Draft 2018 – 2027 Watershed Management Plan

Lower Minnesota River Watershed District

Watershed Management Plan
for the
Lower Minnesota River Watershed District
2018 - 2027

Approved
Month, Day, Year

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LIST OF ACRONYMS AND ABBREVIATIONS

Term	Definition
AC	Acre
BMP	Best Management Practice
BOD	Biochemical oxygen demand
BWSR	Board of Water and Soil Resource
CAC	Citizen Advisory Committee
CAMP	Citizen Assisted Monitoring Program
CCP	Minnesota River Valley National Wildlife Refuge Comprehensive Conservation Plan
CCWMO	Carver County Water Management Organization
CFS	Cubic feet per second
CHL-A	Chlorophyll-a
CIP	Capital Improvement Projects
CLP	Closed Landfill Program
CMMP	Channel Maintenance Management Plan
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
DMMP	Dredge Material Maintenance Plan/ Dredge Material Management Plan
DNR	Minnesota Department of Natural Resources
DOH	Minnesota Department of Health
DOT	Minnesota Department of Transportation
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FIS	Flood Insurance Study
FT	Feet
HVRA	High Value Resources Area
ISTS	Individual Sewage Treatment System
ITPHS	Imminent Threat to Public Health and Safety
LGU	Local Government Unit
LID	Low Impact Development
LMRWD	Lower Minnesota River Watershed District (District)
LUST	Leaking Underground Storage Tanks
LWP	Local Water Plan
M	Meter
M.S.	Minnesota Statute

Managers	District Board of Managers
MCCC	Minnesota Civilian Conservation Corps
MCES	Metropolitan Council Environmental Services
MDA	Minnesota Department of Agriculture
MG/L	Milligram per liter
MN	Minnesota
MnRAM	Minnesota Routine Assessment Methodology
MOU	Memorandum of Understanding
MPCA	Minnesota Pollution Control Agency
MQR	Minnesota River Quadrant
MRCC	Midwestern Regional Climate Center
MS4	Municipal Separate Storm Sewer System
MSP	Minneapolis-St. Paul
MUSA	Metropolitan Urban Services Area
NFIP	National Flood Insurance Program
NGO	Non-Government Organization
NO3	Nitrate
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWI	National wetland inventory
OHWL	Ordinary High Water Level
PLP	Permanent List of Priorities
PRAP	Performance Review and Assistance Program
QA/QC	Quality Control/Quality Assurance
R.M.	River mile
RMP	River mile post
RCRA	Resource Conservation and Recovery Act
SD	Secchi Depth
SDS	State Disposal System
SFHA	Special Flood Hazard Areas
SLMP	Sustainable Lake Management Plan
SNA	Scientific and Natural Area
SSTS	Subsurface Sewage Treatment System
SWCD	Soil and Water Conservation District
SWPPP	Storm Water Pollution Prevention Plan
TAC	Technical Advisory Committee
TDP	Total Dissolved Phosphorus

TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSD	Treatment, Storage and Disposal
TSS	Total Suspended Solids
USAF	United States Air Force
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
VIC	Voluntary Investigation Cleanup
WCA	Wetland Conservation Act
WD	Watershed District
WMO	Water Management Organization
WWTP	Waste Water Treatment Plant
µG/L	Microgram per liter

EXECUTIVE SUMMARY

The Lower Minnesota River Watershed District (District) Watershed Management Plan (Plan) describes how the District will address water resources management over the next 10 years as required by M.S. 103B and 103D and Minnesota Rules (MN Rules) 8410. The purpose of this Plan is to protect, preserve, and manage the surface water resources (Minnesota River, lakes, streams, and wetlands) and groundwater within the District.

In 1960, the District was organized by petition from Hennepin, Ramsey, Dakota, Scott, and Carver counties in response to the Minnesota Watershed Act of 1955.-The District's first Watershed Management Plan was prepared, approved, and adopted in 1961.

The Metropolitan Surface Water Management Program (M.S. 103B) and Watershed Act requires the District to review and update its Plan every ten years.. This Plan will be effective 2018–2027. In addition to complying with the aforementioned laws, this Plan meets the requirements of MN Rules 8410, 8420, and 7050. The Plan includes management standards and procedures for addressing surface water, wetland, and groundwater issues, as well as navigation issues along the Minnesota River.

E1. PLAN ORGANIZATION

This Plan documents the Lower Minnesota River Watershed and its management, and therefore, much of the information is technical. Background information regarding scientific terms and processes is provided where practical. An acronym list is also provided. Readers are encouraged to consult area professionals or professional references for more information.

The Plan contains the following sections as required by MN Rule 8410:

Executive Summary: Provides an overview of the plan.

Introduction: Summarizes State statutes, plan requirements, the organization and its history, and 2010 - present District accomplishments.

Section 1.0: Land and Water Resource Inventory: Presents current and historic background and inventory information regarding the watershed's physical, hydrological, biological, and human environment.

Section 2.0: Issues Identification/Assessment of Problems: Provides an overview of the issues identified during the planning process, assesses the adequacy of existing controls, and identifies potential management gaps.

Section 3.0: **Goals, Policies, and Management Strategies:** Presents the management framework (goals, policies, and strategies) adopted by the District Board of Managers (Managers) to address the priority issues and management gaps. Standards needed, reinforced by the District's Statement of Need and Reasonableness Report, to address these gaps were compiled in Appendix K.

Section 4.0: Implementation Program: Describes the Plan's implementation elements and impact on local governments and residents. This section provides an implementation program table and preliminary annual budgets.

Section 5.0: Impact on Local Units of Government: Expresses the potential financial impact that the Plan changes will have on local government units (LGU).

Section 6.0: Amendment and Reporting: Describes the procedures for amending the Plan and addressing the annual reporting requirement.

E2. WATERSHED ISSUES

Watershed issues are problems or concerns identified by the Managers, by the Technical Advisory Committee (TAC), and the Citizen Advisory Committee (CAC). These issues need attention and, in some cases, resolution. The TAC and CAC held workshops and partnership work sessions to develop a list of watershed issues. Information generated at those sessions was presented to the Board and is addressed here. The following issues were identified and discussed in detail in Section 2.0 - Issues and Problems Assessments.

1. Unclear role of the District
2. Outside influences
3. Water quality
4. Flooding and floodplain management
5. Erosion and sediment control
6. Groundwater
7. Commercial and recreational navigation
8. Public education and outreach
9. Potential problems

E3. WATERSHED MANAGEMENT FRAMEWORK

Section 3.0 presents the Plan's management framework regarding goals, policies, strategies, and standards. This framework is based on the issues identified by the TAC, and Manager, given their priority and the adequacy of existing controls. The District's mission and purpose, presented below, were also taken into consideration when developing the framework.

E3.1. MISSION

The District's mission is to manage and protect the Minnesota River, lakes, streams, wetlands, and groundwater, and to assist and facilitate in providing river navigation by:

- Promoting open communication, partnering with citizens, community organizations, and local, state, and federal agencies.
- Improving and protecting the quality of the Minnesota River and all water bodies in the watershed.

- Minimizing the negative effects of floods and droughts on the Minnesota River and all water bodies in the watershed.
- Collecting and distributing information regarding surface water and groundwater in the watershed; establishing priorities; and developing local plans to improve water resources in the watershed.
- Monitoring and understanding the effects of municipal groundwater appropriations and drought on groundwater levels.
- Working with LGUs to enforce the Wetland Conservation Act.
- Assisting and facilitating the efforts of state and federal agencies to maintain the navigation channel.
- Educating stakeholders about the impact they have on the water resources in the watershed and motivating them to change behaviors that have a negative impact.

E3.2. WATERSHED PURPOSE

The Metropolitan Surface Water Management Act states that the District's purposes and other water management programs (quoted from M.S.103B.201) are as follows:

- Protect, preserve, and use natural surface and groundwater storage and retention systems.
- Minimize public capital expenditures needed to correct flooding and water quality problems.
- Identify and plan for means to effectively protect and improve surface and groundwater quality.
- Establish more uniform local policies and official controls for surface and groundwater management.
- Prevent soil erosion into surface water systems.
- Promote groundwater recharge.
- Protect and enhance fish and wildlife habitat and water recreational facilities.
- Secure the other benefits associated with proper surface and groundwater management.

Unlike other water management programs in the state subject to M.S.103B, the District has an additional purpose, as noted in the District's mission, which is to assist and facilitate the efforts of state and federal agencies to maintain the Minnesota River 9-Foot navigation channel.

E3.3. GOALS

The following goals and associated strategies were established by the District to address issues identified. These goals are not presented in any order and do not reflect rank within the District.

Table E-1: Lower Minnesota River Watershed District Summary of Issues, Goals, and Strategies

Issues	Goals	Strategies
Issue 1: Unclear Role of the District	Goal 1: Organizational Management - To manage the different	Strategy 1.1.1: Work cooperatively with local, state, and federal government; other agencies; and non-government organizations on issues affecting the District's resources.

Issues	Goals	Strategies
Issue 2: Outside Influences	and changing roles of the District	Strategy 1.2.1: Provide public information services Strategy 1.3.1: Perform periodic assessments and program reviews Strategy 1.3.2: Use short and long-term metrics to measure progress
Issue 3: Water Quality	Goal 2: Surface Water Management - To protect, preserve, and restore surface water quality	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.1.1: Lower Minnesota River Watershed District – High value resources area overlay district Strategy 2.2.1: Watershed management standards Strategy 2.2.2: Promote disconnected stormwater management and low impact development Strategy 2.2.3: Cost share incentive program Strategy 2.2.4: Water quality restoration programs Strategy 2.3.1: Modify and continue the monitoring program Strategy 2.3.2: Complete detailed data assessments Strategy 2.3.4: Coordinate with other agencies and water quality programs Strategy 4.4.3: Steep Slopes Standard Strategy 7.2.1: Develop a Vegetation Management Standard/Plan
	Goal 3: Groundwater Management - To protect and promote groundwater quantity and quality	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.3.1: Modify and continue the monitoring program Strategy 3.1.1: Support wellhead protection efforts Strategy 3.2.1: Infiltration standard Strategy 3.2.2: Promote conservation and wise use of groundwater Strategy 3.3.1: Groundwater monitoring Strategy 3.3.2: Regional modeling
	Goal 4: Unique Natural Resources Management - To protect and manage unique resources	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.3.1: Modify and continue the monitoring program Strategy 4.2.1: Data acquisition and management Strategy 4.2.2: Provide technical assistance Strategy 4.2.3: Provide educational opportunities Strategy 4.3.1: Develop a mechanism for identifying and acquiring high value conservation easements Strategy 4.4.1: Encourage wildlife connectivity projects which achieve multiple goals, such as water quality improvements and fen and steep slopes protection Strategy 7.2.1: Develop a Vegetation Management Standard/Plan
	Goal 5: Wetland Management - To protect and preserve wetlands	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 4.3.1: Develop a mechanism for identifying and acquiring high value conservation easements

Issues	Goals	Strategies
		Strategy 5.1.1: Delegate Wetland Conservation Act (WCA) to LGU's Strategy 5.1.2: Require LGU's to conduct wetland inventories and complete wetland management plans Strategy 5.1.3: Review WCA notices as received Strategy 5.1.4: Wetland Standard Strategy 7.2.1: Develop a Vegetation Management Standard/Plan
Issue 4: Flooding and Floodplain Management	Goal 2: Surface Water Management - To protect, preserve, and restore surface water quality	Strategy 2.1.1: Watershed Management Standards
	Goal 6: Floodplain and Flood Management - To manage floodplains and mitigate flooding	Strategy 6.1.1: Floodplain and drainage alteration standard Strategy 6.1.2: Infiltration and peak flow standards Strategy 6.1.3: Manage localized flooding
Issue 5: Erosion and Sediment Control	Goal 6: Floodplain and Flood Management - To manage floodplains and mitigate flooding	Strategy 6.2.1: Adopt infiltration and peak flow standards
	Goal 7: Erosion and Sediment Control - To manage erosion and control sediment discharge	Strategy 2.2.1: Watershed management standards Strategy 4.4.3: Steep Slopes Standard Strategy 7.1.1: Support the NPDES general permit Strategy 7.1.2: Erosion and Sediment Control Standard Strategy 7.2.1: Develop a Vegetation Management Standard/Plan Strategy 7.3.1: Provide streambank and mainstem erosion assessment Strategy 7.3.2: Continue gully erosion repair Strategy 7.4.1: Promote and encourage shoreland protection Strategy 7.4.2: Shoreline and streambank standard
Issue 6: Groundwater	Goal 3: Groundwater Management - To protect and promote groundwater quantity and quality	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.3.1: Modify and continue the monitoring program Strategy 3.1.1: Support wellhead protection efforts Strategy 3.2.1: Stormwater infiltration criteria Strategy 3.2.2: Promote conservation and wise use of groundwater
		Strategy 3.3.1: Groundwater monitoring Strategy 3.3.2: Regional modeling
Issue 7: Commercial and Recreational Navigation	Goal 8: Commercial and Recreational Navigation - To maintain and improve the Lower Minnesota River's navigation and recreational use	Strategy 8.1.1: Promote safety education Strategy 8.2.1: Manage existing Cargill East River (MN – 14.2 RMP) dredge material site Strategy 8.2.2: Beneficial use plan for dredge materials Strategy 8.3.1: Develop a funding structure to ensure proper maintenance and improvement along the river

Issues	Goals	Strategies
Issue 8: Public Education and Outreach	Goal 9: Public Education and Outreach - To increase public participation and awareness of the Minnesota River and its unique natural resources	Strategy 1.2.1: Provide public information services Strategy 4.2.3: Provide educational opportunities Strategy 8.1.1: Promote safety education Strategy 9.1.1: Maintain Citizen Advisory Committee (CAC) Strategy 9.1.2: Develop an outreach program Strategy 9.1.3: Engage volunteers Strategy 9.1.4: Provide opportunity for public input Strategy 9.2.1: Produce scientific studies and work products Strategy 9.2.2: Promote a variety of education programs Strategy 9.2.3: Use multiple outlets to distribute information

E3.4. PLAN IMPLEMENTATION

The three major elements of the implementation program described in Section 4 are highlighted below:

Administrative/Managerial Efforts: This includes staffing, day-to-day operations, and funding for audits, reporting, training, and contingency.

Studies and Programs: The Plan includes the following studies and programs.

- Cost Share Incentive and Water Quality Restoration Program
- Periodic Assessments and Program Reviews
- Detailed Data Assessments
- Monitoring Program
- Vegetation Management Standard/Plan
- Dredge Material Beneficial Use Plan
- 9-Foot Channel Strategic Funding Plan
- Education and Outreach Program
- Sustainable Lake Management Plans
- Geomorphic Assessments
- Paleo-limnology Study
- Fen Stewardship Program
- Water Resources Restoration Fund

Capital Improvements Projects: The Plan includes the following list of capital projects in Table E-2. These projects will be funded in whole or in-part by the District. Additional projects can be added during the annual meeting before the budgeting process starts.

Table E-2: Lower Minnesota River Watershed District – Capital Improvement Projects*

Project Name and Descriptions	Project Partner	Estimated Cost	Estimated Timeline
Assumption Creek Hydrology Restoration Project. Assumption Creek is a trout stream, so it is important to maintain the temperature of groundwater discharge. According to the City of Chaska, portions of the creek dry out periodically. It is unknown exactly what has reduced the hydrology of the creek. It may have been the U.S. Army Corps of Engineers' historic creek rerouting for the brick factory, road construction, or other development effects. The project described here will evaluate the opportunities available to resupply the groundwater hydrology to the creek.	City of Chaska and DNR	$30,000	2019
Carver Creek Restoration Project. This will include stabilizing the outer bends with toe protection, grading banks to a more stable slope, and stabilizing the gully.	City of Carver, Carver WMO, Carver County SWCD and USFWS	$95,000	2019 - 2020

Project Name and Descriptions	Project Partner	Estimated Cost	Estimated Timeline
Minnesota River Corridor Management Project. Using the Minnesota River as a focal point, this project will examine issues facing the river's complex natural system, a shared resource and a place where varied interests and other systems converge. We seek to (1) create greater understanding of the Lower Minnesota River Corridor and its landscape, (2) demonstrate a desired future for the river and how change in the surrounding landscape can help attain this future, (3) suggest a structure or framework by which the vision can be implemented, and (4) identify shared community and public values that form the basis of the project. (This design is modeled after the Vermillion River Corridor Plan.)	All District LGUs	$100,000	2020 - 2021
Groundwater Screening Tool Model. The District will develop a district-specific groundwater model that can be used as a preliminary screening tool for the evaluation of groundwater appropriation requests related to four fens within the district (Black Dog, Fort Snelling, Nicols, and Quarry Island). The goal of the model is to define the approximate extent of the recharge zones for the fens and provide a method for evaluating whether the proposed groundwater withdrawals may cause significant decline in head at one or more of the referenced fens.	DNR	$150,000	2018 - 2020
District Boundary Modification Project. District staff will work with BWSR and the neighboring watershed districts and water management organizations to review and possibly modify the district's jurisdictional boundary.	BWSR, Carver County WMO, and Riley – Purgatory Bluff Creek WD	$10,000	2018
Downtown Shakopee Targeted BMP Feasibility Study. A feasibility study will be done in downtown Shakopee to identify opportunities for implementing the targeted best management practices.	City of Shakopee	$50,000	2022
Dredge Site Restoration Project. This project consists of implementing the site restoration project identified in the February 15, 2017, *Estimate of Probable Cost, Cargill East River (MN–14.2 RMP) Dredge Material Site* technical memorandum prepared by Burns & McDonnell, Young Environmental Consulting Group, LLC, and Berrini & Associates, LLC, for the Cargill East River (MN – 14.2 RMP) Dredge Material Site located on the Minnesota River in Savage, Minnesota.	BWSR	$480,000	2018 - 2019
Eagle Creek (East Branch) Project. This project will restore approximately 2,400 feet of stream and repair erosion under the 128th Street Bridge. The goals of the project are to reduce erosion and improve fish habitat. Due to beaver dams, the stream cuts into three valley walls, contributing to significant deposits of sediment.	DNR, MN Trout Unlimited and City of Savage.	$20,000	2018 - 2019

Project Name and Descriptions	Project Partner	Estimated Cost	Estimated Timeline
East Creek Bank Stabilization Project. Identified in the East Chaska Creek Restoration feasibility study, the scour hole downstream of Crosstown Boulevard Bridge will be repaired, bank armoring installed, toe protection and grade control structures added behind Cuzzy's Brickhouse Restaurant, and bank armoring and toe protection installed on the right bank of East Oak Street.	City of Chaska, MPCA and BWSR	$50,000	2019
East Creek Water Quality Treatment Project This feasibility study reports that the ideal site to construct a treatment wetland was south of the creek in two vacant lots along Chaska Boulevard. Most lots there are paved right up to the edge of the creek bank. The flow could be diverted from the creek channel into a stormwater treatment system to provide for sediment removal, flood storage, and bacteria treatment.	City of Chaska and MPCA	$75,000	2019 - 2020
Minnesota River Assessment of Ecological and Economic Impacts of Sedimentation This project will examine sedimentation in the Lower Minnesota River Watershed including monitoring, modeling, and analyzing sediment sources, sinks, and pathways in the watershed; summarizing how sources, sinks, and pathways may have changed; and estimating the economic and ecological effects of sedimentation. The project team will look at how sedimentation (1) changes the stage-discharge relationships that may cause flooding, (2) generates costs to maintain a commercial navigation channel on the Minnesota River, and (3) affects the watershed with its ecological conditions. Through these analyses, a new baseline can be established, and an understanding created of how changes in land use will alter the watershed baseline and create a new condition.	BWSR and Army Corps of Engineers	$150,000	2024 - 2027
Minnesota River Assessment of Water Storage Benefits and Opportunities. Using the Agricultural Conservation Planning Framework (ACPF) and the Prioritize, Target, and Measure Application (PTMApp), we will determine if a flow reduction would benefit from the placement of storage measures in key locations throughout the basin. This analysis will help us understand if the threshold for meaningful change can be realized to recommend specific levels of storage in the basin. The analysis is needed to accomplish the desired outcomes: (1) hydro-correct DEMs for the lower watershed where storage impacts are desired, (2) run ACPF on priority sub-basins to determine where storage opportunities exist, (3) develop a detailed hydrologic model if one does not exist, (4) run existing and storage scenarios to determine if the amount of the discharges could be lowered for hypothetical rainfall events ranging from 10-year to 100-year events, and (5) summarize the saturation of storage and the maximum change anticipated in the specific agro-ecoregion.	MPCA and BWSR	$150,000	2025 - 2027

Project Name and Descriptions	Project Partner	Estimated Cost	Estimated Timeline
Minnesota River Floodplain Model Feasibility Study. We will review the existing Minnesota River floodplain model to determine if updates are required.	DNR, Army Corps of Engineers, and all LGUs within the District	$30,000	2019
Minnesota River Sediment Reduction Strategy. This project team will collaborate with the MPCA in developing strategies for evaluating and mitigating sediment loads going into the Minnesota River.	MPCA and BWSR	$40,000	2018 - 2019
Minnesota River Study Area 3 – Bluff Stabilization Project. To address river bank erosion, we will analyze the design and construction of the Minnesota River at Study Area 3 project in Eden Prairie. A study was completed in October 2008 for the City of Eden Prairie in cooperation with the district. Our project will expand the 2008 study by collecting and analyzing additional data that will extend to the final design, permitting, and construction.	City of Eden Prairie	$350,000	2022 - 2023
Realignment of the Prior Lake Spring Lake Outlet Channel. This project will place additional capacity and control structures in the channel to handle increased runoff that is draining into the channel because of developments.	City of Shakopee	$100,000	2021 - 2022
Riley Creek Project – Downstream of Flying Cloud Drive. The project will provide an energy dissipation below the County Road 61/ Flying Cloud Drive bridge and redirect flows away from outside the creek meanders.	Hennepin County	$75,000	2018 - 2019
Schroeder's Acres Park/Savage Fen Stormwater Management Project. This project will evaluate options for incorporating storm-water wetland and irrigation reuse systems on the site and address phosphorous, temperature, metals, E. coli and runoff volume in Eagle Creek.	City of Savage and DNR	$220,000	2019 - 2020
Seminary Fen Restoration Site A At the intersection of Engler and Audubon in Chaska, Minnesota, 3.61 acres of wetland will be purchased and restored. This site is dominated by reed canary grass and offers the greatest threat to the rare plants of the Seminary Fen Wetland Community. The site is next to a 6-acre wetland that was restored by the City of Chaska in partnership with the DNR.	City of Chaska and DNR	$75,000	2021
Seminary Fen Restoration Site B A partially drained 17-acre wetland from Falls Curve Road to Old Highway 12, that is predominantly growing reed canary grass, will be restored. The restoration involves disabling the drainage system and restoring vegetation.	City of Chaska and DNR	$75,000	2024 - 2025
Seminary Fen Ravines Site C-2 and C-3 Studies. Seminary Fen Ravine Sites C-2 and C-3 are actively discharging sediment into the Seminary Fen Wetland Complex. This project will conduct a ravine study to estimate sediment contribution to the Seminary Fen from sites C-2 and C-3 and provide approaches and cost estimates for correcting the erosion problems.	City of Chaska and DNR	$60,000	2024 - 2025

Project Name and Descriptions	Project Partner	Estimated Cost	Estimated Timeline
Seminary Fen Ravines Site C-2 and C-3 Design and Construction. The final design and construction will be done for the Ravine Sites C-2 and C-3, which are discharging sediment into the Seminary Fen Wetland Complex.	City of Chaska and DNR	$170,000	2025 - 2027
Spring Creek Project This project consists of retrofitting two catch basins into the structural treatment devices in the Lenzen first and second additions. In addition, the project will treat untreated discharge that comes from upstream into Spring Creek at 6th Street.	City of Carver	$45,000	2019
West Chaska Creek Project. The project will re-meander approximately 1,100 linear feet of a ditched segment of West Chaska Creek. Lengthening the channel will reduce water velocity, lower sheer stress on the banks, reconnect the creek to its floodplain, and reduce the amount of sediment transported downstream to the Minnesota River. Based on upstream reference reaches and changes observed since the creek was straightened, the re-meander project will reduce total suspended solids by an estimated 4,400 pounds per year for 30 years.	Carver County, City of Chaska and Carver County WMO	$50,000	2019

E3.4.1. LOCAL WATER PLANS

The required content of local water plans, as stipulated by MN 8410, is addressed in Section 5. In general, local water plans shall be adopted by LGUs within 18-months of this Plan's approval and shall include:

- Surface Water, Groundwater, Wetlands, Floodplain and Flood Management, Unique Natural Resources, and Erosion and Sediment Control Goals and Policies
- Standards as presented in Appendix K
- Water Conservation Act (WCA) Responsibilities

E3.5. MEASURABLE OUTCOMES

The Plan's success will be measured by successful implementation of policies and strategies to meet the nine identified goals mentioned above. Other success determinations include generated annual review trends and assessment of the program's short and long-term metrics. The short and long-term metrics are provided below in Table E-3.

Table E-3: Lower Minnesota River Watershed District Short-term and Long-term Metrics

Goal	Short-term Metric	Long-term Metric
Goal 1: Organizational Management	• Completion of scheduled activities • Annual LGU Audits • Amount of dollars leveraged for projects from other agencies and property owners	• Formation of a Minnesota River Basin Commission • Legislative funding support
Goal 2: Surface Water Management	• Number and types of projects completed as part of the Cost Share Incentive Program and Water Quality Restoration Programs • Number of targeted studies and projects completed	• Positive trends in water quality parameters identified for monitoring efforts
Goal 3: Groundwater Management	• Number of targeted studies and projects completed	• Positive trends in water quality parameters identified for monitoring efforts
Goal 4: Unique Natural Resources Management	• Number of targeted studies and projects completed • Development and completion of the Fen Stewardship • Development of groundwater model for fen management	• Number and acreage of unique natural resources protected, restored, or enhanced • Acquisition of high valued easements • Sustained protection of the fens and trout waters
Goal 5: Wetland Management	• Completion of scheduled activities	• Number and acreage of wetlands protected, restored, or enhanced

Goal 6: Floodplain and Flood Management	• Completion of scheduled activities	• Number of structures damaged and value of flood damages • Preservation of floodplain resources
Goal 7: Erosion and Sediment Control	• Completion of scheduled activities • Reduction in streambank and ravine bank and slope failures	• Positive trends in water quality • Protection and preservation of Minnesota River Bluff
Goal 8: Commercial and Recreational Navigation	• Completed of scheduled activities • Number of targeted studies and projects completed	• Secure regular congressional and state legislative funding for the 9-Foot channel
Goal 9: Public Education and Outreach	• Number and types of sponsored events • Number of participants at events • Number of articles, press releases, and pamphlets developed and printed • Number of volunteers	• Same as short-term metrics

INTRODUCTION

This section provides introductory information about the Lower Minnesota River Watershed District (District), including the history, location, boundaries, unique characteristics, and management.

I1. HISTORY

In 1955, the Minnesota State Legislature enacted the initial Minnesota Watershed Act, previously called Minnesota Statute (M.S.) Chapter 112. Pursuant to this statutory authority, five counties (Hennepin, Ramsey, Dakota, Scott, and Carver) petitioned for the establishment of a watershed district. On March 23, 1960, the Minnesota Water Resources Board, now the Board of Water and Soil Resources (BWSR), established the Lower Minnesota River Watershed District.

In 1957, the District was part of the first petition in Minnesota. However, the petition was challenged and defeated in the courts. Meanwhile, on the national stage, the U.S. Congress ordered the U.S. Army Corps of Engineers (COE) to deepen the Minnesota River channel from four to nine feet from the confluence with the Mississippi River to river mile (R.M.) 14.7 in Savage, Minnesota. The congressional order required the COE to partner with a local regulatory entity to serve as the local sponsor. The District's original practitioner re-petitioned for the watershed district formation and added the local sponsor role to the petition. The petition was submitted to the COE for the 9-Foot channel. The re-petition was successful, and the District was established in 1960, making it the second watershed district in Minnesota.

Minnesota state statutes and rules affecting watershed districts (WDs) and water management organizations (WMOs) have broadened the role of WDs in water management, especially in the Twin Cities metropolitan area. The statutes affecting WDs and WMOs in the metropolitan area were recodified to M.S.103D and M.S.103B, respectively. One requirement of the statutes is that WDs and WMOs complete watershed management plans and update them every ten years. The District adopted its first Plan in 1961.

I2. LOCATION AND BOUNDARIES

The District is in the southwest part of the Twin Cities metropolitan area along the Minnesota River. The District boundaries 80 square miles of Carver, Hennepin, Dakota, Scott, and Ramsey counties, which includes the Minnesota River valley from Fort Snelling, at the confluence of the Minnesota and Mississippi rivers, upstream to Carver, Minnesota. The District includes the bluffs on both sides of the Minnesota River within this reach of the river. Within the District's boundaries are community portions of Mendota Heights, Mendota, Lilydale, Eagan, Bloomington, Burnsville, Savage, Shakopee, Eden Prairie, Chanhassen, Chaska, Jackson Township, Louisville Township, and Carver. The legal description is in Appendix A.

I3. DISTRICT CHARACTERISTICS

The goals, policies, strategies, implementation plan, and capital improvements program set forth in this Plan reflect the District's specific characteristics. The features of the District include:

- The District boundary generally follows the Minnesota River watershed up to the bluff line.
- Both quantity and quality of surface water resources are very closely tied to groundwater.
- Unique and rare water resources in the District include floodplain wetlands, calcareous fens, and trout waters.
- The District plays a critical role in commercial navigation, as stated in the original order creating the District.
- The District contains the upper reaches of the navigation pools created by Lock and Dam No. 2 on the Mississippi River at Hastings.

I4. DISTRICT MANAGEMENT

The District's affairs are administered by five Managers appointed by County Commissioners. Presently, two Managers are appointed by Hennepin County and one Manager is appointed by Carver, Dakota, and Scott counties. (Ramsey County is no longer represented on the Board since only a small uninhabited area of the county is within the District's boundaries.) Appointments are in three-year terms, and each Manager is eligible for reappointment. Table I-1 lists every Manager who has served, their term of office, and county of residence.

Since 1960, the Managers have met regularly each month. The Managers currently meet on the third Wednesday evening of each month, unless modified. All l meetings are open to the public, and a notice is provided in advance.

Financial records are provided monthly to the Managers. Annually, the Managers authorize and obtain financial audits of the District's books and records. In addition, the Managers review and propose a budget, initially prepared by the District administrator, for the following year. After a public hearing, the budget is approved for implementation.

Table I-1: Lower Minnesota River Watershed District Board of Managers (1960 - Present)

Manager	Term of Office	County Represented
Kenneth W. Westerberg	1960 – 1966	Scott
Charles H. Bingham	1960 – 1968	Ramsey
Alfred W. Hubbard	1960 – 1972	Hennepin
Casimir A. Lubansky	1960 – 1981	Carver
Jens A. Caspersen	1960 – 1984	Dakota
Merrill M. Madsen, Jr.	1966 – 1978, 1984 – 1994	Scott, Dakota
William J. Jaeger, Jr.	1968 – 1977, 1983 – 1994	Ramsey, Hennepin, Hennepin
Paul G. Fallquist	1972 – 1983	Hennepin
Russell A. Sorenson	1977 – 1992	Hennepin
J. William Kennedy	1978 – 1981	Scott
Russell K. Heltne	1981 – 1987	Scott
Cyril B. Ess	1981 – 1996	Carver
Jim A. Kephart	1988 – 1999	Scott
Edward A. Schlampp	1992 – 2012	Hennepin
Wallace E. Neal	1994 – 2002	Hennepin
Eugene A. DePalma	1995 – 1999	Dakota
Terry L. Schwalbe	1996 – 2002	Carver
Glenda Spiotta	1999 – 2002	Scott
Ronald Kraemer	2001 – 2008	Dakota
Stephen B. Dalsin	2002 – 2003	Hennepin
Lawrence Samstad	2002 – 2011	Scott
Leo Forner	2003 – 2006	Carver
Leonard Kremer	2003 – 2016	Hennepin
Kent Francis	2006 – 2015	Carver
Don McCready	2009 – 2010	Dakota
Carla Shutrop	2011 – 2013	Scott
Yvonne Shirk	2011 – 2018	Dakota
Mike Murphy	2015 – 2016	Scott
David Raby	2015 - Present	Hennepin
Jesse Hartman	2016 – Present	Scott

The District expects to have a Citizen's Advisory Committee (CAC) which would serve as an advisory committee to the managers. Once established, the CAC would meet quarterly, at a minimum, to:

- Act as liaison between the District and residents.
- Increase public awareness by educating District residents about actions to protect and improve water resources and habitat within the District.
- Advise the managers and staff on issues important to residents.

The District will consult with some or all its Technical Advisory Committee (TAC), whose current members are listed in the Foreword of this Plan, on an as-needed basis but no less than twice a year to get assistance with the following activities:

- Perform the District's biennial program review.
- Implement Goals 4 and 9 of this Plan, which increase the participation and awareness of unique natural resources and the Minnesota River.
- Implement Goal 9 of this Plan, which increase public participation and awareness of unique natural resources and the Minnesota River.

I5. 2010 – PRESENT ACCOMPLISHMENTS

The District has been invaluable in managing and protecting the Minnesota River, lakes, streams, wetlands, groundwater, and unique resources that respond to the needs of their constituents and partners. Table I-2 presents activities and accomplishments of the District between 2010 – 2016. All projects and activities the District participates in were prioritized as follows: Benefited resources, outcomes, urgency, partnering opportunities, and readiness. Projects with quantifiable and/or qualitative outcomes associated with the District's high value resources (e.g., fens, trout lakes, and trout streams) received priority funding.

Table I-2: Lower Minnesota River Watershed District - 2010 – 2016 Activities and Accomplishments.

WATERSHED MANAGEMENT PLAN ACTIVITIES
Amended the Plan to incorporate the 2012 Governance Study, the 2013 Dredge Material Site Management Plan, and the Strategic Resources Evaluation (SRE).
Participated in the BWSR-led Performance Review and Assistance Program Level II evaluation
Adopted a Data Practices Policy and Procedures, as required by Minnesota Statutes Sections 10.03, subdivision 2 and 13.05, subdivision 5 and 8.
Continued to work on the formation of a Minnesota River Basin Commission at the Minnesota State legislature.
Commented on the Minnesota Sediment Reduction Strategy for the Minnesota River Basin, South Metro Mississippi River Total Suspended Solids Total Maximum Daily Load (TMDL) Study, Chippewa River & Hawk Creek River TMDL/ Watershed Restoration and Protection (WRAP) Strategy, Yellow Medicine One Watershed One Plan, and Minnesota Department of Transportation Statewide Ports and Waterways Plan.

MONITORING PROGRAM	
Carver County Soil and Water Conservation District (SWCD)	Carver County SWCD monitors East & West Chaska creeks for nutrient occurrence and concentration for the District.
Dakota County SWCD	Dakota County SWCD monitors water levels in observation wells in Savage Fen and Seminary Fen for the District.
Scott County SWCD	Scott County SWCD conducts thermal monitoring and performs continuous stream monitoring for water quality on Eagle Creek.
Metropolitan Council Environmental Services (MCES)	Through the Citizen Assisted Monitoring Program (CAMP), MCES monitors water quality of Courthouse, Firemen's and Brickyard lakes.
United States Geological Survey (USGS)	USGS monitors the stream gage on the Minnesota River at Ft. Snelling and samples bedload, loads, and sediment transport in the Minnesota River through a partnership with the District and the U.S. Army Corps of Engineers.
EDUCATION AND OUTREACH	
Metro Blooms Rainwater Garden Workshops	Contributed $11,800 to Metro Blooms to conduct A & B workshops in the cities of Bloomington (2), Savage, Chanhassen, and Eden Prairie. The District also promoted the workshops on its website and provided in-kind promotional materials to the workshop locations.
Metro Water Festival	2013 – 2016, the District has participated in and sponsored ten (10) classrooms to attend the festival 2013 -2016.
Metro Watershed Partners	Contributed $500 to the Metro Watershed Partners for Clean Water Minnesota advertising program.
Blue Thumb Planting for Clean Water	Maintained Blue Thumb membership, promoted it on the District's website, and volunteered in organized activities such as rain garden workshops.

Carver County Environmental Children's Water Festival	Contributed $500 towards bus transportation from Carver County to the State Fair Grounds.
Barge Tour	Hosted a barge tour on the Minnesota River in September. Tour speakers included representatives from the Minnesota Soybean Growers, U.S. Fish & Wildlife Service, CHS, Upper River Services among others. The Minnesota River Basin legislators were invited to learn about the importance of the navigation channel to the Minnesota agricultural economy and the problem upstream sediment poses to navigation.
Magnolia Blossoms Tour	In 2015, the District hosted a tour on the Magnolia Blossom with Riley Purgatory-Bluff Creek Watershed District. Carver County WMO, Nine Mile Creek WD and Nonpoint Education for Municipal Officials (NEMO). Local elected officials were invited and shown a presentation on the problems of urban sediment on the river and what local elected officials could do to manage stormwater runoff and sediment transport and deposition.
Paddle Forward	Sponsored one participant in 2015 Paddle Forward expedition on the Minnesota River by Wild River Academy.
	Hosted a Paddle Forward expedition at the Vernon Ave. dredge site with USGS to explain dredging operations.
The District, with the assistance of its now defunct CAC, developed its education plan (2011).	
The District sponsored a raingarden workshop in the City of Shakopee, presented by Scott SWCD.	
Participated in the Minnesota River Congress and became part of the organizing committee; made a presentation at the Fourth River Congress.	

Published educational/informational articles for homeowners on ways to maintain and improve water quality in yard-scapes.	
Funded five projects under Cost Share Incentive and Water Quality Restoration Program (2014).	
9-FOOT CHANNEL AND DREDGE SITE MANAGEMENT	
Unsuccessfully lobbied for $40,000 from the Port Authority Assistance Program and $4 million for the 9-Foot channel.	
Received a $40,000 grant to develop an access road at River Mile 14.7 Dredge Site (2010).	
Investigated two possible sites for the development of an additional dredge material management site below I-35W, as requested by the U.S. Army Corps of Engineers, and prepared a cost estimate for development of a site on Metropolitan Airport Commission property. After unsuccessful attempts to get funding from the State legislature for a second dredge site, the U.S. Army Corps of Engineers was asked to re-evaluate the need for an additional dredge material management site.	
Requested and received an amendment to the Conditional Use Permit (CUP) from the city of Savage. The CUP allows for unlimited truck traffic into and out of the Vernon Avenue facility.	
Secured a commitment from a local contractor to purchase the existing stockpile of dredge material over the course of the next three years and find reuses for it.	
Licensed local industry to place material dredged from private barge slips temporarily at the Vernon Avenue dredge material management site.	
Retained services of LS Marine to manage the dredge materials at 12020 Vernon Avenue in Savage.	
CAPITAL IMPROVEMENT PROJECTS	
Minnesota River Bank and Bluff Stabilization, Eden Prairie	The District participated in an analysis of the Minnesota River bank erosion problem located southwest of the intersection of Riverview Road and Mooer Lane in Eden Prairie.
Brickyard-Clayhole Shoreline Restoration Project	The District partnered with Carver County WMO and the City of Chaska to conduct a shoreline restoration on Brickyard-Clayhole Lake in Chaska. Contributed cost was $1,333.96 (2011).

Carver County Geologic Atlas	The District contributed $2,064.40 towards the completion of the Carver County Geologic Atlas (2011).
Seminary Fen Ravine Stabilization Project	The District partnered with the city of Chaska to secure a $220,000 Clean Water Fund Grant to restore a ravine tributary to Seminary Fen in Chaska.
Dean Lake Paleolimnology Study	Collaborated with Scott WMO and St. Croix Research Station to better understand the trophic and sedimentation history of the lake.
Long Meadow Lake Outfall Project	The District participated in a project with the City of Bloomington to rehabilitate or reconstruct an existing storm sewer outfall to Long Meadow Lake from the Bloomington Central Station area. The project incorporated water quality best management practices needed to provide additional water quality treatment.
Dred Scott Reuse Feasibility Study	The District investigated possibility of capturing and reusing stormwater to irrigate Dred Scott playfields in Bloomington, MN.
Dakota County Fens Project	The District reviewed 2011–2015 monitoring data collected on fens in the Dakota County. The review considered the state of the fens and provided insight on addition monitoring needs.
East Chaska Creek Feasibility Study	The District completed a feasibility study which investigated stabilization and restoration options for East Chaska Creek.
Riley Creek Stream Restoration Feasibility Study	The District participated in the feasibility study, with Riley Purgatory-Bluff Creek WD on Riley Creek. The study investigated the construction of an energy dissipation structure below County State Aid Highway 61 and redirection flows from outside creek's meanders.

Bluff Creek Project	The District participated in a project with Riley Purgatory Bluff Creek WD, the City of Chanhassen, and the Hennepin County Rail Authority. The focus of the project was to restore and stabilize an outside bend in the creek, repair undercutting of the tunnel under the Minnesota Bluffs Regional Trail, and to create fish passages into and through the tunnel.

1 LAND AND WATER RESOURCES INVENTORY

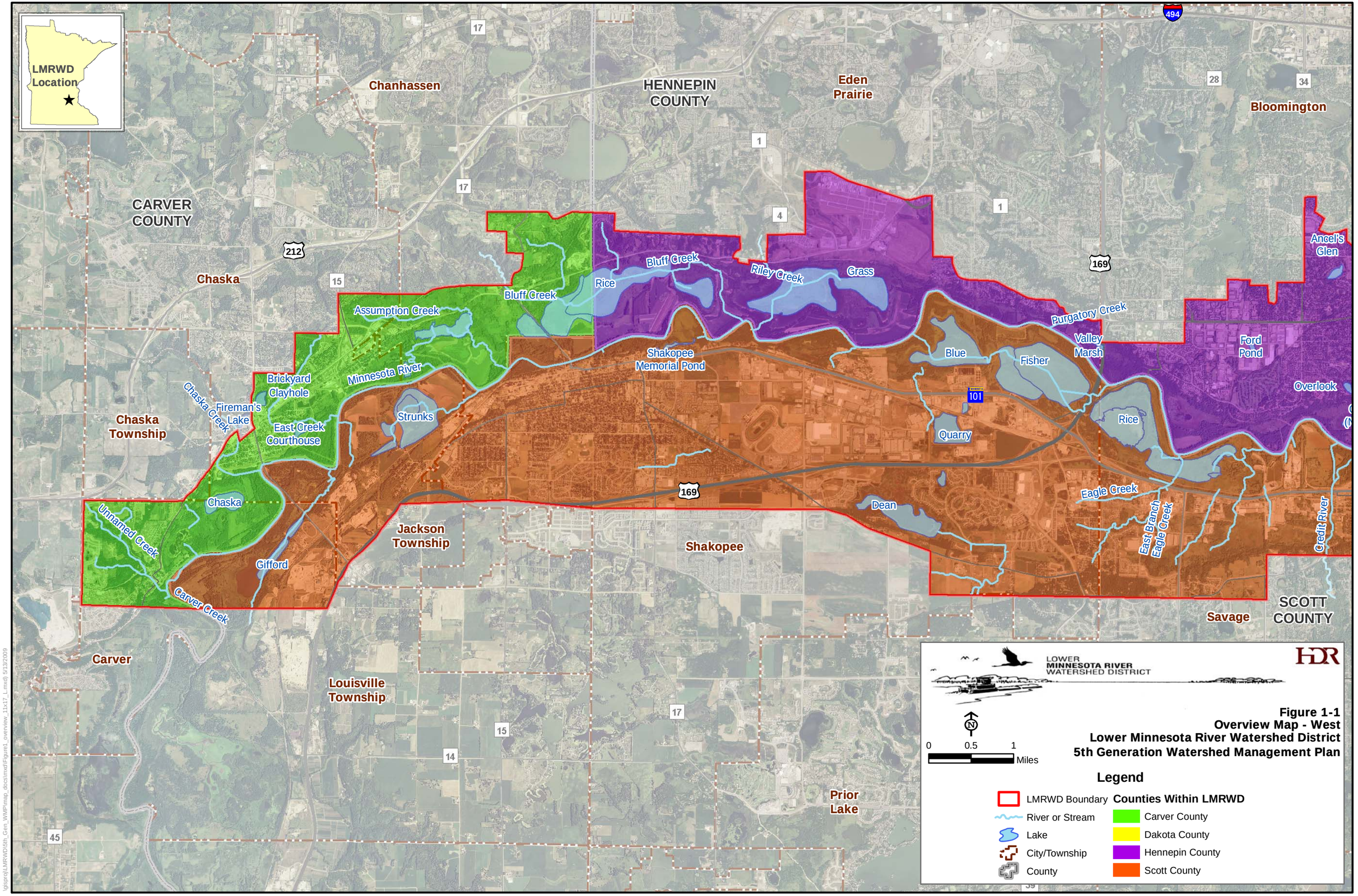
1.1 INTRODUCTION

The District is in the southwest portion of the Minneapolis-St. Paul (MSP) metropolitan area and covers approximately 80 square miles. The District's boundary generally follows the bluff line along both banks of the Minnesota River for approximately 32 river miles (R.M.) from the City of Carver and Louisville Township in the west, to the Minnesota River's confluence with the Mississippi River in the east. The District's authority covers twelve cities, three townships, and five counties, and spans the north bank of the Minnesota River from the City of Carver in Carver County to the City of Minneapolis in Hennepin County, and the south bank of the Minnesota River from Louisville Township in (Figure 1) and Scott County to the City of Mendota in Dakota County (Figure 1-1 and Figure 1-2).

This section presents the District's land and water resource information in accordance with M.S. 103B.231 and MN Rules 8410.0060. The statutes and rules require this plan to "contain an inventory of water resource and physical factors affecting the water resources based on existing records and publications." The paragraphs below provide general information on climate, watershed characteristics such as geology and soils, surface water resources, groundwater quality, and its susceptibility to contamination, fish and wildlife habitat, the human environment, unique features, and potential pollutant sources.

1.2 CLIMATE AND PRECIPITATION

Minnesota has a continental climate, which means it is not affected by the moderating effects of any ocean. Given its mid-latitude location, the District has four distinct seasons. Winters are generally cold and subject to arctic outbreaks, while summers are often subject to prolonged heat due to an influx of warm air from the southwestern United States, or warm, humid air from the Gulf of Mexico. Spring and fall are the moderate times of year but can have outbreaks of severe thunderstorms due to the interaction of cold and warm air masses, which dominate in winter and summer. The following sections document weather station information, temperature, and precipitation trends for the District from 1971-2000.



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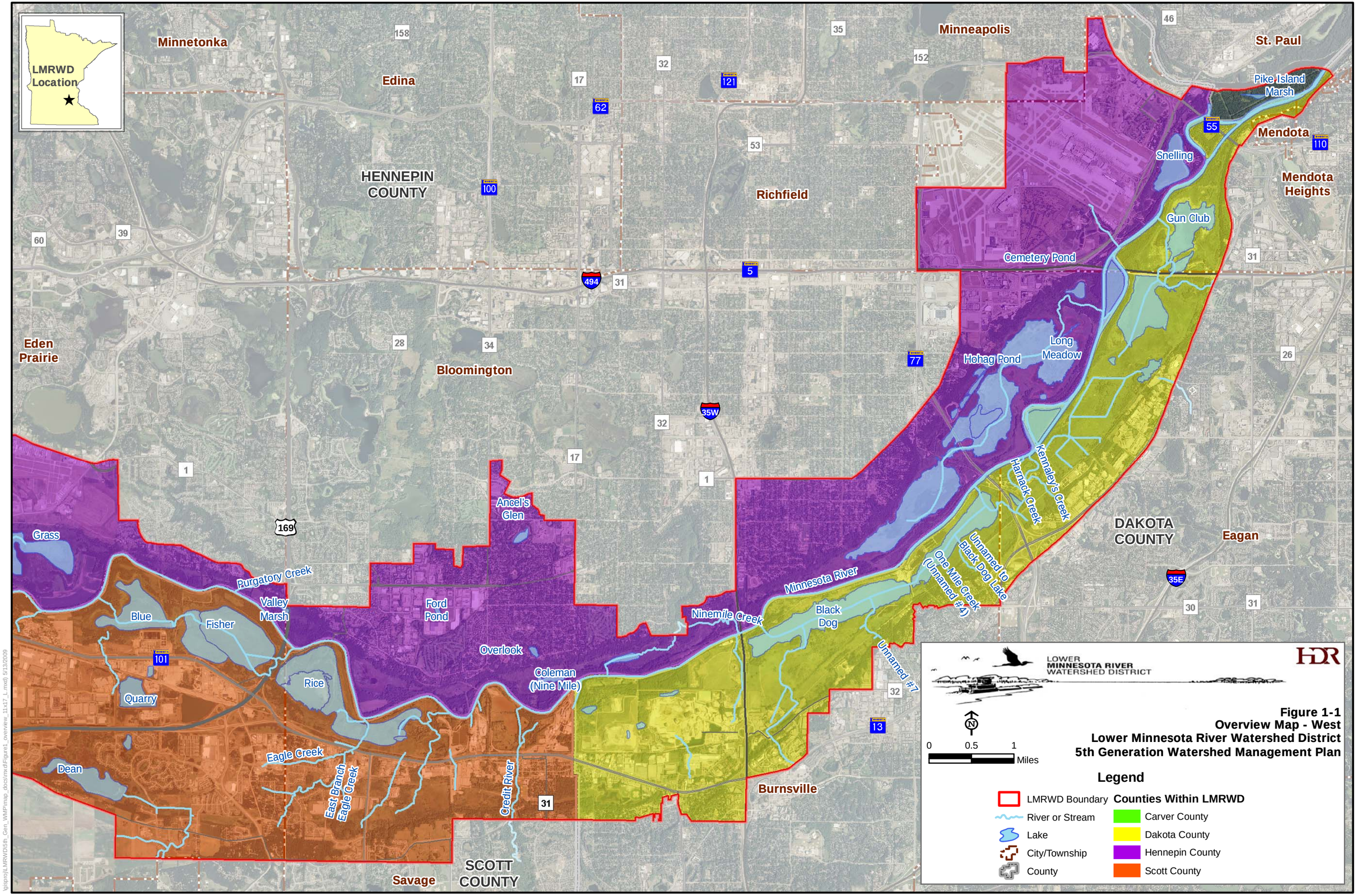

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1.2.1 Weather Station

The MSP Airport Station of the United States National Oceanic and Atmospheric Administration (NOAA) is a "first order" (those maintained by either the National Weather Service or Federal Aviation Administration) weather station located less than two (2) miles from the northern boundary of the District's eastern end. The National Weather Service forecast office for the metropolitan area, located in Chanhassen, also records weather data. There is also a cooperative weather station in Chaska. The Chaska station provides minimum and maximum air temperature readings and precipitation measurements once a day. The Minnesota State Climatology Office manages a network of stations within the District and provides more detailed local weather data.

1.2.2 Temperature

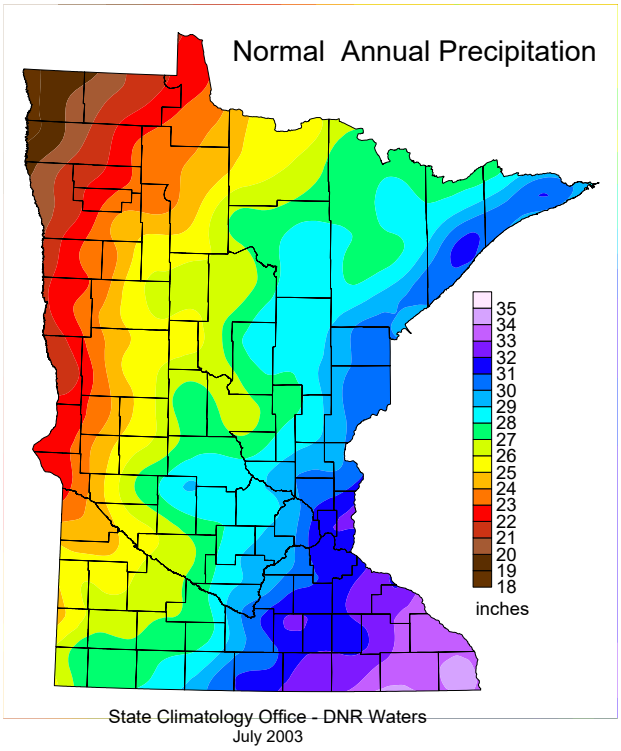
To date, the highest temperature on record at the airport station was 108ºF, set in July 1936, and the lowest temperature was -34ºF, set six (6) months earlier in January 1936. Extreme temperatures tell little except that in one season, temperatures can range from uncomfortably hot to bitterly cold. In general, temperature varies greatly from season to season, or even from day to day. However, a comparison of the MSP Airport station and Chaska station data shows slight temperature differences across the District. The average annual temperatures of the two stations for the current 30-year period are 45.4ºF and 46.4ºF, respectively (MRCC 2000-2010).

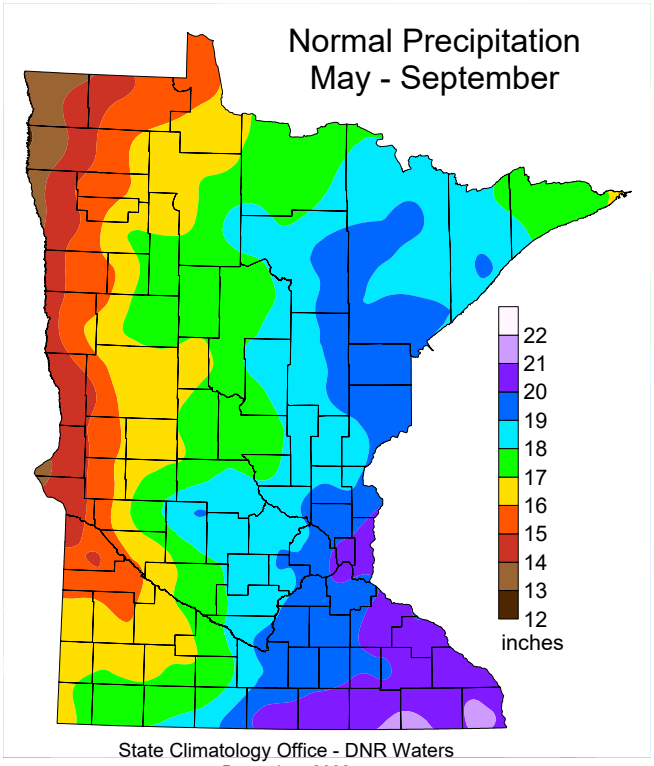
1.2.3 Precipitation

For the current 30-year period, average total annual precipitation at the MSP Airport station and the Chaska Station is 29.4 inches and 30.6 inches, respectively. The difference of one inch of average total annual precipitation does not indicate any significant tendency for any one part of the District to get more precipitation than another. However, in a given event, and especially in the warm season, storm precipitation totals can widely vary between individual stations within a region. Annual precipitation of 17.90 inches in 1987, and 9.82 inches in 1990, is another example of how extremes can occur in the area within a relatively short period of time (MRCC 2000-2010).

Average annual precipitation for the current 30-year period over the state of Minnesota is shown in Figure 1-3, which also shows the current 30-year (1981-2010) average precipitation for May to September, and April through October, respectively. Table 1-1 gives a precipitation summary for the MSP Airport station. Over the entire Minnesota River watershed, annual precipitation ranges from 22 inches in the west to 31 inches in the east.

Figure 1-3: Normal Precipitation





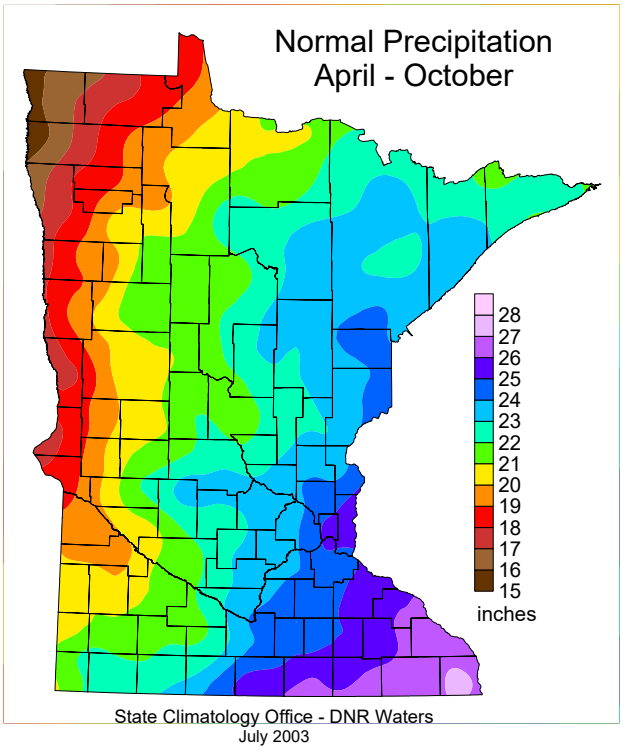


Table 1-1: Precipitation Summary - Minneapolis/St. Paul Airport Station
Averages 1981-2010 Extremes: 1891-2010

Total Precipitation, Inches					Snow inches		# Days with Precipitation	
Month	**Normal**	**Max Yr**	**Min Yr**	**1-Day Max**	**Normal**	**Max Yr**	**≥ .01**	**≥ 1.00**
Jan	0.90	3.63 1967	0.10 1990	1.21 1967	12.2	46.4 1982	8.9	0.0
Feb	0.77	2.14 1981	0.06 1964	1.34 2012	7.7	26.5 1962	7.4	0.0
Mar	1.89	4.75 1965	0.32 1994	1.66 1965	10.3	40.0 1951	9.3	0.2
Apr	2.66	7.00 2001	0.16 1987	2.58 2006	2.4	21.8 1983	10.7	0.4
May	3.36	9.3 2012	0.53 2009	3.39 2012	0.0	2.4 1954	11.5	0.5
Jun	4.25	9.82 1990	0.22 1988	3.28 2003	0.0	0.0 N/A	11.3	1.1
Jul	4.04	17.90 1987	0.58 1975	10.00 1987	0.0	0.0 N/A	10.2	0.9
Aug	4.30	9.3 2007	0.43 1946	7.36 1977	0.0	0.0 N/A	9.7	1.3
Sep	3.08	7.53 1942	0.30 2012	3.55 1942	0.0	1.7 1942	9.8	0.8
Oct	2.43	5.68 1971	0.01 1952	4.83 2005	0.6	8.2 1991	9.2	0.4
Nov	1.77	5.29 1991	0.02 1939	2.91 1940	9.3	46.9 1991	8.7	0.3
Dec	1.16	4.27 1982	0.00 1943	2.47 1982	11.9	33.6 2010	9.8	0.1
Annual	**30.61**	**17.90 1987**	**0.01 1952**	**10.00 1987**	**54.5**	**46.9 1991**	**116.5**	**6.0**
Winter (DJF)	2.83	6.24 – 1967	0.69 – 1958	1.90 02/24/1930	32.0	71.7 – 1967	9.3	0.2
Spring (MAM)	7.41	16.13 – 1965	2.12 – 1910	3.16 05/21/1906	13.7	48.1 – 1965	17.8	1.0
Summer (JJA)	12.43	23.52 – 1987	1.73 – 1894	9.15 07/23/1987	0.0	0.0 – 1949	20.2	3.2
Fall (SON)	6.74	13.50 – 1911	1.71 – 1952	4.96 09/12/1903	10.6	55.1 – 1991	14.5	1.3

Thunderstorms are the main source of precipitation during the warm season and can cause varying degrees of damage due to excessive rain, strong winds, lightning, hail, or any combination. The District's primary interest is heavy or persistent rainfall and runoff, which have the potential to cause flooding. Significant rainfall in June and July of 1993 in the Upper Midwest, combined with wet soil conditions, were the cause of severe flooding in the Upper Mississippi River Basin, including the Minnesota River (Larson, 1996).

Snowfall throughout the entire Minnesota River Basin can be considerable and may cause flooding in the District if the spring thaw occurs rapidly. Rapid melting of snow in the entire watershed was one of the most important contributing factors to the Minnesota River floods in 1951, 1965, 1969, 1997, and 2001. The heaviest monthly snowfall recorded to date at the MSP Airport station was 46.9 inches in November 1991. Annually, snowfall has been recorded in all months except June, July, and August (MRCC-Snow, 2000 - 2010).

Tornadoes and sleet (or freezing rainstorms) occur infrequently. Humidity, another variable in the overall climate picture, is of minor importance, except that the Minnesota River Valley probably experiences higher humidity than the upland areas that border the valley. Fog or low clouds occur, but not with sufficient frequency to warrant management concerns. Generally, the summer precipitation far exceeds that of the winter; summer rainfall usually being sufficient for proper plant growth. From May to September, the growing months, the average rainfall is 18.4 inches, or about 62 percent of the normal annual precipitation. The growing season is approximately 156 to 160 days for the current 30-year period but can be as short as 120 days to as long as 188 days. In a cold year, freezing temperatures may occur until the middle of May and begin again in early September. In a warm year, the spring's last freezing temperature may occur in the first week of April, and not occur again until late October. When adequate precipitation occurs, this growing season is suitable for most crop production (MRCC-Growing, 2000 - 2010).

1.2.4 Climate Variability in Minnesota

The primary source of moisture for warm-season precipitation in Minnesota is the warm, moist air that moves into the state from the Gulf of Mexico. Minnesota is in a unique position relative to dominant, continental air masses. To the west and north, the dominant air mass is semi-arid, while to the south and east, the dominant air mass is semi-humid. As a result, the annual precipitation in the state is highest in the southeast and declines to the northwest.

Seasonal variability occurs as different air masses dominate. During the warm season in Minnesota, moisture from the Gulf of Mexico is often available, and is the reason most of the state's precipitation occurs between May and September. However, when this moisture source is

obstructed, or when atmospheric patterns divert storm systems around Minnesota, drought conditions can occur.

When Gulf of Mexico moisture is abundant and numerous storms move through Minnesota, unusually heavy precipitation can lead to flash floods. Weather patterns that tend to persist over seasonal or longer periods are affected by the jet stream position, which is in turn influenced by ocean temperature anomalies. Although Minnesota has a continental climate, the occurrence of extended periods of wetter or drier conditions is often influenced by ocean temperatures and currents. Regardless of whether the temperature increases or decreases in the event of global climate change, the physical distance between the Gulf of Mexico and the District will remain essentially the same, as will the physical distance between the District and the U.S. and Canadian Rocky Mountains. Thus, the battle for dominance between semi-arid and semi-humid air masses will continue.

Given the multiple weather scenarios affecting Minnesota, wide ranges of climatic outcomes are normal. It is important to note that climate extremes should not be considered as aberrations, but rather treated as an inherent characteristic of a continental climate (DNR-Climate, 2010).

1.3 GEOLOGY AND TOPOGRAPHY

1.3.1 Surficial Geology

Minnesota's geological history includes several periods when great sheets of ice (glaciers) covered the upper Midwest region. The last period when the glaciers advanced as far as the Twin Cities was the Mankato sub-stage of the Wisconsin Glacial Age, about 11,000 years ago.

The Mankato glacier retreated in an erratic fashion. At times, the edge, or terminus, of the glacier remained relatively static for many years. At other times, it melted at a great rate and retreated rather quickly across the face of the land, geologically speaking. These two glacier retreat rates determined the District's geology and topography. First, the glacier deposited large quantities of granular material (glacial till) in the form of a terminal moraine (a row of rocks and soil originally pushed up by the glacier's advancing edge) during its stationary period. The hummocky terrain on the uplands south of the District is typical of such deposits. Second, as the glacier retreated along what is now the Minnesota River Valley, the melt water from the glacier was drained by the Glacial River Warren, which cut a channel in the glacial deposits. That channel is now the Minnesota River Valley. While melting, the glacier released tremendous quantities of water. This water cut the channel much deeper than it appears today. At one time, water filled the valley completely, from Richfield on the north to the bluffs on the south side of the valley.

As the flow receded, the valley filled with sediment. Again, the recession was not continuous, so erosion and sedimentation varied. As a result, the lower valley filled irregularly. Vestiges of this irregular sedimentation appear in terraces, most prominently in the area around Shakopee. Alluvium and terrace deposits cover the majority of District. Moraine deposits and lesser amounts of glacial

outwash deposits cover the remainder of the District. A map of the District's surficial geology is included as Figure 1 -4 and Figure 1-5 (Meyer, 2007).

1.3.2 Bedrock Geology

The District's bedrock geology information was obtained from the Minnesota Geological Survey's 2000 bedrock geologic and topographic maps of the seven-county MSP metropolitan area (Mossler, J.H. and R. G. Tipping 2000). The District's bedrock geology and structure are shown on Figure 1-6 and Figure 1-7. More detailed information on bedrock geology is found in the Hennepin, Ramsey, Dakota, and Scott county geologic atlases and the hydrologic investigations atlas, which covers Carver County.

From the District's western boundary to the west edge of Shakopee, the Minnesota River floodplain follows a buried bedrock valley. The oldest and deepest bedrock formation in this valley is the St. Lawrence/Franconia formation, made up of dolomite and sandstone. At Shakopee, this bedrock valley veers to the north side of the Minnesota River floodplain. In Shakopee's Fisher Lake, another bedrock valley intersects from the south. The combined valley follows an easterly path north of the District through Bloomington, passing into and across the District at the north end of Long Meadow Lake.

The majority of the District includes the subcropping Prairie du Chien group, composed mainly of dolomite. Outcrops of this bedrock formation can be seen on the bluffs on the the Minnesota River's south side, especially in Scott County and the western edge of Dakota County. Between the deeper St. Lawrence/Franconia formation and the Prairie du Chien formation is the Jordan Sandstone, which usually follows the buried bedrock valley. The Jordan sandstone also subcrops on the north side of the Minnesota River floodplain in Bloomington. On the uplands, at the District's very east end, are shallow St. Peter sandstone and Platteville and Glenwood Formations' subcropping bedrock.

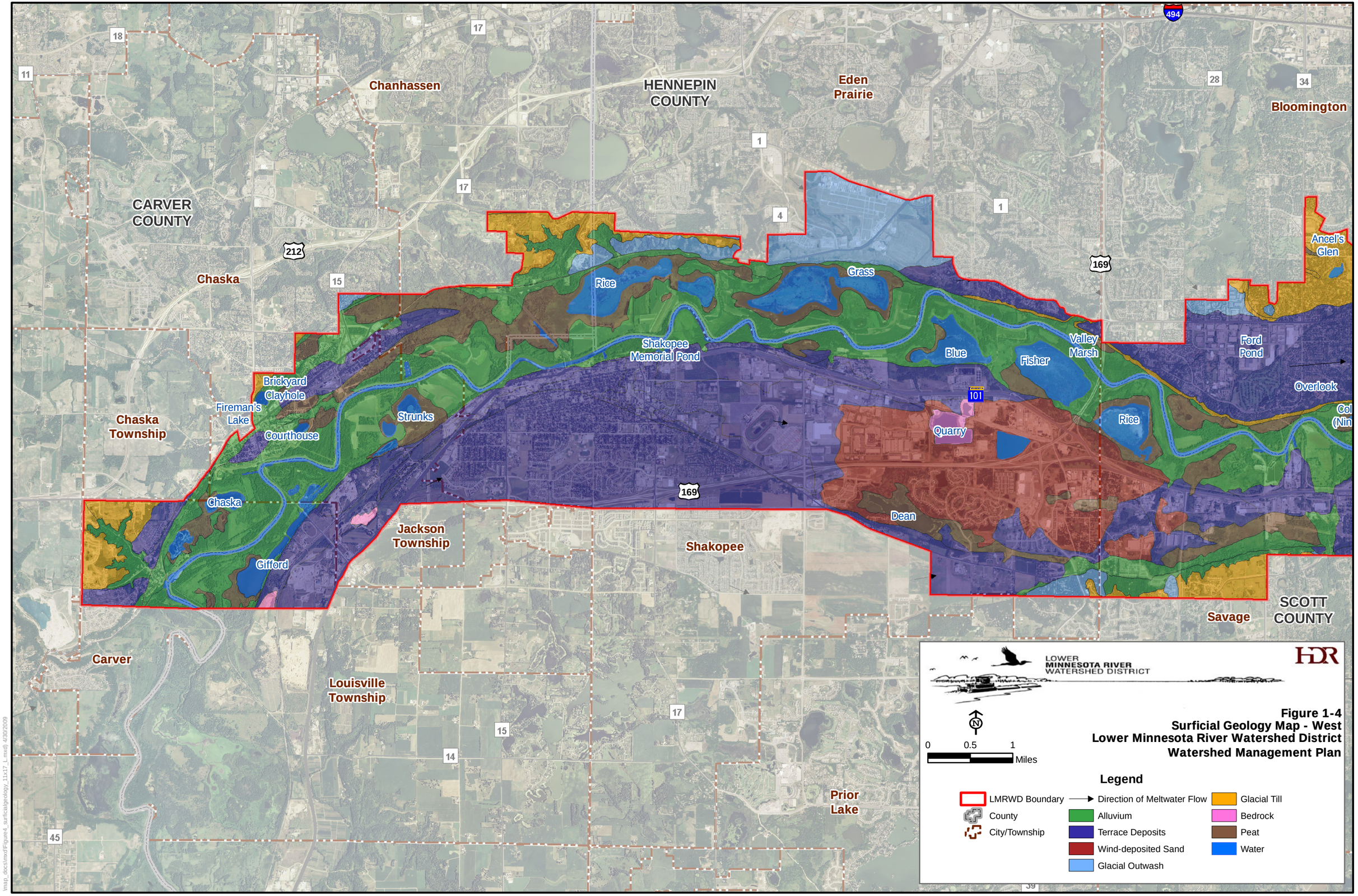
1.3.3 Topography

The District's topography is dominated by the Minnesota River, the broad Minnesota River floodplain, and the steep river bluffs. Figure 1-8 and Figure 1-9 show the topography within the District from east to west. Elevations within the District range from approximately 1,025 feet to 600 feet above mean sea level. The highest elevations occur on the bluffs north of the Minnesota River in the cities of Eden Prairie and Bloomington. The lowest elevations occur throughout the District along the banks of the Minnesota River.

1.4 SURFACE WATER RESOURCES

Surface water resources within the District include several lakes, ponds, wetlands, streams, and approximately 32 miles of the Minnesota River. The Minnesota Department of Natural Resources (DNR) has regulatory jurisdiction over the lakes, wetlands, and watercourses defined as public

waters within the State. Figure 1-10 and Figure 1-11 identify the major DNR regulated public waters within the District.



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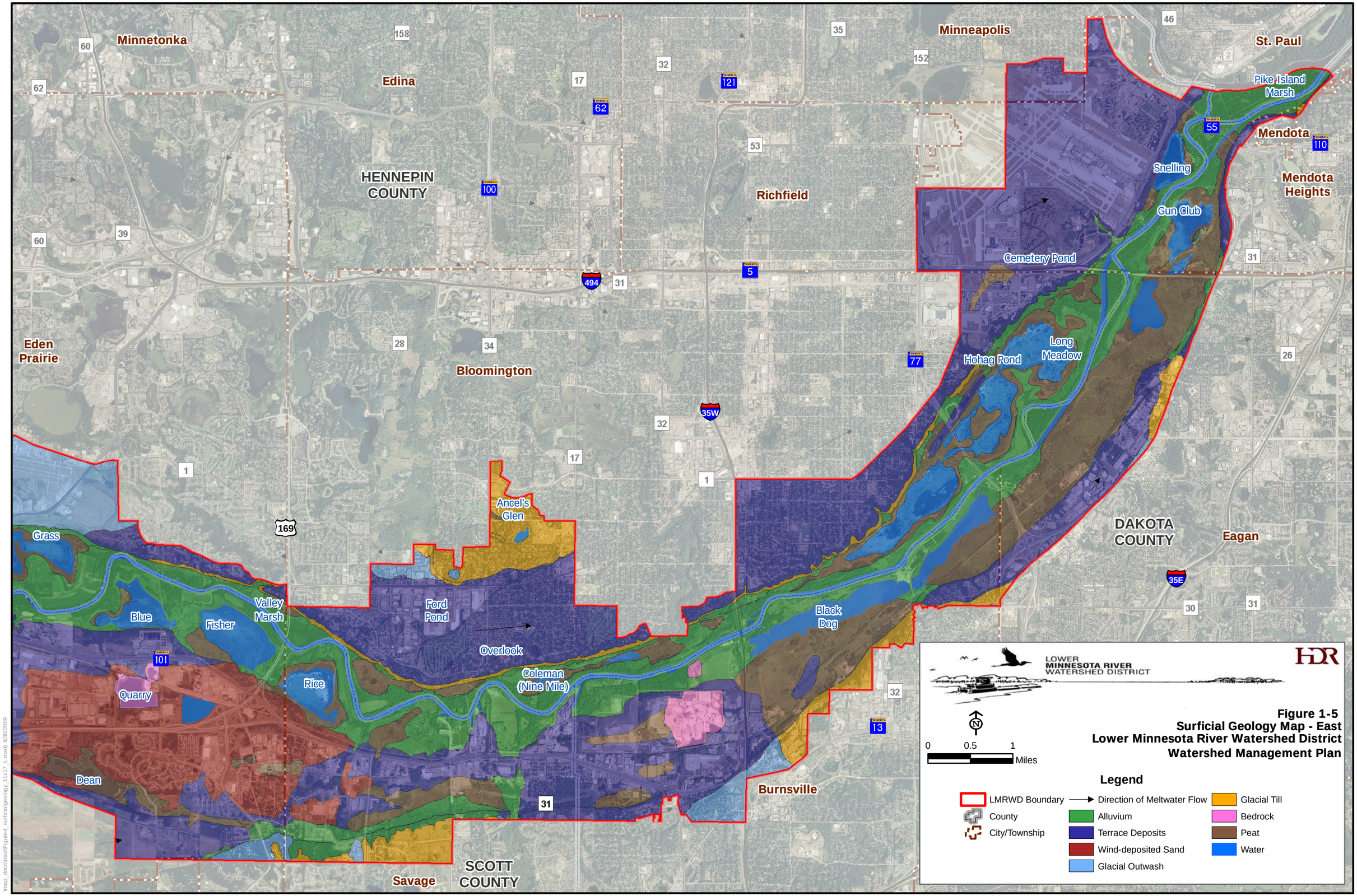

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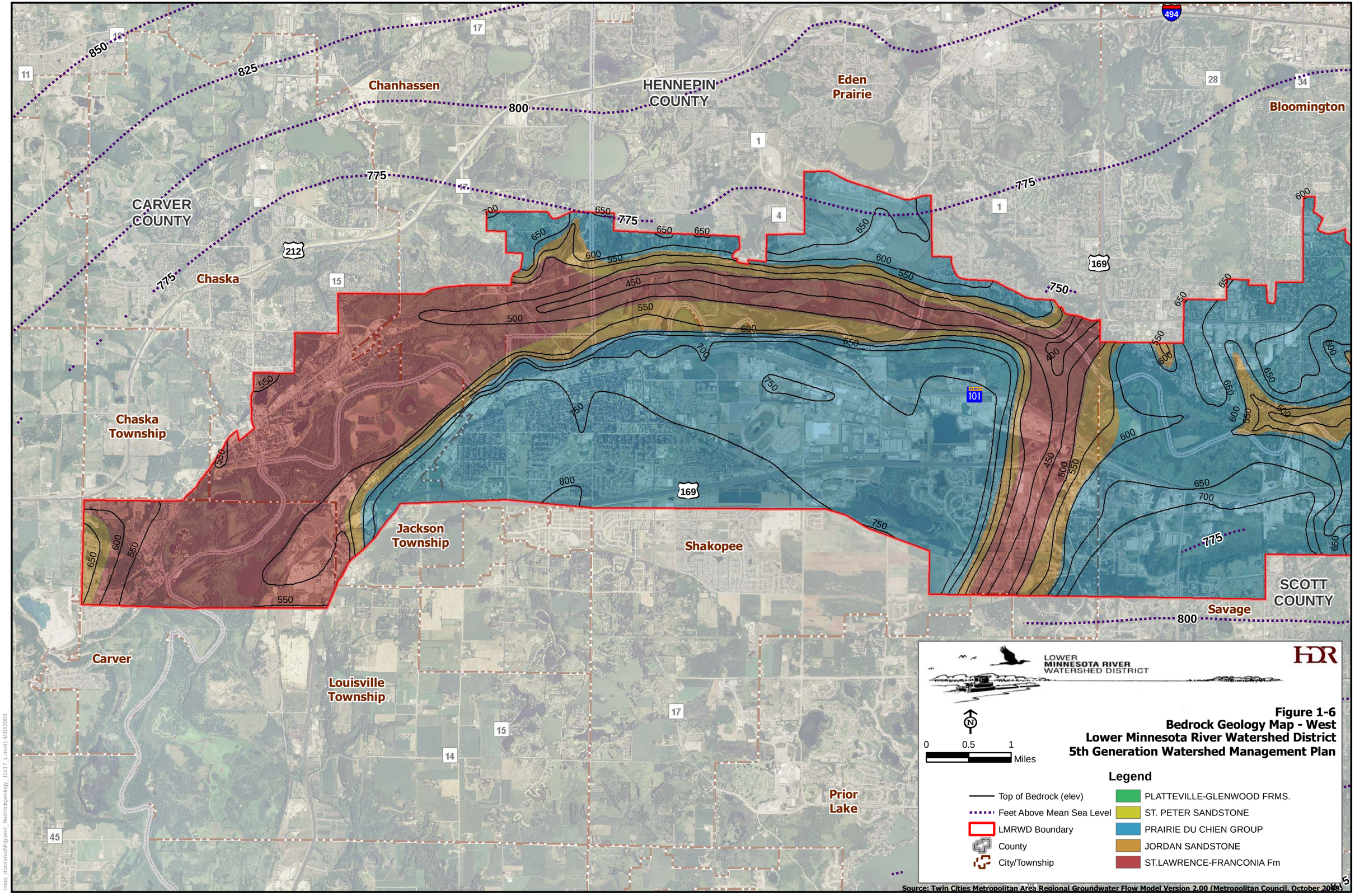
CARVER COUNTY
HENNEPIN COUNTY
SCOTT COUNTY
Chanhassen
Eden Prairie
Bloomington
Chaska
Chaska Township
Jackson Township
Shakopee
Carver
Louisville Township
Savage
Prior Lake
850
825
800
775
750
700
650
600
550
500
450
400
350
494
212
169
101
LOWER MINNESOTA RIVER WATERSHED DISTRICT
HDR
Figure 1-6
Bedrock Geology Map - West
Lower Minnesota River Watershed District
5th Generation Watershed Management Plan
0 0.5 1 Miles
Legend
Top of Bedrock (elev)
Feet Above Mean Sea Level
LMRWD Boundary
County
City/Township
PLATTEVILLE-GLENWOOD FRMS.
ST. PETER SANDSTONE
PRAIRIE DU CHIEN GROUP
JORDAN SANDSTONE
ST.LAWRENCE-FRANCONIA Fm
Source: Twin Cities Metropolitan Area Regional Groundwater Flow Model Version 2.00 (Metropolitan Council, October 2009)
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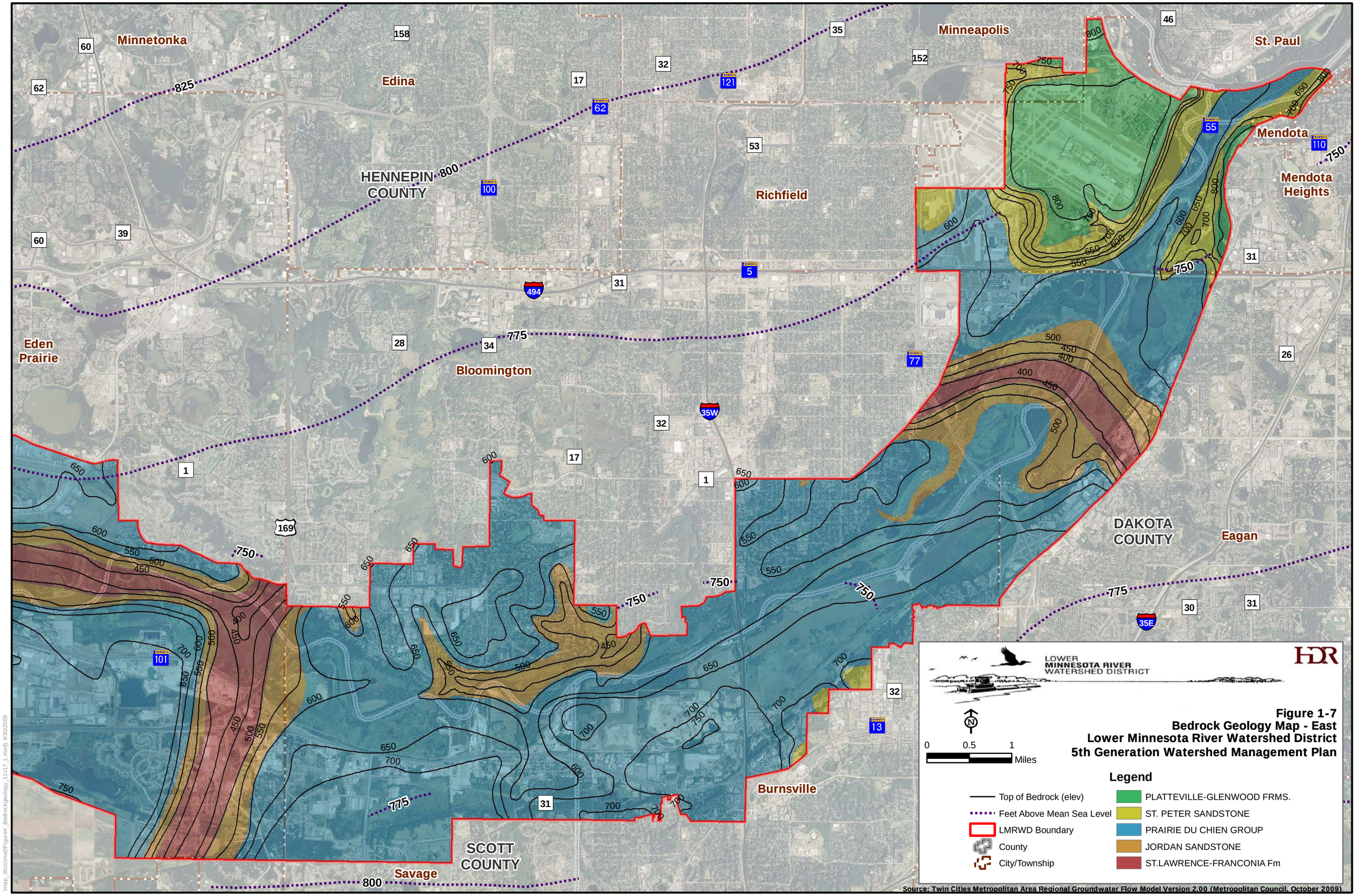
Minnetonka
Edina
HENNEPIN COUNTY
Richfield
Minneapolis
St. Paul
Mendota
Mendota Heights
Eden Prairie
Bloomington
Burnsville
DAKOTA COUNTY
Eagan
SCOTT COUNTY
Savage
825
800
775
750
494
35W
62
121
100
5
55
110
77
169
101
13
35E
LOWER MINNESOTA RIVER WATERSHED DISTRICT
HDR
N
0 0.5 1 Miles
Figure 1-7
Bedrock Geology Map - East
Lower Minnesota River Watershed District
5th Generation Watershed Management Plan
Legend
Top of Bedrock (elev)
Feet Above Mean Sea Level
LMRWD Boundary
County
City/Township
PLATTEVILLE-GLENWOOD FRMS.
ST. PETER SANDSTONE
PRAIRIE DU CHIEN GROUP
JORDAN SANDSTONE
ST.LAWRENCE-FRANCONIA Fm
Source: Twin Cities Metropolitan Area Regional Groundwater Flow Model Version 2.00 (Metropolitan Council, October 2009)
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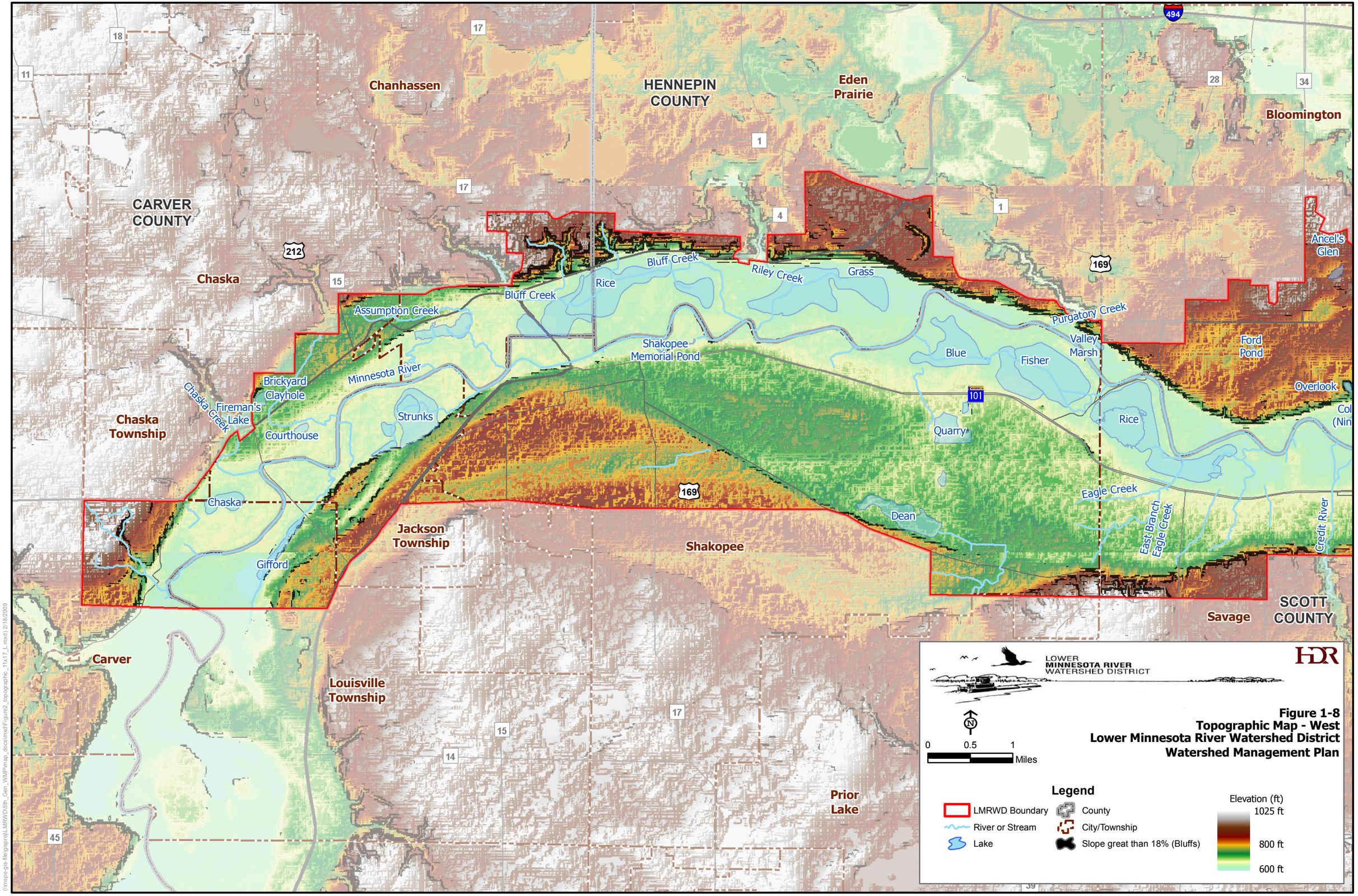

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Minnetonka
Edina
HENNEPIN COUNTY
Richfield
Minneapolis
St. Paul
Mendota
Mendota Heights
Eagan
DAKOTA COUNTY
Eden Prairie
Bloomington
Burnsville
Savage
SCOTT COUNTY
Grass
Blue
Fisher
Valley Marsh
Purgatory Creek
Ford Pond
Ancel's Glen
Overlook
Coleman (Nine Mile)
Rice
Quarry
Dean
Eagle Creek
East Branch Eagle Creek
Credit River
Ninemile Creek
Minnesota River
Black Dog
Unnamed #7
One Mile Creek (Unnamed #4)
Unnamed to Black Dog Lake
Harnack Creek
Kennaley's Creek
Pike Island Marsh
Snelling
Gun Club
Cemetery Pond
Hohag Pond
Long Meadow

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-9
Topographic Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township
- Slope great than 18% (Bluffs)

Elevation (ft)
1025 ft
800 ft
600 ft

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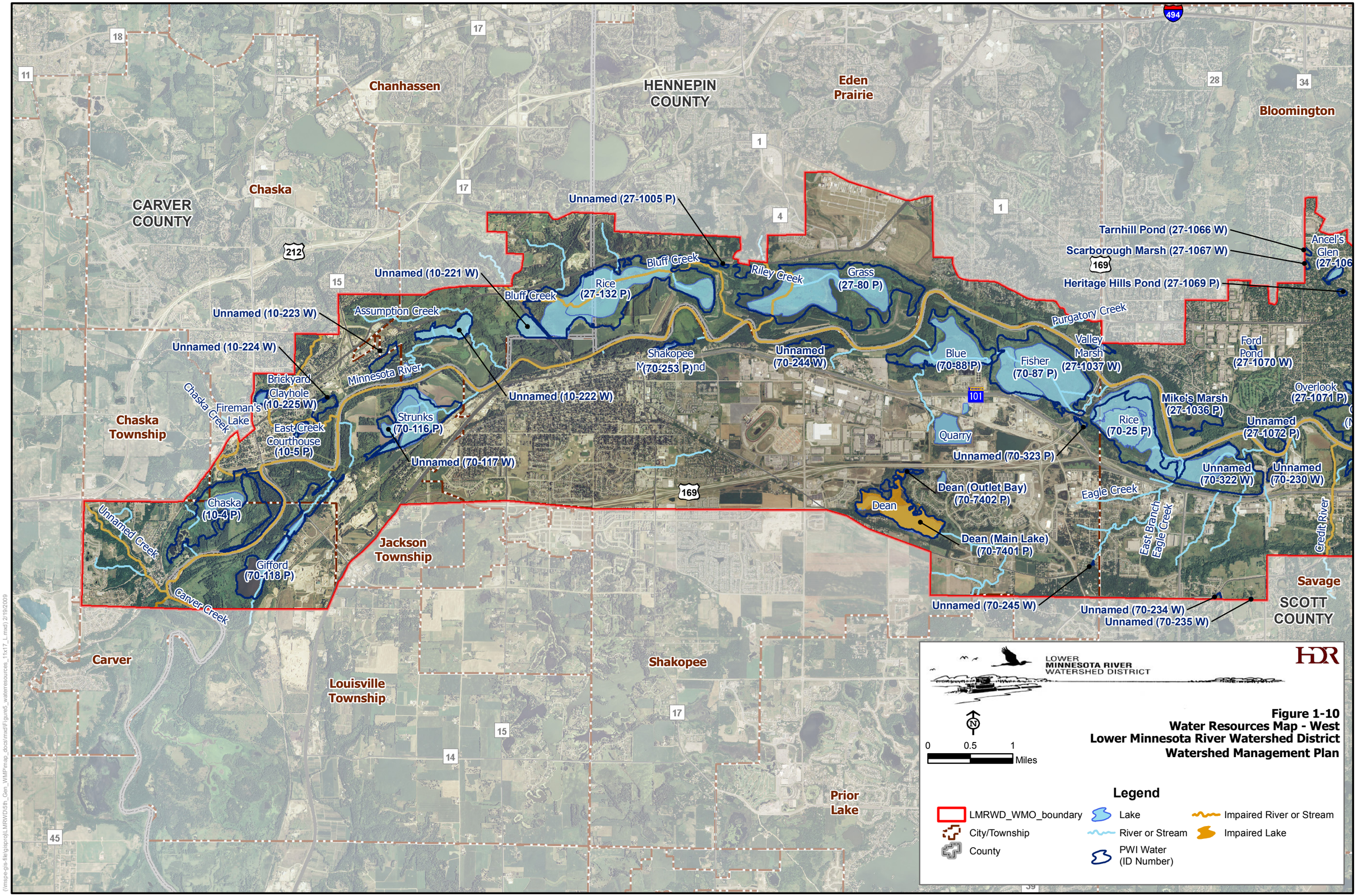

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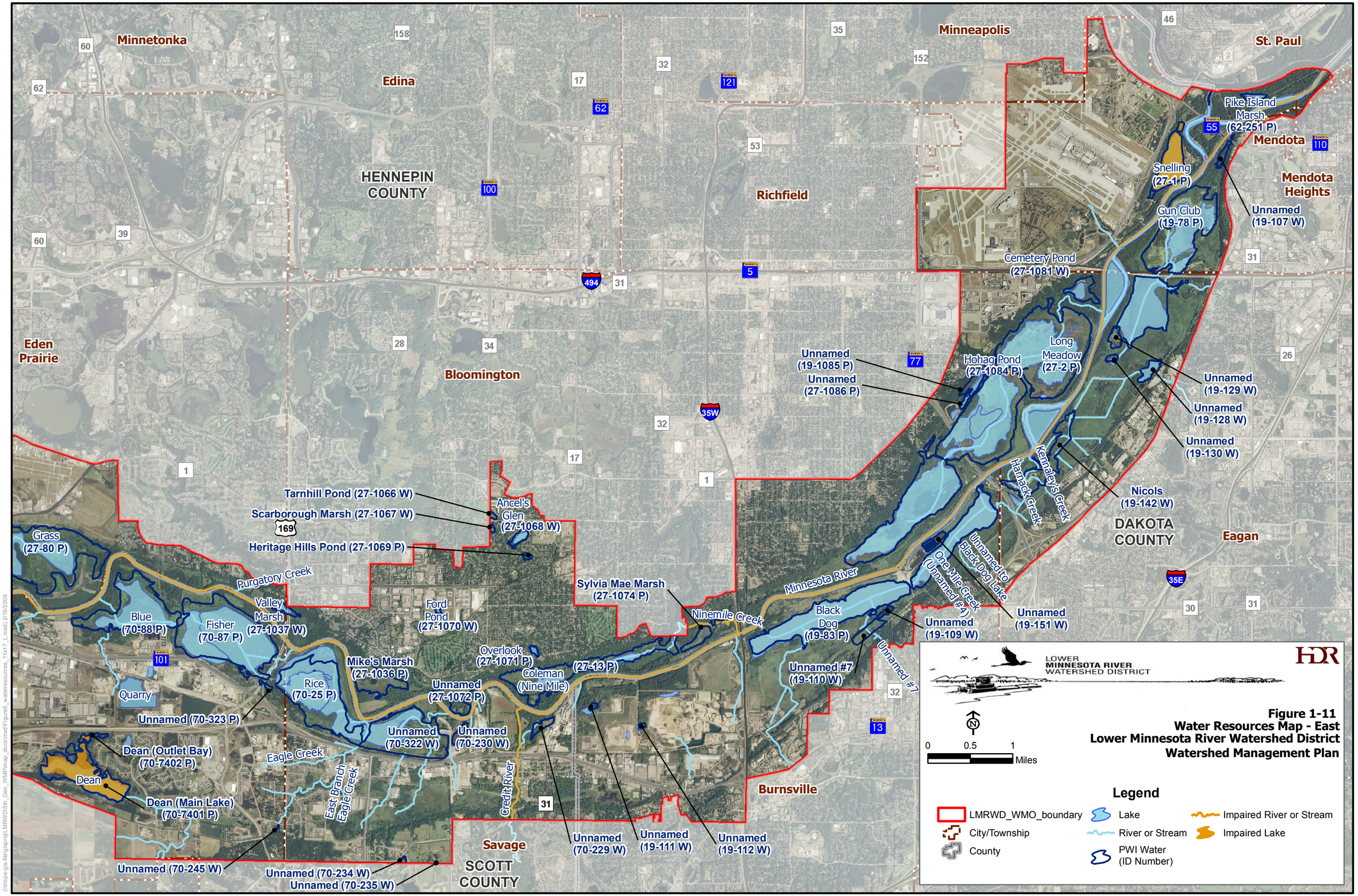

Figure 1-11
Water Resources Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

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1.4.1 Impaired Waters

The Minnesota River, Chaska Creek, Carver Creek, Unnamed Creek (Carver, MN), East Creek, Dean Lake, Snelling Lake, Credit River, Bluff Creek, Riley Creek, and Nine Mile Creek are currently on the Minnesota Pollution Control Agency's (MPCA) list of impaired waters. Lakes and streams on the list do not meet federal water quality standards for designated uses. For each water body on the list, the MPCA is required to conduct a study to determine the allowable Total Maximum Daily Load (TMDL) for each pollutant that exceeds the standards. Impaired waters within the District are summarized in Table 1-2 below. Figure 1-10 and Figure 1-11 identify the locations of public waters listed as impaired by the MPCA. Of the 21 impairments within the District, there are seven completed TMDL Implementation Plans and six in progress.

Table 1-2: 2016 Impaired Waters in the Lower Minnesota River Watershed District

Impaired Water	Affected Use	Pollutant or Stressor	TMDL Study		TMDL Implementation Plan Status
			Start	Completion	
Minnesota River	Aquatic recreation	Fecal Coliform	2018	2022	N/A
Minnesota River	Aquatic consumption	Mercury water column	-	2008	Completed
Minnesota River	Aquatic consumption	Mercury in fish tissue	-	2008	Completed
Minnesota River	Aquatic life	Dissolved oxygen	-	2004	Completed
Minnesota River	Aquatic life	Turbidity	2014	2019	In progress
Minnesota River	Aquatic consumption	PCB in fish tissue	1998	2025	In progress
Dean Lake	Aquatic recreation	Nutrients/ Eutrophication	2014	2019	In progress
Snelling Lake	Aquatic consumption	Mercury in fish tissue	-	2007	Completed
Bluff Creek	Aquatic life	Fish and Biological Assessments	2008	2013	Completed
Bluff Creek	Aquatic life	Turbidity	2008	2013	Completed
Nine Mile Creek	Aquatic life	Chloride	2005	2010	Completed
Nine Mile Creek	Fish and Biological Assessments	Fish and Biological Assessments	2014	2019	In progress
Riley Creek	Aquatic life	Turbidity	2014	2019	In progress
Unnamed Creek	Aquatic recreation	Fecal Coliform	2014	2019	In progress
Carver Creek	Aquatic recreation	Fecal Coliform	-	2007	Completed
Carver Creek	Aquatic life	Turbidity	2014	2019	In progress

Chaska Creek	Aquatic recreation	Fecal Coliform	2014	2019	In progress
East Creek	Aquatic life	Turbidity	2014	2019	In progress
East Creek	Aquatic recreation	Fecal Coliform	2014	2019	In progress
East Creek	Aquatic life	Fish and Biological Assessments	2014	2019	In progress
Sand Creek	Aquatic life	Chloride	-	2016	Completed
Sand Creek	Aquatic life	Turbidity	2014	2019	In progress
Sand Creek	Aquatic life	Fish and Biological Assessments	2014	2019	In progress
Sand Creek	Aquatic life	Nutrients/ Eutrophication	2014	2019	In progress

1.4.2 Minnesota River

The Minnesota River originates at Big Stone Lake on the border of Minnesota and South Dakota. From Big Stone Lake, the river flows southeasterly to Mankato before turning northeastward to its confluence with the Mississippi River at St. Paul, a total distance of 330 miles. The river drains an area of approximately 16,900 square miles, including about 1,610 square miles in South Dakota and 323 square miles in Iowa. In Minnesota, the watershed encompasses 37 counties. Approximately 90 percent of the watershed lands are used for agricultural purposes. There are approximately 825 miles of tributary streams and 2,500 lakes in the Minnesota River watershed.

The river bed is relatively flat with an average slope of about 0.8 feet per mile. The width of the river floodplain varies from 0.75 to 3.0 miles. Upstream of the District, the river is relatively shallow and free-flowing. Shortly after the river enters the District, the combined effect of channel dredging and the backwater pool created by the COE Dam No. 2 on the Mississippi River at Hastings, changes the river's character to a deeper, low-velocity channel maintained for commercial and recreational navigation.

Maximum Minnesota River flows tend to occur during March and April, following the spring snowmelt. Spring and early summer rains normally maintain relatively high river flows through mid-summer. Average river flows fall off through late summer and fall; the lowest flows occur in late winter in the absence of significant surface runoff.

The USGS, in cooperation with the COE, monitors the Minnesota River with a continuous water stage recorder located at R.M. 39.4, approximately 6.0 R.M. upstream of the District's western border. Annual mean discharge from 1935 to 2008 was 4,551 cubic feet per second (cfs). Calculated on an area basis, the mean flow represents a direct runoff amount of 3.8 inches per year over the 16,200-square mile watershed above Jordan. The maximum recorded discharge of 117,000 cfs occurred at Jordan during the spring flood of 1965. Recent significant floods include the summer flood of 1993, the spring flood of 1997, and the spring flood of 2001; with maximum discharges of

92,200 cfs, 82,400 cfs, and 87,100 cfs, respectively. The minimum recorded discharge occurred in November 1955 with a flow rate of 79 cfs.

1.4.3 Streams

Tributary streams flowing to the Minnesota River in the District vary in size from a 1.0 square mile watershed area to nearly 45 square miles. The smaller watershed streams, such as Eagle Creek, Assumption Creek, and other unnamed streams, are groundwater-dependent and either totally or mostly within the District's boundaries. The larger streams, such as Nine Mile Creek, Credit River, Chaska Creek, Bluff Creek, Purgatory Creek, Riley Creek, and Carver Creek, all have origins in watersheds that are outside the District, but they all enter the Minnesota River valley from the surrounding uplands and flow across a portion of the valley before entering the river.

Other watershed districts manage some tributary streams/channels such as Nine Mile Creek, Riley-Purgatory-Bluff Creek, and Prior Lake-Spring Lake. Other streams come under the authority of joint power WMOs such as Credit River, Chaska Creek, and Carver Creek.

The DNR identifies the following four streams in the District as "fishable" trout streams:

- Assumption Creek
- Harnack Creek (Unnamed #1)
- Eagle Creek
- Kennaley's Creek

Figure 1-10 and Figure 1-11 include the trout streams' locations.

1.4.4 Lakes

Most of the District's sixteen lakes are located within or adjacent to the Minnesota Valley National Wildlife Refuge, Recreation Area, and State Trail. Figure 1-10 and Figure 1-11 provide the locations of these lakes. Table 1-3 gives details on each of the lakes within the District that can be classified as floodplain/groundwater or quarry lakes.

Floodplain/groundwater lakes are generally shallow, with fish populations that experience frequent winterkills. However, these lakes are naturally restocked from annual flooding by the Minnesota River. In addition to the water supplied by flooding, all lakes are spring-fed, and some have streams that flow through them. These lakes provide essential habitat for migratory birds, fish, and resident wildlife. For example, a cricket frog population, an extremely rare species in Minnesota, has been found near Coleman Lake (Nine Mile Lake), a floodplain lake in the City of Bloomington. The floodplain/groundwater lakes in the refuge are managed by the U.S. Fish and Wildlife Service (USFWS) to promote the growth of natural wildlife food and to provide wildlife-oriented recreation opportunities.

Dean Lake, in Shakopee, is an expression of the groundwater table in the area. It is underlain by a

relatively thin layer of porous sand and dammed by a ridge of limestone. Groundwater flows through the lake and the lake's water surface elevation is affected by fluctuations in the groundwater table.

Courthouse Lake, in Chaska, is a DNR-designated trout lake and an example of a quarry lake. Quarry lakes are historical stone or clay quarries filled with relatively good quality groundwater. These lakes occasionally experience flooding from the Minnesota River, which can have a degrading effect on water quality through deposition of pollutants carried in the floodwaters.

Table 1-3: Lower Minnesota River Watershed District Lake Data

Lake	Public Waters Inventory Number	Area (ac)	Depth (ft.)		Lake Type	Water Supply
			Average	**Maximum**		
Black Dog	19-83P	391	1.5	3.0-4.0	Floodplain/ groundwater used by Xcel for cooling water	Springs, seepage, intermittent surface drainage
Blue	70-88P	203	1.5	3.0	Floodplain/ groundwater /marsh	Natural springs, seepage, and intermittent surface drainage
Brickyard Clayhole	10-225W	11	25.0	41.0	Quarry	Springs
Chaska	10-4P	46	1.5	3.5	Floodplain/ groundwater	Springs
Coleman	27-13P	114	<1.0	3.5	Floodplain/ groundwater	Nine Mile Creek, seepage, and springs
Courthouse	10-5P	12	25.0	57.0	Trout/quarry	Underground springs
Dean	70-74P	216	3.0	5.0	Floodplain/ groundwater	Seepage, natural springs and intermittent surface drainage
Fisher	70-87P	284	1.0	3.0	Floodplain/ groundwater / marsh	Blue Lake, natural springs, seepage and minor surface drainage
Gifford	70-118P	116	Unknown	Unknown	Floodplain/ groundwater / marsh and old quarry or	Springs, intermittent surface drainage

					channel bed	
Grass	27-80P	467	1.5	3.5	Floodplain/ groundwater	Riley Creek, seepage and springs
Gun Club	19-78P	1216	1.0	2.5	Floodplain/ groundwater /marsh	Springs, seepage
Long Meadow	27-2P	1,188	1.0	3.5	Floodplain/ groundwater / marsh	Natural springs, some surface drainage from north and south
Rice (Hennepin Cty)	27-132P	517	1.0	3.0	Floodplain/ groundwater / marsh	Bluff Creek, springs and intermittent surface drainage
Rice (Scott Cty)	70-25P	259	1.0	3.0	Floodplain/ groundwater / marsh	Natural springs, seepage and some local drainage
Snelling	27-1P	119	6.0	12.0	Floodplain/ groundwater	Mainly natural springs, little surface drainage
Strunks and Unnamed	70-116P and 70-117P	185	1.0	4.0	Floodplain/ groundwater / marsh and southern lake is old quarry or gravel pit	Spring, seepage, and small amount of local drainage

1.4.5 Wetlands

The District also has large areas of wetlands, which are an important part of the natural environment and provide several valuable functions. Wetlands are a critical part of the natural storm drainage system. Wetlands help maintain water quality; reduce flooding and erosion; provide food and habitat for wildlife; and open spaces and natural landscapes for residents. Thus, wetlands are important physical, educational, ecological, aesthetic, recreational, and economic assets to the District.

Some of the District wetlands are adjacent to floodplain lakes, while others result from springs and low wet areas. Springs arising from limestone aquifers produce a special wetland called a calcareous fen. This rare wetland is identified by the specific vegetative community, which is found only in a calcareous fen. MN Rules 7050 identify the following calcareous fens in the District and classify

them as "outstanding resource waters."

- Snelling Fen – Dakota County
- Nicols Meadow Fen – Dakota County
- Quarry Island Fen – Dakota County
- Savage Fen – Scott County
- Seminary Fen – Carver County

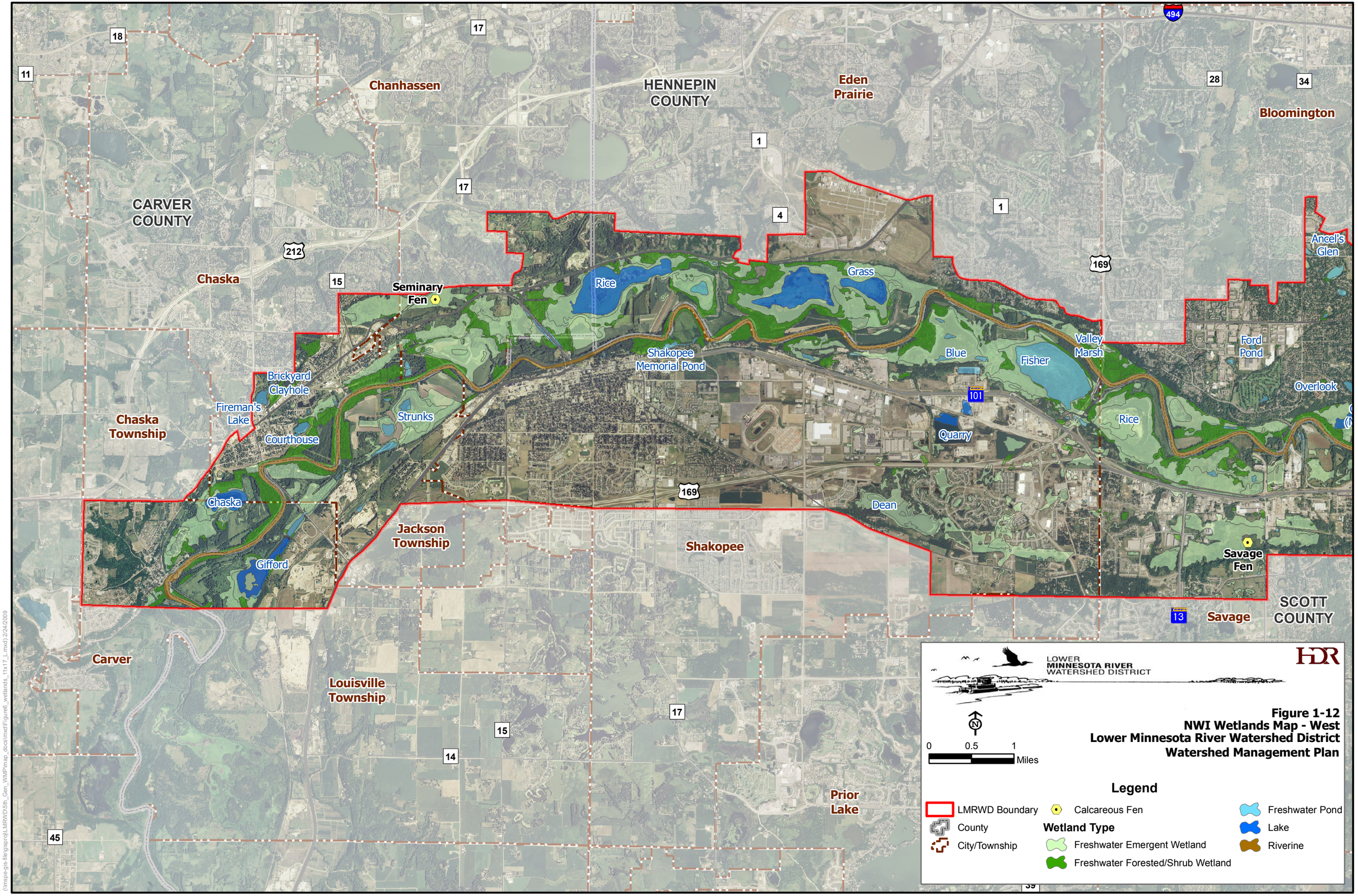
Locations of fens within the District are shown Figure 1-12 and Figure 1 - 13. The DNR is responsible for protecting these calcareous fens with assistance from the District. This partnership has yielded the acquisition of portions of Savage Fen and Black Dog Preserve Fen for management under the Scientific and Natural Area designation.

Figure 1-12 and Figure 1-13 show the National Wetlands Inventory (NWI) wetlands within the District and include information on wetland type and association with other types of water bodies. Detailed information about wetlands and wetland types can be found by contacting the USFWS and the DNR. Other agencies and entities delineate wetlands within the District, including USFWS, the COE, the Minnesota Department of Transportation (DOT) and municipalities and counties that administer the Wetland Conservation Act (WCA). (The WCA is discussed in a later section.)

1.4.6 Stormwater System and Floodplain Information

Communities within the District have local water management plans that include maps showing areas served by each existing stormwater system, including stormwater ponds and outfalls. For specific details about storm drainage systems, a reference to the respective communities' local surface water management plans is provided. The following communities have such plans: Bloomington, Burnsville, Carver, Chanhassen, Chaska, Eden Prairie, Lilydale, Mendota, Mendota Heights, Minneapolis, Savage, Shakopee, and Scott County. Local water management plans provide information about peak flood elevations and flow rates for existing and proposed ponds. All communities within the District have adopted DNR-approved floodplain ordinances. DNR-approved county floodplain ordinances cover unincorporated areas.

The District, in partnership with USGS and the COE, published the Lower Minnesota Floodplain Study in 2004. Upon appropriate review, the information contained in this report may be used as "Best Available Data" until the Federal Emergency Management Agency (FEMA) produces new Flood Insurance Study (FIS) maps of the affected communities.



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Minnetonka
Edina
HENNEPIN COUNTY
Richfield
Minneapolis
St. Paul
Mendota
Mendota Heights
Eden Prairie
Bloomington
Eagan
DAKOTA COUNTY
SCOTT COUNTY
Savage
Burnsville
Pike Island Marsh
Snelling
Gun Club
Quarry Island Fen (Gun Club Lake North)
Cemetery Pond
Fort Snelling Fen (Gun Club Lake South)
Long Meadow
Hohag Pond
Nicols Meadow Fen
Black Dog Lake North Fen
Black Dog
Black Dog Lake Fen
Ancel's Glen
Ford Pond
Overlook
Coleman (Nine Mile)
Valley Marsh
Blue
Fisher
Rice
Quarry
Dean
Grass
Savage Fen

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-13
NWI Wetlands Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

Legend

- LMRWD Boundary
- County
- City/Township
- Calcareous Fen

Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

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1.5 HYDROLOGIC AND HYDRAULIC MODELING

Several cities within the District have constructed hydrologic and hydraulic models in conjunction with their local surface water management plans. These entities should be contacted for additional information. In addition, the DNR maintains hydraulic and hydrologic model data files for those water bodies situated in National Flood Insurance Program (NFIP) participant communities. Specific model information can be found in the appropriate FIS for a water body. Model data files are available from the Floodplain Management Program within the DNR Division of Waters.

1.6 SURFACE WATER QUALITY AND QUANTITY MONITORING

Monitoring in the District is carried out by the Metropolitan Council Environmental Services (MCES) and the District in cooperation with other entities and is available on the MPCA website. The MPCA serves as a central clearinghouse for much of the data. Figure 1-4 and Figure 1-15 show water quality and quantity monitoring sites within the District. (The location of the District's Willow Creek station on these figures is inaccurate; it is in the process of being relocated, and the new location has not been determined). The following sections describe water quality data collection efforts and long-term trend analyses, where available, for the Minnesota River and the District's lakes, streams, and fens.

1.6.1 Lakes

The MCES collects water quality data from Brickyard Clayhole, Courthouse Lake, and Fireman's Lake in cooperation with the City of Chaska and Carver County Environmental Services Departments; and from Dean Lake in cooperation with the City of Shakopee, as part of the Citizen Assisted Monitoring Program (CAMP). Data is available for Brickyard Clayhole and Courthouse Lake from 2005-2015, Dean Lake from 2002-2011, and Fireman's Lake from 2005-2014. Lakes are visited biweekly from April through October and the data is published on the CAMP website.

Surface water samples are collected and analyzed for total phosphorus (TP; typically, the most limiting nutrient in Minnesota lakes), total Kjeldahl nitrogen (TKN), and chlorophyll-a (Chl-a; an estimate of phytoplankton biomass). Secchi transparency (a measurement of water clarity) is also monitored, as well as the lake's perceived physical condition and recreational suitability. In many Minnesota lakes as TP increases, so will phytoplankton biomass (i.e. Chl-a). Also, as phytoplankton biomass increases, water transparency (i.e. Secchi depth) decreases. Volunteers also measure each lake's surface water temperature and fill out a lake sampling form to describe the lake and the weather conditions at the time of sampling. Each lake is sampled at the deepest location.

Table 1-4 shows annual average TP, TKN, Chl-a and Secchi depth for Brickyard Clayhole from 2005-2015. Table 1-4 also shows State of Minnesota eutrophication standards for Chl-a, TP, and Secchi depth found in Minnesota Administrative Rule 7050.0222. Annual average values for all four parameters remained relatively steady over the course of the monitoring period. Relatively slight

increases were observed in TP and TKN concentrations in 2008. and concentrations. In 2013 Chl-a concentrations are the highest within the sampling period while TKN concentrations are the lowest. In 2009, annual average TKN concentration returned to pre-2007 values. Annual average values for Chl-a, TP and Secchi depth all met State of Minnesota eutrophication standards each year.

Table 1-4: Brickyard Clayhole Annual Average Water Quality Parameters

	MN Eutrophication Standard	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Chl-a (mg/L)	<0.014	0.002	0.002	0.003	0.003	0.004	0.003	0.004	0.003	0.013	0.003	0.004
TKN (mg/L)	N/A	0.55	0.53	0.83	1.00	0.57	0.56	0.60	0.52	0.49	0.58	0.52
TP (mg/L)	<0.40	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01
SD (m)	>2.5	4.5	4.8	3.5	3.9	3.8	3.9	3.6	3.5	3.9	3.7	4.1

Chart 1-1 shows the relationship between annual average Chl-a and Secchi depth for Brickyard Clayhole, which is statistically-significant at the alpha 0.05 level. As Chl-a concentrations increase the Secchi depth, or water transparency, should decrease; this inverse relationship is consistent with Chart 1-1.

Chart 1-1: Brickyard Clayhole Annual Average Secchi depth versus Chl-a

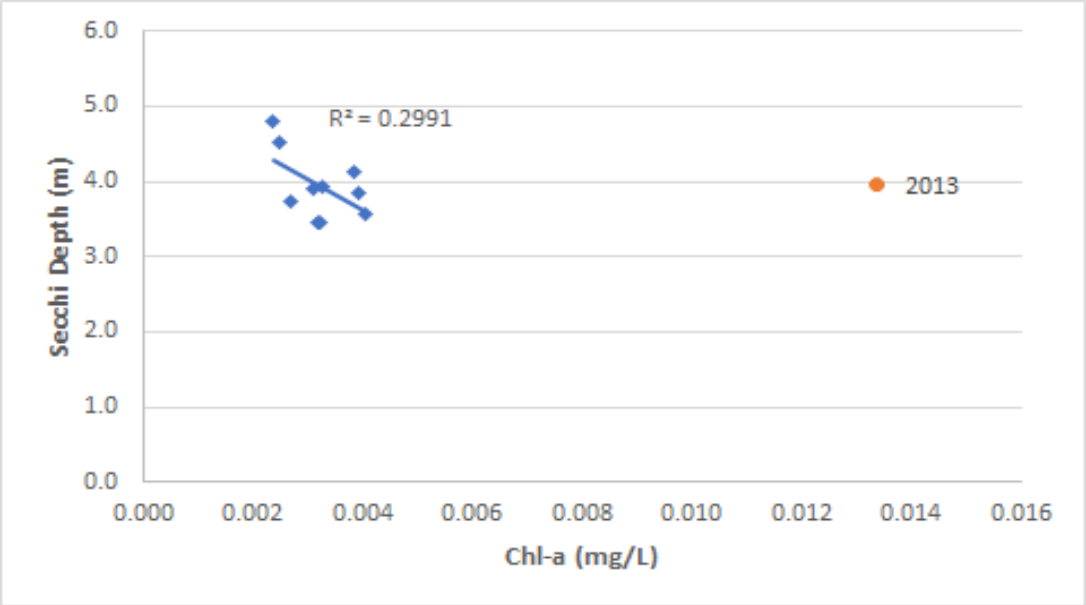


Chart 1-2 shows the relationship between annual average TP and Chl-a measurements for Brickyard Clayhole, which is not statistically-significant at the alpha less than 0.05 level. The relatively narrow range and small values of both TP and Chl-a for Brickyard Clayhole are likely reasons for the poor indistinct relationship.

Chart 1-2: Brickyard Clayhole Annual Average Chl-a versus TP

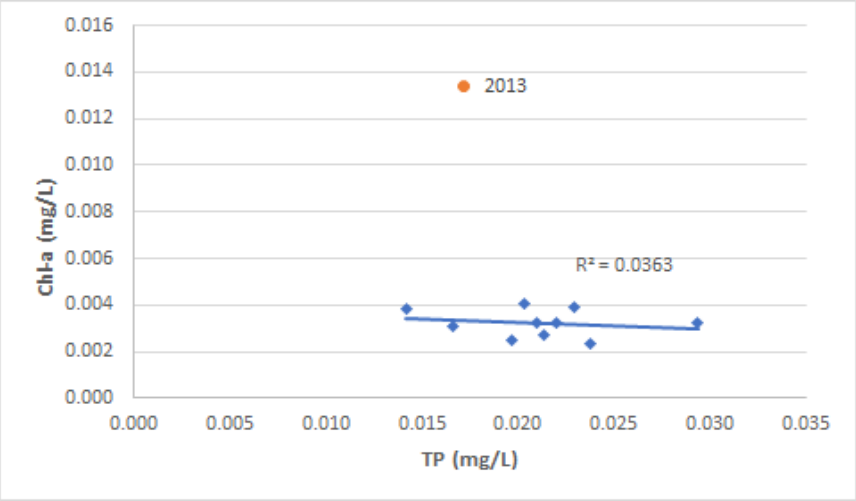


Chart 1-3 shows Brickyard Clayhole annual average Chl-a concentrations for 2005-2015. Chl-a concentrations trended upwards slightly over the course of the measurement period but are still relatively low compared to other lakes except for 2013. The 2013 concentrations, although higher than all recorded years, met the Minnesota eutrophication standard.

Chart 1-3: Brickyard Clayhole Annual Average Chl-a Concentrations

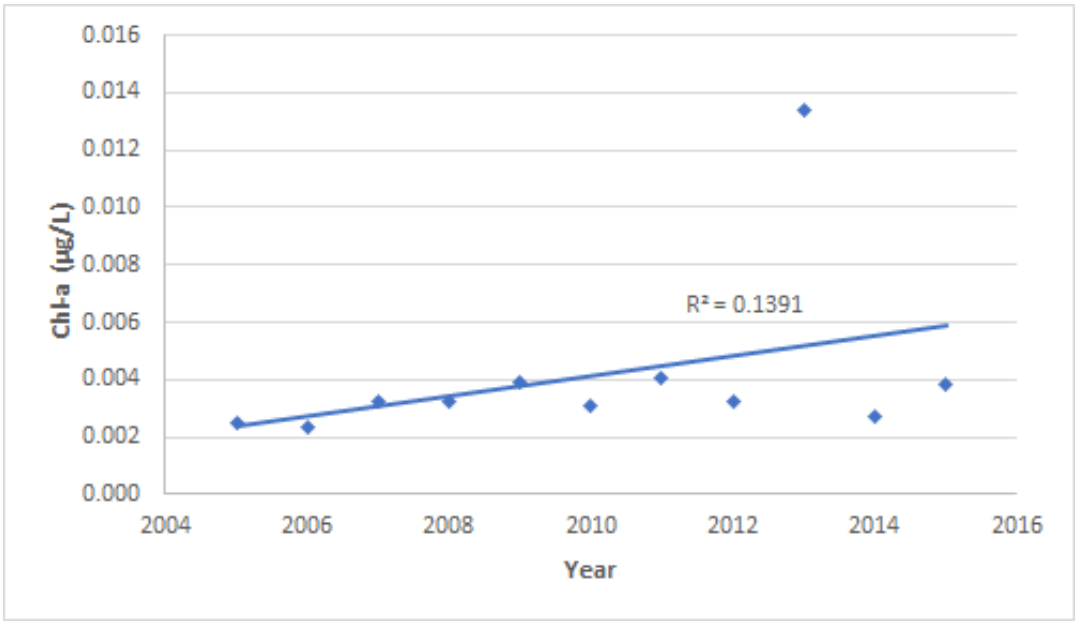


Table 1-5 shows annual average TP, TKN, Chl-a and Secchi depth for Fireman's Lake from 2005 to 2014. Table 1-5 also shows State of Minnesota eutrophication standards for Chl-a, TP, and Secchi depth found in Minnesota Administrative Rule 7050.0222. Annual average values for TKN and Secchi depth remained steady over the course of the monitoring period. The exception was Chl-a, which almost doubles in value from 2009-2010 and from 2011 to 2012.decreased significantly. TP values remained steady except for except for 2012. Annual average values for Chl-a, TP and Secchi depth all met State of Minnesota eutrophication standards each year. The average annual Secchi depth did not meet State of Minnesota Eutrophication standards in 2012 and 2013.

Table 1-5: Fireman's Lake Annual Average Water Quality Parameters

	MN Eutrophication Standard	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Chl-a (mg/L)	<0.014	0.003	0.005	0.002	0.003	0.003	0.006	0.004	0.007	0.007	0.003
TKN (mg/L)	N/A	0.39	0.49	0.37	0.67	0.64	0.52	0.58	0.60	0.52	0.50
TP (mg/L)	<0.40	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.10	0.03	0.02
SD (m)	>2.5	3.0	2.8	2.9	3.2	3.3	2.8	2.5	2.3	2.2	2.8

Chart 1-4 shows the relationship between annual average Chl-A versus Secchi depth for Fireman's Lake. As Chl-a concentrations increase the Secchi depth should be inversely affected decrease; this inverse relationship is consistent with Chart 1-4 below.

Chart 1-4: Fireman's Lake Annual Average Secchi depth versus Chl-a

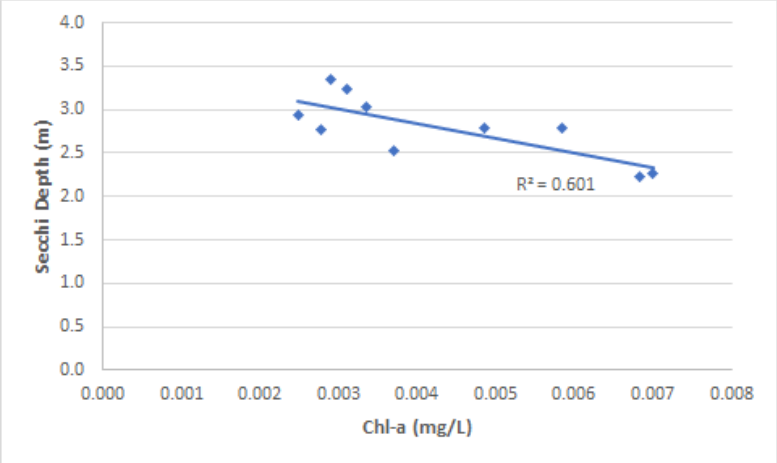


Chart 1-5 shows the relationship between annual average TP and Chl-a for Fireman's Lake, which is not statistically-significant at the alpha = 0.05 level. In many Minnesota lakes, it is expected that as TP increases, so should Chl-a. The relatively narrow range and small values of Chl-a for Fireman's Lake are likely reasons for the indistinct poor relationship.

Chart 1-5: Fireman's Lake Annual Average Chl-a versus TP

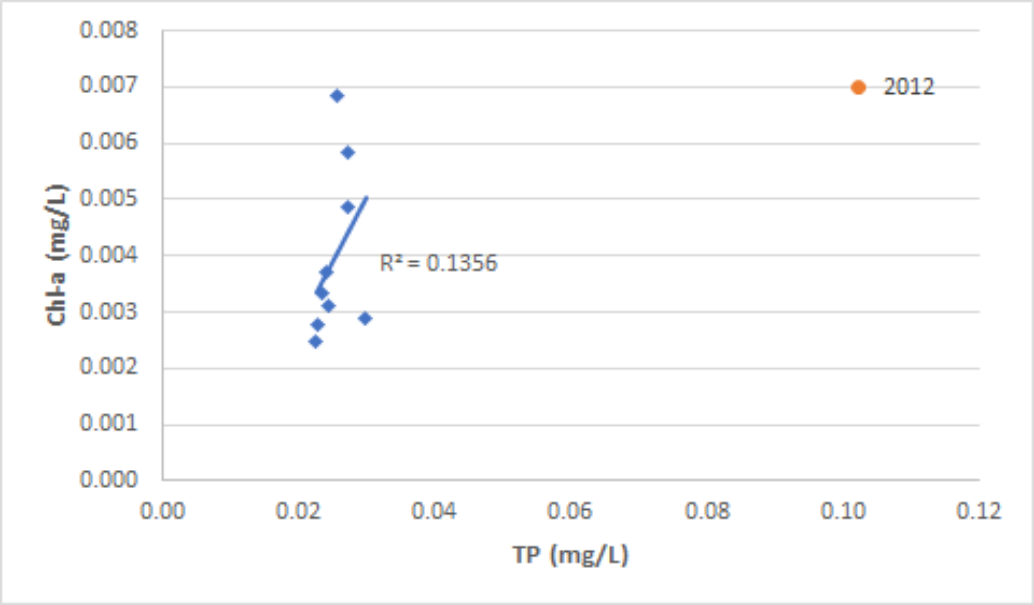


Chart 1-6 shows Fireman's Lake annual average Chl-a concentrations for 2002-2015. Annual average Chl-a for Fireman's Lake have trended upward over the course of the monitoring period.

Chart 1-6: Fireman's Lake Annual Average Chl-a Concentrations

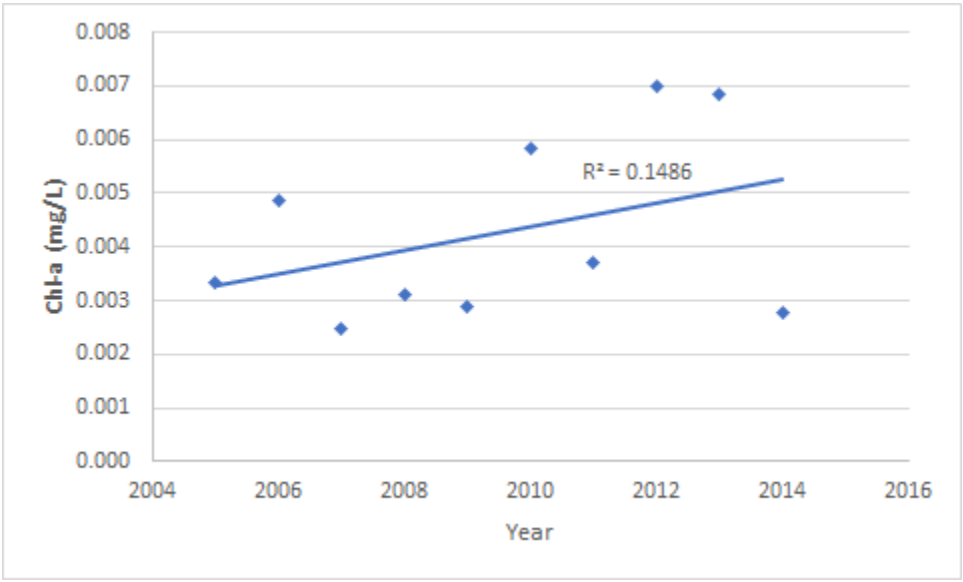


Table 1-6 shows annual average TP, TKN, Chl-a, and Secchi depth for Courthouse Lake from 2005 to 2015. Table 1-6 also shows State of Minnesota eutrophication standards for Chl-a, TP, and Secchi depth found in Minnesota Administrative rule 7050.0222. Annual average values for all four parameters remained steady over the course of the monitoring period except for 2003 to 2006. During this period, TP, Chl-a, and TKN values increased to a relative peak in 2010 and then begin to decrease. and Chl-a decreased before returning to pre-2003 levels.

Table 1-6: Courthouse Lake Annual Average Water Quality Parameters

	MN Eutrophication Standard	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Chl-a (mg/L)	<0.014	0.002	0.002	0.006	0.007	0.005	0.007	0.006	0.003	0.021	0.003	0.002
TKN (mg/L)	N/A	0.58	0.57	0.72	0.98	0.70	0.83	0.74	0.72	0.77	0.69	0.64
TP (mg/L)	<0.40	0.02	0.02	0.02	0.02	0.02	0.04	0.03	0.04	0.03	0.03	0.02
SD (m)	>2.5	4.6	4.7	2.4	3.6	4.1	3.2	3.3	4.2	3.5	4.3	4.0

Chart 1-7 shows the inverse relationship between annual average Chl-a and Secchi depth for Courthouse Lake from 20051-201509, which is not statistically-significant at the alpha = 0.05 level. The relatively narrow range and small values of Chl-a for Courthouse Lake are likely reasons for the poor relationship. Annual average values did not meet State of Minnesota eutrophication standards for Chl-a in 201308, TP in 1997, 1999-2001, and 2004-2005 and Secchi depth in 1997, 1999, and 2007. As Chl-a concentrations increase the Secchi depth should decrease, this relationship is consistent with Chart 1-7 below.

Chart 1-7: Courthouse Lake Annual Average Secchi depth versus Chl-a

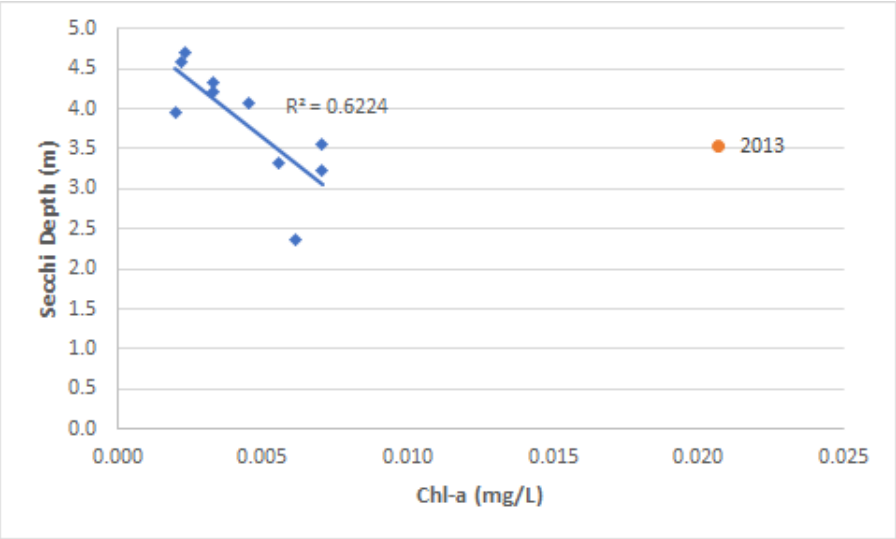


Chart 1-8 shows the relationship between annual average TP and Chl-a for Courthouse Lake. Many Minnesota lakes, it is expected that as TP increases., so should Chl-a; this relationship is observed in Chart 1-8 below. The relatively narrow range and small values of both TP and Chl-a for Courthouse Lake are likely reasons for the indistinct poor relationship. In many Minnesota lakes, it is expected that as TP increases, so should Chl-a; this relationship is observed in Chart 1-8 below.

Chart 1-8: Courthouse Lake Annual Average Chl-a versus TP

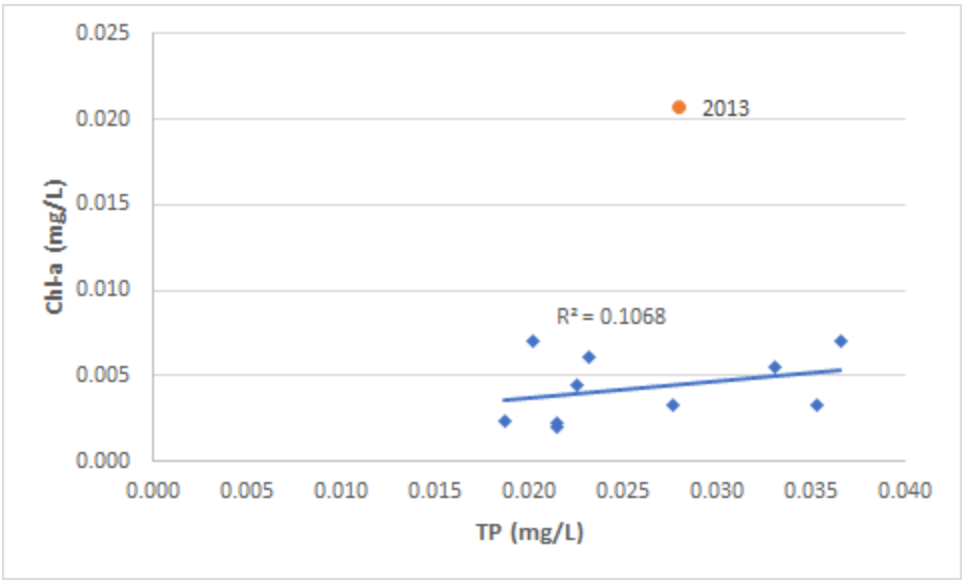


Chart 1-9 shows Courthouse Lake annual average Chl-a concentrations for 20051-2015. Annual average Chl-a concentrations for Courthouse Lake remained relatively steady over the monitoring period except for 2013.

Chart 1-9: Courthouse Lake Annual Average Chl-a Concentrations

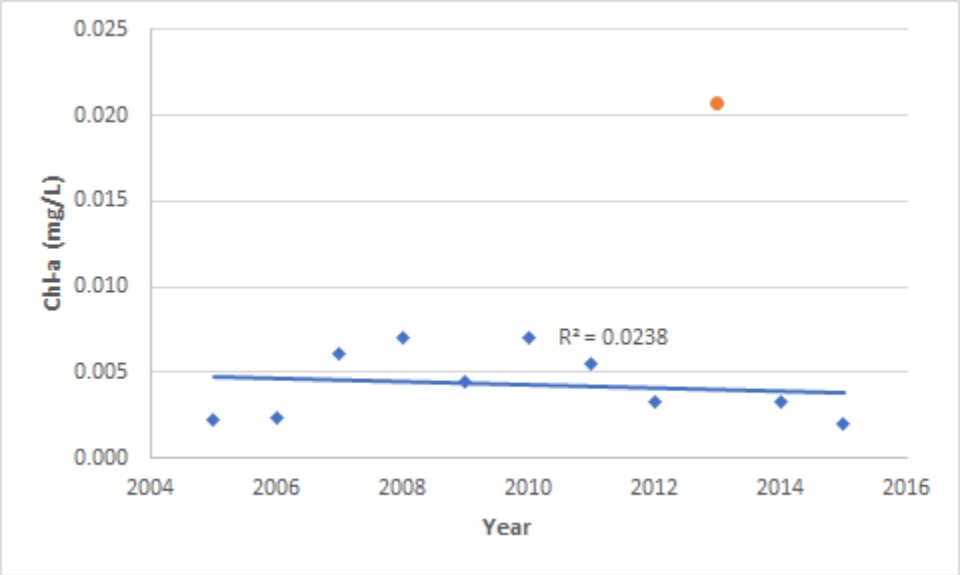


Table 1-7 shows annual average TP, TKN, and Secchi depth for Dean Lake from 2002 to 2011. Table 1-7 also shows State of Minnesota eutrophication standards for Chl-a, TP, and Secchi depth found in Minnesota Administrative rule 7050.0222. Annual average values for TKN and Secchi depth remained steady over the course of the monitoring period. Annual average Chl-a values fluctuated significantly over the monitoring period while TP values trended upwards, however all four parameters achieved relatively low numbers in 2011. Dean Lake only met State of Minnesota eutrophication standard for Chl-a in 2004 and 2011. Dean Lake met the State of Minnesota eutrophication standard for TP in all years except 2009 and did not meet the standard for Secchi depth in any years.

Table 1-7: Dean Lake Annual Average Water Quality Parameters

	MN Eutrophication Standard	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Chl-a (mg/L)	<0.014	0.043	0.024	0.007	0.039	0.067	0.042	0.015	0.047	0.024	0.002
TKN (mg/L)	N/A	2.31	1.74	1.48	2.84	3.36	2.30	3.07	4.45	1.45	0.89
TP (mg/L)	<0.40	0.15	0.21	0.11	0.19	0.28	0.23	0.19	0.44	0.16	0.07
SD (m)	>2.5	0.5	0.6	0.4	0.3	0.7	0.5	1.9	-	0.7	1.6

Chart 1-10 shows the relationship between annual average Chl-a and Secchi depth for Dean Lake. As Chl-a concentrations increase the Secchi depth should decrease. This indirect relationship is consistent with Chart 1-10 below. The relatively narrow range and small values of Chl-a for Dean Lake are likely reasons for the relatively indistinct poor relationship.

Chart 1-10: Dean Lake Annual Average Secchi depth versus Chl-a

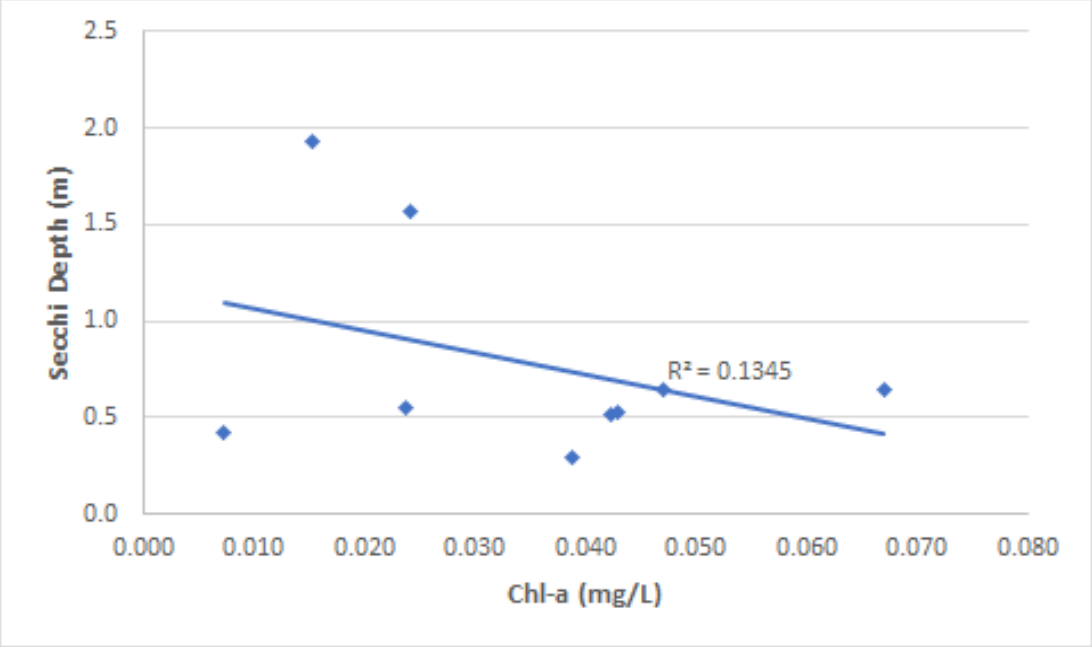


Chart 1-11 shows the direct relationship between annual average Chl-a and TP measurements for Dean Lake. In many Minnesota lakes, it is expected that as TP increases, so should Chl-a; this relationship is observed in Chart 1-11 below.

Chart 1-11: Average Annual Dean Lake Chl-a versus TP

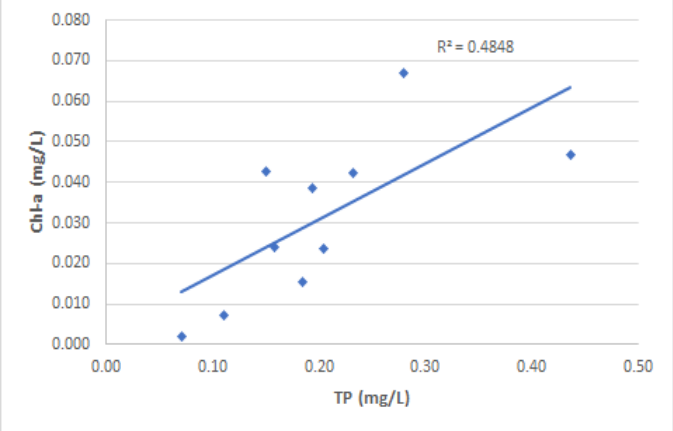
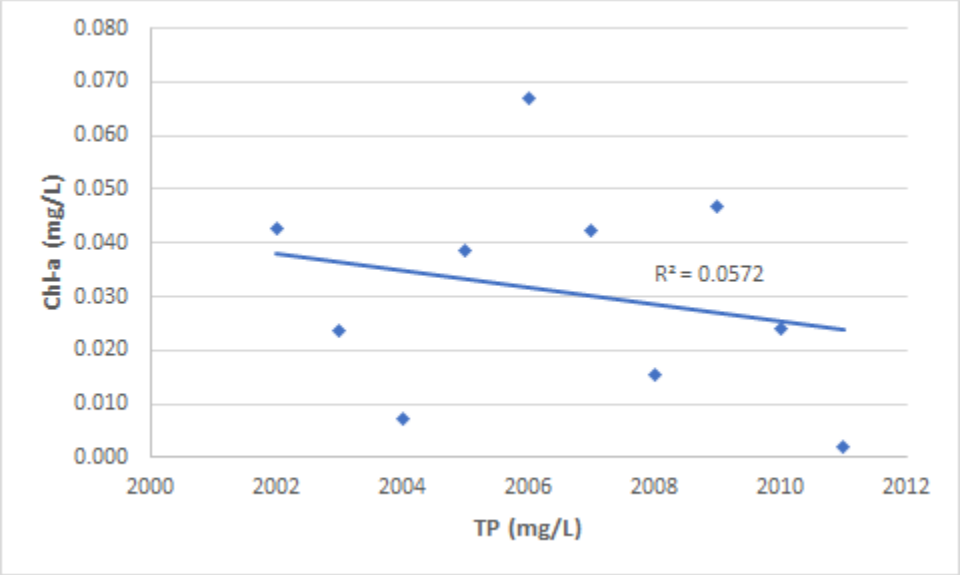


Chart 1-12 shows Dean Lake annual average Chl-a concentrations for 2002-2009. No significant trend exists over the course of the monitoring period.

Chart 1-12: Dean Lake Annual Average Chl-a Concentrations



MCES grades lake water quality relative to other lakes throughout the state based on the data presented in Table 1-8. Table 1-8 below summarizes the lake grade for each of the lakes monitored within the District given by the MCES in the yearly CAMP reports for each lake. Lake grades are based on analysis of water quality monitoring data for the year.

Table 1-8: Metropolitan Council Environmental Service Lake Grade

Lake	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Brickyard	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Courthouse	B	A	A	A	A	A	A	A	A	A	A	B	A	A
Firemen's	A	A	A	A	B	A	A	B	B	A	B	B	A	
Dean	F	D	D	D	F	F	D		C					

Brickyard Clayhole and Courthouse and Fireman's Lake all have had excellent overall water quality over the course of the monitoring period. None of these lakes show any water quality trends, either upwards or downwards. In contrast, Dean Lake has had poor overall water quality over the course of the monitoring period without any upward or downward trends. Floodplain lakes with the District do not have enough water quality data to report. These lakes are significantly influenced by backwater from the Minnesota River, so monitoring data may not provide much information on water quality in these lakes.

1.6.2 Minnesota River

In an effort to understand historical runoff and pollutant loads entering the District from the greater Minnesota River Basin, a trend analysis was performed for annual runoff, total phosphorus (TP), and total suspended solids (TSS). This trend analysis includes monitoring data collected by the Metropolitan Council and the USGS, at the USGS gauge at Jordan (#05330000). Chart 1-13 shows total annual runoff in millions of acre-feet at the USGS gauge at Jordan from 1935 to 2007 (USGS-Water Info, 2009). This data represents the watershed runoff yield from the Minnesota River Basin upstream of the District. A trend analysis of the data indicates that annual yield has increased over the 72 years. The 20-year average annual yield has more than doubled in the latter 57 years, increasing from nearly 2 million acre-feet in 1950 to over 5 million acre-feet in 2007. Chart shows the annual TSS load in tons at the Jordan gauge from 1976 to 2009 (MCES 2009). Chart 1-14 shows the annual TP load in tons at the Jordan gauge from 1979 to 2008 (MCES 2009).

Results of the analysis show that the watershed yield has doubled since the 1940s, the total TSS load has doubled since the 1980s, and the TP load has increased by about 15 percent since the 1980s. This is significant because, unless these trends are reversed, the District will experience more bank scour issues like those in Eden Prairie. These bank scour issues are due to the increased runoff volumes and will suffer more sediment deposition in the navigation channel. In the floodplain lakes, bank scour issues are due to the significant increase in TSS loads. The increases in the TP loads will likely result in increased algae growth and more instances of low dissolved oxygen in the river, which will reduce fisheries habitat.

USGS operates an automatic monitoring network that continuously measures dissolved oxygen, temperature, pH, and specific conductance of the Minnesota River near Fort Snelling at R.M. 3.5. (Specific conductance, a measure of the ability of water to conduct an electrical current, gives a good idea of the amount of dissolved material in the water.) Biological monitoring, which assesses the integrated effects of water pollution on aquatic organisms, is also carried out at this site by the USGS.

Extensive conventional pollutant monitoring is also conducted to complement automatic monitoring. The monitoring results are used to characterize water quality and determine specific sources of pollution. Monitoring results also address the extent and nature of problems that may exist. Conventional pollutant monitoring is carried out at the following sites on the Minnesota River within the District:

- Near Shakopee (R.M. 25.1)
- Near Savage (R.M. 14.3)
- Near the Black Dog Power Plant (R.M. 8.5)
- Near Fort Snelling (R.M. 3.5)

More information regarding USGS monitoring on the Minnesota River is available by contacting the USGS or visiting the program website.

MCES is responsible for collecting and treating wastewater in the MSP metropolitan area. Performance monitoring of the two MCES wastewater treatment plant (WWTP) discharges, at the Seneca WWTP in the City of Eagan and the Blue Lake WWTP in the City of Shakopee, is conducted regularly to meet National Pollutant Discharge Elimination System (NPDES) permit requirements.

Chart 1-1: Annual Mean Discharge at the USGS Jordan Station – Minnesota River

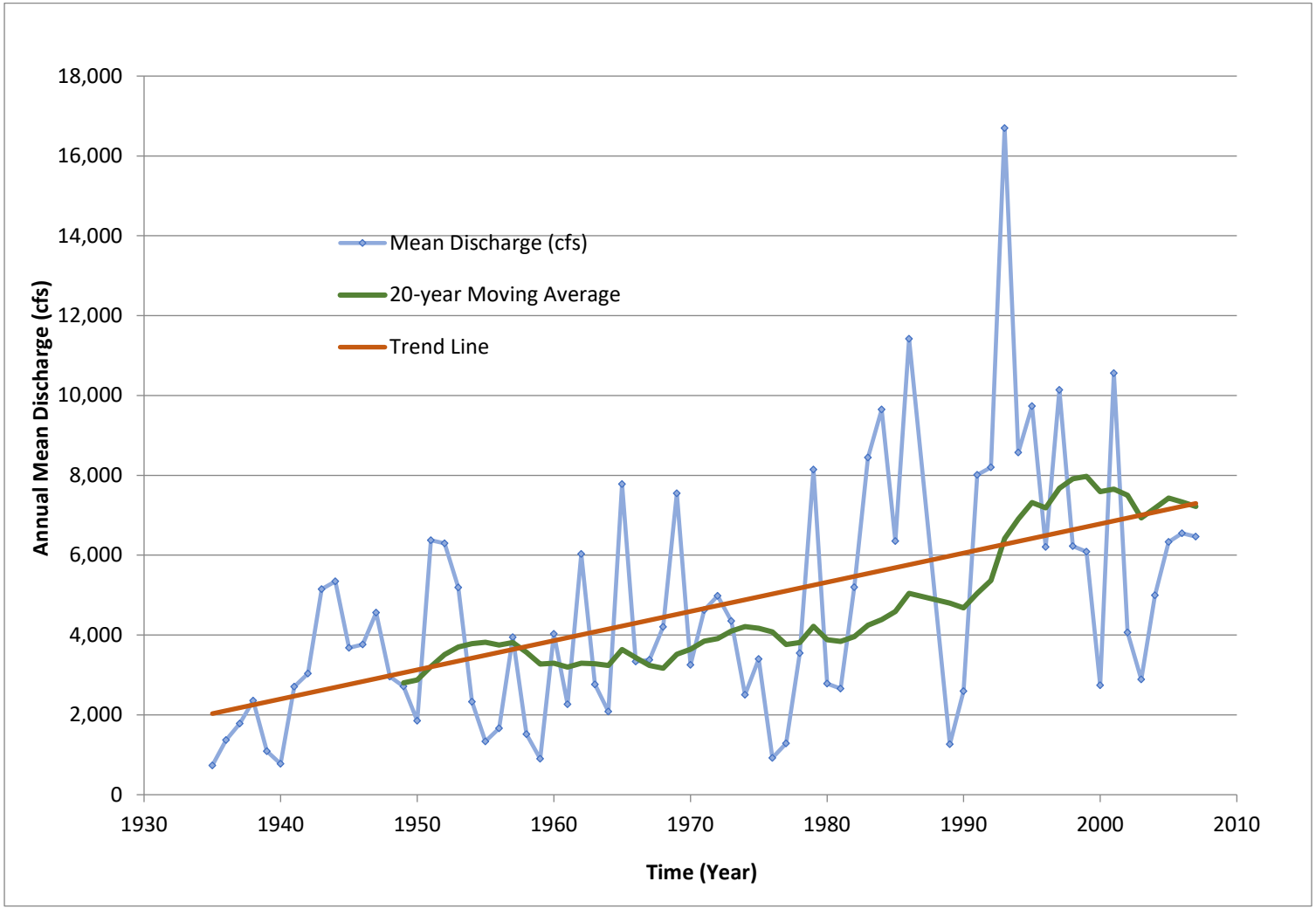


Chart 1-2: Annual Total Suspended Solids Load at the USGS Jordan Station – Minnesota River

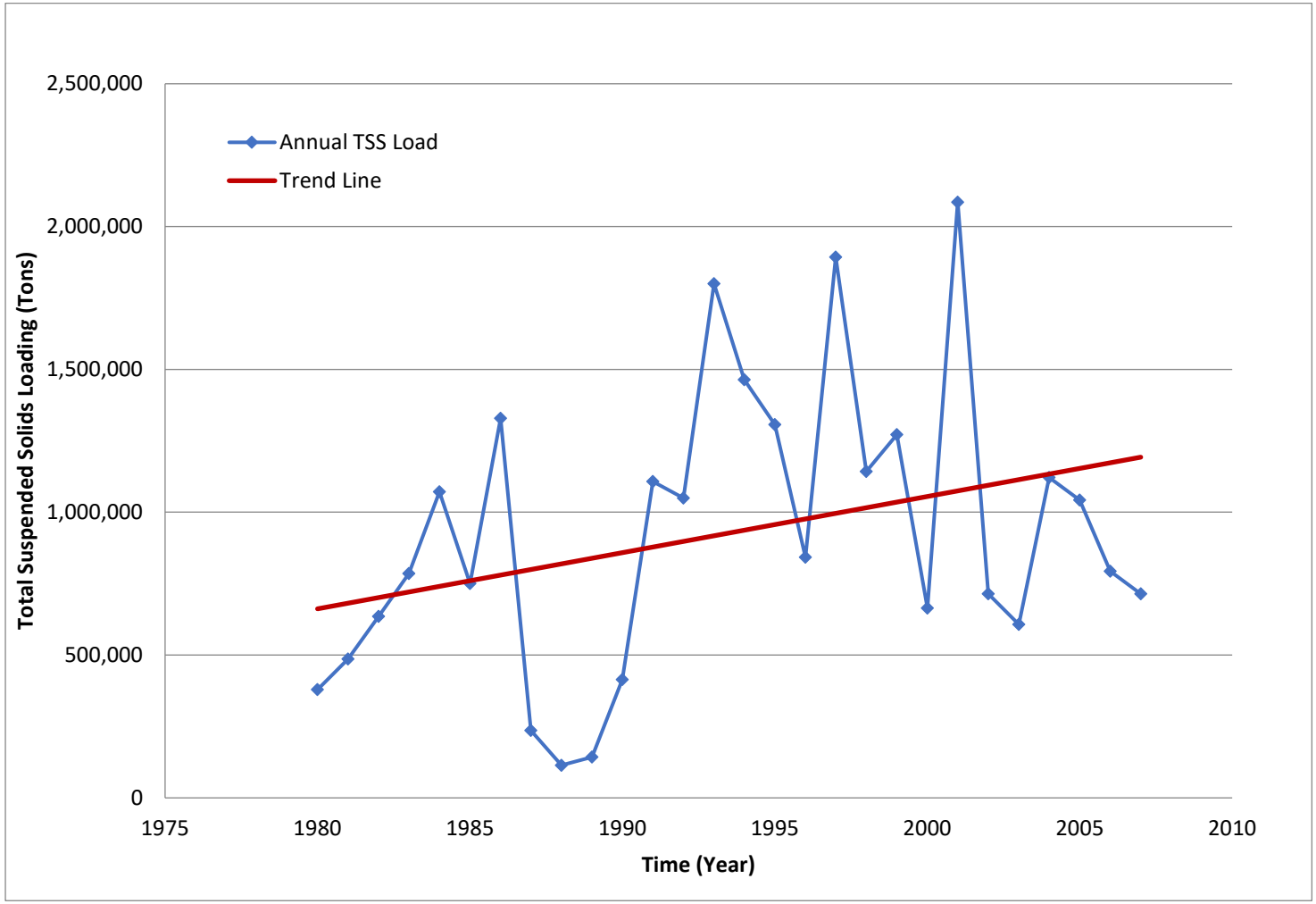
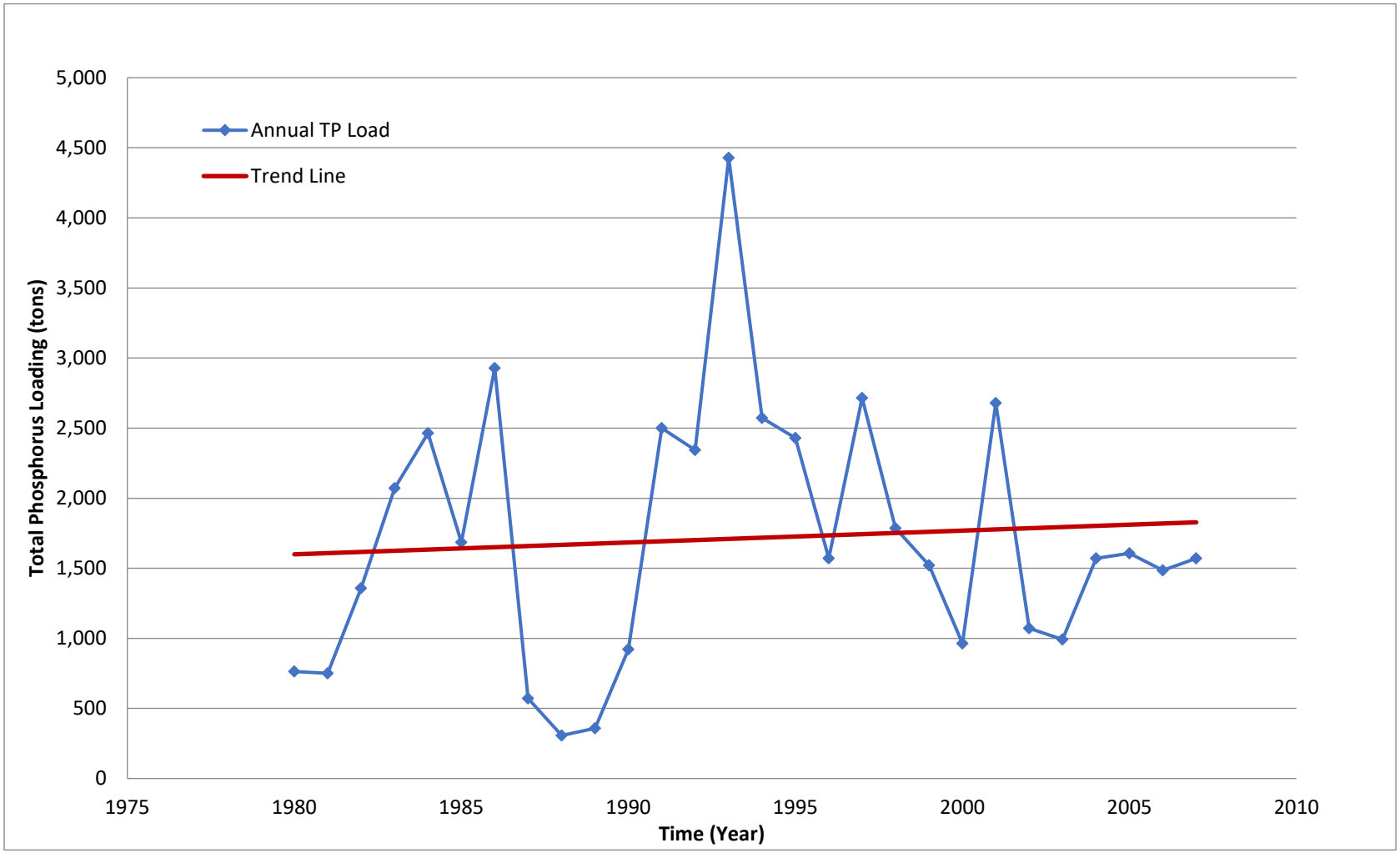
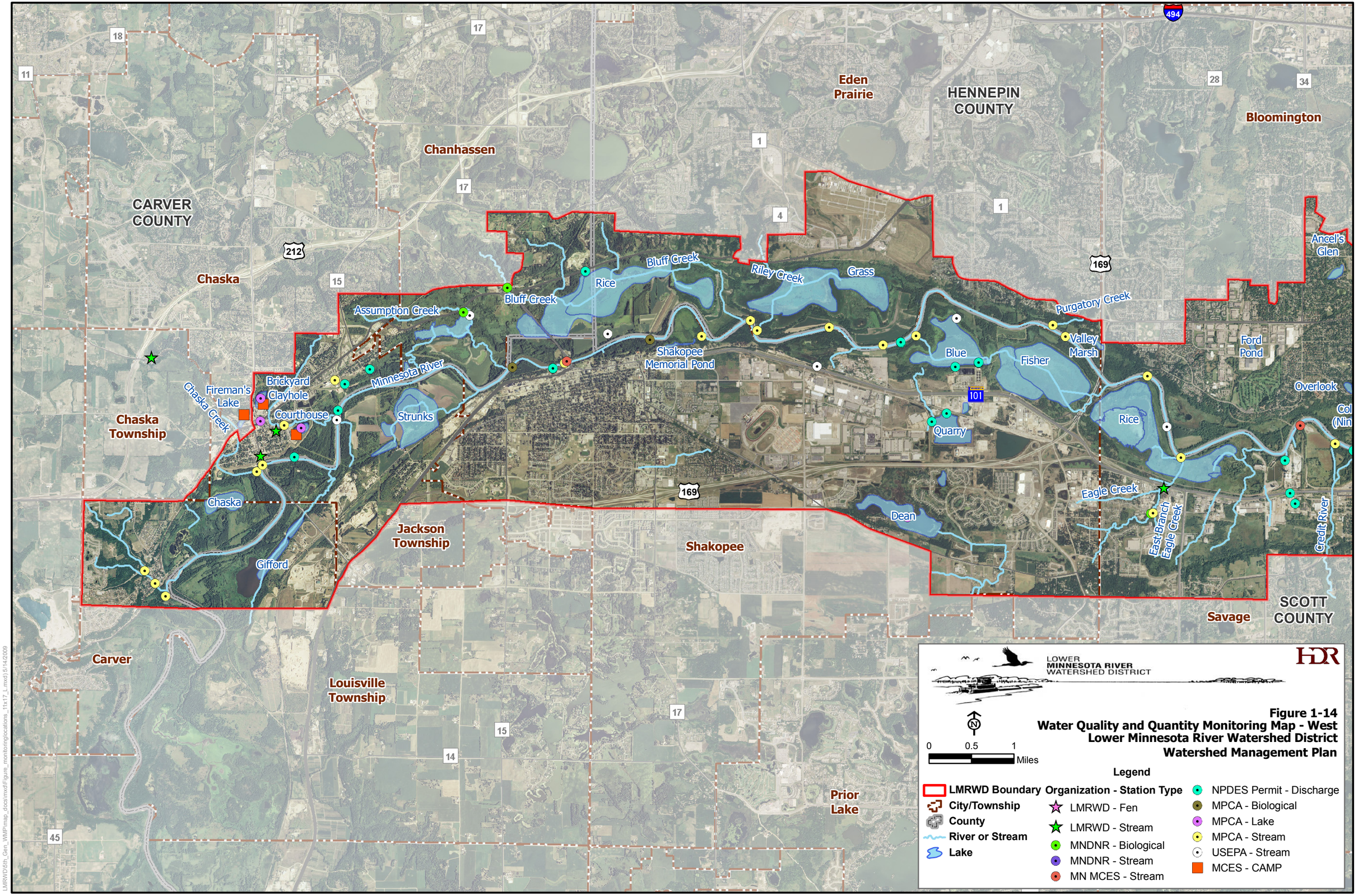


Chart 1-3: Annual Total Phosphorus Load at the USGS Jordan Station – Minnesota River





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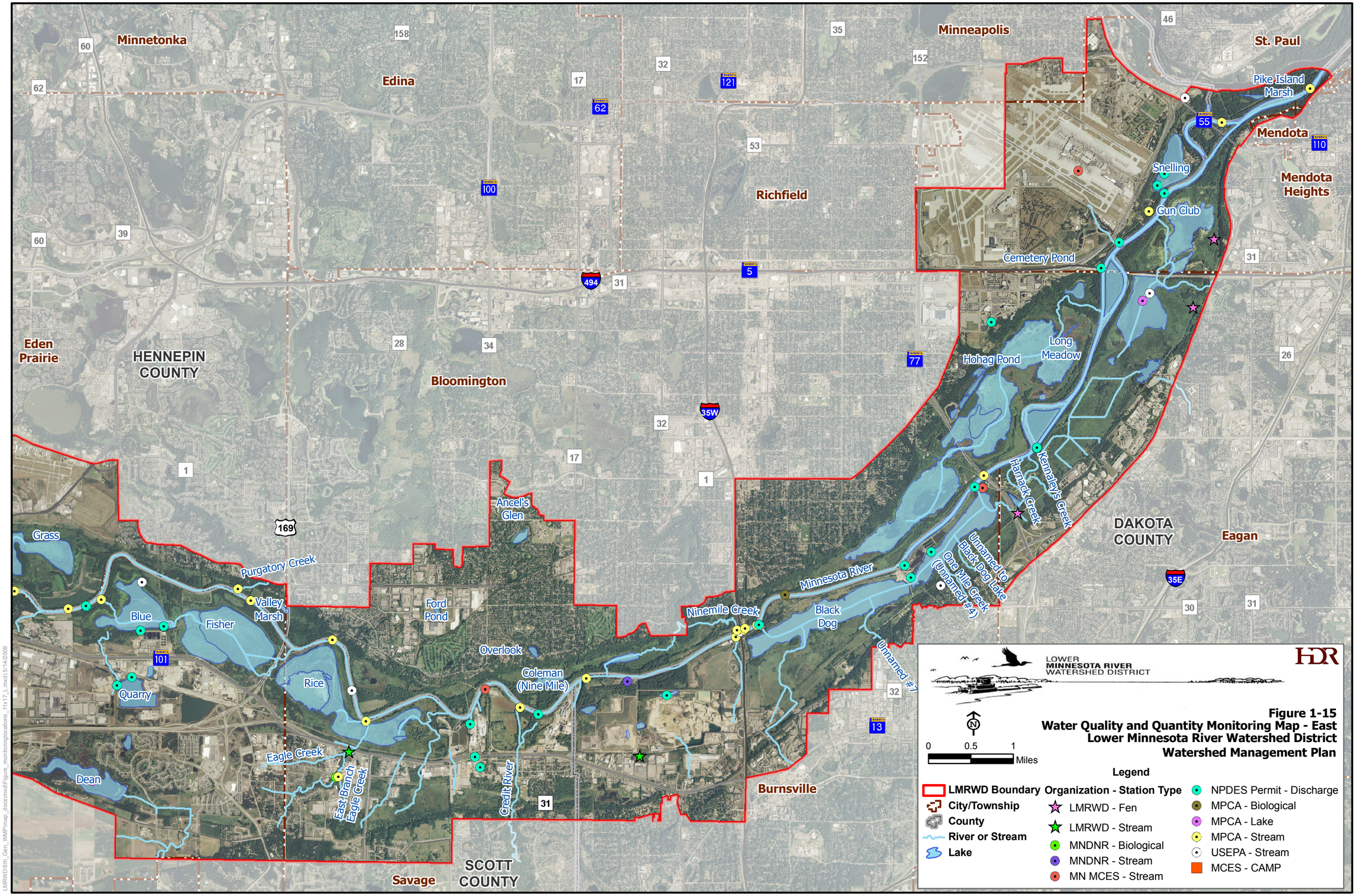

Minnetonka
Edina
Minneapolis
St. Paul
Richfield
Mendota
Mendota Heights
Eden Prairie
HENNEPIN COUNTY
Bloomington
Burnsville
Eagan
DAKOTA COUNTY
SCOTT COUNTY
Savage
Pike Island Marsh
Snelling
Gun Club
Cemetery Pond
Hohag Pond
Long Meadow
Harnack Creek
Kennaley's Creek
Unnamed to Black Dog Lake
One Mile Creek (Unnamed #4)
Minnesota River
Ninemile Creek
Black Dog
Unnamed #7
Ancel's Glen
Ford Pond
Overlook
Coleman (Nine Mile)
Credit River
Grass
Purgatory Creek
Valley Marsh
Blue
Fisher
Rice
Quarry
Eagle Creek
East Branch Eagle Creek
Dean
494
35W
35E
169
100
121
62
5
77
101
110
55
LOWER MINNESOTA RIVER WATERSHED DISTRICT
HDR
Figure 1-15
Water Quality and Quantity Monitoring Map - East
Lower Minnesota River Watershed District
Watershed Management Plan
0 0.5 1 Miles
Legend
LMRWD Boundary
City/Township
County
River or Stream
Lake
Organization - Station Type
LMRWD - Fen
LMRWD - Stream
MNDNR - Biological
MNDNR - Stream
MN MCES - Stream
NPDES Permit - Discharge
MPCA - Biological
MPCA - Lake
MPCA - Stream
USEPA - Stream
MCES - CAMP
LMRWD5th_Gen_WMPmap_docs\mxd\Figure_monitoringlocations_11x17_L.mxd) 5/14/2009

1.6.3 Streams

Since 1999, the District, in cooperation with MCES and Scott SWCD, has operated a stream monitoring station on Eagle Creek in the City of Savage and on Willow Creek in the City of Burnsville, in cooperation with MCES and Dakota SWCD. The purpose of these stations is to measure the mass, or nonpoint source pollutant "load," that tributary streams transport to major rivers. Eagle Creek is sampled during significant runoff events and during base-flow conditions to help determine the sources and extent of nonpoint pollution. Since Eagle Creek supports a trout population, temperature monitoring at additional locations have also been sponsored by the District.

MCES also operates monitoring stations on streams tributary to the District but outside its jurisdiction at Bluff Creek (since 1990), Carver Creek (since 1989), Credit River (since 1989), Nine Mile Creek (since 1989), and Riley Creek (since 1999).

In 2005, MCES published the "2004 Stream Monitoring and Assessment" that, among other analyses, 1) contains the results of a trend analysis performed on annual loads and flow-weighted mean pollutant concentrations using the Kendall Tau test, and 2) compared historic to 2004 mean watershed yields and flow-weighted mean concentrations for several pollutants. The "2004 Stream Monitoring and Assessment" contained analyses for Eagle Creek, Bluff Creek, Carver Creek, Credit River, Nine Mile Creek, Riley Creek, and Willow Creek in addition to 20 other Twin Cities metropolitan area streams.

The MCES' "2004 Stream Monitoring and Assessment" identified potential decreasing trends in Nine Mile Creek for nitrate (NO3), total dissolved phosphorus (TDP), total phosphorus (TP), total suspended solids (TSS), and Bluff Creek for NO3 and TP (MCES, 2004). The report also identified decreasing trends in Sand Creek for TDP and TP, as well as an increasing trend in Sand Creek for TSS.

The MCES' "2004 Stream Monitoring and Assessment" includes watershed yields and flow-weighted mean concentrations. This assessment concluded the following regarding streams within or tributary to the District: 1) Sand Creek delivered the highest flow-weighted mean concentrations of TSS to the Minnesota River, 2) Bluff, Sand, and Riley Creeks had the highest pollutant yields of TSS and 3) in general, the streams tributary to the Minnesota River had the greatest TSS, TP, and NO3 yields of the 27 sites assessed.

In 2012, the MCES completed its annual stream water quality assessment report. The report 1) presents a trend analysis of pollutant concentrations and 2) calculates annual pollutant loads and flow-weighted mean pollutant concentrations of the streams mentioned above, over the record period. The District, to avoid duplication of effort, will use the results of these analyses to prioritize monitoring efforts and implementation activities.

The District, in cooperation with Scott SWCD, has published quarterly or annual reports on Eagle Creek for pollutant monitoring since 2007 and temperature monitoring since 2006. In general, these reports show that Eagle Creek is within eco-region means for pollutants and within trout supporting temperature ranges. The notable exception is winter time concentrations of bacteria, turbidity, and sediment. Because the creek is spring fed, it does not freeze in the winter. The open water attracts many waterfowl to the creek which elevates these pollutants.

The District, in cooperation with Dakota SWCD, has published quarterly reports on Willow Creek Pollutant monitoring since the fourth quarter of 2004. The October – December 2009 Quarterly Report compares 2009 quarterly pollutant concentrations to historical (1999-2008) pollutant concentrations. When 2009 monitoring results are compared against historical mean concentrations, most parameters were near, or below 10-year averages and water quality has remained relatively stable over the historical monitoring period. However, during the first quarter of 2009, concentrations for several endpoints (BOD, chloride, conductivity, hardness, lead, nickel, ammonia, and nitrate/nitrite) were substantially higher than 10-year averages. This is a consequence of early season runoff event samples, which typically carry larger pollutant loads in excess of events sampled later in the year. This pattern of higher pollutant concentrations during the first quarter has routinely been observed for this station and appears to be the norm for this watershed.

In cooperation with Carver County Environmental Services and the City of Chaska, the District has operated three monitoring stations on East Chaska Creek since 2003. The purpose of these sites is to monitor the entire East Chaska Creek watershed for flow and nutrients. This data is used to analyze land use effects within the watershed on the creek.

The District, in cooperation with the Minnesota Department of Agriculture (MDA), Carver County Environmental Services, and the City of Chaska, operates a monitoring site on West Chaska Creek. The purpose of this site is to gauge the output from the entire Chaska Creek watershed into the Minnesota River. The District has published reports for monitoring at this site in 1997 and for the period from 1999 to 2005.

The District has monitored stream flows at three locations and, in cooperation with Chaska High School, monitored invertebrates in Assumption Creek. The District has published reports for stream flow monitoring in Assumption Creek in 2006 and for invertebrate monitoring since 2001. Stream flow monitoring in Assumption Creek indicates presence of year-round baseflow, and invertebrate monitoring indicates that water quality is generally good. The District has monitored invertebrates in Spring Creek in cooperation with Chaska High School. The District has published reports for invertebrate monitoring in Spring Creek since 2001. Invertebrate monitoring in Spring Creek indicate good to very good water quality. In addition, the District monitored temperatures in Unnamed Creek #7 during 2006. Temperature monitoring at Unnamed Creek #7 in 2006 indicates that mean summer

temperature was below the optimal limit for Brown trout for all of 2006. There is little evidence of significant urban stormwater inputs based on temperature data collected in 2006.

Overland runoff and discharge from storm sewers has formed small intermittent streams that have created numerous gullies along the steep slopes of the Minnesota River bluffs. Many of these gullies have experienced excessive erosion, which threatens slope stability and serves as source of sediment in the Minnesota River. In 2007, the District collaborated with the Minnesota Conservation Corps (MCC) to take an inventory of these gullies and detect those with the most severe erosion. The District has used the gully inventory results to identify slope stabilization projects since implementation (and continues to implement with partnering cities).

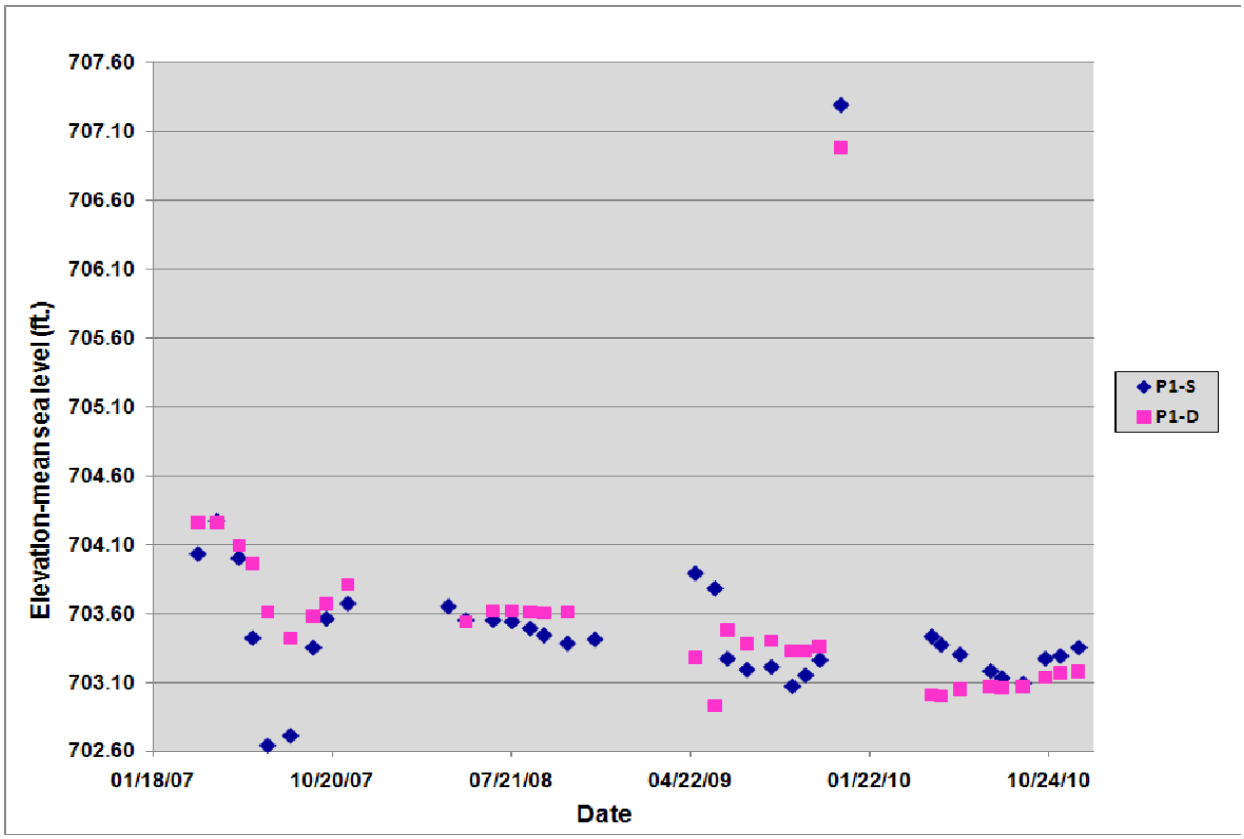
1.6.4 Fens

In 2007, the District began contracting with the Dakota County SWCD to collect monthly "depth to water" measurements for a network of 28 fen wells. Water levels are monitored at the following fens:

- Quarry Island
- Snelling Fen
- Nicols Fen

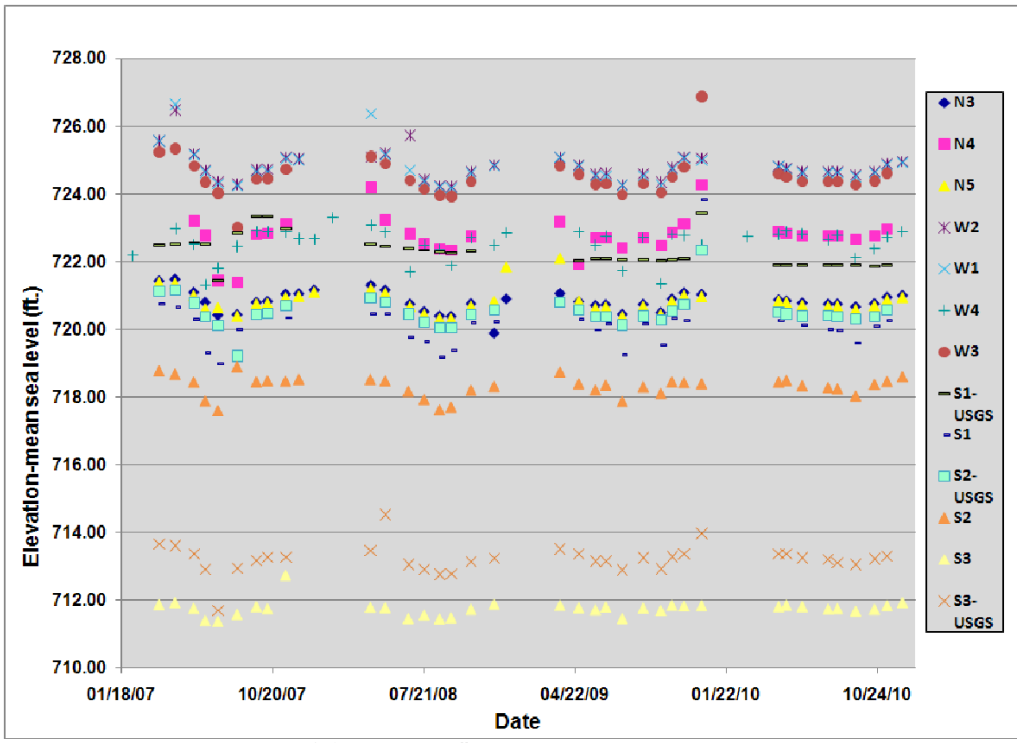
Chart 1-16, Chart 1-17 and Chart 1-18 shows fen well monitoring results for Quarry Island, Snelling and Nicols fens, respectively, from 2007 – 2010.

Chart 1-16: 2007-2010 Quarry Island Fen Well Monitoring Results



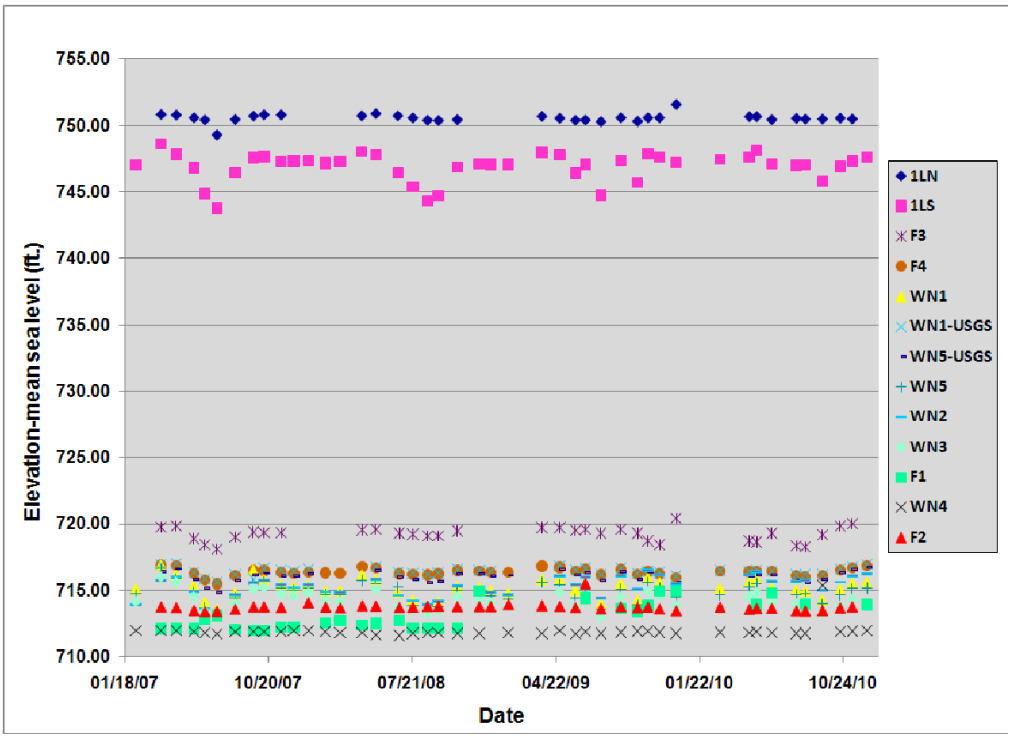
Source: 2010 Lower Minnesota River Watershed District Fen Well Monitoring Report

Chart 1-17: 2007-2010 Snelling Fen Well Monitoring Results



Source: 2010 Lower Minnesota River Watershed District Fen Well Monitoring Report

Chart 1-18: 2007-2010 Nichols Fen Well Monitoring Results



Source: 2010 Lower Minnesota River Watershed District Fen Well Monitoring Report

Water elevations among the 2007-2010 monitoring years have been relatively consistent and follow similar annual patterns in the Snelling and Nichols fens. Water elevations in the shallow wells of the Quarry Island Fen appear to be less consistent and slightly decreasing. In general, water elevations have decreased during dry summer months, and rebounded as precipitation increased in the fall. Although monthly fen well measurements do not closely mirror recent precipitation patterns, measurements do reflect general precipitation trends, especially during summertime periods of low rainfall.

Due to the brief record period for this monitoring effort, a limited regression analysis was performed on the datasets for each well. A trend line was fitted to monthly data from each well to determine if water levels are increasing or decreasing (Table 1-9). A "goodness of fit" test was completed for all trend lines, with R2 values ranging from 0 to 0.6054. Due to these low R2 values, all trends should be considered weak.

Based on this analysis, water elevations in fen wells are mixed and do not demonstrate any obvious trends (low R2 values). However, one of the Nichols fen wells (F1) is beginning to exhibit a slight increasing trend (R2=-.6145). This trend may be due to increased precipitation amounts observed in recent years, reflecting higher groundwater levels. Additional monthly measurements are needed to expand on existing baseline data to provide for a stronger trend analysis.

Table 1-9: Quarry Island, Fort Snelling, and Nichols Fens 2007-2010 Regression Analysis

Quarry Island Fen Trends		
Well	*2007-2010 Trend*	*R2 (Trend Fit)*
P1-S	Negative	0.0034
P1-D	Positive	0.1067
Fort Snelling Fen Trends		
Well	*2007-2010 Trend*	*R2 (Trend Fit)*
N3	Negative	0.0287
N4	Positive	0.0251
N5	Negative	0.0209
W2	Negative	0.0782
W1	Negative	0.0768
W4	Positive	0.0122
W3	Positive	0.0002
S1-USGS	Negative	0.3038
S1	Positive	0.0068
S2-USGS	Positive	0.0001
S2	Negative	0.0006
S3	Negative	0.0056
S3-USGS	Positive	0.0088
Nichols Fen Trends		
Well	2007-2010 Trend	R2 (Trend Fit)
1LN	Positive	0.0017
1LS	Positive	0.0113
F3	N/A	0
F4	Positive	0.0144
WN1	Negative	0.0035
WN1-USGS	Positive	0.0144
WN5-USGS	Positive	0.0428
WN5	Negative	0.0056
WN2	Positive	0.2498
WN3	Negative	0.0654
F1	Positive	0.6054
WN4	Positive	0.0428
F2	Negative	0.0005

Source: 2010 Lower Minnesota River Watershed District Fen Well Monitoring Report

Since 1987, the District installed a series of groundwater observation wells in Savage Fen to monitor groundwater levels in Savage Fen. Chart 1-19 and Chart 1-20 show groundwater level monitoring results for Wells #10 and #12, respectively. These two wells were selected for analysis because they have the longest record period. A trend line was fitted to monthly data for each well to determine if water levels are increasing or decreasing. Groundwater levels for Well #10 and Well #12 trend downwards over time. A "goodness of fit" test was completed for both trend lines, with R^2 values of 0.0134 for Well #10 and 0.0642 for Well #12. Due to these low R^2 values, trends for Wells #10 and #12 should be considered weak.

Chart 1-19: Savage Fen Groundwater Monitoring Results – Well #10

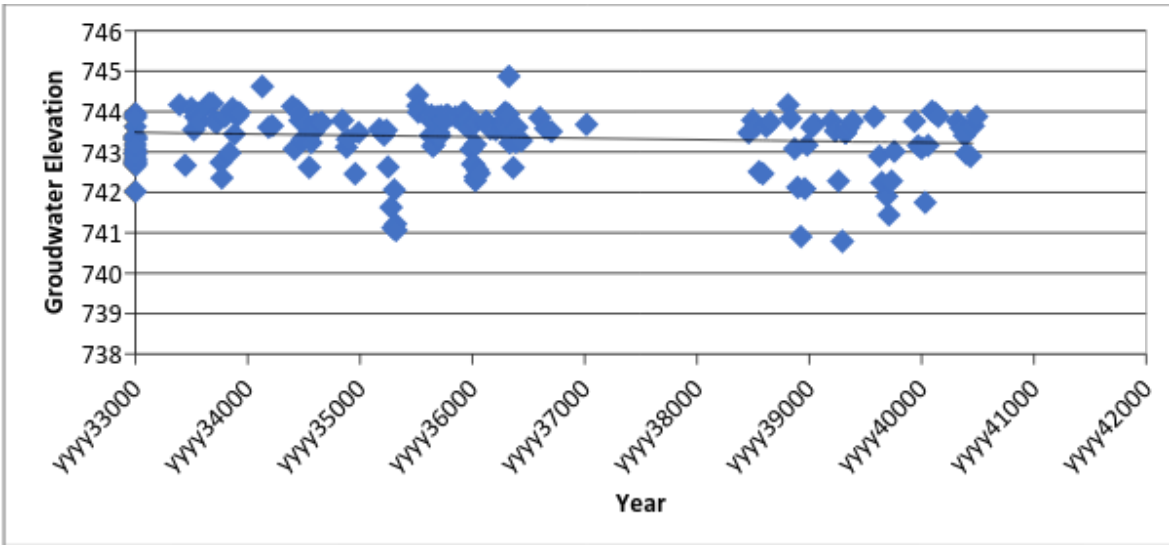
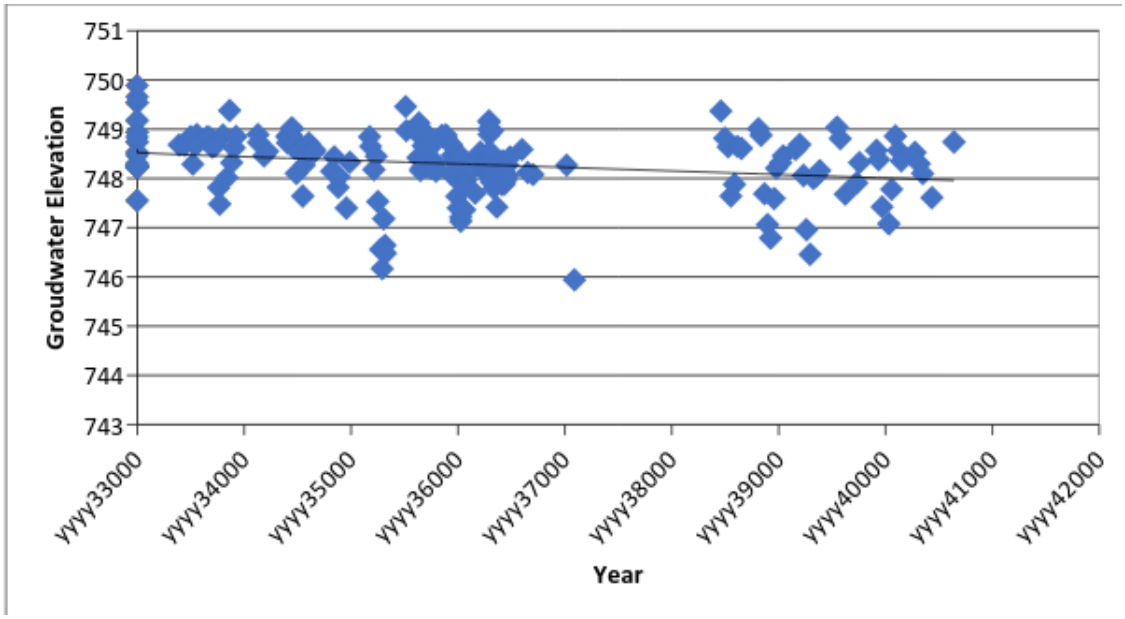


Chart 1-20: Savage Fen Groundwater Monitoring Results – Well #12



The District has also independently monitored water levels at Snelling Fen. Data from the fen monitoring is available at the District office or on the District's website. At Seminary Fen, the District has worked cooperatively with DOT and Carver County to monitor water levels from 2006 to 2007. As part of this Plan, this data was not presented. Longer-term data is needed to determine any trends in water levels at Seminary Fen.

1.7 Surface Water Appropriations

Several DNR-permitted surface water appropriations occur with the District. These include appropriations for irrigation, power generation, quarry dewatering, and other mining operations. Table 1-10 shows the 2007 surface water usage volumes for the DNR-permitted surface water appropriations.

Table 1-10: 2007 DNR Permitted Surface Water Appropriations

Permittee	Water Use	Water Body	Permitted Surface Water Use Volume (millions of gallons per year)
Xcel Energy - Black Dog Plan	Steam Power Cooling	Minnesota River	149,305
Kraemer Mining and Materials, Inc.	Quarry Dewatering	Quarry/Gravel Pit	4,000
Edward Kraemer and Sons, Inc.	Sand and Gravel Washing	Dug Pit	50
Minnesota Valley Country Club	Golf Course Irrigation	Dug Pit	60
Mueller & Sons, Inc.	Sand/Gravel Pit Dewatering	Quarry/Gravel Pit	70
Sever Peterson	Crop Irrigation	Minnesota River	13
US Fish and Wildlife Service	Lake Level Maintenance	Chaska Lake	8
US Fish and Wildlife Service	Fisheries/Hatcheries	Fisher Lake	8

1.7.1 Shoreland Ordinances

Shoreland ordinances vary according to a water body's shoreland classification. The DNR's classifications are natural environment, recreational development, and general development. The DNR's shoreland regulations (i.e., setbacks) are most strict for natural environment water bodies and least strict for general development water bodies. Local government units (LGU) are responsible for the implementation, administration, and enforcement of shoreland management standards through their planning and zoning controls.

All municipalities within the District, except for Mendota Heights, Lilydale, Mendota, and Carver, have DNR-approved shoreland management ordinances. Unincorporated areas come under the counties' authority, all having DNR-approved shoreland ordinances.

1.8 GROUNDWATER RESOURCES

District groundwater protection and management are important issues as counties in the MSP metropolitan area rely highly on groundwater for domestic, municipal, industrial, and agricultural water supplies.

Counties within the District were given authority by the state to adopt groundwater management plans, which provide a mechanism to set priorities, address issues, and build local capacity for groundwater protection and management. Table 1-11 shows the status of the groundwater management plans for each of the District's counties.

Table 1-11: County Groundwater Management Status

County	Groundwater Management Plan Status
Carver	First plan approved in August 1992. The new plan approved in 2016.
Dakota	First plan approved in 1992. Updated plan approved in July 2000. New plan approved in October 2006. The revised plan is scheduled to be submitted in 2018.
Hennepin	Approved in March 1994. No plan to update it.
Scott	First plan drafted in 1996, revised extensively in 1998, and approved in 1999. No update since then.
Ramsey	Approved in September 1995. An updated plan was prepared in 2009 but, it was not submitted for approval. Since 2016, the county is planning to update the 1995 plan. However, this has little impact on the District since Pike Island is the only portion of Ramsey County located within its boundary.

1.8.1 General Groundwater Information

The lower Minnesota River lies within an artesian basin containing glacial sediment and bedrock aquifers with large groundwater reserves. The DNR requires a permit for surface or groundwater appropriation, which is more than 10,000 gallons of water per day or 1.0 million gallons per year. There are certain exemptions to this requirement related to domestic consumption, reuse of permitted water appropriations, test pumping, and agricultural purposes. The DNR Waters Division provides more detailed information on groundwater usage for specific areas and DNR-permitted appropriations within the District.

County geologic atlases and groundwater plans present detailed information about the water table and bedrock aquifers within the District, including the potentiometric surface (a measurement of water pressure) and potential aquifer yield. Figure 1-10 shows water table contours for the area around the District. The potentiometric surface indicates the direction of groundwater flow. Groundwater will flow from the areas of higher potentiometric elevation toward the lower potentiometric elevation. The cut of the Minnesota River valley has a predominant effect on the potentiometric levels in and near the valley.

1.8.2 Groundwater Quality

The District's general quality of deeper groundwater aquifers meets good drinking water standards. Since most District's residents receive their drinking water from these deeper groundwater supplies, groundwater quality protection is of great concern.

As lands within the District continue to develop, the areas with impervious ground cover will increase. This, in turn, restricts the recharge of the aquifers by infiltration. This potential threat can be mitigated by development design practices that condense impervious areas and provide landscape features that promote infiltration.

Within the District, there are various potential sources of groundwater contamination. Septic tanks, spreading of chemicals and wastes, and commercial/industrial sites are all examples of pollution sources that could impair groundwater quality if improperly located or designed. Additional information on pollution sources within the District is provided in future sections.

Areas with sandy soils and a shallow depth to bedrock are particularly susceptible to groundwater contamination due to the soils' rapid infiltration rate. An example of such an area would be the land around the City of Shakopee and Blue Lake. At this location, there is less than 50 feet of sand and gravel outwash over the Prairie du Chien aquifer. More information about areas susceptible to groundwater pollution can be obtained from county geologic atlases and groundwater plans.

1.8.3 Groundwater Availability and Use

Groundwater is available from multiple aquifers, including:

- Surficial aquifer (terrace deposits, alluvium, and glacial outwash)
- St. Peter
- Prairie du Chien-Jordan
- Franconia-Ironton-Galesville
- Mt. Simon

The Minnesota River is a regional groundwater discharge area. Groundwater moves toward the Minnesota River and discharges into the river, floodplain lakes, wetlands, springs, and flowing wells, thus providing a high-quality water source for the District's surface water resources. Flow directions in the surficial aquifers can be locally influenced by nearby surface water bodies or by pumping in deeper aquifers.

Table 1-12 summarizes groundwater use within the District. Surficial aquifer appropriations are included under 'Quaternary' aquifers in the table. The majority of surficial aquifer pumping is for temporary dewatering, which is typically performed for construction purposes and does not result in long-term impacts to the regional water table. As shown in Table 1-12, the primary categories of groundwater use from other aquifers include municipal water supply, agricultural processing, and sewage treatment. The principal source of groundwater for most of these uses, however, is the Prairie du Chien-Jordan aquifer.

Table 1-12: 2007 Groundwater Appropriation

Use Type	Aquifer Use 2007 (Millions of Gallons)				
	Franconia-Ironton-Galesville	Mt. Simon	Multi-Aquifer Wells	Prairie du Chien-Jordan	Quaternary
Agricultural Processing	59		762	136	
Dewatering					473
Fire Protection					14
Golf Course				148	
Landscaping/ Athletic Fields			26	34	
Metal Processing				321	
Municipal Waterworks	214	640	35	2,036	
Non-Metallic Processing				151	
Heating / Air Conditioning				253	
Private Waterworks	6		3	6	
Sewage Treatment				638	
Steam Power Cooling				38	
Total	**279**	**640**	**826**	**3,762**	**487**

Pumping lowers the potentiometric surface in the aquifer, diverting flow toward the well. This diversion can occur vertically as well as horizontally, so that pumping in one aquifer can affect water levels and flow directions in another aquifer. As a result, pumping in a bedrock aquifer can eventually lower the water table in surficial aquifers. Some bedrock aquifers provide recharge to surface water bodies such as fens. As mentioned, the five calcareous fens within the District are recharged from groundwater. The hydraulics of these fens may be affected by pumping. Because of these relationships, all requests for new groundwater appropriations and amendments to existing permits must be reviewed and approved by the DNR. During the review process, and prior to making judgments on the sustainability of an appropriation application (new or existing), the DNR reviews potentiometric surface levels, effects of seasonal pumping, proximity to existing

appropriations, and total aquifer appropriations.

1.8.4 Groundwater Sustainability

Groundwater sustainability has been defined as the development and use of groundwater in a manner that can be maintained for an infinite time without causing unacceptable environmental, economic, or social consequences. Sustainability has traditionally been viewed mostly as water quality protection and the absence of well interference (i.e., one well affecting the production of another).

Water quality protection has focused on aquifer susceptibility to contamination and protection of water supplies from contamination sources. Aquifer susceptibility maps for the District are available in the county geologic atlases for Dakota, Hennepin, Ramsey, and Scott counties, and in the Carver County Surface Water Management Plan. The Minnesota Department of Health (DOH) administers the wellhead protection program, which focuses on preventing contamination of groundwater that may be captured by a public water supply well.

Traditional sources of contamination addressed in county groundwater plans include:

- Underground storage tanks
- Septic tanks
- Abandoned wells
- Use of pesticides and fertilizers
- Landfills and dumps

Future groundwater management for sustainability will include increased focus on coordinated groundwater management, surface water, and water-dependent ecosystems. Examples of this new emphasis include groundwater management to protect discharges to sensitive wetlands. Other examples involve rethinking the quantity and quality of groundwater discharges needed to protect fish and other biologic communities and understanding the amount of water use that can be sustained indefinitely.

1.9 SOILS

Figure 1-16 and Figure 1-17 identify major soil associations within the District. More detailed soils information, such as development limitations, infiltration characteristics, and erosion characteristics of soil groups at specific sites, can be found in the United States Department of Agriculture (USDA) Soil Survey for the District's counties. Information is also available at the SWCD office for each county and on the USDA Natural Resources Conservation Service (NRCS) Website.

1.9.1 General Description

The Minnesota River valley includes, at its lowest elevations, floodplain soils such as alluvium, peat, and muck identified as the Chaska-Minneiska-Colo soil complex. Alluvial soils are usually flood deposits. The particulate sizes range from gravelly sand to silt and clay, with silt and very fine sands being predominant. Peat and muck are soils with high organic content. In peat, partially decayed vegetative (organic) matter such as reeds, grasses, mosses, and leaves can be identified. In muck, the advanced decomposition makes the materials unidentifiable.

At the District's edge of the floodplain, just below the bluffs that border the Minnesota River valley, lie well-drained silt loams and more poorly drained silty clay loams. These soils result from erosion on the higher levels of the bluffs.

In Dakota County, the break between floodplain and upland is very sharp. Above the bluff are soils that formed on glacial drift called the Mankato till, which were deposited as the Grantsburg Sublobe of the Des Moines lobe. These soils are part of the Mankato ice sheet retreated up as the present-day Minnesota River Valley. These gray-brown Podzolic soils developed for the most part under forest conditions that covered most of the District. Today, only remnants of that forest remain.

In Carver County, soils outside the floodplain are fine-textured (sandy to loamy), level to gently sloping, and are the result of the Glacial River Warren deposits. Above these soils, on the steeper slopes, are coarse textured soils. Soils associated with glacial moraine are found on top of the bluffs.

In Hennepin County, the soil associations are like those in Carver County, extending over the same moraine deposits of the north bluff. Above the bluffs near Interstate Highway 35W, there is a small amount of sandy loam. These soils likely developed on stream-deposited material, with the bluff representing an old river terrace. This is further proof of the Glacial River Warren's extent and the existence of river terraces in and near the Minnesota River valley.

In Scott County, about two miles west of Savage and between the floodplain and the higher upland regions, larger terraces appear and become evident to the western end of the District. Several related soils are found on these terraces: silt and silty clay loams on the lower terraces, and sandy loams on the upper terraces. District soils are shown on Figure 1-16 and Figure 1-17.

1.9.2 Soil Erosion and Sedimentation

Erosion and its resulting sedimentation are the primary causes of nonpoint source water quality problems on the Minnesota River. The sediments create navigation problems by forming sandbars which require monitoring for the channel.

Cropland erosion (most of which is located outside of the District) is a major source of the District's sediment problems. Gully, streambank, roadside, and development-related erosion are also sources of sediment problems. Gully erosion can occur because of over-grazing, poor management, or intensive land use above steeply-sloped lands such as the Minnesota River valley bluffs. These bluffs are composed almost entirely of highly erodible, sandy soils that are difficult to control, stabilize, and re-vegetate once disturbed. When development occurs without regard for slope, soil type, or loss of vegetation, soil erosion and sedimentation are accelerated.

Figure 1-16 and Figure 1-17 show highly erodible land and potentially highly erodible land within the District for Scott and Hennepin counties. The topographic information on Figure 1-8 and Figure 1-9 identifies locations of steeply sloped lands (greater than 18 percent) such as the blufflands. Slope is a main factor in determining critical erosion areas; other factors include slope length, land cover, and erodibility.

Soil Association

- CHASKA-MINNEISKA-COLO (MN165)
- ESTHERVILLE-DICKMAN-DAKOTA (MN168)
- HAYDEN-CORDOVA-HAMEL (MN166)
- HUBBARD-ISAN-DUELM (MN072)
- KINGSLEY-MAHTOMEDI-QUAM (MN172)
- LESTER-HAMEL-LE SUEUR (MN080)
- LESTER-HAWICK-TERRIL (MN171)
- LESTER-HAYDEN-MUSKEGO (MN081)
- LESTER-KILKENNY-HOUGHTON (MN152)
- SPARTA-ESTHERVILLE-WAUKEGAN (MN169)
- WAUKEGAN-WADENA-HAWICK (MN173)

HENNEPIN COUNTY
Eden Prairie
Bloomington
CARVER COUNTY
Chaska
Chaska Township
Carver
Jackson Township
Louisville Township
Shakopee
Prior Lake
Savage
SCOTT COUNTY
Rice
Grass
Shakopee Memorial Pond
Blue
Fisher
Valley Marsh
Ancel's Glen
Ford Pond
Overlook
Brickyard Clayhole
Fireman's Lake
Courthouse
Strunks
Quarry
Chaska
Gifford
Dean
494
169
212
101
1
4
15
17
14
45
28
34

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-16
Soils Map - West
Lower Minnesota River Watershed District
Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

Erodibility (Scott & Hennepin Counties)

- Highly erodible land
- Potentially highly erodible land

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Soil Association

- CHASKA-MINNEISKA-COLO (MN165)
- ESTHERVILLE-DICKMAN-DAKOTA (MN168)
- HAYDEN-CORDOVA-HAMEL (MN166)
- HUBBARD-ISAN-DUELM (MN072)
- KINGSLEY-MAHTOMEDI-QUAM (MN172)
- LESTER-HAMEL-LE SUEUR (MN080)
- LESTER-HAWICK-TERRIL (MN171)
- LESTER-HAYDEN-MUSKEGO (MN081)
- LESTER-KILKENNY-HOUGHTON (MN152)
- SPARTA-ESTHERVILLE-WAUKEGAN (MN169)
- WAUKEGAN-WADENA-HAWICK (MN173)

Minneapolis
St. Paul
Pike Island Marsh
Mendota
Mendota Heights
Snelling
Gun Club
Cemetery Pond
Long Meadow
Hohag Pond
HENNEPIN COUNTY
Richfield
Eden Prairie
Bloomington
Ancel's Glen
Grass
Valley Marsh
Blue
Fisher
Ford Pond
Overlook
Coleman (Nine Mile)
Rice
Quarry
Dean
Black Dog
DAKOTA COUNTY
Eagan
Burnsville
Savage
SCOTT COUNTY

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-17
Soils Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

Erodibility (Scott & Hennepin Counties)

- Highly erodible land
- Potentially highly erodible land

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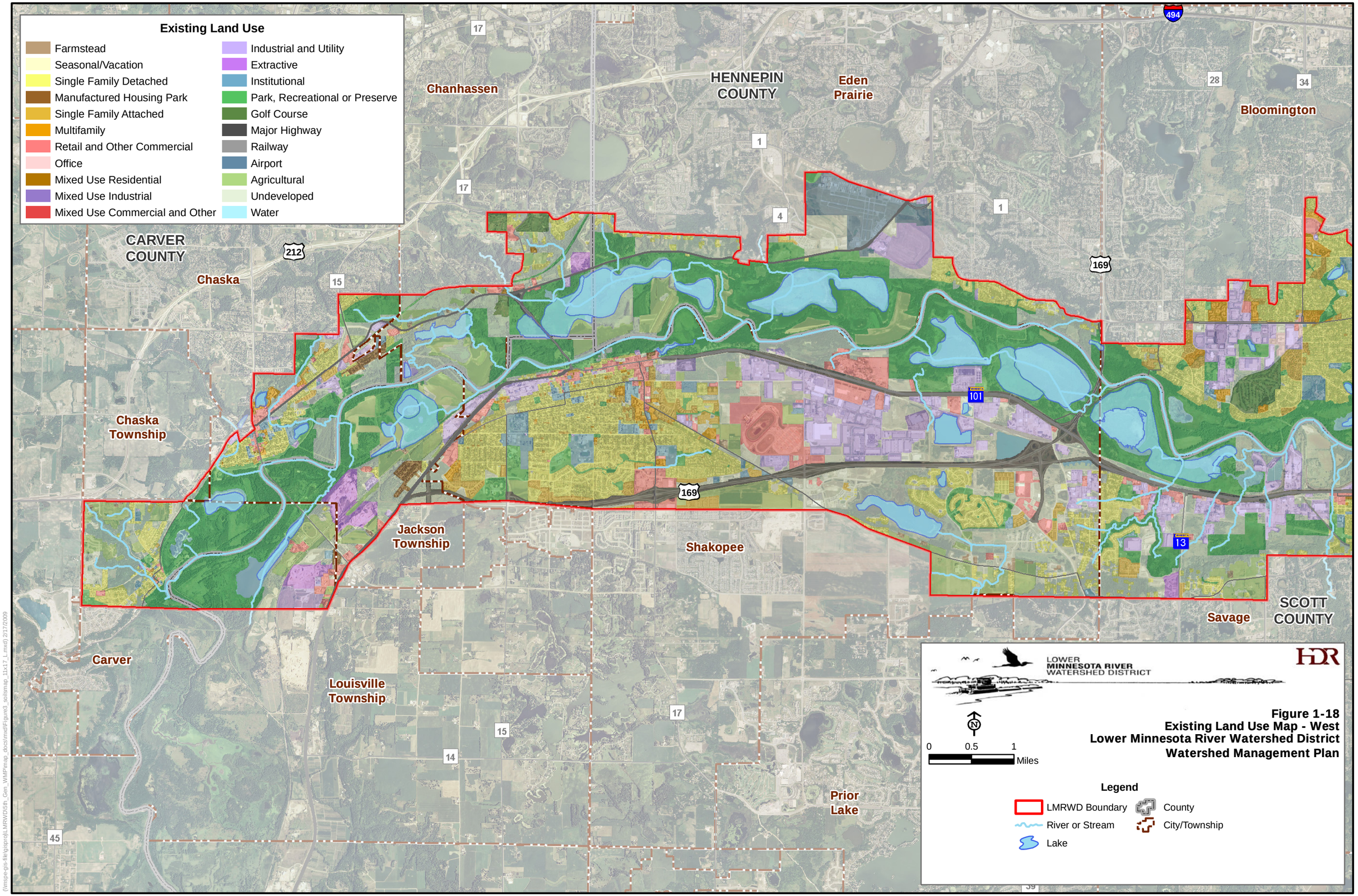
1.10 LAND USE AND PUBLIC UTILITY SERVICE

The District is located in the midst of the growing MSP metropolitan area. This location, coupled with commercial and recreational opportunities provided by the Minnesota River, make the District lands highly desirable for residential, commercial, and industrial development. In addition, the District contains some agricultural lands and large areas of open space. Open space is mostly located in and along the Minnesota River's floodplain and consist almost entirely of public lands, which are administered federally by the USFWS in the Minnesota Valley National Wildlife Refuge. At the state level, the Minnesota DNR manages the parks and opens spaces in the Minnesota Valley State Recreation Area and Fort Snelling State Park and scientific and natural areas (SNAs). Locally, counties and municipalities manage the remaining parks and open spaces.

Figure 1-18 and Figure 1-19 show delineated land use in the District (as of 2005) by the Metropolitan Council. Figure 1-20 and Figure 1-21 show Regional Planned Land Use in the District up to the year 2030, as defined by Metropolitan Council. Land use remains relatively static between publication of this Plan and proposed changes for year 2030. Most land use changes will occur on the Minnesota River's south side in the cities of Shakopee and Savage, where agricultural and forested lands are anticipated to transition to single family residences. Further development of District lands could have serious adverse effects on wildlife, water resources, and other sensitive resources. However, if projects are sited properly and the resources are adequately protected, these concerns may be alleviated.

Figure 1-20 and Figure 1-21 show the Metropolitan Urban Services Area (MUSA) boundaries. Areas within the MUSA currently have municipal sanitary sewer facilities or are planned to have municipal sanitary sewer facilities in the future. Lands outside the MUSA boundary are served by individual waste disposal systems. Lands located within the MUSA boundary are more likely to develop quickly and at a greater density than lands located outside the MUSA boundary.



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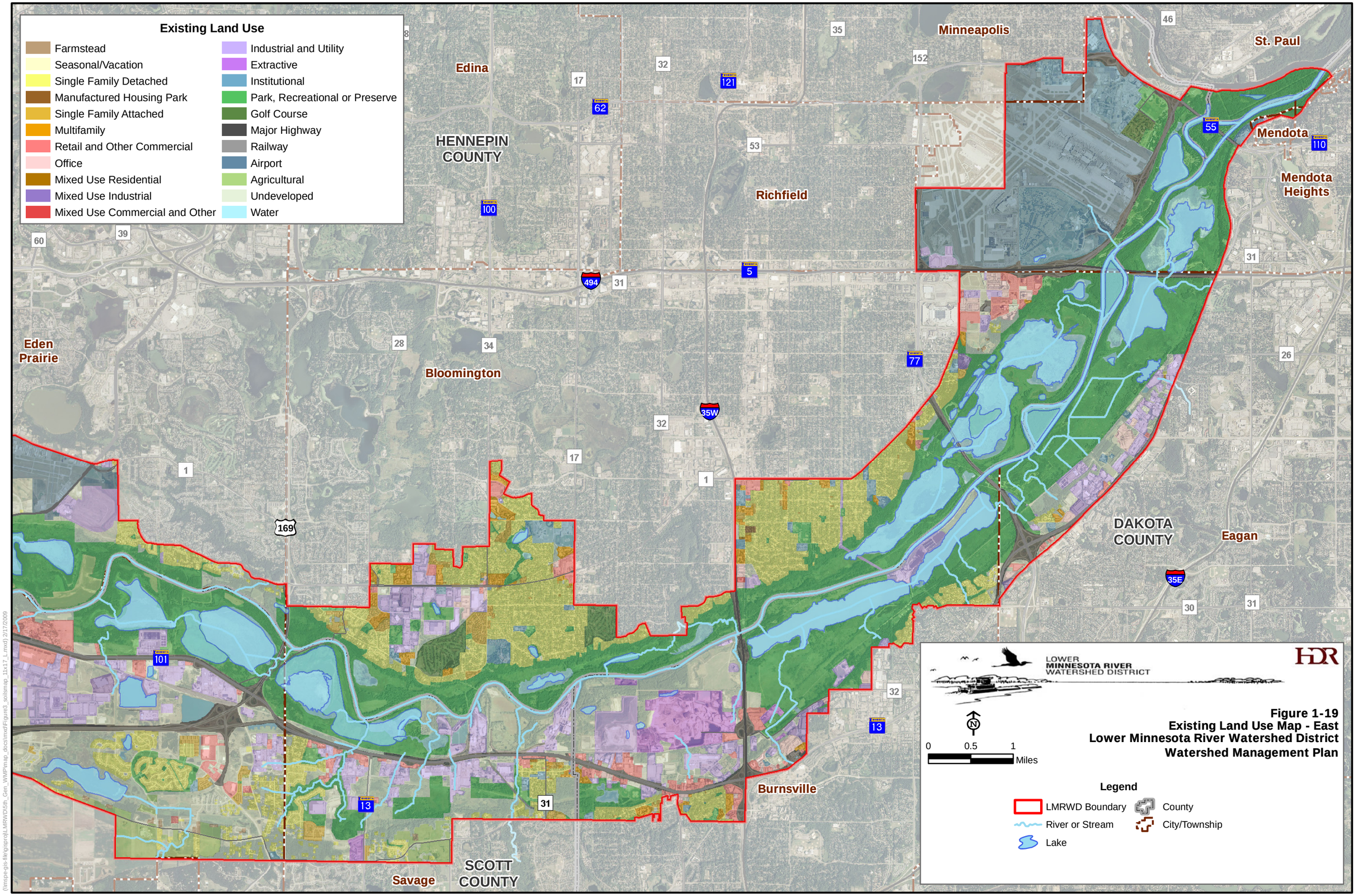

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Regional Planned Land Use

- Agricultural
- Rural or Large-Lot Residential
- Single Family Residential
- Multifamily Residential
- Commercial
- Industrial
- Institutional
- Mixed Use
- Multi-Optional Development
- Park and Recreation
- Open Space or Restrictive Use
- Rights-of-Way (i.e., Roads)
- Railway (inc. LRT)
- Airport
- Vacant or Unknown
- Open Water

Met Council Comprehensive Plan Composite

- 2010 MUSA as of 10/12/06
- 2020 MUSA
- 2030 MUSA
- 2040 Urban Reserve
- Not in Jurisdiction
- Permanent Agricultural
- Permanent Rural
- Undesignated MUSA

HENNEPIN COUNTY
Eden Prairie
Bloomington
CARVER COUNTY
Chaska
Chaska Township
Jackson Township
Shakopee
Carver
Louisville Township
Prior Lake
Savage
SCOTT COUNTY

494 28 34 1 4 1 212 15 169 101 169 13 17 15 14 45 39

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-20
2030 Regional Planned Land Use Map - West
Lower Minnesota River Watershed District
5th Generation Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

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Regional Planned Land Use

- Agricultural
- Rural or Large-Lot Residential
- Single Family Residential
- Multifamily Residential
- Commercial
- Industrial
- Institutional
- Mixed Use
- Multi-Optional Development
- Park and Recreation
- Open Space or Restrictive Use
- Rights-of-Way (i.e., Roads)
- Railway (inc. LRT)
- Airport
- Vacant or Unknown
- Open Water

Met Council Comprehensive Plan Composite

- 2010 MUSA as of 10/12/06
- 2020 MUSA
- 2030 MUSA
- 2040 Urban Reserve
- Not in Jurisdiction
- Permanent Agricultural
- Permanent Rural
- Undesignated MUSA

Minneapolis
St. Paul
Mendota
Mendota Heights
Richfield
Eden Prairie
Bloomington
Burnsville
Eagan
DAKOTA COUNTY
SCOTT COUNTY
Savage

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-21
2030 Regional Planned Land Use Map - East
Lower Minnesota River Watershed District
5th Generation Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

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1.11 WATER BASED RECREATIONAL AREAS

There are approximately 24,000 acres of existing wildlife refuges, parks, trails, and open space along the Minnesota River corridor and managed by the Minnesota Valley National Wildlife Refuge. The Minnesota Valley National Wildlife Refuge was established through the efforts of local citizen groups to protect the Lower Minnesota River valley. The Minnesota Valley Trail was authorized by the state legislature in 1969. Federal legislation entitled "The Minnesota Valley National Wildlife Refuge Act of 1976" declared that the policy of the Congress would preserve the Minnesota River valley and, as a federal action, establish the 9,500-acre Minnesota Valley National Wildlife Refuge and an adjacent 8,000-acre wildlife recreation area. Most of this area is within the District's boundary.

The refuge portion of the area is managed by the USFWS with two main objectives: 1) to provide habitat for a diversity of plants and animals, and 2) to provide opportunities for people to observe and learn about the valley's wildlife. The recreation area is managed by local governments and the DNR. These agencies are developing recreational and educational opportunities that are compatible with Minnesota River valley natural resources. The DNR Division of Parks and Recreation manages the state trail. Management objectives are to develop an accessible, scenic, and recreational travel route between Fort Snelling State Park and Le Sueur. This trail links with other metro area trails to provide hiking, bicycling, horseback riding, snowmobiling, and cross-country skiing opportunities for metropolitan area residents. Figure 1- 22 and Figure 1-23 show the District's existing and proposed regional and state trails, state and federal parks, recreational areas, and the National Wildlife Refuge.

Unique Resources

Trails
- Regional Existing
- Regional Planned
- Regional Proposed
- State Existing

- Trout Lake
- Trout Stream
- MCBS Native Plant Community

MCBS Biodiversity Significance
- Moderate Significance
- High Significance
- Outstanding Significance

- Regionally Significant Ecological Area
- USFWS NWR
- MN SNA
- State Park
- National Park Service Boundary

CARVER COUNTY
Chaska
Chaska Township
Carver
Jackson Township
Louisville Township
Shakopee
Prior Lake
Eden Prairie
Bloomington
Savage
SCOTT COUNTY
Assumption Creek
Courthouse Lake
Minnesota Valley State Recreation Area
Eagle Creek
East Branch Eagle Creek
Savage Fen SNA
494
212
169
101
17
15
14
45
4
1
28
34
39

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-22
Unique Resources Map - West
Lower Minnesota River Watershed District
5th Generation Watershed Management Plan

Legend
- LMRWD Boundary
- County
- City/Township

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Unique Resources

Trails
- Regional Existing
- Regional Planned
- Regional Proposed
- State Existing

- Trout Lake
- Trout Stream
- MCBS Native Plant Community

MCBS Biodiversity Significance
- Moderate Significance
- High Significance
- Outstanding Significance

- Regionally Significant Ecological Area
- USFWS NWR
- MN SNA
- State Park
- National Park Service Boundary

Minneapolis
St. Paul
Mendota
Mendota Heights
Richfield
HENNEPIN COUNTY
Eden Prairie
Bloomington
Fort Snelling State Park
Kennaley's Creek
Harnack Creek
DAKOTA COUNTY
Eagan
OneMileCreek (Unnamed #7)
Unnamed #7
Black Dog Preserve SNA
Burnsville
Eagle Creek
East Branch Eagle Creek
Savage Fen SNA
Savage
SCOTT COUNTY

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-23
Unique Resources Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

Legend
- LMRWD Boundary
- County
- City/Township

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1.12 COMMERCIAL AND RECREATIONAL NAVIGATION

Navigation was one the primary initiatives driving the District's establishment. The District was principally established as a legal entity for providing local participation to the COE to construct a navigation channel. Water-borne freight traffic is one of the District's greatest commercial assets and is of great importance to the local and state economy. The Minnesota River is navigable from its confluence with the Mississippi River to the Carver Rapids, just above the City of Carver. The Hastings Dam, located on the Mississippi River in Hastings, Minnesota, controls the Minnesota River's surface water, which extends as far as the Carver Rapids, just upstream of the District's most westerly boundary.

Construction of a navigation channel on the Minnesota River was first authorized in 1892. In 1892, Congress authorized the Minnesota River navigation project, which provided a 4-foot channel construction from the Minnesota River mouth at its confluence with the Mississippi River, upstream for 25.6 river miles to Shakopee. The COE is authorized to provide channel maintenance if appropriations and environmental concerns are addressed in advance.

In 1942, the COE dredged a 9-foot deep, 100-foot wide channel from the mouth of the Minnesota River to Savage (13.2 river miles), paid for by local interests. The 1958 River and Harbor Act authorized improvements on the Minnesota River from its mouth upstream to R.M. 14.7, a point one-half mile above the railroad bridge near Savage. Under this authorization, a channel 9-feet deep and 100-feet wide was provided. Three cutoffs to eliminate wide passage or turnouts to aid navigation were provided to permit tows to pass safely. The COE, with the District as the local sponsor, finished installation of the 100-foot wide, 9-foot deep channel in August 1968. The navigation channel cost roughly $2 million, or about $136,000 per mile. The dredged materials were placed at temporary disposal sites.

Periodic dredging is required to maintain the navigation channel. The required maintenance is accomplished through a cooperative agreement between the District and the COE. Sites most frequently dredged by the COE are located between R.M. 12 and R.M. 14.7. Sites between river mile 1.0 and 2.0, near Pike Island, and between river mile 4.0 and 5.0 are occasionally dredged. Figure 1-24 and Figure 1-25 show the most frequently dredged locations on the Minnesota River. In the past, private interests extended the navigation channel upstream to R.M. 21.8 near Port Peavey in Shakopee, but this channel has been abandoned.

In 1978, the City of Savage petitioned the District to acquire and develop permanent sites for the disposal of dredged materials resulting from the 9-Foot channel maintenance The Managers accepted the petition and ordered preparation of an engineer's report. The engineer's report recommended acquisition and development of six permanent disposal sites. In 2007, the COE - St. Paul District published a Channel Maintenance Management Plan (CMMP), which reviewed the

feasibility of potential material placement sites along the Minnesota River, including the six sites originally investigated. The CMMP is available on the COE – St. Paul District website.

In 2007, the District acquired a site from Cargill on the Minnesota River's south bank at mile 14.2 for dredge material placement. This acquisition is documented in the COE CMMP. The site was used in 2008, 2009 and 2010 and is estimated to have capacity for 185,000 cubic yards or 7to 9 years of dredge material placement without removal. The District is investigating acquisition of an additional site from the U.S. Air Force (USAF), on the north side of the Minnesota River at R.M. 3.5. This site would provide material placement for the less frequently dredged reaches of the river between R.M. 1.0 and 2.0, near Pike Island, and R.M. 4.0 and 5.0.

Several private dredge material placement sites are also in use within the District. These sites are primarily used for placement of dredge material from barge slip maintenance and include the following sites on the south bank of the river:

- Cargill-Westfield (R.M. 14.8)
- Kraemer (R.M. 12.1)
- Waste Management (R.M. 12.4)

Both private pleasure craft and commercial traffic navigate the Minnesota River within the District. Commercial barge traffic dominates, traveling the entire 14.7 miles upstream from the river mouth to the head of the 9-Foot navigation channel. Generally, tows on the Minnesota River consist of one power unit and two to four barges.

The main commodity transported on the river is bulk grain or grain products. All commercial terminals in the District are in the City of Savage. Cargill handles grain products, corn products, and fertilizer. Bunge and CHS, Inc., both handle grain products. Other commercial terminals include U.S. Salt and Superior Minerals Company. U.S. Salt handles salt, lightweight aggregate, and cotton seed, and Superior Minerals Company handles aggregates. These shippers draw from an approximately 200,000 square-mile area, which includes eastern South Dakota, southeastern North Dakota, all of Minnesota, the western two-thirds of Wisconsin, and the northern two-thirds of Iowa.

According to the DOT Ports and Waterways Section, annual tonnages from the City of Savage commercial terminals decreased from 3,427,182 tons in 2004 to 1,705,650 in 2008. Annual tonnages vary due to seasonal flooding, freight rates, and foreign grain demands. DOT figures further show that the average barge movement via the Minnesota River since 1991 has been over four million tons per year. Ten years of that period had more than five million tons. As for the most recent six-year period, a drop-in barge movement is explained by several events: First, according to DOT, the Minnesota ethanol industry removes roughly 100 million bushels of corn from the river market each year; that's the equivalent of 1,900 barges annually. As a sidenote, dried grains, a byproduct of corn ethanol, has a potential to move via barge when production stabilizes to justify the capital

investment required to handle such movements. Second, periodically, abnormally high ocean shipping rates from New Orleans to Japan, for instance, diverted additional grain from Savage to west coast ports via rail. Without high ocean rates, these grains would have moved from Savage via the river. As a matter of reference, the spread of ocean rates to Japan from Gulf ports versus from Pacific Northwest states increased by a factor of 8 times against the Gulf, meaning grain destined to Japan via the Gulf was simply too expensive. However, the Panama Canal expansion scheduled for completion in 2014 will enable the larger west coast vessels to serve Gulf ports, thus removing the current Gulf penalty. Figure 1-24 and Figure 1-25 show public and private dredge material disposal sites within the District.

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

Figure 1-24
Commercial Navigation Map - West
Lower Minnesota River Watershed District
Watershed Management Plan

0 0.5 1 Miles

Legend

- LMRWD Boundary
- River or Stream
- Lake
- City/Township
- County
- River Mile

Dredged Material Disposal Sites

- District Owned
- Potential District Owned Site
- Privately Owned

Dredged Reaches

- Frequently Dredged
- Occasionally Dredged

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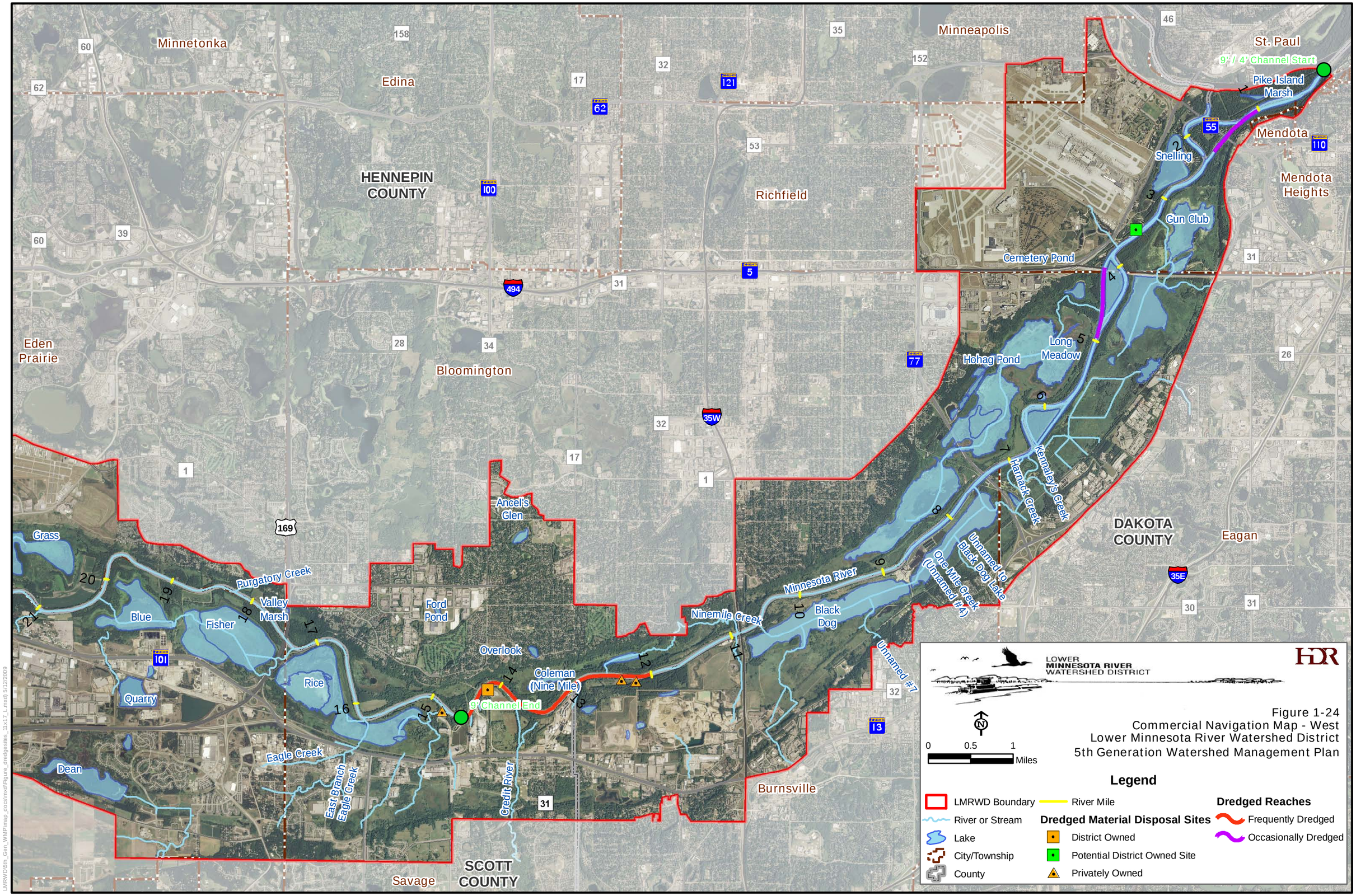

Figure 1-24
Commercial Navigation Map - West
Lower Minnesota River Watershed District
5th Generation Watershed Management Plan

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1.13 FISH AND WILDLIFE HABITAT

The District supports critical needs of many wildlife species. Bird watching clubs have recorded hundreds of bird species in the area during migration. There are also several mammal, amphibian, and reptile species. The District's lakes, streams, and rivers are inhabited by carp, buffalo head, bullhead, shad drum, catfish, dogfish, gar, shiner, northern pike, walleye, trout, and sunfish. Many of these fish are available in abundance and provide excellent fishing opportunities. However, before eating fish taken from the Lower Minnesota River, health warnings from the DOH should be consulted.

Appendix E of the Minnesota Valley National Wildlife Refuge Comprehensive Conservation Plan (CCP), completed in 2004, contains a detailed wildlife inventory. In addition, Appendix A of the CCP contains an environmental assessment that evaluates the effect of various management alternatives on fish and wildlife habitat in the Refuge. This assessment applies to all fish and wildlife located in the District. For additional information, the Conservation Plan is located on the USFWS Website.

1.14 UNIQUE FEATURES AND SCENIC AREAS

The District is home to several areas with moderate to high biodiversity significance. The combination of the Minnesota River, the floodplain, and the river bluffs result in a high occurrence of rare and endangered species, unique features, and scenic areas. Unique features include the fens and trout streams discussed in later sections. Scenic areas include the parks, trails, and refuges previously described.

In addition to unique water resources and scenic areas, there are several rare species and natural communities within the District that are important areas for conservation. Numerous native plant communities found in the District are shown on Figure 1-22 and Figure 1-23. The plant communities, delineated by the Minnesota County Biological Survey, interact with each other and their surrounding environment. These interactions have not been altered by human activity, or by introduction of non-native plant or animal species.

According to the Natural Heritage Information System, maintained by the DNR Natural Heritage and Non-Game Research Program, there are hundreds of known occurrences of rare species and natural communities within the District. The Higgins eye pearly mussel is currently listed as a federally endangered species. The peregrine falcon, previously listed as a federally endangered species and since removed from the list, is still considered a threatened species in Minnesota. Endangered state species located in the District include the western prairie fringed orchid, Henslow's sparrow, the cricket frog, and eared false foxglove.

Rare natural communities include mesic prairies and Boiling Springs in Savage. Mesic prairies are found on sites that have relatively good drainage and contain some of the most diverse prairie

wildflower displays. Mesic prairies are the most threatened prairie because most were converted for agricultural use. Eagle Creek is the home of Boiling Springs, a location where the water bubbles up, creating the illusion that it is boiling. It is considered a sacred site by the local Native American community.

1.15 POLLUTANT SOURCES

1.15.1 Feedlots

Currently, there are no registered feedlots within the District. However, county groundwater plans propose to inventory currently unregistered feedlots.

1.15.2 Abandoned Wells

Abandoned and sealed wells, inactive wells, and wells of unknown status within the District, are identified on Figure 1-26 and Figure 1-27.

1.15.3 Storage Tanks

The MPCA maintains a database of all leak sites, including those from above- and below-ground storage tanks and leaking underground storage tanks (LUST). Many of these leak sites have been closed by the MPCA. The intent of the database is to protect human health and the environment by evaluating, minimizing, or correcting petroleum contamination impacts to soil and water caused by leaking storage tank systems.

Figure1-26 and Figure 1-27 identify LUST site locations.

1.15.4 Industrial Discharges

MCES is delegated as the Control Authority to regulate the use of public sanitary sewer systems within the MCES seven county service area. Companies are issued an Industrial Discharge Permit if it is determined they will have a significant impact on the public sewer system.

Figure 1-26 and Figure 1-27 identify the locations of sites that have been issued an Industrial Discharge Permit by the Industrial Waste and Pollution Prevention Section of MCES.

1.15.5 Wastewater Treatment Plants

Two wastewater treatment plants are located within the District: Seneca in the City of Eagan, and Blue Lake in the City of Shakopee.

Figure 1-26 and Figure 1-27 identify their locations. Discharge from these treatment plants, along with the associated sanitary sewer lines, urban storm water discharges, and various utility lines, present potential environmental hazards within the District.

Inactive or Unknown Status Well Location
Sealed Well Location
MCES Permit
MPCA LUST Site
Wastewater Treatment Plant
State Closed Landfill Program (CLP)
State Superfund Site (PLP)
RCRA Treatment, Storage and Disposal (TSD) Site
RCRA Investigation/Cleanup Site
Permitted Solid Waste
Unpermitted Dump Sites
Voluntary Investigation & Cleanup Site (VIC)

CARVER COUNTY
HENNEPIN COUNTY
SCOTT COUNTY
Chanhassen
Eden Prairie
Bloomington
Chaska
Chaska Township
Carver
Jackson Township
Louisville Township
Shakopee
Prior Lake
Savage
Gifford
Chaska
Courthouse
Fireman's Lake
Brickyard
Clayhole
Strunks
Shakopee Memorial Pond
Assumption Creek
Bluff Creek
Rice
Riley Creek
Grass
Purgatory Creek
Valley Marsh
Blue
Fisher
Quarry
Dean
Eagle Creek
East Branch Eagle Creek
Credit River
Ford Pond
Overlook
Ancel's Glen
Minnesota River
Chaska Creek
17
212
15
1
4
169
494
28
34
101
14
45

LOWER MINNESOTA RIVER WATERSHED DISTRICT
HDR

0 0.5 1 Miles

Figure 1-26
Potential Pollutant Sources Map - West
Lower Minnesota River Watershed District
Watershed Management Plan

Legend
LMRWD Boundary
River or Stream
Lake
County
City/Township

(\\nspe-gis-file\gis\proj\LMRWD\Sh_Gen_WMP\map_docs\mxd\Figure1-0_pollutantsources_11x17_L.mxd) 2/20/2009

- Inactive or Unknown Status Well Location
- Sealed Well Location
- MCES Permit
- MPCA LUST Site
- Wastewater Treatment Plant
- State Closed Landfill Program (CLP)
- State Superfund Site (PLP)
- RCRA Treatment, Storage and Disposal (TSD) Site
- RCRA Investigation/Cleanup Site
- Permitted Solid Waste
- Unpermitted Dump Sites
- Voluntary Investigation & Cleanup Site (VIC)

Minneapolis
St. Paul
Richfield
Mendota
Mendota Heights
Eagan
Eden Prairie
Bloomington
Burnsville
Savage
HENNEPIN COUNTY
DAKOTA COUNTY
SCOTT COUNTY
Pike Island Marsh
Snelling
Gun Club
Cemetery Pond
Long Meadow
Hohag Pond
Kennaley's Creek
Harnack Creek
Unnamed to Black Dog Lake
One Mile Creek (Unnamed #4)
Minnesota River
Ninemile Creek
Black Dog
Unnamed #7
Ancel's Glen
Ford Pond
Overlook
Coleman (Nine Mile)
Grass
Purgatory Creek
Valley Marsh
Blue
Fisher
Rice
Quarry
Eagle Creek
East Branch Eagle Creek
Credit River
Dean

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-27
Potential Pollutant Sources Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

Legend
- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

(\\mspe-gis-file\gisproj\LMRWD\5th_Gen_WMPmap_docs\mxd\Figure1-0_pollutantsources_11x17_L.mxd) 2/20/2009

1.15.6 Landfills and Solid Waste

The MPCA Closed Landfill Program (CLP) is a voluntary program established by the legislature in 1994 to properly close, monitor, and maintain Minnesota's closed municipal sanitary landfills. Three closed sanitary landfills in the CLP program are located within the District in Hennepin (Flying Cloud Sanitary Landfill), Scott (Louisville Landfill), and Dakota (Freeway Sanitary Landfill) counties. Figure 1-26 and Figure 1-27 show their locations.

Figure 1-26 and Figure 1-27 also show the locations of permitted solid waste sites within the District. These facilities manage household and commercial garbage and include landfills, transfer stations, demolition landfills, composting facilities, and solid-waste incinerators.

In the 1980s, MPCA created a list of unpermitted dumpsites that included abandoned dumps, demolition sites, tree disposal sites, industrial dumps, and other dumps. Most of these sites existed prior to the creation of the MPCA in 1967, and detailed information about them is not generally available. If, when these sites are investigated, they are found to present a risk to human health or the environment, they are moved into the appropriate cleanup program.

Figure 1-26 and Figure 1-27 also show locations of unpermitted dump sites within the District.

1.15.7 Hazardous Waste

MPCA, in conjunction with the Environmental Protection Agency (EPA), maintains information on sites with past, present, or potential for future hazardous waste contamination. These sites are regulated and administered under the various programs described below.

State of Minnesota superfund sites, also referred to as Permanent List of Priorities (PLP) sites, are those with known or suspected environmental contamination that has the potential to threaten public health, welfare, or the environment. These sites are investigated and cleaned up under the Minnesota Superfund Program. The PLP sites include those addressed by MPCA, as well as sites with agricultural chemical contamination, which are addressed by the Minnesota Department of Agriculture. PCI, Inc., located in Shakopee, is the only PLP site located within the District. PCI, Inc., shown on Figure 1-26 and Figure 1-27, was an ash disposal site.

Resource Conservation and Recovery Act (RCRA) Treatment, Storage, and Disposal (TSD) facilities are those permitted to treat, store, and dispose of hazardous wastes. These facilities typically collect hazardous wastes from other businesses and treat or dispose of them properly. Safety-Kleen Eagan, located in Eagan, is the only RCRA TSD site within the District (Figure 1-27) RCRA Investigation/Cleanup sites are those where RCRA hazardous waste generators had an actual or potential release requiring investigation and/or cleanup. These generators fall into the very small, small, and large quantity generator classes. There is one RCRA Investigation/Cleanup site located

within the District, General Dynamics, at 3101 East 80th Street in Bloomington (Figure 1-27).

The Voluntary Investigation and Cleanup (VIC) Program allows buyers, sellers, developers, or local governments to voluntarily investigate and, if necessary, clean up contaminated land to facilitate its sale, financing, or redevelopment. Those who complete investigation and/or cleanup activities under MPCA oversight can receive liability assurances that protect them from future superfund liability. Locations of sites in the VIC Program within the District are shown on Figure 1-26 and Figure 1-27.

1.15.8 Pesticide and Fertilizer

The Minnesota Department of Agriculture (MDA) is statutorily responsible for the management of pesticides and fertilizer other than manure to protect water resources. The MDA implements a wide range of protection and regulatory activities to ensure that pesticides and fertilizer are stored, handled, applied, and disposed of in a manner that will protect human health, water resources and the environment. The MDA works with the University of Minnesota to develop pesticide and fertilizer Best Management Practices (BMPs) to protect water resources, and with farmers, crop advisors, farm organizations, other agencies, and many other groups to educate, promote, demonstrate, and evaluate BMPs, to test and license applicators, and to enforce rules and statues. The MDA has broad regulatory authority for pesticides and has authority to regulate the use of fertilizer to protect groundwater.

2 ISSUES AND PROBLEMS ASSESSMENTS

2.1 INTRODUCTION

The District completed a critical review of the 1999 Implementation Plan with the Technical Advisory Committee (TAC), the Citizen Advisory Committee (CAC), the Managers, and staff. In this review, the District identified barriers blocking its ability to manage and protect the Minnesota River, lakes, streams, groundwater, and unique natural resources. The following barriers make it difficult for the District to effectively manage and protect resources:

- Unclear role of the District
- Incomplete understanding of the function and value of some of the resources within the District
- Competition for limited fiscal resources
- Inability to control activities that originate outside District boundaries but affect District resources
- Development and population pressures
- Partial understanding of constantly changing rules and requirements of other regulatory entities (cities, federal and state agencies, and non-governmental organizations)
- Unfavorable perception of the Minnesota River
- Limited state control of nonpoint source pollution
- Increasing demand for recreational opportunities and open space
- Increased runoff volumes and peak discharges
- Limited public participation

These barriers exacerbate District water quality and resource protection issues. The following sections present the issues which directly or indirectly result from these barriers, assess existing programs and their adequacy to address the highlighted issues, and identify management gaps.

Management policies, goals, and strategies addressing the issues and gaps presented in this Section are presented later in this Plan.

2.2 ISSUES SUMMARY

The following issues were identified through the planning process:

1. Unclear Role of the District
2. Outside Influences
3. Water Quality
4. Flooding and Floodplain Management
5. Erosion and Sediment Control
6. Groundwater
7. Commercial and Recreational Navigation
8. Public Education and Outreach

9. Potential Problems

2.2.1 Issue 1 – Unclear Role of the District

The District's role changed notably during the 39-year period from its formation in 1960 through 1999. The District's focus transitioned from its founding goal of assisting the COE in improving navigation of the Minnesota River channel, to one that includes the protection, preservation, surface maintenance, groundwater, and unique natural resources. This change reflects a shift in the value of resource protection and the expectations of watershed districts. With the introduction of new technology and improved methods to manage and protect resources (such as adaptive management, sustainability approach, etc.), the District is expected to change again. The District's challenge is defining a clear role that will enable them to easily adjust to changes.

This shift was identified by the TAC during the 2011 planning process, and it was determined that the managers needed to focus their attention on re-affirming the District's role. This issue involves a disconnection between how the managers see their role (local sponsor to the COE) versus the stakeholders' expectations of being the organization responsible for protecting, preserving, and restoring water resources within the District, as required per the mission and purpose of its formation. To successfully implement the goals and strategies of this Plan, it is important for all parties to be on the same page. Therefore, Goal 1 – Organizations Management, described below, was included in this Plan.

2.2.2 Issue 2 – Outside Influences

The District encompasses the bottom 80 square miles of the 16,900-square-mile Minnesota River Basin (Figure 2-1). Major land use in the basin is agricultural in the upstream reaches and urban in the lower reaches. The District is the last subwatershed before the Minnesota River discharges into the Mississippi River. The District's geographical position makes it susceptible to outside influences. The reach of the Minnesota River and a few other tributaries (Bluff Creek, Riley Creek, Credit River, and others) would continue to be impaired even if the District's discharge of point and nonpoint sources were reduced to zero. This perplexing issue reflects the complexities of protecting resources that are heavily influenced by factors outside the District's control.

Figure 2-1: Minnesota River Basin Map

2.2.3 Issue 3 – Water Quality

2.2.3.1 Nonpoint sources

Nonpoint source pollution causes major violations to water quality standards for the lower Minnesota River. This is pollution that cannot be traced to a single source, as with point source pollution. Instead, pollutants are carried from the land and the atmosphere through runoff water such as stormwater or snowmelt, in seepage through the soil (augmented by tiling), and through atmospheric deposition. Nonpoint source pollutants include:

- Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas
- Oil, grease, and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, crop and forest lands, and eroding streambanks
- Salt leached from the soil by irrigation practices, and from road and parking lot application
- Bacteria and nutrients from waterfowl, livestock, pet wastes, and faulty septic systems
- Hydrologic modifications [1]
- Atmospheric deposition

[1] Changes in the volume, speed, or timing of high and low flows in a water body, generally a stream or river. A major cause in the Minnesota River watershed is the intense agricultural land use in the watershed and development, which changes vegetation and covers land with roofs, sidewalks, streets, and parking lots. Rainwater, unable to soak into soil, rushes with flash-flood-like intensity to streams. (http://bluegreenbldg.org/technical-terms/)

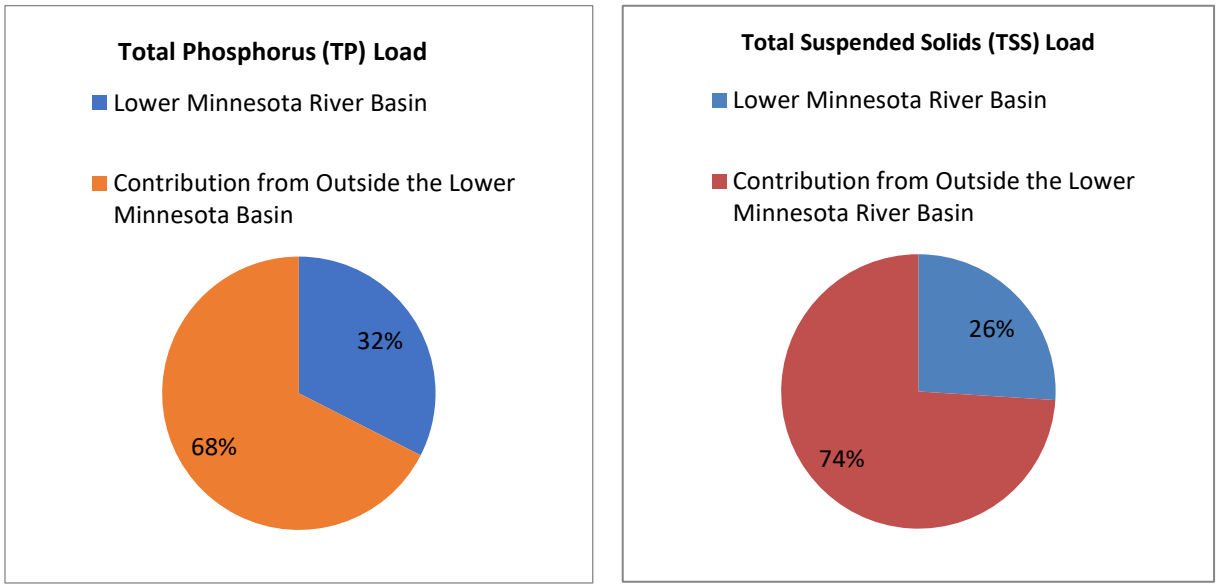
Both natural and human-caused sources of nonpoint pollution are closely related to land use and associated land management practices. As was previously mentioned, the land use in the upper watershed of the Minnesota River Basin is predominately agricultural, with the lower 80 or more square miles being largely urban. These lands outside the District boundaries contribute to the majority of total suspended solids (TSS) and total phosphorus (TP) to the District's water resources, as illustrated in Figure 2-2 and Figure 2-3 (University of Minnesota Extension 2002). The quantities of TSS and TP that end up in the lower Minnesota River cause adverse effects on the river's quality, health, and surrounding resources, such as floodplain lakes and streams.

In urban sectors, vegetated pervious surfaces are being converted to impervious surfaces such as roads, roofs, and parking lots, thereby increasing runoff rates. Potential problems documented in the 1999 Plan from stormwater runoff impacts on water quality, and on fish and wildlife resources include:

- Toxic levels of pollutants resulting in death or impairment of aquatic life
- Reductions in water clarity and quality (including warm water temperatures) resulting in a shift to more pollution tolerant aquatic species
- Wildlife injury or death resulting from ingestion of, or entanglement with, trash and debris
- Negative impacts on wildlife habitat from nutrients, oxygen-poor water, and sediment

Figure 2-2: Comparison of Loads from the Minnesota River Basin.

Figure 2-3: Load Comparison from the Lower Minnesota River Basin and External Contributors



As discussed in amended 2018 Nile Mile Creek watershed management plan, an urban tributary to the lower Minnesota River, "chlorides are another pollutant of particular concern for waterbodies. The primary source of chlorides in stormwater runoff is road salt, applied to roadways, parking lots and sidewalks throughout the winter months to prevent or remove ice build-up. The salt, often in the form of sodium chloride, dissolves in melted snow and is conveyed to downstream waterbodies along with snowmelt runoff. Chlorides are especially difficult to remove once dissolved in water and remain persistent in the environment. High chloride concentrations can be harmful to aquatic life in downstream waterbodies, affecting the osmosis process."

It is difficult to identify and quantify sources of nonpoint pollution affecting water resources while considering the diverse nature of the problem. The District faces challenges such as raising the awareness of land management practices outside their jurisdiction and regulating development and re-development activities within the District to reduce nonpoint source pollution.

2.2.3.2 Point Source Pollution

Point source pollutants, unlike nonpoint sources, discharge to a receiving surface water at a specific point from an identifiable source. Within the District, these sources include, but are not limited to, the Blue Lake and Seneca wastewater treatment plants, commercial dischargers like Gedney Pickle Factory and Rahr Malting, and other sites as identified in Section 1. Within the Minnesota River Basin, outside of the District's authority, there are also point discharges that affect water quality. These include commercial and municipal facilities and discharge from subsurface sewage treatment systems (SSTS) formally known as individual sewage treatment systems (ISTS).

Point source pollution is often known and regulated by MPCA through the National Pollutant Discharge Elimination Systems (NPDES) program. However, smaller point source discharges such as those from SSTS can go unregulated. When left untreated or partially treated, point source pollution may contain small amounts of radiation or toxics that increase water temperature. As a result, aquatic wildlife and habitat are affected, as well as potentially lowering the amount of dissolved oxygen in the receiving water. These pollutants can be hazardous to both humans and other forms of life.

According to the District Dissolved Oxygen Total Maximum Daily Load (TMDL) (Gunderson & Klag 2004), prepared by MPCA in 2004, there are an estimated 155,000 septic systems located wholly or partly in the Minnesota River Basin. Of those, nearly 20,000 are categorized as having the potential to cause imminent threat to public health and safety (ITPHS). SSTS that could cause ITPHS represent improperly treated discharges from noncompliant SSTS flowing to surface water.

2.2.3.3 Specific Water Quality Problems

This section discusses specific water quality problems and issues to be addressed in the District, grouped according to the type of water resource. Water resources discussed include: the Minnesota River, trout lakes/streams, tributary streams, lakes, fens, and wetlands.

2.2.3.3.1 Minnesota River

As documented, the Minnesota River water quality is impaired for aquatic life, recreation, and consumption because of intolerable levels of fecal coliform, mercury, dissolved oxygen, and turbidity. The 1999 Plan noted that the historically severe water quality problems in the Minnesota River are due to the fine-grained soils in the watershed and the large amount of agricultural activity in the basin. It also noted that urban development and some poor wastewater treatment in the MSP metropolitan area contribute to the Minnesota River's existing water quality. However, missing in that assessment was the adverse effect failing SSTS in rural parts of the basin, which exacerbate the agricultural impacts on the river. Flooding also impacts water quality on the Minnesota River, as it erodes the soil surface and transports impaired water to floodplain lakes and streams.

Backwater effects from Lock and Dam No. 2 on the Mississippi River at Hastings, along with stream channelization work, have significantly altered the natural hydraulic characteristics of the lower Minnesota River (MPCA 1985). The resultant slower stream velocities and greater channel depths reduce atmospheric re-aeration potential, which reduces the river's capacity to assimilate pollutant loadings. The slower stream velocities also promote suspended matter settling (nonpoint source pollutants) from upstream. The decomposition of the settled organic matter creates an additional demand on the available dissolved oxygen in the river. In the relatively narrow channel of the lower Minnesota River, the turbulence and wake created by each towboat passage may also add to water quality problems by re-suspending bottom sediments and eroding streambanks.

The Minnesota River's poor water quality is one of the most significant and difficult water quality issues facing Minnesota.

2.2.3.3.2 Trout Lakes and Streams

The District contains several trout streams and lakes. The DNR designated these trout habitats because they have a stable supply of cold water, high oxygen concentrations, shade, and adequate nutrient inputs. These lakes and streams present both opportunities and problems for the District. The primary opportunity is recreational; trout fishing is a favorite pastime of many MSP metropolitan area residents. These streams and lakes present alternatives to outstate destinations.

Trout habitat is sensitive to development pressures associated with encroachment, increased stormwater rate, runoff volume, and nonpoint pollution transport. These affect the temperature and oxygen concentrations in trout habitat. Temperatures higher than 16°C-21°C (60°F-70°F) threaten trout health. According to Kohler and Hubert, most coldwater fish do not tolerate summer temperatures above 22°C (72°F) and fish growth declines rapidly at temperatures above 29°C (68°F) (Kohler & Hubert 1993). Trout need higher oxygen levels than other types of fish (DNR-Trout 1996). Kohler and Hubert state that oxygen concentrations should be at least 8 mg/l for rearing and 10 mg/l for egg and larval development (Kohler & Hubert 1993).

There is increasing concern that some of these trout lakes and streams are not viable to support trout in the near future. An example is trout stream #4 in Burnsville. Sustaining its viability is a concern given the proximity of this resource to an urban area, and the fact that it does not currently contain any trout species.

2.2.3.3.3 Fens

Some of the wetlands within the District are calcareous fens, which require specific hydrologic and chemical conditions to exist. Many factors threaten the health of calcareous fens, including changed groundwater conditions, stormwater runoff, sedimentation, and invasive plants.

These fens are highly dependent on the quantity, quality, and management of the groundwater that feeds them and on control of invasive species. The primary hydrology of fens is reliant on groundwater. However, an understanding of the contributing subsurface recharges areas for each fen is unknown. This makes it a challenge to be proactive in regulating appropriation and water quality controls. All of these details present a bigger issue of the deficiencies in established management requirements for these unique areas.

2.2.3.3.4 Tributary Streams

Many tributary streams enter the District from outside its boundaries. Urbanization and agricultural practices have created significant changes in tributary watersheds, particularly the streams that have large watershed areas outside the District. As a result, water quality problems such as erosion and sedimentation are transported into the District and to the Minnesota River. This points back to Issue 2 - Outside Influences, which was previously discussed.

2.2.3.3.5 Lakes

Dean and Snelling lakes are impaired for aquatic recreation (nutrients) and aquatic consumption (mercury), respectively. In addition, the majority of lakes within the District are floodplain or backwater lakes. Floodwaters from the Minnesota River contribute a large portion of the nutrients and sediments that enter these lakes. After floodwaters subside, the lakes are again separated from the river, trapping the high sediment and nutrient loads.

The TAC shared concerns about properly managing these floodplain lakes due to misunderstandings about their function, value, and lack of water quality data. Due to prolonged sedimentation in Coleman Lake from floodwater and other sources, its perceived function and value has changed and supports an endangered frog species.

2.2.3.3.6 Wetlands

Since many wetlands in the District are in the Minnesota River floodplain, they face the same water quality threats as the floodplain lakes and Minnesota River tributary streams. Because the wetlands act as natural holding ponds during periods of flooding, pollutants from the Minnesota River are deposited in them. In addition, these wetlands are being further deteriorated because of surrounding development pressures.

2.2.4 Issue 4 – Flooding and Floodplain Management

2.2.4.1 Flooding

Flooding occurs when runoff from the landscape exceeds the capacity of natural and manmade storage systems. Excess runoff causes two scales of flooding; localized flooding in the upland stream reaches and municipal drainage systems within the District, and regional flooding affecting large segments of the Minnesota River.

Several factors leading to increased local and regional flooding can be discussed in terms of when they occur within the hydrologic cycle. The first part of the cycle is precipitation, which is a natural phenomenon. Large precipitation amounts and long duration lead to flooding, which are beyond the District's control. The second part of the cycle, runoff from the landscape, is impacted by land use changes due to human activity. An example is the conversion in the last 150 years of prairie land in the upper areas of the Minnesota River basin to agricultural land, and the later conversion from agricultural land to urban and suburban areas in the lower reaches of the basin. The third part of the cycle, storage of runoff on the landscape, is also impacted by human activity and land use change. Many wetlands and other natural depressions in the upland portions of the basin have been filled and drained with subsurface tiling to accommodate agriculture.

The two scales of flooding are not mutually exclusive and can occur simultaneously. For example, high water levels in the Minnesota River can create a backwater condition, whereby flow in a tributary stream is backed up, causing flooding in upstream reaches.

As captured in the District's 2018 Statement of Need and Reasonableness Report for Standard and present here: *Heavy rains over the past decade, including those in June 2014, have led to flooding significant erosion and steep slope failures in other parts of Minnesota as well. Analysis of over 100 years of hourly and daily precipitation data from across Minnesota shows that total precipitation in the state has increased. More significantly, the research shows that extreme rainfall events have gotten larger and become more frequent in the last century, especially over the last three to five decades (Pryor, et al. 2014). In Minnesota, 37 percent more rain falls in large storms (more than 2.5 inches of precipitation) than it did 50 years ago. This increase in the frequency and intensity of extreme precipitation results in more flooding.*

Localized and Minnesota River flooding created infrastructure damage within the District. The most common types of damage are trail washouts, trail crossing damage, and sanitary sewer failure. This damage causes budgetary strain for the owners of this infrastructure. The USFWS, DOT, cities, and counties are among several owners of infrastructure within the District. In addition to repair costs, infrastructure damage can pose health and safety risks to District residents due to road closures.

Another issue caused mainly by Minnesota River and localized flooding is making recreational facilities inaccessible. Flooding can inundate boat landings, parks, and trails, causing unsafe fishing, boating conditions, and damaged trails.

Specific areas within the District subject to flooding and its associated impacts are identified below in Table 2-1(mainly caused by either Minnesota River flooding, local flooding, or both).

Table 2-1: Lower Minnesota River Watershed District Flooding Problem Areas

Area	Main Cause of Flooding
Downtown Carver	Local flooding (Spring Creek), Minnesota River
TH 41 Between Chaska Levee and Gifford's Lake	Minnesota River
Old 212 near Moon Valley Gravel Pit	Minnesota River
Savage Business District near Credit River/Fire Station	Local flooding (Credit River)
Black Dog Road in Burnsville	Minnesota River
Depressional flooding in Mendota	Local flooding

2.2.4.2 Floodplain Management

The District, in partnership with USGS and the COE, published the Lower Minnesota Floodplain Study in 2004. The information contained in this report may be used as "Best Available Data" until FEMA produces new FIS maps of the affected communities. An issue occurred because some individuals seeking floodplain management information within the District consulted the Flood Insurance Rate Maps (FIRM) for communities that have not updated their FIS. Therefore, they are not using the "Best Available Data" despite the official FEMA publication usage. The District publishes the 2004 Study on its website and will continue to provide the "Best Available Data" to cities and counties when projects require this information.

Dakota County has updated FIRM maps, and an FIS report was finalized on June 18, 2010. This is the "Best Available Data" for the mapped flood hazard areas within Burnsville.

2.2.5 Issue 5 – Erosion and Sediment Control

Erosion is the movement of solids, mainly sediment and soil, in the natural environment. Within the District, erosion typically occurs due to water transport and has direct effects on downstream water quality. Erosion is a natural process, but within the District, it has increased due to human land use practices. Similarly, water quality within the District has been greatly impacted by human land use practices within the Minnesota River basin upstream of District boundaries. Examples of land uses which have caused both erosion and degradation of water quality within the District include deforestation, unmanaged construction activity, road-building, and agricultural practices. Land that is used for agriculture experiences a significantly greater rate of erosion than land under natural vegetation. This is important, because a vast majority of the Minnesota River basin upstream of the District is used for agriculture. Agricultural practices upstream also include subsurface drainage which can increase runoff rates and volume leading to bank erosion in the District.

Issues related to erosion and sediment control fall into four categories based on the location and type of erosion: 1) construction site erosion, 2) bluff erosion, 3) streambank erosion, and 4) mainstem erosion. The issues related to each type of erosion are described in further detail below.

2.2.5.1 Construction Site Erosion

Construction erosion occurs when vegetated, stabilized ground surface is disturbed for earth grading and the construction of roads, buildings, parking lots, underground utilities, and other man-made structures. Several best management practices have been developed that can greatly minimize or even negate construction site erosion. However, severe construction site erosion occurs within the District when these practices are implemented improperly. Poor site management is the primary issue related to construction site erosion in the District.

2.2.5.2 Bluff Erosion

The District is home to several miles of bluffs that outline the Minnesota River valley. The main factors that have led to bluff erosion include extreme slopes coupled with human land use above the bluff. Some bluff erosion is natural, but issues identified by the District are driven by human land use practices near the bluffs. These issues are a) insufficient building setbacks above the bluff line, b) insufficient vegetation management, c) the lack of buffers above the bluff line, and d) concentrated channel flow over the bluffs due to drainage practices implemented by homeowners residing on the bluffs.

In 2006 and 2007, the District hired the Minnesota Civilian Conservation Corps (MCCC) to inventory gullies within the District. The inventory identified gullies with current and potential erosion and pollution issues. Cities then reviewed the information and chose the top 3-4 public sites that needed immediate attention. The Cities completed feasibility analyses. As a result, four cooperative projects with the cities of Eden Prairie and Bloomington have been completed: 1) Bloomington Parkers Picnic Area, the District contributed $22,265 for the restoration of a ravine including fill, grading, plantings and erosion control; 2) Bloomington Minnesota River Valley Washout, the District contributed $98,214 for stream bank restoration on an unnamed stream near Lyndale Avenue and the Minnesota River; 3) Eden Prairie Area 4, the District contributed $40,412 for stream bank restoration on Purgatory Cree; 4) Eden Prairie Area 3 River Bank failure, the District contributed $78,704 for a feasibility study of this area of concern at R.M. 19.6 on the left descending bank.

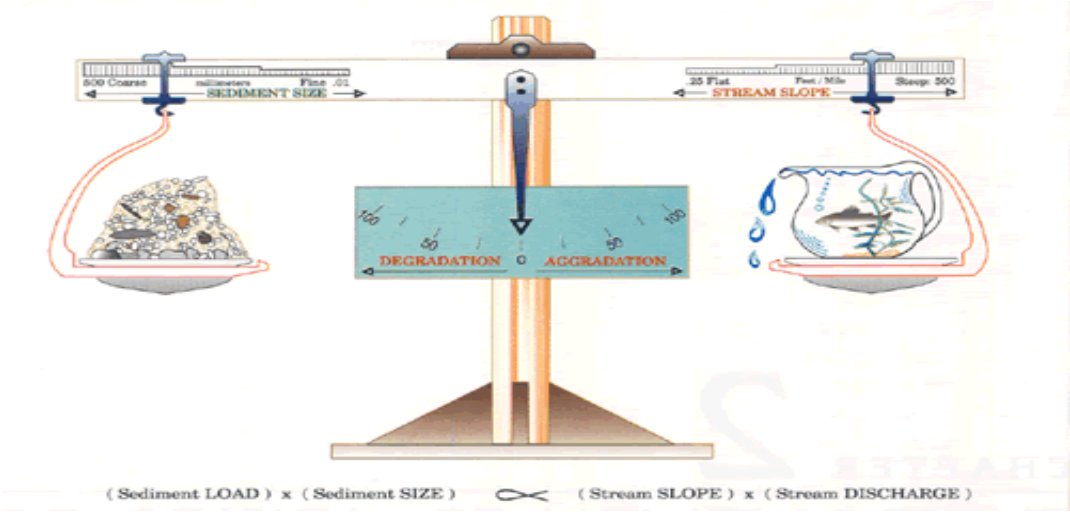
2.2.5.3 Streambank Erosion

Streambank erosion within the District is occurs naturally but accelerates by human activities. Streambank erosion on many Minnesota River tributary streams is driven by two main issues: a) the lack of stream buffers and, to a greater extent, b) significant changes in the hydrologic characteristics of the watershed, in and outside of the District.

Streambank erosion (due to a lack of stream buffers) occurs mainly within urban and suburban areas. Issues arise when property owners remove natural vegetation from the stream banks which accelerates bank erosion.

Changes in hydrologic characteristics of the watershed due to human land use practices is the primary issue surrounding streambank erosion within the District. Stream equilibrium is a method for classifying aggradation and degradation. Aggradation refers to excess sediment deposition, and degradation refers to excess sediment erosion. Lane's scale, shown on Figure 2-4, modified by Rosgen, equates the product of sediment load and sediment size with the product of stream slope and stream discharge (Rosgen). The dynamic equilibrium of natural erosion and deposition is upset when one of these variables shifts excessively causing instability.

Figure 2-4: Lane's Scale of Stream Equilibrium



Stream discharges within the District have increased in the past, tipping stream equilibrium towards degradation and erosion. Stream stability can be directly correlated to the frequency of bankfull flow. Streams are expected to remain stable when the bankfull channel contains the peak flow from a 1-year to 2-year storm event. Wolman and Leopold suggested that the channel-forming discharge has a recurrence interval of 1 to 2 years (Wloman & Leopold 1957). A stream that receives bankfull runoff more frequently is likely to respond with bank erosion and changes in channel alignment. These conditions lead to loss of streamside zones, potential damage to surrounding properties, and large quantities of sediment transported downstream (Bonestroo 2007).

Stormwater management within the District's urbanized areas focused on managing discharge rates higher than bankfull flows in streams tributary to the Minnesota River. High frequency, channel-forming flows have increased, causing stream instability and degradation. An issue is that stormwater management within the District has typically focused on controlling flooding and not on mitigating stream instability and degradation.

2.2.5.4 Mainstem Erosion

Mainstem erosion remains an issue in the District, due mainly to upstream agricultural practices. Subsurface drainage practices in the Minnesota River basin parallel the effect of urbanization on tributary streams within the District, as described above. Subsurface drainage practices increase the amount of water in the channel, forming higher frequency flows in the Minnesota River, which cause bank instability, degradation, and erosion. Runoff volume has increased significantly in the Minnesota River at Jordan since the 1980s (Graph 1-1). This has resulted in a doubling of the annual TSS from the 1980s to the present (Graph 1-2). The main problem the District faces in dealing with this issue is that it lacks the jurisdictional authority to promote management changes.

2.2.6 Issue 6 – Groundwater

Groundwater protection and management are important because residents and businesses within the area rely on groundwater for domestic, municipal, industrial, and agricultural water supplies. For the District, the most important aspect of groundwater protection and management is its effect on unique natural resources, especially fens and trout streams. The quality of these resources relies heavily on the quality and quantity of groundwater supplying them. Issues for the District regarding groundwater protection and management revolve around the lack of understanding of groundwater and surface water interactions and their effect on unique natural resources of the District.

2.2.7 Issue 7 – Commercial and Recreational Navigation

Commercial and recreational navigation issues within the District fall into four categories: a) co-existence of commercial and recreational navigation, b) dredge material management, c) financing, and d) the effect of river traffic on water quality. Issues within each category are described below.

2.2.7.1 Co-Existence of Commercial and Recreational Navigation

The Minnesota River within the District is an important water resource for both commerce and recreation. Commercial activities include barge towing and tour boats. Recreational activities include fishing and the use of pleasure boats, canoes, and personal water craft. Safety becomes an issue where commercial and recreational uses intersect.

Recreational users must be educated on safe river navigation practices, while commercial users must be aware of the different habits of recreational users. Recreational access becomes a complicating factor surrounding this issue, because the District believes there are not sufficient access points for recreation. However, greater accessibility could increase safety issues on the river. Therefore, navigational safety and increased recreational access must be considered as interrelated issues.

2.2.7.2 Dredge Material Management

Dredge material management, as it relates to commercial navigation, is the cornerstone of the District's history and continues to persist as a main responsibility today. Significant sediment quantities are deposited into floodplain lakes and the Minnesota River channel from upstream sources, which necessitates dredging for commercial navigation. Between 2000 and 2005, an average of 33 percent of the TSS load originating from sources upstream was stored in the Minnesota River channel and floodplain between Jordan and Ft. Snelling (MPCA 2009).

The COE published a Dredge Material Management Plan (DMMP) in March 2007 that addressed long-term management of dredging and placement site requirements on the Minnesota River. It included public and private dredging requirements. Existing plans or placement sites formed the baseline condition, but the DMMP looked at additional requirements to satisfy placement of all material projected for the planning period (2007-2034).

During the DMMP development, several problems occurred while evaluating sites below the I-35W Bridge. The DMMP's emphasis was changed to address only the area above the I-35W Bridge. The COE will continue to work on the area below the I-35W Bridge, and supplemental DMMP will be furnished when completed.

The DMMP developed and evaluated several combinations of alternatives. The alternatives were ranked in order of preference for implementation. They were ranked this way because the District is responsible for implementation, and this method would give it the most flexibility in negotiating agreements. The District is currently implementing the DMMP's recommended alternative for dredging above the I-35W Bridge.

If the recommended alternative is no longer possible in the future, implementation will proceed with the next preferred alternative identified in the DMMP's Summary of Alternative Comparisons. The District will be responsible for documenting why implementation is not possible with a reasonable effort to implement the first preferred alternative, prior to pursuing the second preferred alternative.

In addition to providing the District a clear direction regarding which placement sites to acquire and what is required to make sites usable, the DMMP outlines authorities and responsibilities for the agencies involved. The issues surrounding dredge material management are twofold: 1) dredge material site acquisition and 2) dredge material handling. Specific issues concerning dredge material site acquisition include the need to acquire a site for dredging activities, either between R.M. 1.0 and R.M. 2.0, near Pike Island, or between R.M. 4.0 and R.M. 5.0. Space constraints due to the abundance of protected federal and state land in the area complicate site acquisition. Further, there is limited information from the COE as to whether it is financially beneficial to acquire a new site, or to move material east to a COE-operated site in St. Paul. The answer is unclear because the material would be transported greater than four miles, which would incur a surcharge fee.

The District continues to work with the COE, MPCA, and private industry on an operation and maintenance plan for the R.M 14.2 Site. The District's goal for working with these agencies and private industry is to advertise beneficial use(s) of the dredge material. The District, if successful, could operate the site much like a public utility. While the District is not directly involved with dredging operations, which are the responsibility of the COE, it becomes their responsibility to assist the COE as the designated local sponsor for the 9-Foot Channel. Issues exist for the COE in the administration and funding of dredging operations at the Federal level.

After District possession, issues arose concerning dredge material handling. These issues include limited data about the material's beneficial uses, potential liability from pollutants in the material, and pressure to take private dredge material. In addition, the District does not have an operation and management plan for the site at R.M. 14.2.

2.2.7.3 Financing

Financing dredge material management from the 9-Foot channel equates to the acquisition, operation, and maintenance of public dredge material storage sites. As the local sponsor, the District is responsible for providing space for dredge material. This dredge material is taken from the 9-Foot channel by the COE within the District's boundaries.

The District established a 9-Foot channel fund to finance these activities. The fund was initially established by special assessment and supplemented by ad valorem tax in 1980. Recently, the fund has been depleted and the District needs to use other funding mechanisms to restore it. There is a difference of opinion among the Managers as to which mechanism should be used to restore the fund: by an ad valorem tax (assess all properties in the District) or special assessment (assess the benefitted users).

The Mississippi River Project, enacted by the U.S. Congress in the 19th century, provides funding to the COE for dredging operations on the Mississippi River. In 1958, the Project began providing the same funding to the COE for dredging on the Minnesota River. The funds have separate mechanisms, with the Mississippi River Project receiving significantly more funds. In the past, funds to dredge the Minnesota River were insufficient, but the COE was able to borrow from the Mississippi River Project fund. Due to a congressional change, the COE can no longer reallocate funds from the Mississippi River Project to the Minnesota River Project for channel maintenance. The District could have a problem in the future if the Minnesota River channel maintenance appropriations are reduced.

In November of 2010, the Board of Managers passed resolution number 001-2010; a resolution requesting that the United States Congress modify the existing authorizations for the Minnesota River 9-Foot Navigation Channel Project and the Mississippi River 9-Foot Navigation Channel Project to combine them into a single authorization. This resolution, although unsuccessful, asks the United States Congress for a more efficient and cost-effective use of channel maintenance funding for the Minnesota River and to formally recognize it is an integral part of the Upper Mississippi River Navigation System. After years of lobbying the Minnesota State legislature, the District appropriated $240,000 in 2017 and $240,000 in 2018 to implement dredge site restoration and maintenance.

2.2.7.4 The Effect of River Traffic on Water Quality

The District identified an issue regarding the effect of river traffic on water quality, fisheries, and wildlife. According to a 2001 COE study, hydraulic disturbances by recreational vessel traffic include vessel wakes, propeller jet turbulence, propeller entrainment of water, which causes sediment resuspension in shallow areas and bank erosion (Wilcox 2001). Ecological effects of these hydraulic disturbances on the Minnesota River include entrainment and impingement of aquatic plants and wildlife, fish stranding, and habitat disturbance.

2.2.8 Issue 8 – Public Education and Outreach

Limited public participation in District activities and lack of a structured education and outreach plan were identified as issues by the Managers and the TAC. One of the concerns was the need to enhance public participation and educate citizens on the District's goals and policies without duplicating efforts. This District continues to search for ways to attract and maintain members of the District's CAC.

2.2.9 Issue 9 – Potential Problems

Issues described thus far are immediate and ongoing. This section describes issues identified by the District that may happen in the future.

The first potential issue is related to dredge material management. The District could face a liability if any constituent found in the dredge material, while currently not defined as a hazardous material or pollutant. The "chain of custody" and "cradle to grave" concepts within federal hazardous waste and pollutant regulations could potentially make the District responsible for future remediation at locations where dredge materials were eventually used.

The second potential issue relates directly to the 9-Foot channel funding discussion. The District may be unable to support navigation if it is not clear who will pay for commercial navigation maintenance.

A third potential issue is a general concern about future, unfunded federal mandates for entities outside the District, and how the District would help finance mandate implementation. The fourth potential issue is how the District will address upcoming TMDL implementation plans. How will the District assist other entities in achieving the goals set forth in implementation plans, and will the District be responsible for any of these?

2.3 EXISTING REGULATORY CONTROLS

This section describes the controls in place that regulate aspects of the issues previously discussed.

2.3.1 Water Quality

Water quality impacts are regulated at the federal, state, and local levels within the District. The majority of these controls are driven by the Clean Water Act, the primary federal law governing water pollution. In addition, state and local governments have independently implemented controls aimed at reducing water quality impacts. Regulatory controls concerning water quality in the District are described below.

2.3.1.1 National Pollutant Discharge Elimination System (NPDES)

The NPDES is a federal program established under the Clean Water Act (CWA), aimed at protecting the quality of nation's waterways. The NPDES is administered by MPCA and delegated by the U.S. Environmental Protection Agency (EPA). The NPDES regulates three main areas: 1) point source pollution, 2) nonpoint source pollution (construction and industrial activities), and 3) municipal separate storm sewer systems (MS4).

2.3.1.1.1 Point Source Pollution

Facilities that discharge wastewater to a surface or groundwater of the state are regulated under the NPDES/State Disposal System (SDS) Permit. This permit establishes the terms and conditions that must be met for point source discharges. The permit is jointly issued under two programs: NPDES and SDS. The SDS is a state program established under M.S. 115. In Minnesota, when both permits are required, they are combined into one NPDES/SDS Permit administered by the MPCA.

2.3.1.1.2 Construction Activities (Nonpoint Source Pollution)

Activities related to construction that do not discharge directly to surface waters of the state are considered nonpoint source discharges of pollutants. The MPCA regulates construction activities under an NPDES/SDS general permit for sites that disturb:

- One acre or more of soil
- Less than one acre of soil that is part of a "larger common plan of development for sale" and greater than one acre
- Less than one acre of soil, but MPCA determines that the activity poses a risk to water resources

Regulated projects under the NPDES construction stormwater permit are required to develop a stormwater pollution prevention plan (SWPPP). The SWPPP must 1) identify a knowledgeable person to oversee the project, 2) incorporate design and activity requirements, 3) contain discussion of temporary and permanent erosion and sediment control best management practices (BMPs), 4) include a site map, 5) identify areas not to be disturbed, where construction will be phased to minimize duration of exposed areas, and where surface waters and existing wetlands will receive stormwater runoff, and 6) include information on final stabilization methods.

Most construction activities are regulated under MPCA's general NPDES stormwater permit for construction activity, but some construction sites are regulated under individual permits.

2.3.1.1.3 Municipal Separate Storm Sewer Systems (MS4)

The stormwater program for MS4s is designed to reduce sediment and pollution that enters surface and groundwater from storm sewer systems to the maximum extent practicable. Stormwater discharges associated with MS4s are regulated through the use of NPDES permits. An MS4 is a conveyance (or system of conveyances) owned or operated by a city, township, or county and used for collecting or conveying stormwater.

MS4s are required to develop and implement a stormwater pollution prevention program to reduce the discharge of pollutants from their storm sewer system to the maximum extent practicable. The stormwater pollution prevention program must cover six minimum control measures: public education and outreach, public participation, illicit discharge detection and elimination, construction site stormwater runoff control, post-construction stormwater management in new development and redevelopment, and pollution prevention/good housekeeping for municipal operations. The MS4 must identify BMPs and measurable goals associated with each control measure. An annual report on the implementation of the stormwater pollution prevention program must be submitted each year.

2.3.1.2 Loading Assessment and Nondegradation Report

In recent years, MPCA modified the requirements of the NPDES permit for selected MS4s, including several municipalities within the District. In addition to the required stormwater pollution prevention program described above, several MS4s were required to assess the change in stormwater discharge loading for their permitted area using a pollutant loading water quality model. Those MS4s that had significant new or expanded discharges were required to complete a Nondegradation Report and incorporate its findings in BMPs that address nondegradation in their stormwater pollution prevention program. As part of this process, MPCA determined that MN Rules 7050.0185 directs them to consider flow volume as a pollutant and MS4s had to address flow volume changes that have resulted from increased urban development. The MS4s were required to identify mitigation

measures to ensure that flow volumes do not exceed 1988 volumes to avoid negative environmental impacts typically caused by increased flows.

2.3.1.3 Clean Water Act: Section 316

Section 316 of the CWA regulates thermal pollution discharges--Section 316(a)-- and requires standards for cooling water intake structures-- Section 316(b). These standards are applicable to power plants and other industrial facilities. In Minnesota, facilities regulated under Section 316 of the CWA coordinate with MPCA to ensure that regulations are followed.

2.3.1.4 Clean Water Act: Section 303(d)

Section 303(d) of the CWA requires states to:

- Assess all waters of the state to determine if they meet state water quality standards
- List waters that do not meet standards
- Conduct TMDL studies in order to set pollutant reduction goals needed to restore waters

In Minnesota, MPCA is responsible for assessing waters, listing impairments, and conducting TMDLs. MPCA also coordinates closely with other state and local agencies on restoration activities. Section 1 of this plan lists the waters within the District, which are listed under Section 303(d).

2.3.1.5 Public Waters Work Permit Program

The DNR Waters Division oversees the administration of the Public Waters Work Permit Program. This program, which began in 1937, regulates water development activities below the ordinary high water level (OHWL) in public waters and public waters wetlands. Examples of development activities regulated under this permit include filling, excavation, shore protection, bridges, culverts, structures, docks, marinas, water level controls, dredging, and dams.

2.3.1.6 Water Appropriation

The DNR regulates surface and ground water appropriations by requiring a permit for all users withdrawing more than 10,000 gallons of surface or groundwater per day, or 1 million gallons annually. All active water appropriation permit holders are required to measure monthly water use and report water use yearly. In order to safeguard water availability for natural environments and downstream users, the DNR can limit appropriations from surface water under certain low-flow conditions.

2.3.1.7 Subsurface Sewage Treatment Systems (SSTS) Program

The MPCA is responsible for the SSTS program administration formally known as the ISTS program. SSTS is regulated by M.S. 115.55 and 115.56. The SSTS program's goal is to protect public health and the environment through adequate dispersal and treatment of domestic sewage from dwellings or other establishments generating volumes of less than 10,000 gallons per day. To achieve that goal, MPCA periodically revises MN Rules Chapters 7080, 7081, 7082, 7083, assists in interpreting those rules, and administers a statewide SSTS Certification and Licensing Program. The SSTS Certification and Licensing Program requires SSTS installers, maintainers, service providers, designers, advanced designers, inspectors, or advanced inspectors to obtain a license to practice.

2.3.1.8 Feedlot Program

The MPCA is the primary regulator of the collection, transportation, storage, processing, and disposal of animal manure and other livestock operation wastes. In all of the counties within the District—except for Hennepin, where MPCA is primarily responsible—feedlots are regulated under a cooperative agreement between MPCA and county government. County feedlot programs are responsible for implementing state feedlot regulations for facilities with fewer than 1,000 animals, or those that do not require federal permits. County responsibilities include: registration, permitting, inspection, education and assistance, and complaint follow-up.

2.3.1.9 Local Water Quality Regulation

Municipalities and counties within the District have adopted water quality requirements either in ordinances and codes, or within their respective surface water management plans. Much of this regulation is aimed at setting standards for development and redevelopment and enforced during the approval process. In addition, municipalities and counties have adopted shoreland management regulations, which are also enforced during the development and redevelopment process.

2.3.2 Unique Natural Resources

Regulatory controls concerning unique resources such as calcareous fens and trout streams within the District are described below.

2.3.2.1 Trout Stream Management

The DNR is primarily responsible for trout stream management within the District. The controls used by the DNR to manage these resources consist of trout stream designation (MN Rule 6264), fishing regulations (M.S. 97C.021), and easement acquisition. In addition, water quality regulations described earlier in this section are triggered for areas that drain to designated trout streams. NPDES MS4 permit requirements can also be triggered for those MS4s that drain to trout lakes or streams, which would otherwise not require them (MN Rule 7090). Trout lakes are also protected under MN Rule 7050: "Nondegradation for outstanding resource value waters," which is

administered by MPCA. This rule requires that new or expanded discharges to waters that flow into outstanding resource value waters be controlled so as to assure no deterioration in the downstream-outstanding resource value water quality. The rule also protects against thermal impacts.

2.3.2.2 Fen Management

Fen protection in the District is regulated under MN Rule 7050: "Nondegradation for outstanding resource value waters," which is administered by MPCA. Calcareous fens are classified as outstanding resource value waters under this rule. This rule requires that "New or expanded discharges to waters that flow into outstanding resource value waters be controlled so as to assure no deterioration in the quality of the downstream outstanding resource value water."

State rules regarding wetland conservation (MN Rule 8420), administered by BWSR and implemented by local government units, provide for the identification and listing of calcareous fens. In addition, these rules give BWSR the power to approve management plans that restore or upgrade a previously damaged calcareous fen.

The DNR is responsible for fen identification pursuant to MN Rule 8420.102, and restricts off-road vehicle use in fens. The DNR also has a role in fen protection through the acquisition, designation, and management of fen areas as scientific and natural areas (SNA).

2.3.2.3 Minnesota River

The primary regulatory control concerning the Minnesota River is Section 10 of the Rivers and Harbors Act and is described below.

2.3.2.3.1 Rivers and Harbors Act: Section 10

This program regulates the structure placement affecting the Minnesota River's navigable waters. The COE is the agency responsible for administering this program.

2.3.3 Wetlands

There are federal, state, regional, and local regulations pertaining to wetland management and protection within the District. These programs are described in detail below.

2.3.3.1 Clean Water Act: Section 404

This program regulates excavation of wetlands and the discharge of dredged or fill material into waters of the United States, which includes wetlands. There are two types of Section 404 permits: regional and nationwide general permits and individual permits. The COE has primary responsibility for administering the program, but the EPA can appeal to a higher COE authority or veto a COE decision.

2.3.3.2 Food Security Act of 1985: Swampbuster

The Swampbuster program regulates the alteration of wetlands for agricultural use and prohibits farms who receive federal subsidies from draining wetlands. Alteration of a wetland for agricultural use results in ineligibility for all government price and income support programs.

2.3.3.3 Wetland Conservation Act of 1991 (WCA)

The intent of the WCA is to promote no net loss of wetlands. BWSR oversees the administration of WCA within the state, while the DNR provides enforcement. Cities and counties within the District have been designated as the LGUs or administrators of the WCA at the local level. DOT is the WCA LGU on its rights of way. WCA rules regulate some excavation. WCA rules require that drained and filled wetlands be replaced at a minimum ratio of 1:1 in agricultural areas and 2:1 in non-agricultural areas. The 1:1 replacement ratio only applies if the land is kept in agricultural use for 10 years after replacement. LGUs may have stricter wetland regulations. Amendments to the WCA in 1994 allow for preparation of wetland management plans by LGUs that may give more flexibility through a more regional wetland analysis. The DNR is involved in the WCA enforcement and is responsible for identification, protection, and management of calcareous fens.

2.3.4 Floodplain Management

Floodplain management responsibilities in the District are shared by FEMA, the state, and LGUs. The NFIP drives floodplain management efforts at all levels and is described below.

2.3.4.1 National Flood Insurance Program

The NFIP was created through the National Flood Insurance Act of 1968. The program enables property owners in participating communities to purchase flood insurance protection from the government. This insurance provides an alternative to disaster assistance and meets the escalating costs of repairing damage to buildings and their contents caused by floods. NFIP participation is based on an agreement between local communities and the federal government, which states that if a community will adopt and enforce a floodplain management ordinance to reduce future flood risks

to new construction in Special Flood Hazard Areas (SFHA), the federal government will make flood insurance available within the community as financial protection against flood losses.

All of the local communities within the District participate in the NFIP.

2.3.4.2 Local Flooding Regulation

Most LGUs within the District have also adopted rate control standards and freeboard requirements to protect property from flooding outside of the SFHAs designated by the NFIP.

2.3.5 Erosion and Sediment Control

2.3.5.1 City and County Regulation

Several cities and counties within the District have adopted bluff setbacks, steep slope ordinances, and vegetation management requirements in an effort to reduce bluff erosion. In addition, erosion and sediment control measures have been established within city codes, ordinances, and surface water management plans in an effort to meet NPDES requirements.

2.3.6 Groundwater

Groundwater within the District is regulated by the DNR and the Department of Health (DOH). Regulatory controls handle both groundwater quality and quantity and are described below, with the exception of water appropriation which was already described.

2.3.6.1 Wellhead Protection

Wellhead protection prevents drinking water pollution by managing potential sources of contamination in the area that supplies water to a public well. The DOH administers the wellhead protection requirements found in M.S. 4720. Under these rules, local governments who own and operate public drinking supply wells are required to complete a wellhead protection plan. The wellhead protection plan includes a delineation of the wellhead protection area and an assessment of the existing land and water impacts on the aquifer serving the well. Specific wellhead protection requirements vary for the different classifications of public water systems in Minnesota.

2.3.6.2 Abandoned Wells

Decommissioned wells that have not been properly sealed can be a source of groundwater contamination, potentially affecting nearby drinking water wells. The DOH administers M.S. 103I.301 which spells out well-sealing requirements. Counties within the District also have grant programs which assist property owners to seal abandoned or unused wells properly.

2.3.7 Commercial and Recreational Navigation

2.3.7.1 Safety

The DNR administers the Boat and Water Safety program, which provides the public with safety information, collects and interprets statistical data on boat and water accidents and boating in general, and handles the free mandatory boating and safety education program for youth. The Minnesota Boating Guide, published by the DNR, summarizes Minnesota's boating laws and regulations. Another DNR publication summarizes the state's laws governing personal watercraft. The U.S. Coast Guard and Coast Guard Auxiliary offer courses that provide instruction to boaters at all levels. Information on these courses is available on the DNR website.

2.3.7.2 Dredge Material Management

COE policy dictates the development and implementation of Dredged Material Management Plans (DMMP) which satisfy the long-term material placement needs for COE navigation projects. The objective of the DMMP is to prepare a coordinated, long-term plan for managing dredging and placement site requirements. A DMMP has been prepared for the Minnesota River in Scott, Hennepin, and Dakota counties above the I-35W Bridge. A DMMP will need to be prepared for the Minnesota River below the I-35W Bridge.

2.3.7.3 Financing

The District has several options available to fund channel maintenance (either directly or indirectly) through financing of other District operations and improvements. These options are listed below and described in detail in future sections of this Plan.

- District-wide Ad Valorem
- Capital Improvements Funding
- Stormwater Utility
- Special Assessment
- State Funding

2.4 MANAGEMENT GAPS

The existing regulatory controls were presented to determine their adequacy in addressing the issues identified by the District through the planning process. Based on existing programs and an analysis of their ability to address the District's issues, management gaps were generated and are described below. These management gaps exist when neither the District nor any other entity is addressing a particular aspect of an issue.

2.4.1 Issue 1 – Unclear Role of District

As the District evolved, so has its role and responsibilities. That shift, coupled with expectations and the irregular shape of the District, has left a couple of notable management gaps. The 9-Foot channel maintenance has driven the District's role historically. However, the District's role has shifted, and is now required to address various water quality and quantity issues within its boundary. Exacerbating this issue is that the District's boundary does not follow a hydrologic boundary and therefore is limited in how it can take on expected roles beyond channel maintenance. While stakeholders perceive the District as the lead agency in many roles related to water quality and quantity, it does not have the jurisdictional control necessary to address many of those roles.

2.4.2 Issue 2 – Outside Influences

The District's geography and the upstream watershed draining to it make it highly susceptible to outside influences. The District has limited control over many activities affecting water quality and quantity issues within the District. Management gaps arising from the size disparity between the Minnesota River Basin and the District's jurisdictional area include: unregulated areas and land management practices in many areas of the basin and non-uniform standards, especially between urban and rural areas of the basin.

2.4.3 Issue 3 – Water Quality

2.4.3.1 Nonpoint Source

2.4.3.1.1 Land Use Management

The District reviews projects within its jurisdiction to ensure that they meet their water quality policies. Other land development permitting entities in the District forward plans to the District for comment. A management gap exists here because the District relies on other entities to both submit projects for review and incorporate its comments. The gap is review authority for all projects affecting sensitive resources. The current review process often does not provide adequate protection.

The District has signed memorandums of understanding (MOUs) with LGUs in its jurisdiction to enforce Districts policies. The District needs to ensure that these MOUs are being properly executed by the LGUs.

2.4.3.1.2 Use of Water Quality Data

The District has sponsored itself in cooperation with other water quality data collection efforts. However, some of this information has not been used as part of any analysis and therefore is of little use in documenting overall trends, which can assist in making informed management decisions.

2.4.3.1.3 Minnesota River Basin

This gap is related to nonpoint water quality management in the agricultural areas of the Minnesota River Basin that drain to the District. While most urbanizing areas have adopted and enforced water quality standards and practices, agricultural stormwater quality has gone relatively unregulated. The gap is the lack of a regulatory body with the leverage and financial capability necessary to address Basin-wide issues. Because the gap encompasses many more entities than just the District, it must be addressed at a higher level. The District has initiated a dialogue with representatives at the state legislature to begin addressing this issue through a basin commission.

2.4.3.2 Point Source

The management gap identified for point source water quality issues involves point source pollution from septic systems within the Minnesota River Basin. According to the Lower Minnesota River Dissolved Oxygen TMDL, approximately 20,000 individual septic systems flow untreated to surface water in the Basin. The management gap is that there is no single entity in charge of addressing cleanup of these unregulated discharges.

2.4.4 Issue 4 – Flooding and Floodplain Management

Two management gaps related to flooding and floodplain management have been identified and are described below:

- Inconsistent runoff peak rates and infiltration standards are being enforced within the District's jurisdiction. The District has adopted peak runoff rate control standards for projects requiring review but has not adopted infiltration standards. Infiltration standards can reduce runoff volumes which, in some instances, can help mitigate localized flooding.
- The District lacks authority to regulate runoff outside of its boundaries.

2.4.5 Issue 5 – Erosion and Sediment Control

Three management gaps have been identified for issues related to erosion and sediment control in the District.

2.4.5.1 Bluff Erosion

While many of the cities and counties within the District have vegetation management standards, the standards are inconsistent. In addition, the District has not established vegetation management standards addressing practices such as vegetative cutting, clearing on bluffs, and steep slopes

2.4.5.2 Streambank Erosion

The District and other entities do not have management controls in place on streams not identified as trout streams.

2.4.5.3 Mainstem Erosion

The District has sponsored studies to determine BMPs to combat mainstem bank erosion. However, the source of mainstem erosion is mostly due to increased runoff rates and volume originating outside of the District.

2.4.6 Issue 6 – Groundwater

Groundwater is vital to many of the unique resources in the District, mainly trout waters and fens. Groundwater resources are currently managed by the DOH and the DNR with a focus on human consumption; fen and trout stream recharge areas are not specifically identified or regulated. This represents a management gap. Because these areas have not been identified, they cannot be protected to ensure the health of the unique natural resources they support.

2.4.7 Issue 7 – Commercial and Recreational Navigation

Management gaps have been identified for several issues related to commercial and recreational navigation.

2.4.7.1.1 Navigational Safety

While the DNR and the US Coast Guard provide navigational safety resources to both commercial and recreational watercraft operators, much of this information is not readily available to the average recreational user.

2.4.7.1.2 Effect of Boat Traffic

No entity regulates boat traffic on the river with the intent of addressing water quality and mitigating the oftentimes detrimental effects of boat wake.

2.4.7.1.3 Beneficial Use for Dredge Material

The District has acquired a site for temporary dredge material disposal and storage. To effectively manage the dredge material in the long term, the District must identify uses for the material.

2.4.7.2 Channel Maintenance Fund

The District must decide how to restore the 9-Foot channel fund. Alternatives to an ad valorem tax and a special assessment have been, and will continue to be, examined. In addition, the 4-foot channel needs attention. Potentially, a maintenance plan needs to be developed for the 4-foot channel.

2.4.8 Issue 8 – Public Education and Outreach

The District maintains a website with educational information and actively participates in regional education programs and events. Awareness is growing among the public of how actions within the District affect the river and other unique natural resources.

3 GOALS, POLICIES, AND MANAGEMENT STRATEGIES

The roles of watershed districts have changed since the Lower Minnesota River Watershed District formed in 1960. These roles now reflect new public values, which have reordered priorities within the District. Several of the District's purposes expressed in the original petition for establishment of the District conflict with the present-day purposes set forth in M.S. 103B.201. Overall, today's District goals are consistent with the purposes stated in recent statutes, recognizing that the District must address commercial navigation. The goals, policies, and strategies set forth in this section of the Plan reflect the specific characteristics of this District.

3.1 MISSION AND PURPOSE

The District's mission and purpose are presented below, followed by the goals, policies, and strategies generated through the planning process with the TAC, CAC, Managers, and staff.

3.1.1 Mission

The District's mission is to manage and protect the Minnesota River, lakes, streams, wetlands, and groundwater, and to provide river navigation by:

- Promoting open communications and collaboration with citizens, community organizations, and local, state, and federal agencies.
- Improving and protecting the quality of the Minnesota River and all water bodies in the watershed.
- Minimizing the negative effects of floods and droughts on the Minnesota River and all water bodies in the watershed.
- Collecting and distributing information regarding surface water and groundwater in the watershed; establishing priorities; and developing local plans to improve water resources in the watershed.
- Monitoring and understanding the effects of municipal groundwater appropriations and drought on groundwater levels.
- Working with LGUs to enforce the WCA.
- Assisting and facilitating state and federal agency efforts to maintain the navigation channel.
- Educating stakeholders about the impact they have on the watershed's water resources and changing behaviors that have a negative impact.

3.1.2 Purpose

The Metropolitan Surface Water Management Act states that the District's purposes and other water management programs (quoted from M.S. 103B.201) are as follows:

- Protect, preserve, and use natural surface and groundwater storage and retention systems.
- Minimize public capital expenditures needed to correct flooding and water quality problems.
- Identify and plan for means to effectively protect and improve surface and groundwater quality.

- Establish more uniform local policies and official controls for surface and groundwater management.
- Prevent soil erosion into surface water systems.
- Promote groundwater recharge.
- Protect and enhance fish and wildlife habitat and water recreational facilities.
- Secure other benefits associated with proper surface and groundwater management.

Unlike other water management programs in the state subject to M.S. 103B, the District's additional purpose is to improve navigation. The District's primary role in navigation improvement is to serve as the local sponsor for the COE. In that role, the District is responsible for acquiring and managing dredge material sites.

The mission and purpose of the District, together with the issues and management gaps discussed in the previous section, serve as the foundation for the goals, policies, and strategies summarized below. This Plan streamlines the regulation imposed on LGUs and reduces inconsistencies by incorporating policies and strategies like surrounding WDs and WMOs, where appropriate.

3.1.3 Goal Summary

Table 3-1: Summary of District Issues, Goals, and Strategies

Issues	Goals	Strategies
Issue 1: Unclear Role of the District Issue 2: Outside Influences	Goal 1: Organizational Management	Strategy 1.1.1: Work cooperatively with local, state, and federal government; other agencies; and non-government organizations on issues affecting the District's resources. Strategy 1.2.1: Provide public information services Strategy 1.3.1: Perform periodic assessments and program reviews Strategy 1.3.2: Use short and long-term metrics to measure progress
Issue 3: Water Quality	Goal 2: Surface Water Management	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.1.1: Lower Minnesota River Watershed District – High value resources area overlay district Strategy 2.2.1: Watershed management standards Strategy 2.2.2: Promote disconnected stormwater management and low impact development Strategy 2.2.3: Cost share incentive program Strategy 2.2.4: Water quality restoration programs Strategy 2.3.1: Modify and continue the monitoring program Strategy 2.3.2: Complete detailed data assessments Strategy 2.3.4: Coordinate with other agencies and water quality programs Strategy 4.4.3: Steep Slopes Standard Strategy 7.2.1: Develop a Vegetation Management Standard/Plan

Issues	Goals	Strategies
	Goal 3: Groundwater Management	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.3.1: Modify and continue the monitoring program Strategy 3.1.1: Support wellhead protection efforts Strategy 3.2.1: Infiltration standard Strategy 3.2.2: Promote conservation and wise use of groundwater Strategy 3.3.1: Groundwater monitoring Strategy 3.3.2: Regional modeling
	Goal 4: Unique Natural Resources Management	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.3.1: Modify and continue the monitoring program Strategy 4.2.1: Data acquisition and management Strategy 4.2.2: Provide technical assistance Strategy 4.2.3: Provide educational opportunities Strategy 4.3.1: Develop a mechanism for identifying and acquiring high value conservation easements Strategy 4.4.1: Encourage wildlife connectivity projects which achieve multiple goals, such as water quality improvements and fen and steep slopes protection Strategy 7.2.1: Develop a Vegetation Management Standard/Plan
	Goal 5: Wetland Management	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 4.3.1: Develop a mechanism for identifying and acquiring high value conservation easements Strategy 5.1.1: Delegate Wetland Conservation Act (WCA) to LGU's Strategy 5.1.2: Require LGU's to conduct wetland inventories and complete wetland management plans Strategy 5.1.3: Review WCA notices as received Strategy 5.1.4: Wetland Standard Strategy 7.2.1: Develop a Vegetation Management Standard/Plan
Issue 4: Flooding and Floodplain Management	Goal 2: Surface Water Management	Strategy 2.1.1: Watershed Management Standards
	Goal 6: Floodplain and Flood Management	Strategy 6.1.1: Floodplain and drainage alteration standard Strategy 6.1.2: Infiltration and peak flow standards Strategy 6.1.3: Manage localized flooding
Issue 5: Erosion and Sediment Control	Goal 6: Floodplain and Flood Management	Strategy 6.2.1: Adopt infiltration and peak flow standards
	Goal 7: Erosion and Sediment Control	Strategy 2.2.1: Watershed management standards Strategy 4.4.3: Steep Slopes Standard

Issues	Goals	Strategies
		Strategy 7.1.1: Support the NPDES general permit Strategy 7.1.2: Erosion and Sediment Control Standard Strategy 7.2.1: Develop a Vegetation Management Standard/Plan Strategy 7.3.1: Provide streambank and mainstem erosion assessment Strategy 7.3.2: Continue gully erosion repair Strategy 7.4.1: Promote and encourage shoreland protection Strategy 7.4.2: Shoreline and streambank standard
Issue 6: Groundwater	Goal 3: Groundwater Management	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.3.1: Modify and continue the monitoring program Strategy 3.1.1: Support wellhead protection efforts Strategy 3.2.1: Stormwater infiltration criteria Strategy 3.2.2: Promote conservation and wise use of groundwater Strategy 3.3.1: Groundwater monitoring Strategy 3.3.2: Regional modeling
Issue 7: Commercial and Recreational Navigation	Goal 8: Commercial and Recreational Navigation	Strategy 8.1.1: Promote safety education Strategy 8.2.1: Manage existing Cargill East River (MN – 14.2 RMP) dredge material site Strategy 8.2.2: Beneficial use plan for dredge materials Strategy 8.3.1: Develop a funding structure to ensure proper maintenance and improvement along the river
Issue 8: Public Education and Outreach	Goal 9: Public Education and Outreach	Strategy 1.2.1: Provide public information services Strategy 4.2.3: Provide educational opportunities Strategy 8.1.1: Promote safety education Strategy 9.1.1: Maintain Citizen Advisory Committee (CAC) Strategy 9.1.2: Develop an outreach program Strategy 9.1.3: Engage volunteers Strategy 9.1.4: Provide opportunity for public input Strategy 9.2.1: Produce scientific studies and work products Strategy 9.2.2: Promote a variety of education programs Strategy 9.2.3: Use multiple outlets to distribute information

3.2 GOAL 1: ORGANIZATIONAL MANAGEMENT TO MANAGE THE DISTRICT'S DIFFERENT ROLES

As mentioned, the roles of watershed districts have changed since the District formed in 1960. These new roles have reordered priorities and how issues are evaluated and addressed. To adequately address assumed roles, the District identified and defined five primary policies which were reaffirmed during the planning process for this Plan.

Policy 1.1: Serve as a Facilitator

Strategy 1.1.1: Work Cooperatively with Local, State, and Federal Government; Other Agencies; and Non-Government Organizations on Issues Affecting District Resources

Under this strategy, the District will continue to work collaboratively with other government and non-government organizations (NGOs) to assess resources, to share costs on projects that protect or enhance these resources, and to lobby the Minnesota State Legislature and the United States Congress to ensure the Minnesota River receives the financial resources necessary to fulfill its mission and purpose.

The District will undertake projects that develop, protect, enhance, and/or restore resources within its authority (such as erosion control, greenbelts, habitat creation, etc.), either independently or jointly with other LGUs or other organizations, as discussed in future sections, or in response to petitions. For independent projects, the District will coordinate with LGUs before project initiation. The District will place a higher priority on projects identified in this Plan and in future resources/implementation plans. Projects under consideration include, but are not limited to, those that benefit navigation (dredge material disposal sites, bank erosion control, etc.), protect fens and steep slopes, address erosion and sediment control, grant public access, and promote public enjoyment of resources in the District.

The District will continue its effort at the Minnesota State Legislature to facilitate the formation of a Minnesota River Basin Commission. The commission would have the authority necessary to manage land use practices and control point and nonpoint source pollution currently affecting the Minnesota River's quality.

Policy 1.2: Serve as an Educator

Strategy 1.3.1: Perform periodic assessments and program reviews

This strategy was modeled after the Scott WMO policy for regular program and progress assessment. The District will regularly assess and review its programs through use of the following:

- Annual reports to BWSR
- Annual financial audits
- Annual water quality monitoring reports

- Annual reports or meetings with the LGUs to track and document local water plan (LWP) implementation
- Periodic review of development plans, targeting 10 percent of permits issued and the program's equivalence with this Plan
- A bi-annual program reviews that benchmarks accomplishments against the strategies and outcome articulated in the Plan

To avoid undue stress on the LGUs, the District will have annual reporting coincide with MS4 Permit Program annual reporting. The District will address the review findings, which will be included in the annual report to improve operations. If reviews identify any needed Plan changes or additions, the District will address them through the Plan amendment process. The District will also use BWSR's Metro Watershed Performance Review and Assistance Program (PRAP) guidance to ensure that it is meeting BWSR's required performance standards.

The District does not wish to duplicate existing regulatory authority of other agencies. The Managers believe that regulations are more properly performed at the local level (cities, townships, counties), rather than by the District. If the District finds that an LGU has failed to enforce its standards and policies, then the District will adopt regulations after taking the appropriate statutory steps to enforce its standards and policies.

Strategy 1.3.2: Use short-term and long-term metrics to measure progress.

This strategy was also modeled after the Scott WMO policy for regular assessment of programs and progress, Strategy 7.6.2. Strategy 1.3.2 provides a set of metrics to help the District evaluate both short and long-term progress. The short-term metrics tend to be programmatic and related to the accomplishment of "activities, the number of activities, or the number of participants." Long-term metrics generally involve resource-based outcomes. Short-term and long-term metrics are presented in Table 3-2.

Table 3-2: Lower Minnesota River Watershed District Short-term and Long-term Metrics

Goal	Short-term Metric	Long-term Metric
Goal 1: Organizational Management	• Completion of scheduled activities • Annual LGU Audits • Amount of dollars leveraged for projects from other agencies and property owners	• Formation of a Minnesota River Basin Commission • Legislative funding support
Goal 2: Surface Water Management	• Number and types of projects completed as part of the Cost Share Incentive Program and Water Quality Restoration Programs • Number of targeted studies and projects completed	• Positive trends in water quality parameters identified for monitoring efforts
Goal 3: Groundwater Management	• Number of targeted studies and projects completed	• Positive trends in water quality parameters identified for monitoring efforts
Goal 4: Unique Natural Resources Management	• Number of targeted studies and projects completed • Development and completion of the Fen Stewardship • Development of groundwater model for fen management	• Number and acreage of unique natural resources protected, restored, or enhanced • Acquisition of high valued easements • Sustained protection of the fens and trout waters
Goal 5: Wetland Management	• Completion of scheduled activities	• Number and acreage of wetlands protected, restored, or enhanced
Goal 6: Floodplain and Flood Management	• Completion of scheduled activities	• Number of structures damaged and value of flood damages • Preservation of floodplain resources
Goal 7: Erosion and Sediment Control	• Completion of scheduled activities • Reduction in streambank and ravine bank and slope failures	• Positive trends in water quality • Protection and preservation of Minnesota River Bluff
Goal 8: Commercial and Recreational Navigation	• Completed of scheduled activities • Number of targeted studies and projects completed	• Secure regular congressional and state legislative funding for the 9-Foot channel
Goal 9: Public Education and Outreach	• Number and types of sponsored events • Number of participants at events • Number of articles, press releases, and pamphlets developed and printed •	• Same as short-term metrics

3.3 GOAL 2: SURFACE WATER MANAGEMENT TO PROTECT, IMPROVE, AND RESTORE SURFACE WATER QUALITY

Improved water quality in the Minnesota River is a priority with state and federal policy makers, the District's Managers, staff, and advisory committees. Impaired or poor-quality water resources can unfavorably impact recreational uses, aquatic habitat, wildlife, groundwater quality, and other water activities.

More than 16,000 square miles of the Minnesota River watershed are beyond the District's control. Management of in-stream water quality from these tributary areas will be coordinated with other agencies with wider influence and authority. The District is committed to protecting and improving water quality originating within its boundaries and assisting other municipalities and WMOs to reduce point and nonpoint pollutant discharges to the Minnesota River and other water resources.

The following policies and strategies were identified through the planning process to protect and improve surface water resources to meet targeted state of Minnesota water quality standards, pursuant to MN Rule 7050, within the District.

Policy 2.1: Use of High Value Resources Area Overlay District to Manage Water Resources

Strategy 2.1.1: Lower Minnesota River Watershed District - High Value Resources Area Overlay District

This strategy consists of managing water resource projects within the District based on whether a project is located within a high value resources area (HVRA) overlay district. Many unique natural resources located within the District, such as calcareous fens and trout waters, warrant special management. These resources will be managed for specific, identified, natural, and biological communities of special importance or significance, in accordance with existing or future official management plans, such as the DNR Savage Fen Resource Plan and the Eagle Creek Aquatic Management Area Plan. General management goals for these water resources are to understand, preserve, protect, and restore unique natural resources, while evaluating projects which propose to alter fens, buffer areas, shoreland areas, water crossings, or other unique natural resources. Specifically, HRVA overlay districts have protection standards, as presented in Appendix K. The process for identifying resources for placement in HVRA overlay district is provided on the District's website: www.lowermnriverwd.org.

Policy 2.2: Prevent Further Water Quality Degradation

Strategy 2.2.1: Watershed management standards

The District has refined its watershed management standard to focus of managing resources with identified gaps in protection strategies as presented in the District's 2018 Statement of Need and Reasonableness report. The resulting watershed management standards are presented in Appendix K.

This strategy promotes disconnected stormwater management, flow de-synchronization, and stormwater volume control practices. The previous standards set the stage for runoff volume control and establish requirements to manage peak runoff rates. These standards also included a number of low impact development (LID) credits that could be used as an effective way to design the site and promote LID, while satisfying the volume control requirement. This strategy continues the current standards and incorporates additional LID practices that can be used for credits including:

- Buffer credit
- Forest/prairie restoration credit
- Grassed channel credit
- Green rooftop credit
- Natural area conservation credit
- Non-rooftop disconnection credit
- Permeable paver credit
- Reuse of stormwater credit.
- Rooftop disconnection credit
- Soil amendment credit

To receive credit, project proposers must request the credit(s), and provide calculations and documentation showing that the criteria set forth in the Minnesota Stormwater Manual are met (Minnesota Stormwater Manual 2005).

Strategy 2.2.3: Cost Share Incentive Program

The purpose of this strategy is to provide educational, technical, and financial assistance to landowners (residential, commercial, industrial...etc.); to implement projects that have water quality, water quantity, channel maintenance, trout stream, fen or wetland restoration, or aquatic habitat benefit within the District; and to help achieve the goals of this Plan. A detailed description of this program can be found in on the District's website: www.lowermnriverwd.org.

The cost share and incentives will be reviewed annually. Program effectiveness will be measured in two ways: 1) by comparing water quality trends before and after projects are implemented and 2) by how many projects are funded through the program.

Strategy 2.2.4: Water Quality Restoration Program

The purpose of this strategy is to provide financial assistance to non-government organizations and LGUs within the District, implement BMPs, and carry out studies which will protect and improve water resources within the District. This broad-based program implements Goals 2 and 3, which are to protect, improve, and restore surface water and groundwater quality within the District.

The water quality restoration program will fund activities that reduce urban nonpoint source pollution, improve, and protect groundwater quality, and promote surveys and studies of wetlands' (fen) health and management. Program effectiveness will be measured in two ways: 1) by comparing water quality trends before and after projects are implemented, and 2) by how many projects are funded through the program._A detailed description of this program can be found on the District's website: www.lowermnriverwd.org.

Policy 2.3: Enable Informed Decisions

The objective here is to collect and analyze data necessary for making informed decisions.

Strategy 2.3.1: Modify and Continue the Monitoring Program

This strategy continues the cooperative relationship with MCES, CAMP, cities, counties, and SWCDs, as described in Section 1.6 (Surface Water Quality and Quantity Monitoring), with some modifications. These modifications initially include:

- Adding the MCES' Quality Assurance (QA) objectives to the monitoring program
- Incorporating regular data analysis to identify trends

The QA objectives consist of the collection of duplicate samples to assess field precision. One duplicate sample will be collected per lake or stream, per year. Given the monthly sampling schedule, this amounts to about 10 percent of samples. The guideline/target for assessing field precision will be the relative difference of less than 30 percent for total phosphorus.

In addition to working toward to the goals of the QA objective of field precision, the District will incorporate accuracy and bias, representativeness, completeness, comparability, and analytical sensitivity objectives as specified in the MCES QA program.

Strategy 2.3.2: Complete Detailed Data Assessments

Over the past few years, the District has collected a large quantity of water quality data. The Plan includes a preliminary assessment of lake water quality data. However, the last comprehensive data evaluation was completed in 2000. Periodic data evaluations are necessary to convert data into information that decision makers can use. Data collected for each water resource will be evaluated on a 3-year or 5-year cycle. As part of Strategy 1.3.1, all of the water resources within the watershed will be evaluated. An outcome of Strategy 1.3.1 will be groupings of water resources into High,

Medium, and Low categories for detailed data assessments and timetables formulated for each category.

Strategy 2.3.3: Coordinate with Other Agencies and Water Quality Programs

This strategy consists of the District's coordination with the MDA, MPCA, DNR, and Metropolitan Council; to stay informed and collaborate on changes to state standards and best practices for water impairments on the 303(d) listings. District staff will maintain communications with the various agencies, invite them to participate on the TAC, and attend agency-sponsored meetings and training as time allows.

3.4 GOAL 3: GROUNDWATER MANAGEMENT TO PROTECT AND PROMOTE GROUNDWATER QUALITY AND QUANTITY

Groundwater quality and quantity are dependent on the infiltration of surface water/rainfall through the soil, which is dependent on soil type, land cover, weather, and other factors. Changes to any of these factors will influence groundwater. While some of the factors are difficult to control, some activities and changes to land cover can be regulated and/or managed. Groundwater is a finite resource with inputs and outputs. The input is generally rainwater and snowmelt that seep into the ground. The outputs can be groundwater that is pumped out for human use, or groundwater that naturally discharges to lakes, wetlands, and streams.

Maintaining clean, safe groundwater supplies is critical to human and environmental health and to the economic and social vitality of our communities. Groundwater can be contaminated by commercial and industrial waste disposal, landfills, leaking petroleum tanks, septic systems, mining operations, feedlots, and fertilizer/pesticide applications. The quantity and quality of groundwater flows have a direct impact on the resources located in the District, such as floodplains, wetlands, calcareous fens, and trout waters. The District intends to play an active role working with other units of government and groups, and to maintain and/or improve the health of these water resources.

Policy 3.1: Support and Assist in Intercommunity Management of Groundwater

Strategy 3.1.1: Support Wellhead Protection Efforts

This strategy consists of supporting wellhead protection planning efforts with District staff time and technical assistance, or a District consultant when requested by LGUs.

Policy 3.2: Promote Groundwater Recharge

Strategy 3.2.1: Infiltration Standards

This strategy consists of establishing criteria as described previously to protect the quality of groundwater when infiltration practices are used to control stormwater runoff volumes. This might include pretreatment, as necessary, prior to infiltration for some source areas such as those with medium or high groundwater susceptibility, and areas close to wells. It could also include prohibiting infiltration of runoff from certain land uses, or where there is shallow groundwater or poor soils.

The District's infiltration standards are presented in Appendix K.

Strategy 3.2.2: Promote Conservation and Wise Use of Groundwater

This strategy consists of incorporating messages of conservation and wise use of groundwater through information sharing and education initiatives with the Metropolitan Council, Rural Water Utility and other applicable organizations.

Policy 3.3: Protect and Improve Groundwater-Sensitive Water Resources

Strategy 3.3.1: Groundwater Monitoring

This strategy consists of continuing and improving groundwater monitoring in the District. In 2005, the District developed strategies for a groundwater monitoring plan to provide guidance to the District and to increase information available on groundwater quality. This strategy would implement the recommendations of that report.

Strategy 3.3.2: Regional Modeling

The Metropolitan Council recently completed a region model called the Metro Model 2. This strategy works with the Metropolitan Council on model uses.

GOAL 4: UNIQUE NATURAL RESOURCES MANAGEMENT

TO PROTECT AND MANAGE UNIQUE NATURAL RESOURCES

The lower Minnesota River valley is a unique area which supports the critical needs of many fish and wildlife species. It also provides tremendous outdoor recreation and educational opportunities for the MSP metro population. The District's goal is to maintain or improve the quality and quantity of fish and wildlife habitat and outdoor recreational opportunities.

Policy 4.1: Maintain or Improve the Quality and Quantity of Fish and Wildlife Habitat

Strategy 4.1.1: Encourage Protection of Fish and Wildlife Habitat

This strategy consists of working with the DNR, local governments, and NGOs to implement practices that will protect fish and wildlife habitat. These practices include, but are not limited to, limiting disturbance and soil erosion during construction, modifying zoning and subdivision codes, and establishing stream buffers.

Increases in sediment and nutrient load decreases oxygen levels in the river which has an adverse effect on the aquatic habitat in both the river and in floodplain lakes within the District. The District will work with regulatory agencies and upstream watershed entities to reduce sediment and nutrient loads.

Policy 4.2: Advocate for Protection, Education, and Monitoring of Unique Natural Resources

Strategy 4.2.1: Data Acquisition and Management

This strategy consists of providing technical and financial support for data acquisition and management. The District will work with state, federal, and local entities to determine data needs and the best approach to manage the data.

Strategy 4.2.2: Provide Technical Assistance

This strategy consists of providing District staff time to assist LGUs, NGOs, and landowners interested in preserving unique natural resources. This assistance includes providing analysis, design, operation, and coordination on projects.

Strategy 4.2.3: Provide Educational Opportunities

This strategy provides educational opportunities in resource areas such as signage and kiosks for the public. In addition, the District will develop educational material which can be provided to landowners and metro area tourists.

Policy 4.3: Coordinate with LGUs to Identify and Develop Critical Trails and Green Space Corridors for Improvement and Protection

Strategy 4.3.1: Develop a Mechanism for Identifying and Acquiring High Value Conservation Easements

This strategy consists of reviewing studies to protect, preserve, and enhance resource connectivity and identify prime areas for conservation easements. Once the areas have been identified, the District will work collaboratively with the LGUs, USFWS, DNR, and other regulatory agencies to acquire the necessary easements.

Policy 4.4: Protect, Preserve, and Enhance the Connectivity of Wildlife Habitat

Strategy 4.4.1: Encourage Wildlife Connectivity Projects which Achieve Multiple Goals, Such as Water Quality Improvements, and Fen and Bluff Protection

This strategy consists of promoting projects that incorporate connectivity of wildlife resources. Understanding that water quality and water resources management projects are the primary focus; the District will also consider, during review of projects, the potential each project to fragment, maintain, preserve, or restore resource connectivity.

Strategy 4.4.2: Greenways and Open Space Protection

Greenways and open space preserve hydrologic corridors, provide flood protection, and safeguard groundwater resource areas. This strategy consists of supporting the DNR Metro Greenway Program goals. Greenways and open space protection will be considered when evaluating projects which propose to alter wetlands, buffers, floodplains, shorelands, water crossings, and other unique natural resources.

Strategy 4.4.3: Steep Slopes Standard

The District's Steep Slopes Standard, designed to protect the Minnesota River Bluff and water quality, is presented in Appendix K.

3.5 GOAL 5: WETLAND MANAGEMENT TO PROTECT AND PRESERVE WETLANDS

Wetlands are an abundant resource within the District, providing value to the community. Wetlands come in many different shapes, sizes, and types and perform a variety of physical, chemical, and ecological functions. A healthy watershed is one in which wetlands are an integral part of the ecosystem.

Wetlands are among the most productive ecosystems in the world. These resources can support an immense variety of species of microbes, plants, insects, amphibians, reptiles, birds, fish, and mammals. Wetlands supply recreational and aesthetic benefits, flood reduction benefits, biodiversity, and low stream-flow augmentation. They enhance property values, serve as sources for groundwater recharge and discharge, and provide nutrient cycling, wildlife habitat, and fishery resources. Well-planned wetland protection and management efforts can have far-reaching benefits within the watershed and beyond. Active wetland management can improve water quality and wildlife habitat, as well as provide recreational and educational opportunities for the public. The District's goal is to protect and preserve these precious resources.

Policy 5.1: Preserve Wetlands for Water Retention, Recharge, Soil Conservation, Wildlife Habitat, Aesthetics, and Natural Water Quality Enhancements

Strategy 5.1.1: Delegate Wetland Conservation Act (WCA) to LGUs

This strategy consists of LGUs continuing, or taking on, the role of local regulatory authority responsible for administering the WCA and MN Rules 8420. Most of the cities, counties, and townships within the District are designated to administer the WCA. DOT also administers WCA along its ROW within the District. The District will act as the regulatory authority only if an LGU refuses to take on their role as the regulatory authority. LGUs must protect wetlands from impacts in the following order: 1) avoid, 2) minimize, and 3) mitigate. In addition, when wetland impacts are unavoidable, wetland mitigation shall be accomplished through restoration, wetland creation, or other actions specified in WCA to achieve no net loss of wetlands in the District. LGUs must also evaluate the need to establish a wetland banking system per MN Rule 8410.0080 subpart 8.

Strategy 5.1.2: Require LGUs to Conduct Wetland Inventories and Complete Wetland Management Plans

This strategy consists of requiring LGUs to evaluate the function and value of wetlands, either through development of a comprehensive wetland management plan or on a case by case basis, in accordance with MN Rules 8410.0060. LGUs shall use, or require the use of, the Minnesota Routine Assessment Methodology version 3.0 (MnRAM 3.0, as amended) or some other approved methodology to assess the function and values of individual wetlands. As part of the annual program audit discussed under Strategy 1.4.3, compliance will be assessed during the annual audit and documented in the District's annual report.

Strategy 5.1.3: Review WCA Notices as Received

This strategy consists of the District staff reviewing WCA notices from state and federal agencies regarding regulation changes. These notices will be evaluated and forwarded to the managers; LGUs within the District; and posted on the District's website.

3.6 GOAL 6: FLOODPLAIN AND FLOOD MANAGEMENT TO MANAGE FLOODPLAINS AND MITIGATION FLOODING

The natural function of river and stream floodplains is to carry or hold excess water during times of flooding. This function can be greatly hindered by channel restrictions and floodplain encroachments, thereby aggravating the tendency of the river to flood and cause damage. The floodplain also provides habitat for many species of plant and animal life. All communities within the District have DNR-approved floodplain ordinances. Adoption of these ordinances regulate floodplain activities, unless the LGUs give the authority to the District. Landowners are required to obtain the necessary approvals from the appropriate LGU before making alterations to floodplains of the Minnesota River, streams, and other water bodies.

Policy 6.1: Maintain Natural Water Storage Areas and the Minnesota River Floodway

Strategy 6.1.1: Floodplain and Drainage Alteration Standard

The District's floodplain and drainage alteration standards are presented in Appendix K.

Strategy 6.1.2: Infiltration and Peak Flow Standards

The District's infiltration and peak flow standards are presented in Appendix K.

Strategy 6.1.3: Manage Localized Flooding

This strategy consists of requiring LGUs to address mitigation of localized flooding in their LWPs. These areas must include those local flooding areas listed in Table 2-1 and any other areas identified by the LGU.

3.7 GOAL 7: EROSION AND SEDIMENT CONTROL. TO MANAGE EROSION AND CONTROL SEDIMENT DISCHARGE

Policy 7.1: Endorse the NPDES General Permits

Strategy 7.1.1: Support the NPDES General Permits

This strategy formalizes the requirement for LGUs to incorporate NPDES General Permits (Construction Stormwater and Municipal Separate Storm Sewer [MS4]) requirements in their respective local water plans. The District requires LGUs to regulate land-disturbing activities to protect against erosion and sedimentation and to limit the quantity of sediment entering water resources, as described in Appendix K. In addition, LGUs are encouraged to enforce the NPDES General Permit.

Strategy 7.1.2: Erosion and Sediment Control Standard

The District's erosion and sediment control standards are presented in Appendix K.

Policy 7.2: Adopt Vegetation Management Standard

Strategy 7.2.1: Develop a Vegetation Management Standard/Plan

This strategy consists of the District undertaking an effort in partnership with the DNR, USFWS, BWSR, NRCS, and NGOs (e.g. Great River Greening), to develop a vegetation management standard/plan for unique natural resources within the District. This plan would be functional for all who live, work, and invest in the District.

Policy 7.3: Manage Streambank and Mainstem Erosion

Strategy 7.3.1: Continue Work of Addressing Gully Erosion

This strategy consists of the District continuing the work with local partners on repairing gullies that were identified in the gullies inventory project completed in 2006. The District will use funding set aside as part of its Gully Erosion Projects contingency fund to implement projects, if the LGUs where the potential repair projects exist have funding or other resources available to work with the District, to implement a repair project.

Policy 7.4: Maintain Shoreland Integrity

Strategy 7.4.1: Promote and Encourage Shoreland Protection

The District requires all government entities within its authority to identify, rank, and map disturbed shoreland areas. Shoreland areas include streambanks, the banks of the Minnesota River, and lakeshore areas. Along these areas, the District will promote and encourage protection of non-disturbed shoreland and restoration of disturbed shorelines and streambanks to their natural state, to the maximum extent practical. In addition, the District will discourage the removal of streambank and lakeshore vegetation during and after construction projects.

Strategy 7.4.2: Shoreline and Streambank Standard

The District's shoreline and streambank standards are presented in Appendix K.

Policy 7.5: Maintain the Integrity of Minnesota River Bluff Areas

Strategy 7.5.1: Promote and Encourage Bluff Protection

The District requires that all government entities within its authority administer the Steep Slopes Standard for areas identified in the District's Steep Slopes overlay district. Along these areas, the District will promote and encourage protection of non-disturbed bluffs and restoration of disturbed bluffs to their natural state, to the maximum extent practical. In addition, the District will discourage the removal of vegetation from Minnesota River Bluff areas during and after construction projects.

Strategy 7.5.2: Steep Slopes Standard

The District's Steep Slopes Standard, designed to protect the Minnesota River Bluff and water quality, is presented in Appendix K.

3.8 GOAL 8: COMMERCIAL AND RECREATIONAL NAVIGATION TO MAINTAIN AND IMPROVE NAVIGATION AND RECREATIONAL USE OF THE LOWER MINNESOTA RIVER

Since the District's establishment in 1960, the Managers' philosophy has been to participate in the construction and maintenance of the lower Minnesota River's navigation channel as a primary responsibility. The District's goal is to maintain its role as the local sponsor to the COE and to preserve the public's recreational opportunities.

Policy 8.1: Promote Co-Existence of Commercial and Recreational Navigation on the Lower Minnesota River

Strategy 8.1.1: Promote Safety Education

The District will undertake a proactive, focused, educational program in collaboration with the DNR, U.S. Coast Guard, and Coast Guard Auxiliaries regarding best practices for safe use of the river. In the interim, links to existing safety programs and material will be added to the District website.

Strategy 8.1.2: Promote River-Oriented Recreational and Economic Development

As part of its management of a dredge material disposal site, the District will allow, under separate agreement, disposal and transfer of private dredge material as necessary to provide for commercial and recreational land uses facilitated by the navigation channel.

Policy 8.2: Manage Dredge Material

Strategy 8.2.1: Manage Existing Cargill East River (MN – 14.2 RMP) Dredge Material Site

The District will continue its role as the local sponsor responsible for providing placement site(s) for the COE. The purpose is to place dredge material from the Minnesota River and maintain a 9-foot-deep river channel. The District owns and operates the Cargill East River (MN – 14.2 RMP) Dredge Material Site (Site) where the COE temporarily stores dredge material from the river. Dredge material dries at the Site prior to being taken offsite. Additionally, the District will continue to provide for private dredge spoil disposal and transfer at the Site under agreement with private and public commercial and recreational interests making use of the 9-foot navigation channel. No other sites are being investigated at this time.

Strategy 8.2.2: Beneficial Use Plan for Dredge Materials

The District has a few dredge materials placement sites. Once material is placed in these areas, movement or material use is required to free storage space, should the COE need it for additional dredge material. This strategy consists of the District's beneficial use plan for dredge material, which would address the material use. The following approaches will be considered for the plan:

- Locating sites where aquatic habitat can be created using dredged material/concrete rubble from federal and non-federal projects in an environmentally acceptable manner
- Establishing methods/processes, programs, and authorities that can assist with using and distributing the material
- Investigating funding partners and their respective roles
- Exploring alternative construction materials that can be used for containment structures, such as concrete rubble from demolition projects
- Creating a marketing plan to assist in fostering discussions with potential users
- Establishing best management practices for dredged material

Policy 8.3: Provide Funding for Dredge Material Management

Strategy 8.3.1: Develop a Funding Structure to Ensure Proper Maintenance and Improvement the Cargill East River (MN – 14.2 RMP) Dredge Material Site (Site)

This strategy consists of developing a strategic plan for funding necessary activities to facilitate the District's role as local sponsor for the COE's 9-Foot Navigation Channel Project as it related to disposal of dredge materials. The following approaches will be considered for funding:

- Use of ad valorem taxes based on District benefit from the 9-Foot Navigation Channel Project.
- Use of benefit assessments based on individual property benefit from the 9-Foot Navigation Channel Project.

- Pursuit and use of State funding as provided by the Legislature.

3.9 GOAL 9: PUBLIC EDUCATION AND OUTREACH PROGRAM TO INCREASE PUBLIC PARTICIPATION AND AWARENESS OF UNIQUE NATURAL RESOURCES AND THE MINNESOTA RIVER

Policy 9.1: Encourage Public Participation

Strategy 9.1.1: Maintain the Citizen Advisory Committee (CAC)

This strategy consists of starting and maintaining the CAC as an advisory committee to the Managers. The CAC will:

- Act as liaison between the District and residents.
- Increase public awareness by educating District residents about actions to protect and improve water resources and habitat within the District.
- Advise the managers and staff on issues important to residents.

They will be responsible for:

1. Brainstorming ways to inform residents about the District and its resources. Examples include:
    a. Host neighborhood meetings
    b. Organize and promote community fairs and other events
    c. Educate landowners on vegetative buffers
    d. Develop and install educational signs
    e. Stencil storm sewer catch basins
    f. Organize and coordinate tours of District projects
2. Collaborating with local community groups to use as a platform for education and outreach. Examples include:
    a. Boy/Girl Scouts
    b. School groups
    c. Senior citizen groups
    d. Veteran's groups
    e. Non-profit environmental groups
3. Developing an education and outreach plan, incorporating information gathered from tasks 1) and 2), and this Plan

4. Developing and implementing habitat improvement projects
5. Collecting water level and water quality data
6. Advising managers on other issues within the District

The Managers and the CAC will meet regularly with the adjoining WDs/WMOs to determine how to manage shared water resources.

Strategy 9.1.2: Develop an Outreach Program

This strategy consists of developing an education outreach program to familiarize the LGUs and the public with District activities. The outreach program will include:

1. District attendance at meetings of city councils, counties, the Minnesota River Joint Powers Board, public interest groups (such as Friends of the Minnesota River Valley), etc.
2. District presentations to schools, conferences, and seminars regarding activities in the District, water resource issues in the District, etc.
3. Conducting public tours of the watershed to targeted groups, such as city engineers, public officials, environmental groups, and members of the citizen and technical advisory committees.

Sponsorship of and/or participation in grassroots level environmental initiatives, such as streambank cleanup, storm drain stenciling, etc.

6. Coordination with other groups and LGUs in developing education programs or implementing ongoing education efforts to produce targeted educational materials.

Strategy 9.1.3: Engage Volunteers

The District will continue to solicit and empower volunteers to help with water quality monitoring. Currently, the District solicits volunteers and provides modest funding for equipment purchases and the analysis of samples in participation with citizen-assisted monitoring program and the citizen stream-monitoring program.

Strategy 9.1.4: Provide Opportunity for Public Input

The District values input from the public regarding operations and design of its programs, as well as ideas for resource management. This strategy provides opportunities for the public to provide input through open workshops and open house meetings. Actions for this strategy include having these types of meetings as part of the design for any new major programmatic effort.

3.10 GOAL 10: ENCOURAGING OTHER LGUS TO INCLUDE INFORMATION ABOUT THE DISTRICT IN THEIR WATER RESOURCE-RELATED DOCUMENTS.

Policy 10.1: Provide Education and Marketing to Foster Sustainable Behavior and Environmental Stewardship

Strategy 10.1.1: Produce Scientific Studies and Work Products. The District recognizes that scientific studies are technical and are generally not written for the public. This strategy consists of collecting and/or creating specific outreach materials written for the public. The District maintains a library of pamphlets and brochures on water quality, lawn fertilizing, septic system care, etc.; but anticipates the need for additional materials to present the results of scientific studies and of water plan initiatives and strategies.

Strategy 10.1.2: Promote a Variety of Education Programs

The District recognizes that the public is diverse, that different public segments are interested in different topics, and some public segments have activity preferences. The District has therefore chosen to have a variety of education programs. This variety has been on display throughout the discussion of this goal and includes open house meetings, written materials, hands-on stewardship events, workshops, etc. This strategy articulates the District's intent to use a variety of venues for education.

Strategy 10.1.3: Use Multiple Outlets to Distribute Information

The District recognizes that various information outlets reach different audiences. This strategy articulates the District's intention of using multiple outlets to distribute information when possible. Various outlets include literature racks at county offices, community newspapers, websites, e-mail distribution lists, etc.

4 IMPLEMENTATION PROGRAM

This section presents the Implementation Program (Program) for the Plan. The District's Program addresses water resources and programmatic issues discussed in Section 2 and applies the goals, policies, and strategies address in Section 3. The District's Program consists of administrative and managerial efforts, coordination, studies, programs, capital improvement projects (CIP), and funding mechanisms to successfully execute the Plan. Each element is described below. The Program schedule and budget are presented in Table 4-1. Since this Plan was not completed in time for the 2017 budgeting cycle, this Program begins in 2018 and ends in 2027. The Program's estimated impacts on residents and local government are presented in the next section. The District will review the implementation program every two years, at minimum.

4.1 ADMINISTRATIVE AND MANAGERIAL

Administrative and managerial efforts will be carried out by the District's administrator. The administrator, and consultants will perform the District's day-to-day operations and implement other elements of the Program, as discussed below. Administrative services also include legal, audit, bookkeeping services, office space, office equipment, office rent, information management systems (e.g. computers, copiers, website, etc.), training, and general engineering services. The District's general levy finances these efforts.

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Table 4-1: Lower Minnesota River Watershed District - Implementation Program Budget for 2018 -2027

ACTION	Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
EXPENDITURE										
Administrative/Managerial										
General Administrative Services, Conferences, Coordination with LGUs, Stakeholders and other Project Partners, LGU Program Reviews, 9-Foot Channel, and Advisory Committees (Technical and Citizen)	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
Administrative/Managerial Budget Total	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
Studies and Programs										
Cost Share Incentive and Water Quality Restoration Program	$20,000	$20,000	$20,000	$50,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Education and Outreach Program	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$40,000	$40,000
Fen Stewardship Program	$75,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
Geomorphic Assessments (Trout Streams)	$50,000		$50,000				$50,000	$50,000		
Monitoring Program	$65,000	$65,000	$65,000	$75,000	$75,000	$75,000	$75,000	$75,000	$100,000	$100,000
Paleo-limnology Study (Floodplain Lakes)	$50,000						$50,000			
Sustainable Lake Management Plans (Trout Lakes)	$50,000		$50,000		$50,000		$50,000	$50,000		$50,000
Vegetation Management Plan		$50,000							$65,000	
Water Resources Restoration Fund			$100,000	$100,000	$120,000	$125,000	$100,000	$100,000	$160,000	$150,000
Studies and Programs Budget Total	$340,000	$190,000	$340,000	$280,000	$320,000	$275,000	$400,000	$350,000	$410,000	$385,000
Capital Improvements										
Assumption Creek Hydrology Restoration Project		$30,000								
Carver Creek Restoration Project		$80,000	$15,000							
Minnesota River Corridor Management Project			$25,000	$75,000						
Groundwater Screening Tool Model	$50,000	$50,000	$50,000							
District Boundary Modification Project	$10,000									
Downtown Shakopee Targeted BMP Feasibility Study					$50,000					
Dredge Site Restoration Project	$240,000	$240,000								
Eagle Creek (East Branch) Project	$10,000	$10,000								
East Creek Bank Stabilization Project		$50,000								
East Creek Water Quality Treatment Project		$50,000	$25,000							
Minnesota River Assessment of Ecological and Economic Impacts of Sedimentation							$25,000	$30,000	$45,000	$50,000
Minnesota River Assessment of Water Storage Benefits and Opportunities.							$30,000	$25,000	$45,000	$50,000
Minnesota River Floodplain Model Feasibility Study		$30,000								
Minnesota River Sediment Reduction Strategy	$15,000	$25,000								
Minnesota River Study Area 3 – Bluff Stabilization Project					$100,000	$250,000				
Realignment of the Prior Lake Spring Lake Outlet Channel				$70,000	$30,000					
Riley Creek Project – Downstream of Flying Cloud Drive	$50,000	$75,000								
Schroeder's Acres Park/Savage Fen Stormwater Management Project		$39,555	$181,055							
Seminary Fen Restoration Site A				$75,000						
Seminary Fen Restoration Site B							$50,000	$25,000		
Seminary Fen Ravines Site C-2 and C-3 Studies							$20,000	$40,000		
Seminary Fen Ravines Site C-2 and C-3 Design and Construction								$55,000	$50,000	$65,000
Spring Creek Project		$45,000								
West Chaska Creek Project		$50,000								
Capital Improvements Budget	$375,000	$774,555	$296,055	$220,000	$180,000	$250,000	$125,000	$175,000	$140,000	$165,000

ACTION	Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
TOTAL EXPENDITURES	$965,000	$1,214,555	$886,055	$750,000	$750,000	$775,000	$775,000	$775,000	$800,000	$800,000
REVENUE										
General Levy	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
Planning and Implementation Levy	$475,000	$588,500	$500,000	$500,000	$500,000	$525,000	$525,000	$525,000	$550,000	$550,000
WBF - Pilot Funding (Scott)		$73,275	$73,275							
WBF - Pilot Funding (Carver)		$12,736	$12,736							
WBF - Pilot Funding (Dakota)		$32,725	$32,725							
WBF - Pilot Funding (Hennepin)		$17,319	$17,319							
Special Channel Maintenance Funding										
Grants	$240,000	$240,000								
TOTAL REVENUE	$965,000	$1,214,555	$886,055	$750,000	$750,000	$775,000	$775,000	$775,000	$800,000	$800,000

4.2 COORDINATION WITH LOCAL, STATE, AND FEDERAL GOVERNMENTS AND NON-GOVERNMENT ORGANIZATIONS

This sub-section implements the District's role as a facilitator. It involves staff coordination with local, state, and federal government and non-government organizations, participation in issues discussed during the State of Minnesota Legislative session, and collaboration with the COE to secure federal funds for the Minnesota River 9-foot channel.

Table 4-2: Coordination Strategies with District Partners

Strategy	Coordination Partner(s)	Schedule
Strategy 1.1.1, 1.2.1, 2.3.1, 2.3.4	LGUs, BWSR, MPCA, Metropolitan Council, SWCDs and neighboring WDs and WMO	Quarterly at a minimum
Strategy 1.3.3, 2.2.1, 6.1.1-2	LGUs	Annually
Strategy 2.2.3, 2.2.4	LGUs and SWCDs	Annually
Strategy 2.3.1-3, 3.2.1, 4.2.1-3	LGUs, BWSR, MPCA, Metropolitan Council, SWCDs, and neighboring WDs and WMO	Annually
Strategy 3.3.1	DOH	Annually
Strategy 5.1.2 - 3	LGUs and BWSR	Annually
Strategy 7.1.1	MPCA, LGUs	Annually
Strategy 7.4.1	LGUs, SWCDs and shoreland property owners	Annually
Strategies 8.2.1, 8.2.2, 8.3.1	COE, LGUs	On-going
Strategies 9.1.1-4 and 9.2.1-3	LGUs, TAC, CAC, and SWCDs	On-going, Quarterly

4.3 STUDIES AND PROGRAMS

Studies and programs include:

- Cost share Incentive and Water Quality Restoration Program (All strategies)
- Periodic Assessments and Program Reviews (Strategy 1.3.1)
- Detailed Data Assessments (Strategy 2.3.2)
- Monitoring Program (Strategies 2.3.1-2 and 3.3.1)
- Vegetation Management Standard/Plan (Strategy 7.2.1)
- Dredge Material Beneficial Use Plan (Strategy 8.2.2)
- 9-Foot Channel Strategic Funding Plan (Strategy 8.3.1)
- Education and Outreach Program (Strategies 1.2.1, 4.2.3, 8.1.1, 9.1.1-4 and 9.2.1-3)

These studies and programs were introduced and described in Section 3. Budgets for each study and program, with expenses beyond staff time, are shown in Table 4-1. These preliminary budgets are

reviewed and approved annually. Revenue for the operation and management of the District is primarily through the District's planning and implementation levy.

4.3.1 Sustainable Lake Management Plans

Sustainable lake management plans (SLMPs) will be developed for trout lakes in the District. These SLMPs will assess the following:

- Aquatic plant coverage and management
- Exotic species issues and management
- Shoreline condition and management
- Nutrient and temperature dynamics and management
- Stormwater runoff and groundwater contributions and management
- Roles and responsibilities for management
- Implementation schedule and plan
- Recreational opportunities (pier, public access, etc.…)

4.3.2 Geomorphic Assessments

The geomorphic assessments will consider changes in trout stream alignment, confluence point(s), or geometry, and stream reaches upstream and downstream of confluence point(s). Stream width-to-depth ratios, stream bed slope, meander pattern, and other bed features shall be modeled according to a stable reference reach. Reference reaches are nearby, hydrologically, and geomorphically-stable stream segments. A reference reach could be upstream or downstream, or in a nearby watershed. Assessment of the current and future discharge and sediment regimes shall be based on watershed conditions that are above stream or as close as possible to the stream.

4.3.3 Paleo-limnology Study

The District is home to several floodplain lakes. These lakes are inundated with water and sediment from the Minnesota River. Through this project, the District will analyze sediment cores in two (2) lakes to understand their quality and rate deposition over time.

4.3.4 Fen Stewardship Program

The District, in partnership with the DNR and Metropolitan Council, will develop a fen stewardship program for the District's fens. The effort will review historical data, assess current conditions, and develop a road map for restoration, preservation, and protection of the District's fens.

4.3.5 Water Resources Restoration Fund

This broad-based fund implements Goal 2 and 3, which are to protect, improve, and restore surface water and groundwater quality within the District. This program will fund projects sponsored by LGUs that reduce urban nonpoint source pollution, improve, and protect groundwater quality, and promote surveys and studies of wetlands' (fen) health and management. Program effectiveness will

be measured in two ways: 1) by comparing water quality trends before and after projects are implemented, and 2) by how many projects are funded through the program.

4.4 CAPITAL IMPROVEMENT PROJECTS

Water management organizations that have adopted a watershed management plan, in accordance with M.S. 103B.231, may certify for payment by the counties all or any part of the cost of capital improvement projects (CIP) contained in the capital improvement program of the Plan. A copy of the Plan shall be forwarded to the county boards.

The District is required to hold a public hearing on the proposed CIP. The public hearing details must be published in a legal newspaper once a week for two successive weeks in counties that have affected waters and lands. The last publication shall occur not more than 30 days, or less than ten (10) days before the hearing. The notice shall state the hearing's time and place, the general nature of the proposed improvement, the estimated cost, and the cost improvement's payment method, including the cost allocated to each county. At least ten (10) days before the hearing, the District shall send notices by mail to the counties, each home rule charter, or statutory city or town located wholly or partly within the District's territory. The District recognizes that failure to mail a notice (or have defects in the notice) shall not invalidate the proceedings. After the proceedings and assessment statements have been filed with the auditor, each affected county shall pay its apportioned share of the project's total cost based on the engineer's reports or Managers' order.

Table 4-3 contains descriptions and planning level cost estimates for the CIP identified for the period between adoption of this Plan and the biennial Plan review.

Table 4-3: Lower Minnesota River Watershed District – Capital Improvement Projects

Project Name	Project Descriptions	Project Partner	Estimated Cost	Estimated Timeline
Capital Improvement Projects				
Assumption Creek Hydrology Restoration Project	Assumption Creek is a trout stream, so it is important to maintain the temperature of groundwater discharge. According to the City of Chaska, portions of the creek dry out periodically. It is unknown exactly what has reduced the hydrology of the creek. It may have been the U.S. Army Corps of Engineers' historic creek rerouting for the brick factory, road construction, or other development effects. The project described here will evaluate the opportunities available to resupply the groundwater hydrology to the creek.	City of Chaska and DNR	$30,000	2019
Carver Creek Restoration Project	This will include stabilizing the outer bends with toe protection, grading banks to a more stable slope, and stabilizing the gully.	City of Carver, Carver WMO, Carver County SWCD and USFWS	$95,000	2019 - 2020
Minnesota River Corridor Management Project	Using the Minnesota River as a focal point, this project will examine issues facing the river's complex natural system, a shared resource and a place where varied interests and other systems converge. We seek to (1) create greater understanding of the Lower Minnesota River Corridor and its landscape, (2) demonstrate a desired future for the river and how change in the surrounding landscape can help attain this future, (3) suggest a structure or framework by which the vision can be implemented, and (4) identify shared community and public values that form the basis of the project. (This design is modeled after the Vermillion River Corridor Plan.)	All District LGUs	$100,000	2020 - 2021
Groundwater Screening Tool Model	The District will develop a district-specific groundwater model that can be used as a preliminary screening tool for the evaluation of groundwater appropriation requests related to four fens within the district (Black Dog, Fort Snelling, Nicols, and Quarry Island). The goal of the model is to define the approximate extent of the recharge zones for the fens and provide a method for evaluating whether the proposed groundwater withdrawals may cause significant decline in head at one or more of the referenced fens.	DNR	$150,000	2018 - 2020
District Boundary Modification Project	District staff will work with BWSR and the neighboring watershed districts and water management organizations to review and possibly modify the district's jurisdictional boundary.	BWSR, Carver County WMO, and Riley – Purgatory Bluff Creek WD	$10,000	2018
Downtown Shakopee Targeted BMP Feasibility Study	A feasibility study will be done in downtown Shakopee to identify opportunities for implementing the targeted best management practices.	City of Shakopee	$50,000	2022

Project Name	Project Descriptions	Project Partner	Estimated Cost	Estimated Timeline
Dredge Site Restoration Project	This project consists of implementing the site restoration project identified in the February 15, 2017, *Estimate of Probable Cost, Cargill East River (MN–14.2 RMP) Dredge Material Site* technical memorandum prepared by Burns & McDonnell, Young Environmental Consulting Group, LLC, and Berrini & Associates, LLC, for the Cargill East River (MN – 14.2 RMP) Dredge Material Site located on the Minnesota River in Savage, Minnesota.	BWSR	$480,000	2018 - 2019
Eagle Creek (East Branch) Project	This project will restore approximately 2,400 feet of stream and repair erosion under the 128th Street Bridge. The goals of the project are to reduce erosion and improve fish habitat. Due to beaver dams, the stream cuts into three valley walls, contributing to significant deposits of sediment.	DNR, MN Trout Unlimited and City of Savage.	$20,000	2018 - 2019
East Creek Bank Stabilization Project	Identified in the East Chaska Creek Restoration feasibility study, the scour hole downstream of Crosstown Boulevard Bridge will be repaired, bank armoring installed, toe protection and grade control structures added behind Cuzzy's Brickhouse Restaurant, and bank armoring and toe protection installed on the right bank of East Oak Street.	City of Chaska, MPCA and BWSR	$50,000	2019
East Creek Water Quality Treatment Project	This feasibility study reports that the ideal site to construct a treatment wetland was south of the creek in two vacant lots along Chaska Boulevard. Most lots there are paved right up to the edge of the creek bank. The flow could be diverted from the creek channel into a stormwater treatment system to provide for sediment removal, flood storage, and bacteria treatment.	City of Chaska and MPCA	$75,000	2019 - 2020
Minnesota River Assessment of Ecological and Economic Impacts of Sedimentation	This project will examine sedimentation in the Lower Minnesota River Watershed including monitoring, modeling, and analyzing sediment sources, sinks, and pathways in the watershed; summarizing how sources, sinks, and pathways may have changed; and estimating the economic and ecological effects of sedimentation. The project team will look at how sedimentation (1) changes the stage-discharge relationships that may cause flooding, (2) generates costs to maintain a commercial navigation channel on the Minnesota River, and (3) affects the watershed with its ecological conditions. Through these analyses, a new baseline can be established, and an understanding created of how changes in land use will alter the watershed baseline and create a new condition.	BWSR and Army Corps of Engineers	$150,000	2024 - 2027

Project Name	Project Descriptions	Project Partner	Estimated Cost	Estimated Timeline
Minnesota River Assessment of Water Storage Benefits and Opportunities.	Using the Agricultural Conservation Planning Framework (ACPF) and the Prioritize, Target, and Measure Application (PTMApp), we will determine if a flow reduction would benefit from the placement of storage measures in key locations throughout the basin. This analysis will help us understand if the threshold for meaningful change can be realized to recommend specific levels of storage in the basin. The analysis is needed to accomplish the desired outcomes: (1) hydro-correct DEMs for the lower watershed where storage impacts are desired, (2) run ACPF on priority sub-basins to determine where storage opportunities exist, (3) develop a detailed hydrologic model if one does not exist, (4) run existing and storage scenarios to determine if the amount of the discharges could be lowered for hypothetical rainfall events ranging from 10-year to 100-year events, and (5) summarize the saturation of storage and the maximum change anticipated in the specific agro-ecoregion.	MPCA and BWSR	$150,000	2025 - 2027
Minnesota River Floodplain Model Feasibility Study	We will review the existing Minnesota River floodplain model to determine if updates are required.	DNR, Army Corps of Engineers, and all LGUs within the District	$30,000	2019
Minnesota River Sediment Reduction Strategy	This project team will collaborate with the MPCA in developing strategies for evaluating and mitigating sediment loads going into the Minnesota River.	MPCA and BWSR	$40,000	2018 - 2019
Minnesota River Study Area 3 – Bluff Stabilization Project	To address river bank erosion, we will analyze the design and construction of the Minnesota River at Study Area 3 project in Eden Prairie. A study was completed in October 2008 for the City of Eden Prairie in cooperation with the district. Our project will expand the 2008 study by collecting and analyzing additional data that will extend to the final design, permitting, and construction.	City of Eden Prairie	$350,000	2022 - 2023
Realignment of the Prior Lake Spring Lake Outlet Channel	This project will place additional capacity and control structures in the channel to handle increased runoff that is draining into the channel because of developments.	City of Shakopee	$100,000	2021 - 2022
Riley Creek Project – Downstream of Flying Cloud Drive	The project will provide an energy dissipation below the County Road 61/ Flying Cloud Drive bridge and redirect flows away from outside the creek meanders.	Hennepin County	$75,000	2018 - 2019
Schroeder's Acres Park/Savage Fen Stormwater Management Project	This project will evaluate options for incorporating storm-water wetland and irrigation reuse systems on the site and address phosphorous, temperature, metals, E. coli and runoff volume in Eagle Creek.	City of Savage and DNR	$220,000	2019 - 2020
Seminary Fen Restoration Site A	At the intersection of Engler and Audubon in Chaska, Minnesota, 3.61 acres of wetland will be purchased and restored. This site is dominated by reed canary grass and offers the greatest threat to the rare plants of the Seminary Fen Wetland Community. The site is next to a 6-acre wetland that was restored by the City of Chaska in partnership with the DNR.	City of Chaska and DNR	$75,000	2021

Project Name	Project Descriptions	Project Partner	Estimated Cost	Estimated Timeline
Seminary Fen Restoration Site B	A partially drained 17-acre wetland from Falls Curve Road to Old Highway 12, that is predominantly growing reed canary grass, will be restored. The restoration involves disabling the drainage system and restoring vegetation.	City of Chaska and DNR	$75,000	2024 - 2025
Seminary Fen Ravines Site C-2 and C-3 Studies	Seminary Fen Ravine Sites C-2 and C-3 are actively discharging sediment into the Seminary Fen Wetland Complex. This project will conduct a ravine study to estimate sediment contribution to the Seminary Fen from sites C-2 and C-3 and provide approaches and cost estimates for correcting the erosion problems.	City of Chaska and DNR	$60,000	2024 - 2025
Seminary Fen Ravines Site C-2 and C-3 Design and Construction	The final design and construction will be done for the Ravine Sites C-2 and C-3, which are discharging sediment into the Seminary Fen Wetland Complex.	City of Chaska and DNR	$170,000	2025 - 2027
Spring Creek Project	This project consists of retrofitting two catch basins into the structural treatment devices in the Lenzen first and second additions. In addition, the project will treat untreated discharge that comes from upstream into Spring Creek at 6th Street.	City of Carver	$45,000	2019
West Chaska Creek Project	The project will re-meander approximately 1,100 linear feet of a ditched segment of West Chaska Creek. Lengthening the channel will reduce water velocity, lower sheer stress on the banks, reconnect the creek to its floodplain, and reduce the amount of sediment transported downstream to the Minnesota River. Based on upstream reference reaches and changes observed since the creek was straightened, the re-meander project will reduce total suspended solids by an estimated 4,400 pounds per year for 30 years.	Carver County, City of Chaska and Carver County WMO	$50,000	2019
Potential Projects - Unfunded				
Trout Stream #4 Restoration	The DNR and MN Trout Unlimited are considering rehabilitating a trout stream near the Cedar Bridge area. These efforts are to keep the stream listed as a trout stream by the DNR. The City of Burnsville may need to make storm sewer and drainage improvements in the existing system to help the stream become a viable trout habitat.	DNR, MN Trout Unlimited, City of Burnsville	$10,000	2018
Resiliency Assessment of Major Drainage Systems and Improvements	This assessment includes a review of the City of Burnsville's major drainage systems to identify areas where failure of major drainage systems would necessitate expensive repairs in a short time and/or cause significant damage to private buildings. These high-risk areas will be identified to aid staff in planning future improvements.	City of Burnsville	$390,000	2018 - 19
Keller Lake to Minnesota River Hydrologic and Hydraulic Analysis and Report	This analysis of the chain of water bodies that starts at Keller Lake and ends at the Minnesota River will identify adjustments that could be made to optimize water levels in the system. Changing rainfall frequencies and amounts are the reasons for this reevaluation.	City of Burnsville	$75,000	2019
Minnesota River Quadrant (MQR) Stormwater and Floodplain Study and Report	This analysis of the MRQ's overall stormwater management system needs will accommodate future development. The report will guide the review of future developments in the MRQ to optimize the location of future stormwater management facilities.	City of Burnsville	$50,000	2022

Project Name	Project Descriptions	Project Partner	Estimated Cost	Estimated Timeline
Bluff Area Risk Analysis	This analysis of the bluffs within the city will identify areas where the risk of failure is high or where failure would lead to a public safety risk or create a significant expense in a short time. This study will aid in the planning of related improvements in future capital improvement plans and future maintenance operations to proactively prevent slope failure.	City of Burnsville	$50,000	2018
Ravine Restoration	This analysis of ravines will target those most in need of maintenance and then fund their repair to prevent loss of soils, retaining property values and reducing off-site deposit of these soils.	City of Burnsville	$1,000,000	2019-2021
Transportation Capital Improvement Plan	This plan includes storm sewer system repair in Dakota County and the cities within it. Transportation infrastructure should be more environmentally sensitive.	Dakota County, Applicable LGUs	$2,500,000	2018-2022
Parks and Greenways Capital Improvement Plan	This plan advances natural resource protection and restoration of the park and greenway system. In addition to managing 2,280 acres of land that have been restored or are undergoing restoration, the 2018–2022 CIP will restore an additional 956 acres. No specific projects are named, but $1.023 million dollars is set aside annually for "Natural Resources Management: Base Program Funding."	Dakota County	$1,023,000	2018-2022
Land Conservation Capital Improvement Plan	This program works with willing landowners and partners to permanently protect and manage shoreland along rivers, streams, and undeveloped lakeshore; high-quality natural areas; wetlands; and associated agricultural land throughout Dakota County. Easements are a main component of this plan, mainly on agricultural lands, but on other private lands as well. Monitoring of the easements will also take place to ensure compliance with legal and stewardship plans and NRMP (natural resources management systems plan) requirements.	Dakota County, State of MN, Environmental Legacy Fund	$11,335,000	2018-2022
Salisbury Hill (CR 51) Ravines	This is a high-priority project for the WMO. It's willing to lead, finance, or provide incentives for this project. Unstable ravines are contributing large amounts of sediment to the Minnesota River and affecting county road maintenance. This project was included as a CIP in the previous plan but has been delayed because of changing priorities from the 2014 disaster and the need to wait for decisions about the future of roads in the area. The schedule is currently unknown because we are waiting for decisions about roads in the area.	Scott County WMO	$750,000-$1,500,000	2019-2026
Blaha Ravine	These ravine stabilization projects have been discussed with the City of Belle Plaine in the past; they have now included it as an official request in the letter of issues submitted to the Scott WMO at the start of the plan update process. The Scott WMO acknowledges that this will have some pollutant-loading reduction to the Minnesota River, but the reduction is small compared to the whole basin; thus, it is listed as a Tier 2 project. The City of Belle Plaine will lead the project.	Scott County, Belle Plaine, Scott WMO	$234,000	2019-2026
Chestnut Ravine		Scott County, Belle Plaine, Scott WMO	$102,000	2019-2026
SSTS Direct Discharge Incentives	In 2007, the county board established a cost-share program to accelerate the elimination of direct discharge SSTS. The approved TMDLs for Carver and Bevens Creeks identified that some of the	Carver County, CCWMO	$150,000	

Project Name	Project Descriptions	Project Partner	Estimated Cost	Estimated Timeline
	fecal coliform entering those water bodies was from direct discharge and (failing) septic systems. The program offers direct incentives and low-interest loans to landowners to fix these systems, which are mainly concentrated in rural and agricultural areas in the county. The program is responsible for the entire county, except the City of Chanhassen, which has its own program.			
Blakeley Bluffs Ravine Stabilization, Phase 1	Phase 1 calls for assessment of ravine erosion on three county parcels within the future Blakeley Bluffs Park Reserve. Active erosion is occurring in several ravines. It appears the current rate of erosion is causing sedimentation and pollution of the dry creek bed leading to the Minnesota River. Further erosion has the potential to cut further into the bluff top areas, potentially encroaching on areas designated for future park use. Further understanding of the issue is needed to determine an appropriate response. Stabilization measures are likely needed to slow down the erosion currently taking place.	Scott County, Clean Water	$100,000	2019-2020
Wetland Mitigation Bank	Wetland credits are needed for projects that are not eligible for the BWSR Local Road Wetland Replacement Program. The program does not provide mitigation for impacts due to trails or capacity-only construction projects. These types of improvements require the purchase of wetland banking credits on the open market or on-site mitigation. This project will work with several sites and potential property owners where wetland restoration is feasible and cost-effective to develop a wetland restoration project. If easements on suitable sites can be secured, construction could occur in the same year, and some credits could be released for use by the county as soon as as-built plans are prepared and certified.	Scott County, State of MN	$795,000	2019-2023
CH 51 & CH 53 Culvert Replacement	Culverts will be replaced to address continuing erosion stabilization problems along the right-of-way. These culverts are larger in size and cannot be replaced by county maintenance forces. CH 51: between CH 1 and gravel portion. CH 53: ~ 1/2 mile south of TH 169	Scott County	$668,000	2018

4.5 FUNDING MECHANISMS

Laws regarding project funding are different between metropolitan WDs and WMOs, and out-state watershed districts. M.S. Chapter 103D applies to all watershed districts, while Chapter 103B applies only to the Minneapolis/St. Paul metropolitan area watershed districts and WMOs. Since the District is both a watershed district and in the metropolitan area, both sets of statutes apply. This section provides a summary of the funding sources available to the District, followed by a discussion of the District's proposed funding method(s).

4.5.1 Funding Statutes Available to Watershed District

4.5.1.1 Special Assessments

M.S. 103D.601 allows a project to be instituted by resolution by a majority of the watershed district managers. The project must be financed by grants totaling at least 50 percent of the estimated cost, and the engineer's estimate of costs to parties (including assessments against benefited properties but excluding state, federal, or other grants) is not more than $750,000. Initiated projects using this procedure must be paid for by special assessments against benefitting properties. Benefitted properties are defined in M.S. 103D.725.

M.S. 103D.701 requires that to initiate projects, watershed districts must first have a BWSR-approved watershed management plan. Projects that are to be paid for by assessment of benefited property must be initiated by a petition, by unanimous resolution of the managers, or by some other method prescribed in statute.

M.S. 103D.705 provides for cities or residents to petition a watershed district for a project that generally conforms to the watershed management plan. The petitioners must guarantee the funds used to pay for the project's preliminary feasibility studies.

4.5.1.2 Ad Valorem Taxes

M.S. 103D.905 allows watershed district managers to use a portion of their administrative fund for project construction and maintenance beneficial to the watershed district. The upper limit of this fund is $250,000 per year for the District. This also authorizes watershed district managers to levy a tax over the entire watershed district (an ad-valorem tax) to pay the cost attributable to the basic water management features of projects initiated by petition of a municipality/political subdivision, or at least 50 resident owners whose property is within the watershed. The levy may not exceed 0.00798 percent of the taxable market value for a period not to exceed 15 consecutive years.

Procedure for Projects to be Funded Using M.S. 103D.905, Subd. 3 (Basic Water Management Features Projects)

Formal minor plan amendments are not required for projects funded using the additional levy allowed under M.S. 103D.905, Subd. 3. Therefore, the District will follow an informal proposed project information process to inform the LGUs about these proposed projects. The District

will distribute the proposed project information to the affected LGUs for review and comment, but not to the state review agencies or the Metropolitan Council. BWSR will not take formal action, since it is not a formal amendment.

M.S. 103B.231 requires watershed districts within the Twin Cities metropolitan area to prepare a water management plan. The statute requires that a capital improvement project be part of the Plan. For those improvements included in the plan M.S. 103B.231, Subd.10 and M.S. 103D.605, allow watershed districts to implement projects without a petition. According to these statutes, watershed districts may levy ad valorem taxes to pay for capital improvements (including maintenance of improvements) either over the entire watershed district (M.S. 103B.241), or over all property within a portion or subwatershed of the watershed district (M.S. 103B.251). M.S. 103B.241, like M.S. 103D.729, also allows watershed districts to accumulate funds to finance improvements as an alternative to issuing bonds. For the District to use either funding mechanism, the District must adequately describe the projects, studies, and project maintenance in the Plan. The Plan must also specify that the source of funding will be in accordance with these statutes. Currently there is no levy limit.

The advantage of using M.S. 103B.231 (Subd. 10) and 103B.241 is that a hearing is not required for each project. If the capital improvement project is specified in the Plan, the watershed district need only conduct an annual hearing on the entire capital improvement program, in accordance with M.S. 103B.241. Under M.S. 103B.241, projects are paid for by ad valorem tax over the entire watershed district.

M.S. 103B.251, on the other hand, allows the watershed district to set up a special taxing district or subwatershed over which funds are raised by an ad valorem tax. M.S. 103B.251 requires that (a) a copy of the Plan be filed with the county, (b) a special improvement hearing be held for the capital improvement projects, and (c) the county raises the funds by selling bonds paid for by an ad valorem tax over the subwatershed/special tax district.

4.5.1.2.1 Procedure for Projects to be Funded Using M.S. 103B.241 or M.S. 103B.251

Formal minor plan amendments will be required for projects funded under M.S. 103B.241 or M.S. 103B.251 that are not described in sufficient detail in the Plan. The District will follow the formal minor plan amendment process of MN Rules 8410.0140 for these types of projects. The formal process requires that the District distribute the plan amendment to the affected local units of government, the Metropolitan Council, and the state review agencies (including BWSR) for review and comment. The counties will have 90 days from receipt of the minor plan amendment to either approve or disapprove the amendment, and to hold any public hearings regarding the amendment. Unless the District agrees to an extension, if a county fails to complete its review within the prescribed period, the amendment will be deemed approved by that county. The proposed amendment will be deemed as a minor amendment if either BWSR

agrees that the amendment is a minor amendment, or BWSR fails to act within 45 days of receipt of the minor plan amendment.

4.5.1.2.2 Procedure Following Approval of Proposed Project Information or Minor Amendment

Following approval of the proposed project information or minor amendment, and prior to advertising for project bids, the District will hold at least one additional public hearing to review the final design of the proposed project. At this point, the District shall have completed the final design plans and specifications necessary for the contract bidding process and construction. Although this last stage of public hearings is not required by statute, the public and other interested parties will have an additional opportunity to review and comment on the details of the proposed project.

4.5.1.3 Utility/Fees

Like stormwater utilities for cities, M.S. 103D.729 allows watershed districts to establish a water management district, or a subwatershed within the District, for collecting revenues and paying project costs initiated under M.S. 103B.231, M.S. 103D.601, 605, 611, or 730. For the District to use this funding mechanism, it must be included in its Plan, or the Plan must be amended to include this funding mechanism in accordance with 103D.411 or 103D.231 and in compliance with subdivisions 3 and 4.

4.5.2 Emergency Projects

M.S. 103D.615 allows watershed district managers to declare an emergency and order work to be done without a contract. The cost of work can be paid for either by special assessment against benefitted properties or an ad valorem tax levy, if the cost is not more than 25 percent of the most recent administrative ad valorem levy.

M.S. 103B.252 allows watershed districts to declare an emergency and order work to be done without a contract. M.S. 103B.252 is like M.S. 103D.615, except it does not contain levy limits. In addition to the abovementioned funding sources, the District could receive funding from various state, federal, and private sources, such as grant and loan programs. This affords the District the opportunity to use grants and loans for projects instead of county-issued bonds.

4.5.3 Proposed Funding Mechanisms

The District has financed its past administrative, program, and project costs through its annual administrative fund ad valorem tax levies under the authority of the Watershed Act (M.S. 103D.905). The District's administrative fund levy limit is $250,000. The District's administrative fund is used only for initiatives that benefit the water resources of the District; it is not used for projects that benefit commercial navigation. Many of the District's efforts and funding have been put toward activities that address water quality, runoff management, or flood control problems and issues. In the past, the District has maintained a capital reserve fund consisting of any unused portions of previous administrative levies.

Both the Watershed Act, referenced above, and the Metropolitan Surface Water Management Act (M.S. 103B.201 *et seq.*) provide additional revenue generating authority to the District. For projects creating a unique benefit to individual properties, the District may adopt and levy benefits assessments against project-benefitted properties. For projects and programs of District-wide benefit, that are included in the District's CIP, the District may impose an additional ad valorem tax levy to generate the revenue necessary to implement programs and projects on its CIP. For special water or resource management projects, the District may establish a Water Management District within which it may impose a water management charge to pay for basic water management activities made necessary by land uses with in the Water Management District.

Other than the administrative fund, all revenue generating authorities of the District require strict compliance with administrative proceeding requirements found in the Watershed Act and Metropolitan Surface Water Management Act.

4.5.4 Petitioned Projects

The District will place a priority on petitioned projects that are identified as implementation projects in future resource plans. The advantages of a petition process are: 1) the statute sets forth a definite process for the petition and subsequent actions; 2) the Managers are required to decide whether to order the project or not; and 3) if additional funding is needed, the statute allows for ad valorem funding of these petitioned projects. The disadvantage of the petition process is that it may require more lead time to approve a project than the current District process. M.S.103D.905, subd.3 allows the District to levy an additional ad valorem tax over the entire District to pay for the basic water management features of projects, which have been initiated by a petition of a municipality within the watershed. The Managers anticipate funding projects using this authority, except projects that benefit navigation. If no city petitions the District for a project which the District believes is a priority, the District may consider initiating the project under the provisions of Chapter 103.

5 IMPACT OF IMPLEMENTATION

This section discusses how the District's implementation program will affect administrative and operational costs to the LGUs.

5.1 LOCAL WATER PLAN DEVELOPMENT AND IMPLEMENTATION

LGUs are required to develop a local water plan (LWP) with a coordinated system of managing the watershed on a regional or subwatershed basis consistent with this Plan. In accordance with MN Rules 8410.0160, each LWP must, at a minimum, meet the requirements for LWPs in Minnesota Statutes, section 103B.235, except as provided by the watershed management organization plan under part 8410.0110, subpart 3. This requirement allows for all or part of the Plan to be adopted by an LGU for all or part of its LWP within 18 months following approval of the District's amended Plan.

5.1.1 District LWP Review

After consideration, but before adoption by the governing body, each LGU shall submit its LWP to the District for review and consistency with this Plan. The District shall approve or reject all or part of the LWP. The District shall have 60 days to complete its review and shall, as part of its review, consider the comments by the Metropolitan Council. If the District fails to complete its review within the prescribed period, the LWP shall be deemed approved unless the LGU agrees to an extension.

5.1.2 Metropolitan Council Review

Concurrent with LWP submission to the District, as provided in M.S. 103B.235 Subdivision (Subd.) 3a, each LGU shall submit its LWP to the Metropolitan Council for review and comment. The Metropolitan Council shall have 45 days to review and comment on the LWP (or parts of the LWP) with respect to consistency with the council's comprehensive development guide. The Metropolitan Council's 45-day review period shall run concurrently with the District's 60-day review period. The Metropolitan Council shall submit its comments to the District and shall send a copy of its comments to the LGU. If the Metropolitan Council fails to submit comments within the 45-day period, the District shall complete its review as provided in M.S. 103B.235. Subd. 3a.

5.1.3 Administration and Enforcement of LWPs

LGUs are responsible for implementing and enforcing LWPs covering their jurisdictions. The District will have oversight responsibility to ensure implementation of LWPs. Oversight will include spot checks of municipal projects and program audits. If the LGU is found non-compliant, the District will work with the LGU to correct the issue. However, if problems persist, the District will develop a permitting program to assume the land use authorities granted by M.S. 103B and 103D to

enforce the standards in this Plan. The District's preferred position is to avoid unnecessary duplication of permitting programs.

5.2 EXISTING CONTROL

The District's intention in developing this Plan was to limit additional requirements imposed upon LGUs. The impact of the District's Plan on each LGU is difficult to quantify, although general observations can be made. Most of the Plan's implementation program elements are either solely District projects, projects initiated by the LGUs, or voluntary projects/programs that call for cooperation and collaboration with LGUs. Many of the implementation program elements reflect the goals, policies, and requirements of state and regional units of government that LGUs need to address. The District recognizes the importance of minimizing the financial burden on the member municipalities and taxpayers. These standards were developed in compliance with MN Rules 8410.0080 and may require additional resources and work for the LGUs, at least in the short-term.

6 ADMINISTRATION

6.1 AMENDMENTS TO THE PLAN

This Plan remains in effect through 2027, unless it is superseded by the adoption and approval of a subsequent plan. All amendments to this Plan must follow the procedures set forth in this section, or as required by Minnesota laws and rules. Amendments to the Plan may be proposed by any person, special interest group, LGU, or federal, state, or regional agency to the District managers. All proposed amendments must be submitted to the District Administrator in writing and must identify the problem, need, rationale for District involvement, and cost estimate. The District will review all proposals at monthly Board meetings to determine whether or not proposed changes fit state laws and rules governing minor or major amendments.

6.1.1 Major Amendments

MN Rules 8410.0140, Subp. 2, requires that all plan amendments adhere to the procedure documented in M.S. 103B.231, Subp. 11, except when the proposed amendments constitute minor amendments according to the following provisions:

A. The District sent copies of the amendment(s) to the Plan review authorities for review and comment, allowing at least 30 days for receipt of comments, ensured that the minor amendment procedure was followed, and directed comments to the District and the BWSR Board.
B. BWSR Board has either agreed that the amendment(s) is minor or failed to act within five (5) working days of the end of the comment period specified in item A, unless an extension is mutually agreed to with the District.
C. No county board filed an objection to the amendment(s) with District and BWSR Board within the comment period specified in item A, unless the county and District agreed to an extension.
D. The District held a public meeting to explain the amendment(s) and published a legal notice of the meeting twice, at least seven (7) days and 14 days before the meeting date.
E. The amendment(s) is not necessary to make the Plan consistent with an approved and adopted county groundwater plan.

Major changes, or changes that affect other jurisdictions within the District, shall be submitted to those jurisdictions for review and comment as required by M.S. 103B.231, Subp. 11. The District staff shall notify the sponsor of each proposed amendment of the public meeting time and place and shall publish or distribute meeting notices summarizing all proposed changes. Furthermore, before any action on the proposed amendment, LGUs shall be given a period of sixty (60) days review if the action proposes changes in funding. Changes requiring LGU and agency review will indicate the impact on LWP and identify those local plans that will require revision upon approval of the change. The review period shall be limited to sixty (60) days.

Concurrently, the proposed changes shall be submitted to the Metropolitan Council, DNR, MPCA, DOA, DOH and BWSR. Following the prescribed review period, or upon receipt of all comments, the District shall publish a notice of public hearing on the proposed plan amendments in at least one legal newspaper in each of the municipalities covered under the Plan.

6.1.2 Amendment Format and Distribution

Upon completion, the District will submit the Plan amendment to the appropriate review authorities in a format consistent with MN Rules 8410.0140, Subp. 4. The rule requires that, unless the entire document is reprinted, all adopted amendments must be printed with replacement pages for the Plan. Each page must:

- Show deleted text as stricken and new text as underlined
- Be renumbered as appropriate
- Include the effective date of the amendment

The District will maintain a distribution list of everyone who receives a copy of the Plan. Within 30 days of adopting an amendment, the District will distribute copies of the amendment to everyone on the distribution list.

6.2 ANNUAL REPORTING

MN Rules 8410.0150 requires that the District complete annual financial activities and audit reports within 120 days of the end of the calendar year. The District shall submit to BWSR the aforementioned reports, separately or combined as a single document, for the preceding fiscal year if it has expended or accrued funds during that time.

6.2.1 Financial Report

MN Rules 8410.0150, Subp. 2., requires that all annual financial reports have the following information:

- District approved budget
- Reporting of revenue
- Reporting of expenditures

6.2.2 Activity Report

The activity report shall include the following, as outlined in MN Rules 8410.0150, Subp.3:

- A list of the District managers, advisory committee members, and manager vacancies at the end of the reporting year, including the names of designated officers and members, contact information, and each appointed member's county
- A list of District employees and consultants, including mailing addresses and telephone numbers

- An assessment of the previous year's annual work plan that indicates whether the stated goals and objectives were achieved or not achieved, with an explanation
- A projected work plan for the next year indicating the desired goals and objectives
- A summary of water quality monitoring data collected by the District or its local units of government
- An evaluation of the local plan adoption and implementation status based on a review of LGU activities by the District during the past year
- A copy of the written communication required by part 8410.0100, subpart 3
- The District's activities related to the biennial solicitations for interest proposals for legal, professional, or technical consultant services under M.S., section 103B.227, subdivision 5
- An assessment of fund balance changes, including a description of the program costs with respect to the overall annual budget.

6.2.3 Audit Report

A financial audit report, prepared by a certified public accountant or the state auditor, shall include a balance sheet, a classification of revenues and expenditures, an analysis of changes in final balances, and any additional statements considered necessary for full financial disclosure.

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Appendix A: Lower Minnesota River Watershed District Legal Description

IV.

That the territory proposed to be included in the district is as follows:

Beginning at a point in the Mississippi River where the boundary between Ramsey County and Dakota County intersects the east line of Section 22, Township 28 North, Range 23 West, 4th principal meridian; thence south along the east boundary of said Section 22 to the north right-of-way line of T. H. No. 13, thence westerly and southwesterly along said north right-of-way limits of T. H. No. 13 to a point where the same intersects the west line of Section 19, Township 27, Range 23; thence north along the west line of said Section 19 to a point where the same intersects contour line 800 feet above sea level, 4th general adjustment, 1929; thence southwesterly along said 800 ft.

contour line to a point where said contour line intersects the boundary line between Scott County and Dakota County; thence south on said boundary line to the north right-of-way line of T. H. No. 13; thence west along the north right-of-way line of said T. H. No. 13 to a point where the same intersects said contour line 800 thence westerly along the north right-of-way line of said T. H. No. 13 to a point in Section 16, Township 115, Range 21 West, 5th principal meridian, where said T. H. No. 13 intersects said contour line 800; thence following the course of said 800 ft. contour line to a point where the same intersects the south line of Section 11, Township 115, Range 23 West, 5th principal meridian; thence west along the south side of said Section 11 and Section 10 to a point near the south quarter corner of said Section 10 where the south line of said Section 10 intersects said 800 ft. contour line; thence southwesterly along said 800 ft. contour line to the north 16th line of Section 21, Township 115, Range 23 West, 5th principal meridian; thence west along said north 16th line through Sections 21 and 20 and a part of Section 19 to a point where said north 16th line intersects the 800 ft. contour line on the west side of the Minnesota River; thence northerly along the course of said 800 ft. contour line on the westerly and northerly side of the Minnesota River to a point where said 800 ft. contour line intersects the E-W quarter line of Section 36, Township 116 North, Range 22 West, 5th principal meridian; thence east along said quarter line to the west line of Section 31, Township 116, Range 21 West, 5th principal meridian; thence south along the west line of said Section 31 to the southwest corner thereof; thence east along the north side of Section 6, Township 115 North, Range 21 west, 5th principal meridian, to the northeast corner of said Section 6; thence south along the east side of said Section 6 to a point at or near the east quarter corner of said Section 6 where the same intersects said 800 ft. contour line; thence easterly along the course of said 800 ft. contour line to a point where the same intersects the south line of Section 21, Township 27 North, Range 24 West, 4th principal meridian, thence east along the south line of said Section 21 to a point where the same intersects said contour line 800; thence easterly along the course of said contour line 800 to a point where the same intersects the Mendota Bridge highway; thence easterly to the nearest point on the west end of Pike Island; thence northerly along the west end of said Pike Island to the Mississippi River; thence easterly along the north shore of said Pike Island to the easterly tip thereof; thence on a straight line to the point of beginning.

Appendix B: Reserved

Appendix C: Reserved

Appendix D: Reserved

Appendix E: Reserved

Appendix F: Reserved

Appendix G: Reserved

Appendix H: Reserved

Appendix I: Reserved

Appendix J: Reserved

Appendix K: Lower Minnesota River Watershed District Draft Standards

1 Appendix K: Lower Minnesota River Watershed District Draft Standards

Table of Contents

1 Foreword

In 1955, the Minnesota State Legislature enacted the initial Minnesota Watershed Act (Act), previously called Minnesota Statute (M.S.) Chapter 112. Pursuant to this statutory authority, five counties (Hennepin, Ramsey, Dakota, Scott, and Carver) petitioned for a watershed district. On March 23, 1960, the Minnesota Water Resources Board, now the Board of Water and Soil Resources (BWSR), established the Lower Minnesota River Watershed District (District or LMRWD). The District, as stated in M.S. 103D.201, is responsible for conserving the state's natural resources by land use planning, flood control, and other conservation projects. The District uses sound scientific principles for the protection of public health and welfare and the provident use of natural resources.

The District is located in the southwest part of the Twin Cities metropolitan area along the Minnesota River. It encompasses 80 square miles of Carver, Hennepin, Dakota, Scott, and Ramsey Counties, which includes the Minnesota River Valley from Fort Snelling, at the confluence of the Minnesota and Mississippi Rivers, upstream to Carver, Minnesota. The width of the District includes the bluffs on both sides of the Minnesota River within this reach of the river. Portions of the communities of Mendota Heights, Mendota, Lilydale, Eagan, Bloomington, Burnsville, Savage, Shakopee, Eden Prairie, Chanhassen, Chaska, Jackson Township, Louisville Township, and Carver are located within the District's boundaries.

The Act, and its successors, necessitates that the District prepare and implement a watershed management plan (Plan) for the lower Minnesota River watershed area. Additionally, the Metropolitan Surface Water Management Act (M.S.103B.201-.253) requires certain plan components and local government compliance. The District has adopted a Plan pursuant to the Act. These Standards implement the Plan's principles and objectives. If the Standards identified are not implemented, the District will exercise its authority granted under M.S. 103B to enforce these Standards through the creation of rules and a permitting program.

2 Relationship with Municipalities

The District recognizes that the control and determination of appropriate land use is the responsibility of the municipalities or local government units (LGU). Given its desire for local implementation and coordination of regulatory authorities, the District anticipates implementation and enforcement of the Standards outlined in this document by the appropriate LGU. The exception being, the Shoreline and Streambank Alteration, Water Appropriations and Water Crossing Standards which will be administered by the Minnesota Department of Natural Resource with input from District.

In accordance with M.S. 103B.235, LGUs are responsible for adopting Local Water Plans (LWP) and local controls necessary to implement the directives and standards set forth in the Plan and presented herein. The District recognizes that the authorities and procedures used by the various

LGUs in implementing these Standards will not be identical, and therefore, some LGUs may occasionally need language and procedures that vary from the language and procedures outlined herein. In all cases, the District reserves the right to conduct periodic audits/inspections of LGU programs, project approvals, permits, and other processes to assess conformance with these Standards. The Standards are intended as a minimum threshold requirement that must be met, and LGUs may adopt more restrictive requirements.

The District prefers to allow LGUs to serve as the permitting authority for these Standards. To avoid unnecessary duplication of permitting programs, the District anticipates providing oversight in order to confirm that LWPs, including the Standards, are properly implemented and enforced. If an LGU, however, fails to properly implement an adopted LWP, or fails to adopt and implement local controls necessary to implement these Standards, as determined by the District, the District may revoke the LWP approval and take enforcement actions as required to ensure compliance with these Standards. The District will not be responsible for liabilities, costs, and damages caused by the lack of proper implementation by an LGU.

3 Definitions

Regarding these Standards, unless the context otherwise requires, the following terms are defined below. References in these Standards to specific sections of the Minnesota Statutes or Minnesota Rules include amendments, revisions, or recodifications of such sections. The words "shall" and "must" indicate a mandatory standard; the word "may" indicates a permissive standard.

Abstractions: Removal of stormwater from runoff, by such methods as infiltration, evaporation, transpiration by vegetation, and capture and reuse, such as capturing runoff for use as irrigation water.

Agricultural Activity: The use of land for the growing and/or production of agronomic, horticultural, or silvicultural crops, including nursery stock, sod, fruits, vegetables, flowers, cover crops, grains, Christmas trees, and grazing.

Alteration or Alter: When used in connection with public waters or wetlands, is any activity that will change or diminish the supply, course, current or cross-section, of public waters or wetlands.

Atlas 14: Precipitation frequency estimates released by the National Oceanic and Atmospheric Administration's National Weather Service Hydrometeorological Design Studies Center. The information supersedes precipitation frequency estimates in Technical Paper No. 40 (1961), National Weather Service HYDRO-35 (1977) and Technical Paper No. 49 (1964).

Base Flood Elevation: The computed elevation to which floodwater is anticipated to rise during the base flood. Base flood elevations are shown on Flood Insurance Rate Maps (FIRMs) and on the flood profiles.

Best Management Practices or BMPs: Structural or non-structural methods used to treat runoff, including such diverse measures as ponding, street sweeping, filtration through a rain garden and

infiltration to a gravel trench.

Bioengineering: Various shoreline and streambank stabilization techniques using aquatic vegetation and native upland plants, along with techniques such as willow wattling, brush layering, and willow-posts.

Buffer zone: An area of maintained grassy or woody vegetation adjacent to a waterbody.

Compensatory storage: Excavated volume of material below the floodplain elevation required to offset floodplain fill.

Construction activity: Disturbance to the land that results in a change in the topography, existing soil cover (both vegetative and non-vegetative), or existing soil topography that may result in accelerated stormwater runoff, leading to soil erosion, and the movement of sediment into surface waters or drainage systems.

Development: The construction of any public or private improvement project, infrastructure, structure, street, or road, or the subdivision of land.

Dewatering: The removal of water for construction activity.

Drain or Drainage: Any method for removing or diverting water from waterbodies, including excavation of an open ditch, installation of subsurface drainage tile, filling, diking or pumping.

Easement: The right to use the land of another owner for a specified use and may be granted for the purpose of constructing and maintaining walkways, roadways, subsurface sewage treatment systems, utilities, drainage, driveways, and other uses.

Erosion: The wearing away of the ground surface as a result of wind, flowing water, ice movement, or land-disturbing activities.

Erosion and Sediment Control Plan: A plan of BMPs or equivalent measures designed to control runoff and erosion and to retain or control sediment on land during the period of land-disturbing activities in accordance with the applicable standard.

Excavation: The artificial removal of soil or other earth material.

Existing conditions: Site conditions at the time of application consideration by the LGU or District, before any of the work has commenced, except that when impervious surfaces have been fully or partially removed from a previously developed parcel, but no intervening use has been legally or practically established, "existing conditions" denotes the previously established, developed use and condition of the parcel.

FEMA: Federal Emergency Management Agency

Fens: Rare and distinctive wetlands characterized by a substrate of non-acidic peat and dependent on a constant supply of cold, oxygen-poor groundwater rich in calcium and magnesium bicarbonates.

Fill: Any rock, soil, gravel, sand, debris, plant cuttings, or other material placed onto land or into

water.

Floodplain: The area adjacent to a waterbody that is inundated during a 100-year flood.

Floodway: The channel of the river or stream and the adjacent land that must remain free from obstruction, so the 100-year flood can be conveyed downstream.

Fully reconstructed: The reconstruction of an existing impervious surface that involves site grading and subsurface excavation so that soil is exposed. Mill and overlay and other resurfacing activities are not considered fully reconstructed.

Groundwater Recharge: The replenishment of groundwater storage through infiltration of surface runoff into subsurface aquifers.

Hardship: As defined in Minnesota Statues, Chapter 394.

High Value Resource Area or HVRA: Portion of land (or a watershed) contributing runoff to a trout water and/or fen within the Lower Minnesota River Watershed District.

Impervious Surface: A constructed hard surface that either prevents or retards the entry of water into the soil and causes water to run off the surface in greater quantities and at an increased rate of flow than prior to development. Examples include rooftops, sidewalks, patios, driveways, parking lots, storage areas, and concrete, asphalt, or gravel roads.

Infiltration: A passage of water into the ground through the soils.

Infrastructure: The system of public works for a county, state, or municipality including, but not limited to, structures, roads, bridges, culverts, sidewalks; stormwater management facilities, conveyance systems and pipes; pump stations, sanitary sewers and interceptors, hydraulic structures, permanent erosion control and stream bank protection measures, water lines, gas lines, electrical lines and associated facilities, and phone lines and supporting facilities.

Land-Disturbing Activity: Any change of the land surface to include removing vegetative cover, excavation, fill, grading, stockpiling soil, and the construction of any structure that may cause or contribute to erosion or the movement of sediment into water bodies. The use of land for new and continuing agricultural activities shall not constitute a land-disturbing activity under these standards.

Landlocked basin: A localized depression that does not have a natural outlet at or below the 100-year flood elevation.

Linear project: Construction or reconstruction of a public road, sidewalk or trail, or construction, repair or reconstruction of a utility or utilities that is not a component of a larger contemporaneous development or redevelopment project.

Local Government Unit (LGU): Local government unit, such as cities and counties.

Local Water Plan (LWP): A plan adopted by each municipality pursuant to Minnesota Statute 27 103B.235.

MNDOT: Minnesota Department of Transportation

MPCA: Minnesota Pollution Control Agency

MPCA General Construction Permit: General Permit Authorization to Discharge Storm Water Associated with Construction Activity under the National Pollutant Discharge Elimination System/State Disposal System Permit Program Permit MN R100001 (NPDES General Construction Permit) issued by the Minnesota Pollution Control Agency, August 1, 2013, and as amended.

Municipality: Any city or township wholly or partly within the Lower Minnesota River Watershed District.

Natural Vegetation: Any combination of ground cover, understory, and tree canopy that, while it may have been altered by human activity, continues to stabilize soils, retain and filter runoff, provide habitat, and recharge groundwater.

Nested: A hypothetical precipitation distribution where the precipitation depths for various durations within a storm have the same exceedance probabilities. This distribution maximizes the rainfall intensities by incorporating selected short-duration intensities within those needed for longer durations at the same probability level. As a result, the various storm durations are "nested" within a single hypothetical distribution. Nested-storm distribution (or frequency-based hyetograph) development must be completed utilizing the most recent applicable National Weather Service reference data (e.g., Atlas 14), in accordance with:

1. the alternating block methodology as outlined in Chapter 4 of the HEC-HMS (Hydrologic Engineering Center - Hydrologic Modeling System) Technical Reference Manual, (USACE, 2000);
2. methods in HydroCAD;
3. methods established by the Natural Resources Conservation Service; or
4. otherwise as approved by the District.

Reference: U.S. Army Corps of Engineers. 2000. Hydrologic Modeling System HEC-HMS Technical Reference Manual.

NPDES: National Pollutant Discharge Elimination System

Nondegradation: For purposes of these rules, nondegradation refers to the regulatory policy stated in Minnesota Rules 7050.0185, as it may be amended.

Ordinary High Water Level (OHW): Ordinary high water level, as defined by the Minnesota Department of Natural Resources, means the boundary of water basins, watercourses, public waters, and public waters wetlands, and:

a. The OHW is an elevation delineating the highest water level that has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial.
b. For watercourses, the OHW is the elevation of the top of the bank of the channel.

c. For reservoirs and flowages, the OHW is the operating elevation of the normal summer pool.

Overlay District: A district established by Lower Minnesota River Watershed District standards/regulations that may be more or less restrictive than the primary District's standards/regulations. Where a property is located within an overlay district, it is subject to the provisions of both the primary standards/regulations and those of the overlay district.

Owner: Any individual, firm, association, partnership, corporation, trust, or any other legal entity having proprietary interest in the land.

Person: Any individual, trustee, partnership, unincorporated association, limited liability company, or corporation.

Public Drainage System: Any drainage system as defined in Minnesota Statutes Section 103E.005, subdivision 12.

Public Project: Land development or redevelopment or other land-disturbing activities for which a District permit is required that is conducted or sponsored by a federal, state, or local governmental entity.

Public Waters: Any waters as defined in Minnesota Statute 103G.005, subdivision 15.

Qualified Professional: A person, compensated for her/his service, possessing the education, training, experience, or credential to competently perform or deliver the service provided.

Redevelopment: Any construction or improvement performed on sites where the existing land use is commercial, industrial, institutional, or residential.

Runoff: Rainfall, snowmelt, or irrigation water flowing over the ground surface.

Sediment: The solid mineral or organic material that is in suspension, is being transported, or has been moved from its original location by erosion and has been deposited at another location.

Sedimentation: The process or action of depositing sediment.

Shoreland District: Shoreland areas regulated by a local municipal or county Shoreland Ordinance, or by Minnesota Statues Section 103F. Generally, Shoreland District consists of land located within a floodplain, within 1,000 feet of the ordinary high water level of a public water or public waters wetland, or within 300 feet of a stream or river.

Shoreline: The lateral measurement along the contour of the ordinary high water mark of waterbodies other than watercourses, and the top of the bank of the channel of watercourses, and the area waterward thereof.

Site: A contiguous area of land under common ownership, designated and described in official public records and separated from other lands.

Standard: A preferred or desired level of quantity, quality, or value.

Steep slope: A natural topographic feature having average slopes of 18 percent or greater measured

over a horizontal distance of 25 feet or more.

Steep Slopes Overlay District. A district containing steep slope areas established by Lower Minnesota River Watershed District standards/regulations and is subject to the provisions of both the primary standards/ regulations and those of the overlay district.

Stormwater: Stormwater runoff, snow melt runoff, and surface runoff and drainage.

Structure: Anything manufactured, constructed, or erected that is normally attached to or positioned on land, including portable structures, earthen structures, water and storage systems, drainage facilities and parking lots.

Subsurface Sewage Treatment System or SSTS: A sewage treatment system, or part thereof, serving a dwelling, or other establishment, or group thereof, and using sewage tanks followed by soil treatment and disposal or using advanced treatment devices that discharge below final grade. Subsurface sewage treatment system includes holding tanks and privies.

Subwatershed: A portion of land (or a watershed) contributing runoff to a particular point of discharge.

Surface Water: All streams, lakes, ponds, marshes, wetlands, reservoirs, springs, rivers, drainage systems, waterways, watercourses, and irrigation systems regardless of whether natural or artificial, public or private.

Thalweg: A line following the lowest points of a valley, river, stream, or creek bed.

Trout waters: Trout lakes or streams that support a population of stocked or naturally produced trout.

Waterbody: All surface waters, watercourses, and wetlands as defined in these Policies.

Watershed: A region draining to a specific watercourse or water basin.

Wellhead Protection Plan: A document that provides for the protection of a public water supply, submitted to the Minnesota Department of Health, is implemented by the public water supplier, and complies with: (a) the wellhead protection elements specified in the 1986 amendments to the Federal Safe Drinking Water Act, United States Code, title 42, chapter 6A, subchapter XII, part C, section 300h-7 (1986 and as subsequently amended); and (b) Minnesota Rules parts 4720.5200 to 4720.5290.

Wetland: Any wetland as defined in Minnesota Statutes Section 103G.005, subdivision 19.

4 Administrative Procedures

The LMRWD is a political subdivision of the state under the Minnesota Watershed Act, and a watershed management organization as defined in the Metropolitan Surface Water Management Act. These Acts provide the District with power to accomplish its statutory purpose – to protect, preserve and restore water resources and to improve Minnesota River navigation within the boundaries of the District through sound scientific principles. The Plan, developed through an

extensive stakeholder process and adopted by the District pursuant to the Acts, provides the principles, objectives and scientific basis for these Standards.

These Standards protect the public health, safety and water and natural resources of the District by responsively regulating improvement or alteration of land and waters within the District to reduce the severity and frequency of high water level and the erosive nature of high flows, to preserve floodplain and wetland storage capacity, to improve the chemical and physical quality of surface and ground waters, to reduce sedimentation, to preserve unique resources (such as fens, trout waters and bluffs/ steep slopes), and to promote and preserve natural infiltration areas.

4.1 Variance and Conditional Use

4.1.1 Policy Statement

It is the District's policy to allow LGUs to grant variances or issue conditional use permits according to processes for such actions contained in existing local controls, except for the professional certification requirement for steep slopes. The District will cooperate with and, if requested, provide technical and other assistance to LGUs when considering variances from these Standards.

4.1.2 Standards

Each LGU shall notify the District of requested variances and conditional use permits and allow the District to provide comment on the requested action. Variances that would circumvent the intent and purposes of the Standards shall not be granted.

4.2 Enforcement

In accordance with M.S. 103B.235, each LGU within the District is required to prepare an LWP, capital improvement plan, and official controls as necessary to bring local water management into conformance with the District's Plan. LGUs shall enforce and implement the requirements of these Standards through the development and implementation of an LWP and supporting ordinances. Each LGU shall amend and/or update its official controls, regulations, and permitting processes as necessary to implement and enforce these Standards. The District reserves the right to conduct periodic audits/inspections of LGU's programs and/or projects to verify the Plan and these Standards are being followed. In addition, the District reserves the right to audit project approvals and permits by LGUs to assess conformance with District's policies, standards, objectives, and criteria. If an LGU fails to properly implement an approved LWP, or any of these Standards, the District may revoke the LGU's Local Plan Approval and administer the Standards for that LGU.

The District shall not be responsible for any liabilities, costs, damages, or other negative impacts caused by the failure of an LGU to implement or enforce these Standards.

5 Erosion and Sediment Control Standard

5.1 Policy Statement

It is the District's policy to:

- Minimize erosion and sediment transport to lakes, streams, fens, and the Minnesota River.
- Retain or control sediment on land during land-disturbing activities.
- Prevent the resource degradation and the loss or damage of property due to erosion and sedimentation.
- Protect receiving water bodies, wetland, and storm sewer inlets.
- Require the preparation and implementation of erosion and sediment control plans to control runoff and erosion.

5.2 Regulated Activity and Threshold

5.2.1 General

Land-disturbing activities of one (1) acre or more.

5.2.2 High Value Resources Area (HVRA) Overlay District, as shown on the Lower Minnesota River Watershed District – High Value Resources Area Overlay District Map (Figure K1).

Land-disturbing activities that involve the displacement or removal of 5,000 square feet or more of surface area or vegetation, or the excavation of 50 cubic yards or more of earth within the HVRA overlay district.

5.3 Exceptions

No erosion control plan or permit shall be required for the following land-disturbing activities:

- Minor land-disturbing activities such as home gardens contained within a residential lot, landscape repairs, and maintenance work.
- Installation of any fence, sign, telephone or electric poles, or other kinds of posts or poles.
- Emergency activity necessary to protect life or prevent substantial harm to persons or property.
- All maintenance, repair, resurfacing, and reconditioning activities of existing road, bridge, and highway systems that do not involve land-disturbing activities outside of the existing surfaced roadway.

- Agricultural activity.

5.4 Standards

5.4.1 General

An erosion and sediment control plan and inspection and maintenance strategy shall be required for all regulated activities meeting the thresholds defined above.

5.4.1.1 Erosion and sediment control plan including:

a) Topographic maps of existing and proposed conditions that clearly indicate all hydrologic features and areas where grading will expose soils to erosive conditions, as well as the flow direction of all runoff; temporary erosion and sediment control BMP, and permanent erosion control BMPs.

b) Construction schedule with implementation of best management practices highlighted.

c) Construction staging plan.

d) Name, address, and phone number of the individual (s) responsible for inspection and maintenance of all erosion and sediment control measures.

e) Documentation on the status of the project's General Permit Authorization to Discharge Storm Water Associated with Construction Activity Under the National Pollutant Discharge Elimination System (NDPES)/State Disposal System (SDS) Permit Program, Permit MN R100001 (NPDES General Construction Permit), issued by the Minnesota Pollution Control Agency, August 1, 2013, as amended.

5.4.1.2 Inspection and Maintenance

5.4.1.2.1 Inspection

Routine inspections shall be conducted at least once every seven (7) days during active construction and within 24 hours after a rainfall event greater than 0.5 inches in 24 hours by the Owner or the Owner's representative. Following a rainfall inspection, the next inspection shall be conducted within seven (7) days. The inspection schedule will be modified for the following conditions:

a) Where parts of the construction site have permanent cover, but work remains on other parts of the site. Inspections of the areas with permanent cover shall be reduced to once per month.

b) Where construction sites have permanent cover on all exposed soil areas and no construction activity is occurring anywhere on the site, monthly inspections shall be

performed for 12 months (except during frozen ground conditions). After the 12th month of permanent cover and no construction activity, inspections may cease until construction activity resumes, or sooner if notified by the District or the LGU.

c) Where work has been suspended due to frozen ground conditions, the inspection and maintenance schedule shall resume within 24 hours after runoff occurs at the site or upon resuming construction, whichever comes first.

Routine inspections shall include:

a) All areas disturbed by construction activity and areas used for storage of materials that are exposed to precipitation.

b) Discharge locations, inaccessible locations, and nearby downstream locations where inspections are practicable.

c) Locations where vehicles enter or exit the site for evidence of off-site sediment tracking.

Records for each inspection and maintenance activity shall be kept on file with the owner and shall contain the following information:

a) Date and time of inspection.

b) Name, title, and qualifications of person(s) conducting inspection.

c) Date, duration, and amount of all rainfall events that produce more than 0.5 inches of rain in a 24-hour period, and whether any discharges occurred.

d) Inspection findings, including corrective action recommendations and implementation dates.

e) Locations of the following:

i. Sediment discharges or other pollutants from the site.

ii. BMPs that need to be maintained.

iii. BMPs that have failed to operate as designed or proven inadequate for a particular location.

iv. BMPs that are needed and did not exist at the time of inspection.

f) Documented changes to the erosion and sediment control plan.

g) Inspector's signature.

An Inspection Log shall be kept by the Owner with the Erosion and Sediment Control Plan for a period of three (3) years from completion of the project.

5.4.1.2.2 Maintenance

All maintenance conducted during construction must be recorded in writing, and these records must

be kept. All nonfunctional BMPs must be repaired, replaced, or supplemented with functional BMPs within 24 hours after discovery, or as soon as field conditions allow access unless another period is specified below. Maintenance will include the following:

a. Excess sediment behind silt fences and biorolls shall be removed and properly disposed of when sediments reach one-third the height of the structure. Such sedimentation shall be corrected within 24 hours of discovery.

b. Construction site vehicle exit locations shall be inspected for evidence of off-site sediment tracking onto paved surfaces. Tracked sediment will be removed from all paved surfaces within 24 hours of discovery, or if applicable, within a shorter time.

c. Surface waters, including drainage ditches and conveyance systems, shall be inspected for evidence of erosion and sediment deposition. Evidence of erosion and/or sediment deposition will be addressed within seven (7) days.

d. Infiltration areas shall be maintained to ensure no compaction or sedimentation occurs.

e. Construction entrances shall be maintained daily.

f. Turf shall be maintained until final stabilization is established.

The maintenance of temporary erosion and sediment controls and implementation of additional controls shall be performed as soon as possible and before the next storm event, whenever practicable. All remaining temporary erosion and sediment controls and accumulated sediments from silt fences will be removed within 30 days of achieving final stabilization at the site.

5.4.2 HVRA Overlay District, as shown on the Lower Minnesota River Watershed District – High Value Resources Area Overlay District Map (Figure K1).

5.4.2.1 Grading/Erosion Control Plan

The grading/erosion control plan must meet all of the requirements of section 5.4.1.1 subsections a – d.

5.4.2.2 Inspection and Maintenance

All of the requirements set forth in section 5.4.1.2 must be met.

6 Floodplain and Drainage Alteration

6.1 Policy Statement

It is the District's policy to:

- Regulate alterations within the floodplain and drainageways within the watershed to provide

flood protection to natural resources, permanent structures, and private lands, in accordance with M.S. 103F.

- Preserve existing water storage capacity below the 100-year high water elevation of all public waters, wetlands subject to the Wetland Conservation Act, and public drainage systems subject to Minnesota's buffer law in the watershed to minimize the frequency and severity of high water.
- Minimize development below the Federal Emergency Management Agency (FEMA) base flood elevation that will unduly restrict flood flows or aggravate known high water problems.

6.2 Regulated Activity and Threshold

Alteration to or filling land below the 100-year flood elevation of any wetland, public water, or landlocked subwatershed (as identified by municipalities) shall be subject to the following regulations and shall be completed in accordance with a state-approved floodplain management and shoreland ordinance:

a) No filling is allowed within the 100-year floodplain which causes a rise in the 100-year flood elevation without providing compensatory floodplain storage equal to or greater than the volume of fill. A no-rise certification by a professional engineer satisfies this requirement.

b) No grading or filling is allowed within the 100-year floodplain which reduces the flood carrying capacity of the watercourse.

c) The lowest floor of the lowest enclosed area of proposed structures must be a minimum of two (2) feet above the 100-year high water level of nearby surface waters or one (1) foot above the emergency overflow elevation, whichever is greater, unless they have protection through flood proofing or by another approved construction technique.

d) No permanent structure, with the exception of drainage conveyance structures and monitoring equipment, may be constructed in the floodway as it is shown on FEMA flood maps.

6.3 Exceptions

If the 100-year high water elevation of a waterbody is entirely within a municipality, the waterbody does not outlet during the 100-year event, and the municipality has adopted a floodplain ordinance prescribing an allowable degree of floodplain encroachment, the ordinance governs the allowable degree of encroachment.

6.4 Standards

a. Fill shall not cause a net decrease in storage capacity below the projected 100-year high water elevation nor an increase in the 100-year elevation of a waterbody.

b. The allowable fill area shall be calculated by a professional engineer registered in the state of Minnesota. Creation of floodplain storage capacity to offset fill shall occur before any fill is placed in the floodplain, unless it has been demonstrated to the District and the municipality that doing so is impractical and that placement of fill and creation of storage capacity can be achieved concurrently. Any placement of fill prior to creation of floodplain storage capacity will only be allowed upon a demonstration by a registered professional engineer that such work will not aggravate high water conditions.

c. Fill or grading shall not cause a decrease in the conveyance capacity of a waterbody below the projected 100-year high water elevation.

d. The conveyance capacity shall be calculated by a professional engineer registered in the state of Minnesota. The analysis must demonstrate no decrease in conveyance upstream and downstream of the proposed fill or grading.

e. All new residential, commercial, industrial, and institutional structures shall be constructed such that the lowest floor of the lowest enclosed area (including basement or crawl space) is at a minimum of two (2) feet above the 100-year high water elevation.

f. No person shall install or remove a culvert or other artificial means to remove or drain surface water, create artificial pond areas, or obstruct the natural flow of waters without demonstrating that there is no adverse impact on upstream or downstream landowners or water quality, habitat, or fisheries.

g. Temporary placement of fill within the floodway for staging or processing of river dredge or fill material, including facilities for such activities, shall be allowed when conducted, in whole or part, pursuant to a cooperative or local sponsorship agreement with the United States under the Rivers and Harbors Act and it meets requirements of the LGU.

7 Stormwater Management Standard

7.1 Policy Statement

It is the District's strategy to:

- Manage new development, redevelopment, and drainage alternations, by requiring each development or land-disturbing activity to manage its stormwater effectively, either on or off-site.
- Promote and encourage a reduction in runoff rates, to encourage infiltration, and to promote groundwater recharge.
- Encourage infiltration and stormwater storage in the upland areas of the District.
- Maximize groundwater recharge as a means of maintaining drinking water supplies, preserving base flows in streams and water levels in fens, and limiting discharges of

stormwater to downstream receiving waters.

- Protect and maintain existing groundwater flow, promote groundwater recharge, and improve groundwater quality and aquifer protection.
- Require that property owners control the rate and volume of stormwater runoff originating from their property so that surface water and groundwater quantity and quality is protected or improved, soil erosion is minimized, and flooding potential is reduced.
- Protect and improve natural resources within the watershed to prevent further degradation.

7.2 Regulated Activity and Threshold

7.2.1 General

Development, redevelopment, and drainage alterations (including roads) creating new impervious areas greater than one (1) acre.

7.2.2 High Value Resources Area (HVRA) Overlay District, as shown on the Lower Minnesota River Watershed District – High Value Resources Area Overlay District Map (Figure K1).

Development, redevelopment, and drainage alterations (including roads) creating new impervious areas greater than 10,000 square feet (sq. ft.).

7.3 Standards

7.3.1 General

7.3.1.1 Rate Control

Stormwater runoff rate from development, redevelopment, and drainage alterations shall not exceed the existing runoff rates for the 1-year or 2-year, 10-year, and 100-year 24-hour events using Atlas 14 nested distribution.

7.3.1.2 Volume

Projects that create one (1) acre or more of new impervious surface on sites without restrictions, the post-construction stormwater runoff volume retained onsite shall be equivalent to 1-inch of runoff from impervious surfaces or the MPCA's Construction General Permit abstraction requirements (as amended), whichever is greater.

7.3.1.3 Water Quality

Projects shall have no net increase from existing conditions in total phosphorus (TP) and total suspended solids (TSS) to receiving waterbodies.

7.3.2 HVRA Overlay District, as shown on the Lower Minnesota River Watershed District – High Value Resources Area Overlay District Map (Figure K1).

7.3.2.1 Rate Control

Stormwater runoff rate from development, redevelopment, and drainage alterations shall not exceed the existing rates for the 1-year or 2-year, 10-year, and 100-year 24-hour events using Atlas 14 nested distribution.

7.3.2.2 Volume

1. New Development: For new, nonlinear developments that create 10,000 sq. ft. or more of new impervious surface on sites without restrictions, the post-construction stormwater runoff volume retained onsite shall be equivalent to 1.1 inches of runoff from impervious surfaces.
2. Redevelopment: Nonlinear redevelopment projects on sites without restrictions that create 10,000 sq. ft. or more of new and/or fully reconstructed impervious surfaces shall capture and retain onsite 1.1 inches of runoff from the new and/or fully reconstructed impervious surfaces.
3. Linear projects on sites without restrictions that create 10,000 sq. ft. or greater of new and/or fully reconstructed impervious surfaces, shall capture and retain the larger of the following:
    a. 0.55 inches of runoff from the new and fully reconstructed impervious surfaces.
    b. 1.1 inches of runoff from the net increase in impervious area.

To the maximum extent practicable, volume control shall be fully met onsite. Site conditions may make infiltration undesirable or impossible. The Owner must make soil corrections and/or investigate other locations on the site for feasible infiltration locations. Infiltration of stormwater should avoid areas of contaminated soil. Infiltration practices are not allowed in:

a) Areas that receive discharges from vehicle fueling and maintenance facilities.

b) Areas with less than three (3) feet of separation distance from the bottom of the infiltration system to the elevation of the seasonally saturated soils or the top of bedrock.

c) Areas that receive discharges from industrial facilities which are not authorized to infiltrate industrial stormwater under an NPDES/SDS Industrial Stormwater Permit issued by the Minnesota Pollution Control Agency (MPCA).

d) Areas where high levels of contaminants in soil or groundwater will be mobilized by the infiltrating stormwater.

e) Areas of predominately Hydrologic Soil Group D (clay) soils unless allowed by an LGU

with a current NPDES/SDS Municipal Separate Storm Sewer Systems (MS4) permit.

f) Areas within 1,000 feet up-gradient, or 100 feet down-gradient of active karst features unless allowed by an LGU with a current MS4 permit.

g) Areas within a Drinking Water Supply Management Area (DWSMA) as defined in Minnesota Rule 4720.5100, subp. 13., unless allowed by an LGU with a current MS4 permit.

h) Areas where soil infiltration rates are more than 8.3 inches per hour unless soils are amended to slow the infiltration rate below 8.3 inches per hour, or as allowed by an LGU with a current MS4 permit.

If the Owner claims that infiltration is not feasible or allowed onsite, sufficient supporting documentation must be provided. Filtration technologies may be an acceptable alternative for type C and D soils and other sites where infiltration is infeasible given the criteria above.

7.3.2.3 Water Quality

7.3.2.3.1 Total Phosphorus and Total Suspended Solids

All projects shall have a net decrease TP and TSS to receiving waterbodies from existing conditions. For new development projects, the decrease in TP and TSS shall be 60 percent and 80 percent from existing conditions, respectively.

7.3.2.3.2 Buffer Zone

An undisturbed buffer zone of 100 linear feet from trout waters shall be maintained at all times, both during construction and as a permanent feature after construction, except where a water crossing, or other encroachment is necessary to complete the project.

Exceptions: Buffer encroachments (circumstance and reason) and restoration activities must be documented. The replacement of existing impervious surfaces within the buffer zone is allowed. All potential water quality, scenic, and other environmental impacts of these exceptions must be minimized by the use of additional or redundant BMPs and documented.

7.3.2.3.3 Temperature Controls

Permanent Stormwater Management facilities shall be designed to minimize any increase in the temperature of trout waters receiving waters resulting from the 1-year and 2-year 24-hour precipitation events. This includes all tributaries of designated trout streams within the Public Land Survey System (PLSS) Section where a trout water is located. Projects that discharge to trout waters must minimize the impact using one or more of the following measures, in order of preference:

a. Minimize new impervious surfaces.

b. Minimize the discharge from connected impervious surfaces by discharging to vegetated areas, or grass swales, and using other nonstructural controls.

c. Use Infiltration or other volume reduction practices to reduce stormwater runoff in excess of pre-project conditions (up to the 2-year, 24-hour precipitation event).

d. Design appropriate combination of measures such as shading, filtered bottom withdrawal, vegetated swale discharges, or constructed wetland treatment cells that will limit temperature increases when incorporating ponding. Also, design the pond to drawn down in 24 hours or less.

e. Use other methods that will minimize any increase in the temperature of the trout water.

7.3.3 Maintenance and Easement

1. All stormwater management structures and facilities must be designed for maintenance access and properly maintained in perpetuity so that they continue to function as designed.

2. A maintenance plan shall identify and protect the design, capacity, and functionality of onsite and offsite stormwater management facilities; specify the methods; and schedule responsible parties for maintenance for every stormwater management facility.

3. The maintenance agreement shall be recorded with the applicable county (Carver, Dakota, Hennepin, Scott, or Ramsey) as part of the LGU development approval process.

4. A public entity assuming a maintenance obligation may submit a written executed agreement in lieu of the recorded maintenance agreement.

7.3.4 Alternative Measures

Sites where infiltration is infeasible, should comply with the NPDES General Construction Permit, issued by the Minnesota Pollution Control Agency, August 1, 2013 as amended.

8 Shoreline and Streambank Alteration Standard

8.1 Policy Statement

It is the District's policy to:

- Manage stable, intact, and vegetated shorelines and streambanks that provide valuable functions to the associated water resource, including erosion prevention, reinforcement of soils through root structure, trapping of nutrients and sediments, and provision of fish and wildlife habitat.

- Promote the preservation and enhancement of the ecological integrity and natural appearance of shorelines and streambanks with the intent of preventing erosion.

- Encourage practices such as bioengineering and preservation of natural vegetation practices,

when alterations are necessary.

- Preserve water quality and the ecological integrity of the riparian environment, including wildlife and fisheries habitat, and recreational water resources.

8.2 Regulated Activity and Threshold

a. Improvement or alteration below the ordinary high water mark of a lake or wetland, or the bankfull height of a watercourse; including but not limited to, bioengineered installations, placement of riprap, retaining walls, sand blankets, or boat ramps.

b. Maintenance of an existing riprap or hard-armored shoreline or streambank that involves the addition of new material or structural change.

8.3 Standards

a. Use bioengineering techniques to the extent possible. The use of bioengineering is encouraged as an alternative to traditional engineered stabilization techniques for cost advantage, aesthetic superiority, and ecological integrity. If bioengineering cannot provide a stable shoreline, a combination of riprap and bioengineering may be used to restore or maintain shoreline. If a combination of riprap and bioengineering cannot provide a stable shoreline within a reasonable period, riprap may be used to restore or maintain shoreline.

   - Live plantings incorporated in shoreline bioengineering must be native aquatic vegetation and/or native upland plants.
   - Riprap used in shoreline erosion protection must be sized appropriately in relation to the erosion potential of the wave or current action of the particular water body, but in no case shall the riprap rock average less than six (6) inches in diameter or more than 30 inches in diameter. Riprap shall be durable, natural stone, and of a gradation that will result in a stable shoreline embankment. Stone, granular filter, and geotextile material shall conform to standard Minnesota Department of Transportation (MNDOT) specifications, except that neither limestone nor dolomite shall be used for shoreline or stream bank riprap but may be used at stormwater outfalls. All materials used must be free from organic material, soil, clay, debris, trash, or any other material that may cause siltation or pollution.
   - Riprap placement shall conform to the natural alignment of the shoreline/streambank.
   - A transitional layer consisting of graded gravel, at least six (6) inches deep, and an appropriate geotextile filter fabric shall be placed between the existing shoreline and any riprap. The thickness of riprap layers should be at least 1.25 times the maximum stone diameter. Toe boulders, if used, must be at least 50 percent buried.
   - Riprap must not cover emergent vegetation, unless authorized by a Department of Natural Resources (DNR) permit.

- Riprap shall extend no higher than the top of bank or two feet above the 100-year high water elevation, whichever is lower.

b. Stabilize the shoreline with minimal horizontal encroachment and without interference of water flow or navigation. No riprap or filter material shall be placed more than six (6) feet waterward of the OHW. Streambank riprap shall not reduce the cross-sectional area of the channel or result in a stage increase of more than 0.01 feet at or upstream of the treatment.

c. Design of shoreline erosion protection must reflect the engineering properties of the underlying soils and any soil corrections or reinforcements necessary. The design shall conform to engineering principles for wave energy dispersion and resistance to deformation from ice pressures and movement, considering prevailing winds, fetch, and other factors that induce wave energy.

d. Use of riprap for merely cosmetic purposes is prohibited.

e. Use retaining walls only when there is no adequate stabilization alternative and in accordance with MN Rules 6115.0211. Retaining walls extending below the OHW of a water body are prohibited, except where:

- There is a demonstrable need for a retaining wall in a public improvement project.
- The design of the retaining wall has been certified by a registered engineer.

A determination by the District for a project meeting this Standard does not preclude it from needing a DNR Public Waters Work Permit.

9 Steep Slopes Standard

9.1 Policy Statement

It is the District's policy to:

- Protect water quality down gradient steep slopes from pollutant loadings of sediment, nutrient, bacteria, and other contaminants.
- Maintain stability of steep slopes, shorelines, and other areas prone to erosion.
- Sustain and enhance the biological and ecological functions of non-invasive vegetation on steep slopes.
- Minimize impacts to and preserve the natural character and topography of steep slopes.
- Protect properties and waterbodies adjacent to steep slopes from erosion, sedimentation, flooding, and other damage.
- Promote public safety by requiring certification from qualified individuals before land-disturbing activities and other changes to land on steep slopes.

9.2 Regulated Activity and Threshold

- Land-disturbing activities that involves the excavation of 50 cubic yards or more of earth, or displacement or removal of 5,000 square feet or more of surface area or vegetation within the Steep Slopes Overlay District, as shown on the Lower Minnesota River Watershed District - Steep Slopes Overlay District Map (Figure K2).

- Activities requiring municipal/LGU grading, building, parking lot, and foundations permits that result in a net increase in impervious surface or stormwater runoff within the Steep Slopes Overlay District as illustrated on Figure K2.

9.3 Exceptions

- Upon showing, to the satisfaction of the LMRWD, that the LGU has enacted and is following official controls necessary to meet the intent of these standards, the LMRWD may issue an exception to the standard for projects with land-disturbing activities that require a municipal grading, building, parking lot, or foundation permit that impact less than 50 cubic yards or less than 5,000 square feet of surface area or vegetation. The exception, if issued, will be documented in a Memorandum of Agreement wherein the LGU must agree: (1) that it will enforce its official controls; (2) that the exception will terminal if the LGU amends its official controls, so they no longer meet the intent of these standards; and (3) that it will provide notice to the LMRWD of all permits issued under the exception.
- New impervious areas associated with driveway widenings that drains to the street where runoff water is managed by a municipal storm sewer system.
- Maintenance, repair, or replacement of existing structures, public roads, utilities, and drainage systems within the Steep Slopes Overlay District.
- Disturbances that are part of an approved local water plan (LWP) to repair, grade, or re-slope existing steep slopes that are eroding or unstable to establish stable slopes and vegetation.
- Native plantings that enhance natural vegetation of steep slopes.
- Selective removal of noxious, exotic, or invasive vegetation using locally recognized methods to control and/or minimize their spread.
- Pruning of trees or vegetation that are dead, diseased or pose a public hazard, and removal of vegetation in emergency situations from steep slopes.
- Maintenance of existing lawns, landscaping, and gardens.
- Agricultural and forestry activities.

9.4 Standard

The standards outlined in this section apply to the areas identified on the Lower Minnesota River Watershed District - Steep Slopes Overlay District Map (Figure K2).

A. Land disturbing activities as regulated in this section may occur within the Steep Slopes Overlay District, provided a qualified professional/professional engineer registered in the state of Minnesota certifies the suitability of the area for the proposed activities, structures or uses resulting from the activities and the following requirements are addressed:

1. Minimum erosion and sediment control best management practices (BMPs) include site stabilization and slope restoration measures to ensure the proposed activity will not result in:

i. adverse impacts to adjacent and/or downstream properties or water bodies;

ii. unstable slopes conditions; and

iii. degradation of water quality due to erosion, sedimentation, flooding, and other damage.

2. Preservation of existing hydrology and drainage patterns. Land-disturbing activities may not result in any new water discharge points on steep slopes or along the bluff.

Stormwater ponds, swales, infiltration basins, or other soil saturation-type features shall not be constructed within Steep Slopes Overlay District.

10 Water Appropriations Standard

10.1 Policy Statement

It is the District's policy to:

- Maintain groundwater recharge and protect groundwater from contamination.
- Promote management practices that protect groundwater recharge and quality.
- Support enforcement of Wellhead Protection Plans, Individual Sewage Treatment Systems/ISTS, and community septic ordinances.
- Support development and implementation of Wellhead Protection Plans.
- Review appropriations requests for groundwater in HVRAs.
- Evaluate the potential impacts of public or private infrastructure (including private and municipal groundwater appropriations) interference of flows on groundwater recharge, transmission, and discharge.

10.2 Regulated Activity and Threshold

Temporary withdrawal of groundwater for construction dewatering, landscaping, dust control, and hydrostatic testing of pipelines, tanks, and wastewater ponds, and groundwater withdrawal of more than 10,000 gallons of water per day or 1 million gallons per year within HVRA Overlay District, as shown on the Lower Minnesota River Watershed District – High Value Resources Area Overlay District Map (Figure K1).

10.3 Standards

10.3.1

A. In all cases of groundwater appropriation requiring a DNR permit in the District, a copy of the permit application and information on the location of the discharge/withdrawal shall be filed with the District for review.

B. Develop and submit a discharge management plan to the District.

C. Demonstrate no net change in groundwater levels to adjacent fen.

11 Water Crossing Standard

11.1 Policy Statement

It is the District's policy to:

- Prohibit the use of beds and banks of streams and lakes for the placement of roads, driveways, and utilities.
- Regulate crossings of watercourses for driveways, roads, and utilities to maintain stream stability, conveyance capacity, and the ability to transport, without adverse effect, the flows and detritus of its watershed.
- Preserve the ecological integrity of the riparian and aquatic environment, including wildlife and fisheries habitat and recreational water resources.
- Encourage improvement of wildlife passage and habitat, especially for projects involving culvert and public right-of-way in or near natural corridors.

11.2 Regulated Activity and Threshold

Horizontal drilling under or placement of a road, highway, utility, bridge, boardwalk or associated structure in contact with the bed or bank of any waterbody, including alteration of a waterbody to enclose it within a pipe or culvert.

11.3 Exceptions

Ecological restoration of a waterbody that has been significantly altered from its natural state or degraded, for which the proposed application would provide a greater degree of resource protection and restoration than would strict compliance with the standard.

11.4 Standards

a. Show the effects of the project through analysis completed by a qualified professional on the stream's physical characteristics, hydraulic capacity, and water quality.

b. Time construction by taking advantage of seasons with no or low stream flow as appropriate.

c. Time construction to avoid spawning seasons, if applicable.

d. Demonstrate a public benefit and ensure the crossing will retain adequate hydraulic and navigational capacity for the portion of a road, highway, utility, or associated structure that crosses the bed or bank of any waterbody. If applicable, the project should not adversely affect water quality, and represent the "minimal impact" solution to a specific need with respect to all other reasonable alternatives.

e. Projects must follow the DNR manual *Best Practices for Meeting DNR General Public Waters Work Permit GP 2004-0001*, and as amended, when applicable.

f. Size and place stream crossings, as follows:

- Regardless of the stream's width-to-depth ratio (bankfull width/mean depth), minimum culvert width shall match or exceed stream bankfull width (water surface width at discharge associated with the 1.5-year return period). Combined width of multiple culverts is satisfactory.
- Culvert length shall extend beyond side slope toe and be buried one-sixth of its height.
- Slope of culvert shall match stream thalweg (the deepest continuous line along a watercourse) slope.
- When using multiple culverts, offset culvert inverts. Use the fewest and largest multiples possible. A minimum vertical separation of 1-foot is required between the lowest placed culvert and multiples.
- Alignment of culvert shall match stream alignment.
- Additional consultation is required with DNR, the District, and other regulatory agency staff when the stream is a designated trout stream or contains endangered or threatened species.

g. Provide a maintenance agreement. A declaration, or other recordable instrument, stating terms for hydraulic capacity maintenance shall be recorded in the County recorder's office or registrar before activity commences. In lieu of recordation, a public body or project proposer

without a property interest sufficient for recordation may assume the maintenance obligation by means of a written agreement. The agreement shall state that if the ownership of the structure is transferred, the public body shall require the transferee to comply with this requirement.

h. Preserve aquatic and upland wildlife passages.

Figure K1: Lower Minnesota River Watershed District – High Value Resources Area Overlay District Map

Lower Minnesota River Watershed District

Black Dog Creek

Kennaley's Creek

Lower Minnesota River Watershed District

Eagan-Inver Grove Heights Watershed Management Organization

Nicols Meadow Fen

Unnamed Stream

Black Dog Lake North Fen

Unnamed Stream

Bloomington

Burnsville

Lower Minnesota River Watershed District

Black Dog Watershed Management Organization

77

35W

Black Dog Lake Fen

13

Burnsville

Eagan

35E

2,000 0 2,000 Feet

NORTH

Scale: 1" = 2,000'

High Value Resource Area (HVRA)
- HVRA Overlay District

MNDNR Publicly Available Data
- Calcareous Fen Point
- Trout Stream
- Trout Pond/Lake

Jurisdictional Boundaries
- Municipal Boundary
- Lower Minnesota River Watershed District
- Riley-Purgatory-Bluff Creek Watershed District
- Black Dog Watershed Management Organization

Minnetonka
Eden Prairie
Area Enlarged

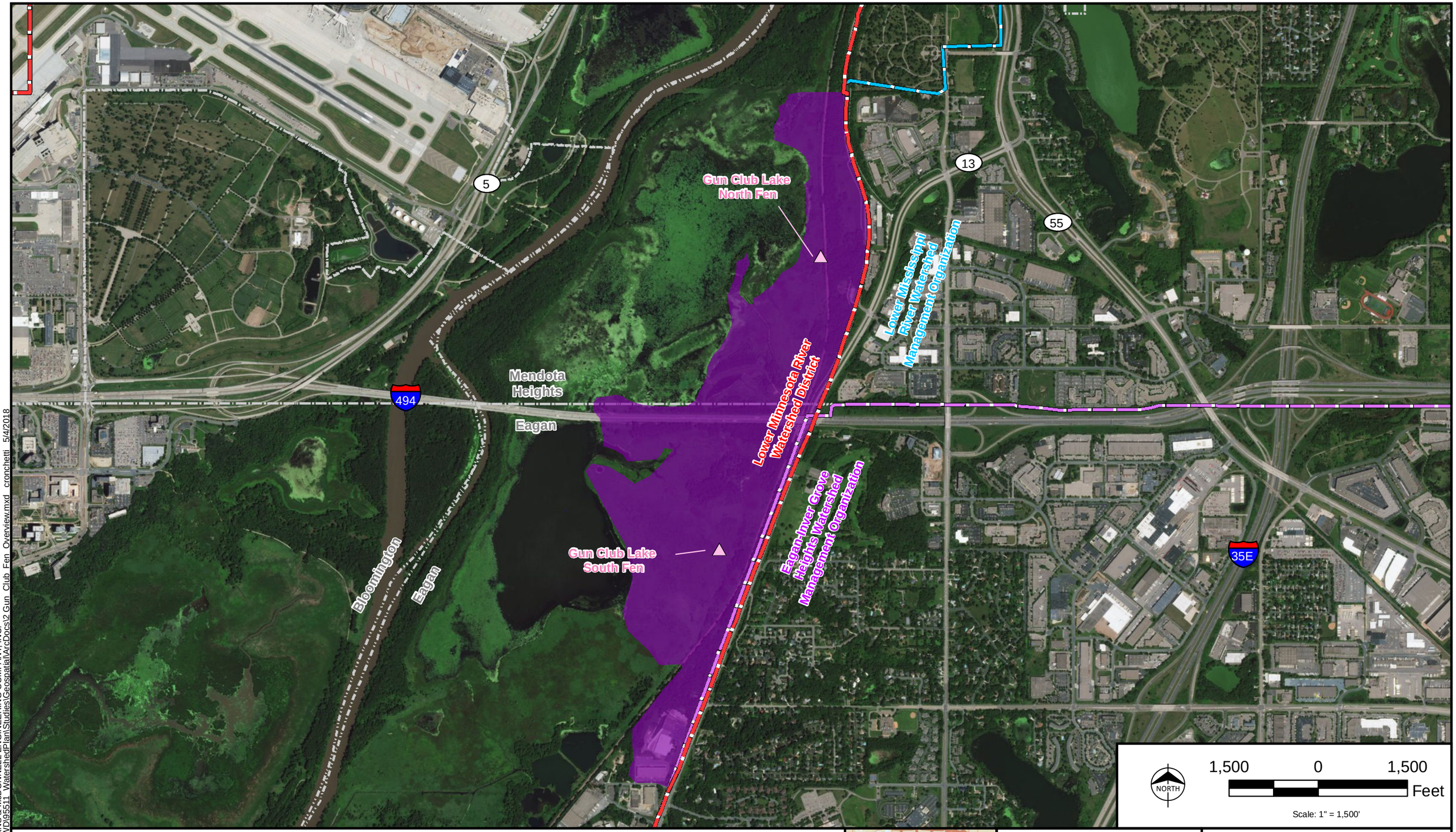
LOWER MINNESOTA RIVER WATERSHED DISTRICT

BURNS McDONNELL

Lower Minnesota River Watershed District
High Value Resources Area
Overlay District Map
Figure K1
1 of 5

Source: MNDNR, MN Geospatial Commons, ESRI, and Burns & McDonnell Engineering Company, Inc.

Issued: 5/4/2018



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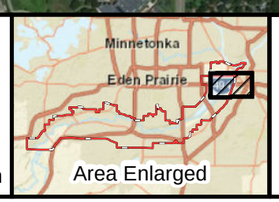
High Value Resource Area (HVRA)
- HVRA Overlay District

MNDNR Publicly Available Data
- Calcareous Fen Point
- Trout Stream
- Trout Pond/Lake

Jurisdictional Boundaries
- Municipal Boundary
- Lower Minnesota River Watershed District
- Riley-Purgatory-Bluff Creek Watershed District
- Lower Mississippi River Watershed Management Organization



LOWER MINNESOTA RIVER WATERSHED DISTRICT

BURNS McDONNELL

Lower Minnesota River Watershed District
High Value Resources Area
Overlay District Map
Figure K1
2 of 5

Source: MNDNR, MN Geospatial Commons, ESRI, and Burns & McDonnell Engineering Company, Inc.

Issued: 5/4/2018

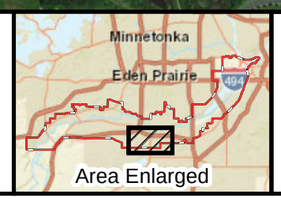
Shakopee
Savage
Bloomington
Savage
169
13
21
Unnamed Stream
Unnamed Stream
Unnamed Stream
Eagle Creek
Eagle Creek, East Branch
Savage Fen
Lower Minnesota River
Watershed District
Prior Lake Spring
Lake Watershed District
Scott County Watershed
Management Organization

NORTH
1,500 0 1,500 Feet
Scale: 1" = 1,500'

High Value Resource Area (HVRA)
- HVRA Overlay District

MNDNR Publicly Available Data
- Calcareous Fen Point
- Trout Stream
- Trout Pond/Lake

Jurisdictional Boundaries
- Municipal Boundary
- Lower Minnesota River Watershed District
- Prior Lake Spring Lake Watershed District
- Scott County Watershed Management Organization



LOWER MINNESOTA RIVER WATERSHED DISTRICT
BURNS McDONNELL

Lower Minnesota River Watershed District
High Value Resources Area
Overlay District Map
Figure K1
3 of 5

Source: MNDNR, MN Geospatial Commons, ESRI, and Burns & McDonnell Engineering Company, Inc.

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Riley-Purgatory-Bluff Creek Watershed District

Carver County Water Management Organization

212

Riley-Purgatory-Bluff Creek Watershed District

Lower Minnesota River Watershed District

61

101

Seminary Fen

Assumption Creek

Unnamed Stream

Carver County Water Management Organization

Lower Minnesota River Watershed District

Chanhassen

Shakopee

Chaska

Chanhassen

61

1,250 0 1,250 Feet

NORTH

Scale: 1" = 1,250'

High Value Resource Area (HVRA)
- HVRA Overlay District

MNDNR Publicly Available Data
- Calcareous Fen Point
- Trout Stream
- Trout Pond/Lake

Jurisdictional Boundaries
- Municipal Boundary
- Lower Minnesota River Watershed District
- Riley-Purgatory-Bluff Creek Watershed District

Minnetonka

Eden Prairie

Area Enlarged

LOWER MINNESOTA RIVER WATERSHED DISTRICT

BURNS McDONNELL

Lower Minnesota River Watershed District
High Value Resources Area
Overlay District Map
Figure K1
4 of 5

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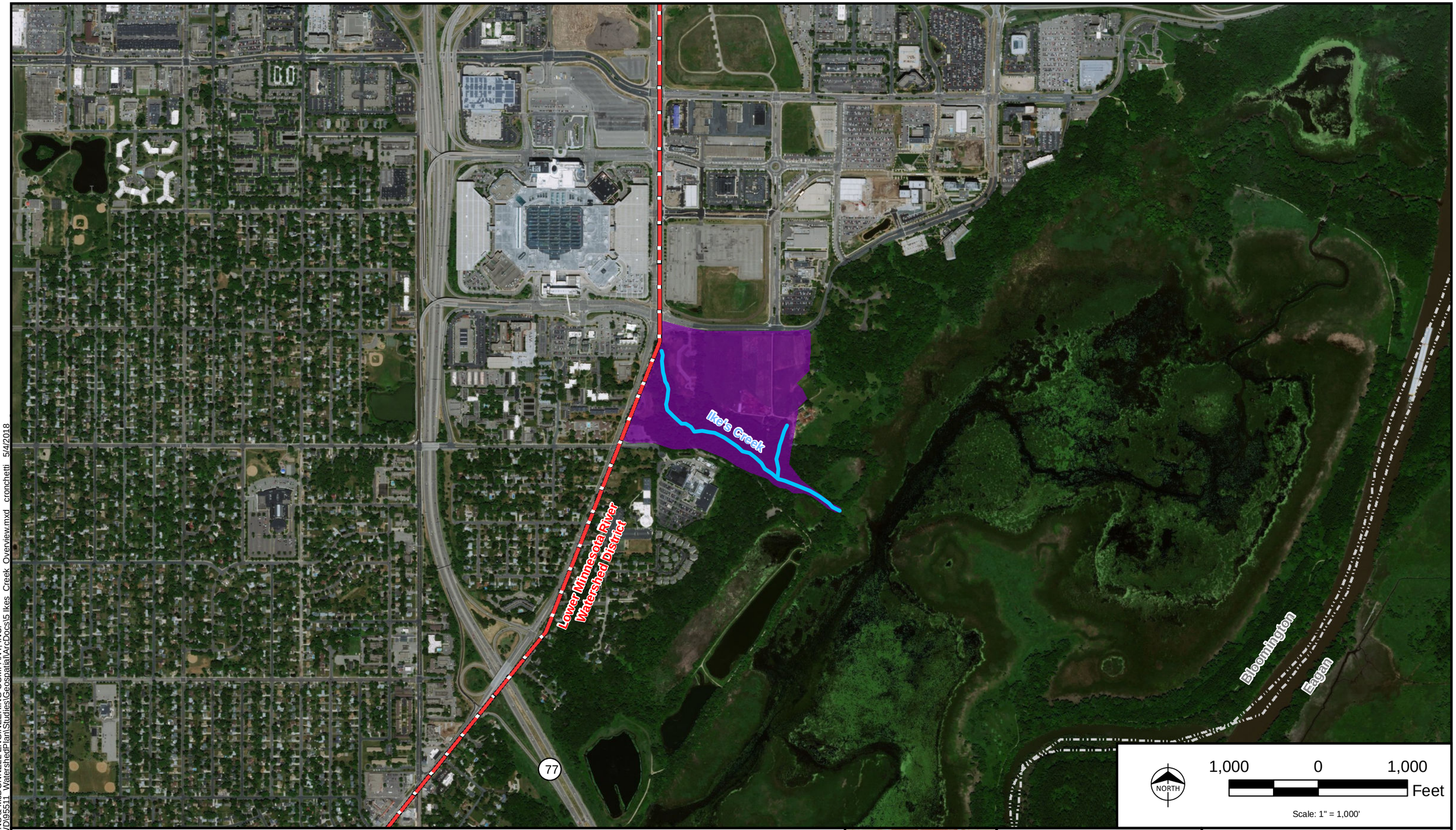

High Value Resource Area (HVRA)
- HVRA Overlay District

MNDNR Publicly Available Data
- Calcareous Fen Point
- Trout Stream
- Trout Pond/Lake

Jurisdictional Boundaries
- Municipal Boundary
- Lower Minnesota River Watershed District

LOWER MINNESOTA RIVER WATERSHED DISTRICT

BURNS McDONNELL

Lower Minnesota River Watershed District
High Value Resources Area
Overlay District Map
Figure K1
5 of 5

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Source: MNDNR, MN Geospatial Commons, ESRI, and Burns & McDonnell Engineering Company, Inc.

Issued: 5/4/2018

1 Figure K2: Lower Minnesota River Watershed District – Steep Slopes Overlay District Map
2

Steep Slope

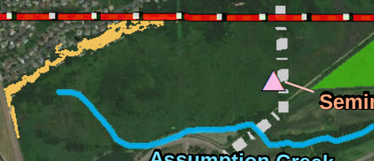
Watershed District Boundary
- Carver County
- Riley-Purgatory-Bluff Creek
- Scott
- Lower MN River

MNDNR Publicly Available Data
- Stream\River
- Impaired River or Stream
- Impaired Lake
- SNA - Fens
- PWI Water
- Trout Stream
- Calcareous Fen Point
- Municipal Boundary

2,000 1,000 0 2,000
Feet

NORTH

Map Index



BURNS McDONNELL

Lower Minnesota River Watershed District
Steep Slopes Overlay District
Figure K2
1 of 9

Issued: 5/8/2018

Source:ESRI, MNDNR, Minnesota Geospatial Information Office, Burns & McDonnell Engineering Company, Inc.

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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Steep Slope

Watershed District Boundary
- Carver County
- Scott
- Lower MN River

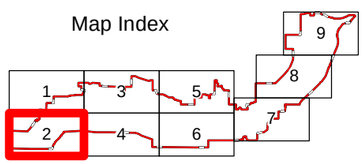
MNDNR Publicly Available Data
- Stream\River
- Impaired River or Stream
- Impaired Lake

- SNA - Fens
- PWI Water
- Trout Pond/Lake
- Calcareous Fen Point
- Municipal Boundary

2,000 1,000 0 2,000
Feet

NORTH

Map Index



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Lower Minnesota River Watershed District
Steep Slopes Overlay District
Figure K2
2 of 9

Source:ESRI, MNDNR, Minnesota Geospatial Information Office, Burns & McDonnell Engineering Company, Inc.

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Red Rock Lake
Staring Lake
Lake Riley
Rice Lake
Chanhassen
Eden Prairie
Shakopee
Shakopee
Purgatory Creek
Riley Creek
Bluff Creek
Minnesota River
Assumption Creek
Fisher Lake Outlet
Fisher Lake
HIGHWAY 212
LYMAN BLVD
RILEY LAKE RD
GREAT PLAINS BLVD
DELL RD
BRAXTON DR
PIONEER TRL
EDEN PRAIRIE RD
MITCHELL RD
STARING LAKE PKWY
COLUMBINE RD
HOMEWARD HILLS RD
PROSPECT RD
SPRING RD
CHARLSON RD
FLYING CLOUD DR
HIGHWAY 101
1ST AVE E
1ST AVE W
4TH AVE E
6TH AVE W
HOLMES ST S
MARSCHALL RD S
SARAZIN ST
SHENANDOAH DR
EAGLE CREEK BLVD
COUNTY ROAD 101
CANTERBURY RD S
VALLEY PARK DR

Steep Slope

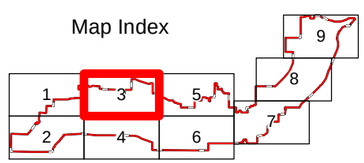
Watershed District Boundary
- Riley-Purgatory-Bluff Creek
- Scott
- Lower MN River

MNDNR Publicly Available Data
- Stream\River
- Impaired River or Stream
- Impaired Lake
- SNA - Fens
- PWI Water
- Trout Stream
- Calcareous Fen Point
- Municipal Boundary

2,000 1,000 0 2,000
Feet

NORTH

Map Index



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Lower Minnesota River Watershed District
Steep Slopes Overlay District
Figure K2
3 of 9

Source:ESRI, MNDNR, Minnesota Geospatial Information Office, Burns & McDonnell Engineering Company, Inc.

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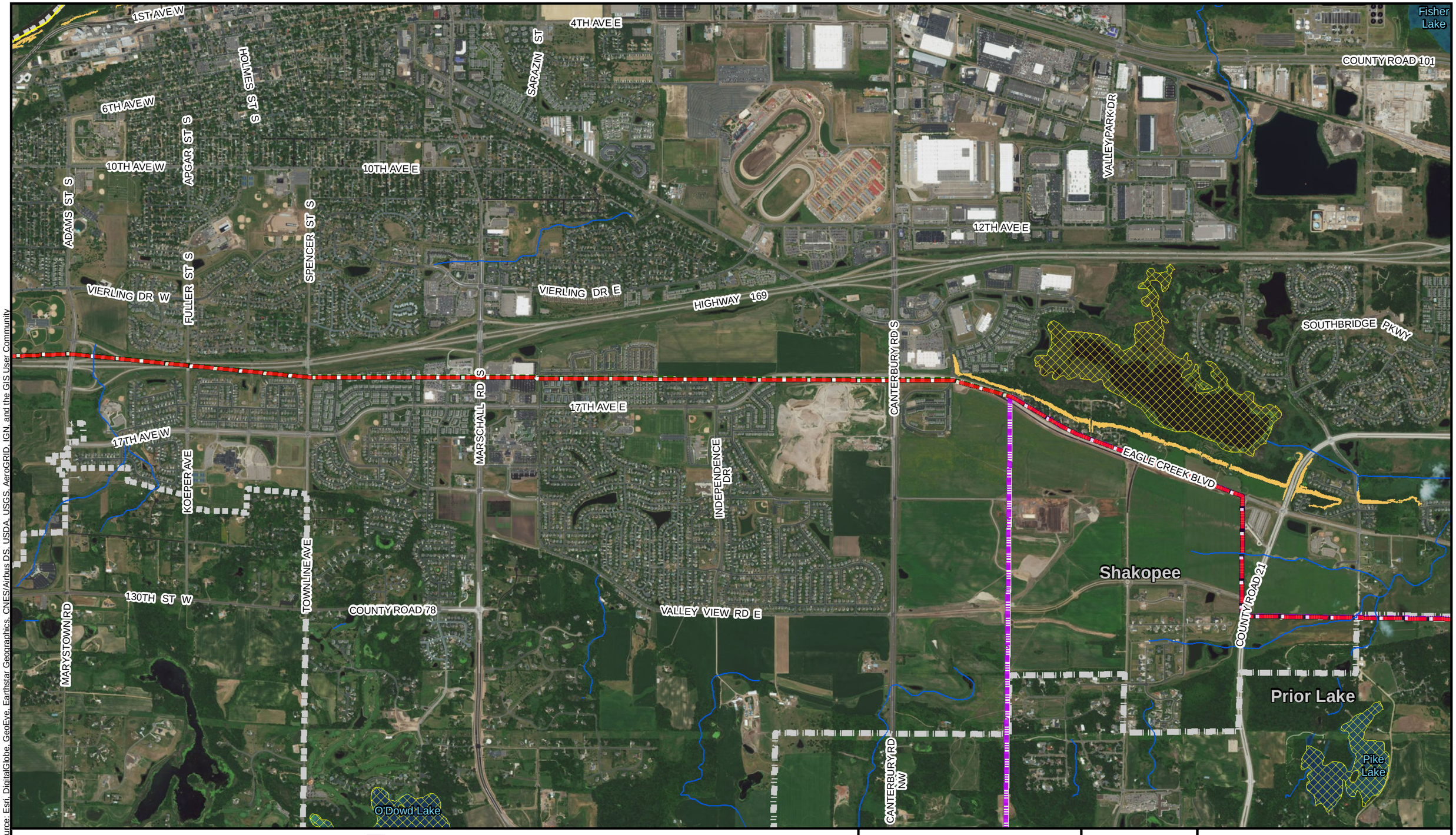


Steep Slope

Watershed District Boundary
- Prior Lake-Spring Lake
- Scott
- Lower MN River

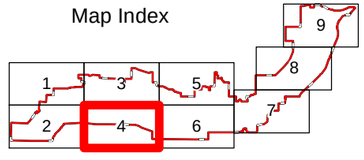
MNDNR Publicly Available Data
- Stream\River
- Impaired River or Stream
- Impaired Lake

- SNA - Fens
- PWI Water
- Calcareous Fen Point
- Municipal Boundary

2,000 1,000 0 2,000
Feet

NORTH

Map Index



Lower Minnesota River Watershed District
Steep Slopes Overlay District
Figure K2
4 of 9

Issued: 5/8/2018

Source:ESRI, MNDNR, Minnesota Geospatial Information Office, Burns & McDonnell Engineering Company, Inc.

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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Steep Slope

Watershed District Boundary
- Riley-Purgatory-Bluff Creek
- Scott
- Lower MN River

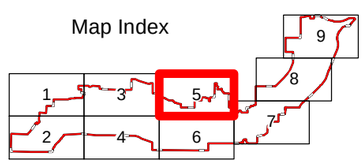
MNDNR Publicly Available Data
- Stream\River
- Impaired River or Stream
- Impaired Lake

- SNA - Fens
- PWI Water
- Calcareous Fen Point
- Municipal Boundary

2,000 1,000 0 2,000
Feet

NORTH

Map Index



Lower Minnesota River Watershed District
Steep Slopes Overlay District
Figure K2
5 of 9

Source:ESRI, MNDNR, Minnesota Geospatial Information Office, Burns & McDonnell Engineering Company, Inc.

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Fisher Lake
Fisher Lake Outlet
Savage
NORMANDALE BLVD
OVERLOOK DR
AUTO CLUB RD
Minnesota River
Bloomington
COUNTY ROAD 101
HIGHWAY 169
Credit River
Savage
Burnsville
SOUTHBRIDGE PKWY
Eagle Creek
Eagle Creek
HIGHWAY 13 W
LYNN AVE
Savage Fen
COUNTY ROAD 21
COUNTY ROAD 18
EAGLE CREEK BLVD
WILLIAMS DR
MCCOLL DR
DAKOTA AVE
GLENDALE RD
Prior Lake
Shakopee
Savage
Pike Lake
CREST AVE NE
HIGHWAY 13
BURNSVILLE PKWY W

Steep Slope

Watershed District Boundary
- Black Dog
- Prior Lake-Spring Lake
- Scott
- Lower MN River

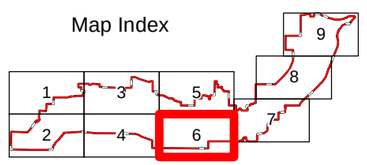
MNDNR Publicly Available Data
- Stream\River
- Impaired River or Stream
- Impaired Lake

- SNA - Fens
- PWI Water
- Trout Stream
- Calcareous Fen Point
- Municipal Boundary

2,000 1,000 0 2,000
Feet

NORTH

Map Index



Lower Minnesota River Watershed District
Steep Slopes Overlay District
Figure K2
6 of 9

Source:ESRI, MNDNR, Minnesota Geospatial Information Office, Burns & McDonnell Engineering Company, Inc.

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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Steep Slope

Watershed District Boundary
- Black Dog
- Eagan-Inver Grove
- Scott
- Lower MN River

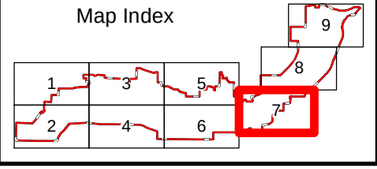
MNDNR Publicly Available Data
- Stream\River
- Impaired River or Stream
- Impaired Lake

- SNA - Fens
- PWI Water
- Trout Stream
- Calcareous Fen Point
- Municipal Boundary

2,000 1,000 0 2,000
Feet

NORTH

Map Index



Lower Minnesota River Watershed District
Steep Slopes Overlay District
Figure K2
7 of 9

Source:ESRI, MNDNR, Minnesota Geospatial Information Office, Burns & McDonnell Engineering Company, Inc.

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82ND ST W
86TH ST W
86TH ST E
90TH ST W
90TH ST E
94TH ST W
98TH ST W
98TH ST E
102ND ST W
102ND ST E
106TH ST W
LINDAU LN
24TH AVE S
28TH AVE S
34TH AVE S
OLD CEDAR AVE S
OLD SHAKOPEE RD E
LYNDALE AVE S
NICOLLET AVE S
PORTLAND AVE S
INTERSTATE 35W
HIGHWAY 77
Minnesota River
Oxboro Lake
Bloomington
Eagan
Burnsville
Black Dog Lake
Black Dog Lake North
Black Dog Creek
Kennaley's Creek
Nicols Meadow Fen
Gun Club Lake
Gun Club Lake South
HIGHVIEW AVE
LONE OAK RD
SIBLEY MEMORIAL HWY
FOUR OAKS RD
COACHMAN RD
YANKEE DOODLE RD
BLUE CROSS RD
ASHBURY RD
HIGHWAY 13 E
SILVER BELL RD
BLACKHAWK RD
Blackhawk Lake
NICOLS RD
RAHN RD
INTERSTATE 35E
DEERWOOD DR
CARNELIAN LN

Steep Slope

Watershed District Boundary
- Eagan-Inver Grove
- Scott
- Lower MN River

MNDNR Publicly Available Data
- Stream\River
- Impaired River or Stream
- Impaired Lake

- SNA - Fens
- PWI Water
- Trout Stream
- Calcareous Fen Point
- Municipal Boundary

2,000 1,000 0 2,000
Feet

NORTH

Map Index
1 2 3 4 5 6 7 8 9

Lower Minnesota River Watershed District
Steep Slopes Overlay District
Figure K2
8 of 9

Source:ESRI, MNDNR, Minnesota Geospatial Information Office, Burns & McDonnell Engineering Company, Inc.

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Steep Slope

Watershed District Boundary
- Eagan-Inver Grove
- Lower MS River
- Scott
- Lower MN River

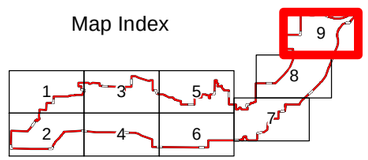
MNDNR Publicly Available Data
- Stream\River
- Impaired River or Stream
- Impaired Lake

- SNA - Fens
- PWI Water
- Calcareous Fen Point
- Municipal Boundary

2,000 1,000 0 2,000
Feet

NORTH

Map Index



Lower Minnesota River Watershed District
Steep Slopes Overlay District
Figure K2
9 of 9

Source:ESRI, MNDNR, Minnesota Geospatial Information Office, Burns & McDonnell Engineering Company, Inc.

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