized mechanical plants, the continuous discharge flow would be about four cubic feet per second (cfs). The Long Prairie River minimum flows would be exceeded the months of December, January and February. The effluent discharge would approach the July low flow. The 1972 - 1994 statically flow dates is enclosed.

The goal of the study centers around the Long Prairie River's low flow condition. The modeling study of the Long Prairie River was intended to identify the most efficient and practical methods of attaining the ammonia (and resulting BOD) reductions.

The report should have provided recommendations for the cities with stabilization ponds:

A. After spring ice out, when would the ammonia levels decrease?

B. Could a delay in the spring discharge, within the April 1 to June 30 discharge window, reduce the ammonia levels?

C. The discharge schedule for pond systems has not been clearly discussed. The proposed Eagle Bend wastewater treatment facility's wet weather flow is 195,630 gpd. Under this situation, if the wastewater flow was completely discharged (3 series) at 6 inches per day, it would entail 24 days per season. The Long Prairie River flows should be at least 200 - 250 cfs.

D. The dry weather and normal wastewater flow will require two series of discharge from the proposed Eagle Bend wastewater treatment facility. At a discharge rate of six inches per day, 16 days of discharge would be necessary. If the discharge rate was reduced to four inches per day the discharge period would be 24 days.

In summary, the controlled discharge from the stabilization ponds is about 32 to 48 days annually. The mechanical plant method suggested in the TMDL report would discharge 365 days per year. The report has not objectively evaluated the advantages of the Eagle Bend and the other communities' stabilization pond system in relation to the Long Prairie water quality and low flow periods.

Response:

The recommendations on page 12-9 in the report does not advocate for the use of mechanical plants in general or for the small communities in particular. The only reference it makes to mechanical plants is for the Long Prairie industrial discharges. MPCA staff realize that there is a trade-off between mechanical plants and pond systems in regard to daily impact, loadings and flow amounts. Staff is committed to working with pond facility personnel to develop management strategies for the ammonia toxicity, as much as is reasonably possible.

The Minnesota Pollution Control Agency Citizen Board may be discussing whether or not to grant a contested case hearing on this study. If the hearing is granted, the case will go before an administrative law judge for processing. If the hearing is denied, the study can be submitted to the U. S. Environmental Protection Agency for approval. For information on the Citizen Board Agenda and results of the hearing request go the MPCA Web Page/About MPCA/ Citizen Board or click on http://www.pca.state.mn.us/about/board/index.html.

Sincerely,

Pat Shelito

Pat Shelito
Project Manager, Community and Area Wide Programs Unit
Brainerd Office
Regional Environmental Management Division

PS:vms

cc: Orv and Alberta Hall, Alexandria
Delvin Slathe, Mayor, City of Eagle Bend, Eagle Bend
Sue Cuchna, Administrator, Clarissa
Sam Cossentine, Waste Water Operator, Clarissa
Bruce Nelson, ALASD, Alexandria
Emily Wolf, Water Plan Technician, Alexandria
Jeff Gunderson, Operator, Carlos
Rick Zwieg, City Council, Carlos
Tom Augustine, Larson-Peterson & Associates, Inc., Detroit Lakes
John Erdmann, Wenck Associates, Inc., Maple Plain
EPA, Chicago, IL

bcc: Faye Sleeper, MPCA, St. Paul

FLAHERTY & HOOD

Professional Association

OCT 15 2003

October 14, 2003

Faye Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

BY FAX AND U.S. MAIL

**Re: Long Prairie River Total Maximum Daily Load (TMDL)
Request for Contested Case Hearing by Alexandria Lake Area Sanitary District (ALASD)**

Dear Ms. Sleeper:

It is my understanding that the above-referenced matter is scheduled to come before the MPCA Citizens' Board at its October 28, 2003 meeting. Please consider this ALASD's formal request that this matter be removed from the Board's October meeting agenda, and placed on the agenda for the Board's November 2003 meeting. Although the Central Lake Region Sanitary District (CLRSD) has not retained my firm for representation in this matter, CLRSD has notified me of its support for this request as well.

ALASD has retained Flaherty & Hood, P.A. to represent it in this matter. From conversations with ALASD's executive director, Bruce Nelson, it is my understanding that the MPCA and ALASD may be close to a resolution on the issues giving rise to ALASD's request for a contested case hearing on the Long Prairie River TMDL. Given the time it will take to work out the details of a settlement or, in the alternative, the time it would take for ALASD to prepare for a presentation to the Board, I believe that a delay would be appropriate at this time.

Please respond as soon as possible on the Board's disposition of this request. Questions may be directed to me at 651-225-8840 or swnyhus@flaherty-hood.com. Thank you for your consideration and prompt attention to this matter.

Yours very truly,

FLAHERTY & HOOD, P.A.

Steven W. Nyhus
Associate Attorney

cc: Darlene Sigstad, MPCA Citizens' Board Secretary
Bruce A. Nelson, Executive Director, ALASD
Jerry Haggenmiller, Chairman, CLRSD

Minnesota Pollution Control Agency

December 5, 2003

Mr. Steve Nyhus, Attorney
Flaherty & Hood
444 Cedar Street, Suite 1200
St. Paul, Minnesota 55101

RE: Long Prairie River Total Maximum Daily Load (TMDL) Petition for Contested Case Hearing by Alexandria Lake Area Sanitary District (ALASD)

Dear Mr. Nyhus:

I have discussed with you the Long Prairie River TMDL several times since receipt of your letter of October 31, 2003, and now wish to document the status of this matter. This TMDL will not be brought before the Minnesota Pollution Control Agency (MPCA) Citizens Board in December 2003, to allow us time to resolve the outstanding issues. Your letter stated that three issues were critical to resolving this matter, and I will focus on those three issues in this letter.

Issue 2: Todd County Soil and Water Conservation District total phosphorus goals/guidelines/targets in the Long Prairie River Study will effectively (de facto) establish Phosphorus Water Quality Standards for the Long Prairie River without following the proper process. As such these goals/guidelines/targets should not be included in the TMDL.

The MPCA has removed this document from the body of the TMDL and placed it in the appendix. We ask that you review the current TMDL which is on our website to determine if we have satisfied your request. If not, please let us know specifically what further changes you believe need to be made to resolve this issue. The TMDL can be found at:
http://www.pca.state.mn.us/publications/reports/tmdl/long-prairie1-15.pdf.

Issue 3: The Long Prairie River from the headwaters of Lake Carlos (mile 92.0) to Long Prairie (mile 47.8) should be de-listed. According to the TMDL Study the dissolved oxygen impairment is caused by a naturally occurring condition. Therefore, an amended water quality standard should be established for the Long Prairie River reflecting this natural condition.

The MPCA has reviewed this request. The reach that the MPCA determined is naturally occurring is from mile 85.5 – mile 89.0 within the 303(d) listed reach from the headwaters (Lake Carlos – mile 89.0) to Spruce Creek (mile 80.9). The Assessment Unit ID is 07010108-506. There is impairment at river mile 83.1 that does not result from naturally occurring conditions. The U.S. Environmental Protection Agency has now given approval to the MPCA for a category 4D of the integrated listing. Category 4D is defined as "no TMDL required due to naturally occurring condition." This category is actually very restrictive, as water bodies in category 4D cannot receive new or expanded discharges. We are willing to split the listed reach and place the segment from river mile 85.5 to river mile 89.0 into category 4D.

Also, we are considering a possible change to the point source discharge in this reach and how that would be addressed. I will follow up with further information on this in the near future.

Issue 6. Facility plans previously submitted to the MPCA have proposed a treatment plant on the Long Prairie River. This proposed plant was not included in any modeling done for the TMDL. Petitioner claims such modeling is necessary for a comprehensive TMDL.

The MPCA has agreed that additional modeling for this potential discharge may be done, but will not be included in the TMDL. My understanding is that ALASD is willing to pay for this. John Erdman of Wenck Associates is working with Dan Folsom of Widseth, Smith, and Nolting to accomplish this task. I will send a letter documenting that the MPCA is fully aware and approves of this modeling, once we have the mechanism in place to accomplish this task.

As stated in your letter, the following issues will be withdrawn if we can resolve issues 2, 3, and 6 listed above, to the satisfaction of ALASD and Central Lake Region Joint Powers Board (CLJPB).

Issue 1: Petitioner believes that rulemaking is necessary to complete a TMDL and establish Waste-load Allocations and Load Allocations. Rulemaking provides the legal authority and assurance of due process for all stakeholders.

Issue 4: The Long Prairie River from the City of Long Prairie (mile 47.8) to the Crow Wing River (mile 0.2) should be de-listed. According to the TMDL Study the cause of the impairment is point source discharges. Through existing permitting authority Waste Load Allocations (WLA) should be applied to these point sources and if necessary, WLA should be applied to permitted non-point Confined Animal Feeding Operations (CAFO's).

Issue 5: Lake Carlos is not in the defined TMDL Study area and therefore should not receive a load allocation. In addition, Lake Carlos is not an impaired water body and under the law cannot receive a load allocation for that reason.

I believe this summarizes the status of these issues. Please contact me at (651) 297-3365 if you disagree or wish to discuss this letter.

Sincerely,

for Faye E. Sleeper, Manager
Water Policy and Coordination Section
Regional Environmental Management Division

cc: Pat Shelio, MPCA Brainerd
Sylvia McCollor, Environmental Outcomes Division
Bob Roche, Attorney General's Office
Jeff Risberg, MPCA/REM/WPC/WTAP
Jerome Haggenmiller, CLJPB
Bruce Nelson, Executive Director, ALASD

FES/GS:kb