Watershed Management Plan
2018–2027

Prepared for the City of Hastings
October 2018

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Barr Engineering Co.

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Contents

List of Tables

List of Figures

Certifications

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer in the under the Laws of the State of Minnesota.

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PE #: 47642

October 30, 2018
Date

Acronyms

Acronym	Description
AIS	Aquatic Invasive Species
BMP	Best Management Practice
BWSR	Minnesota Board of Water and Soil Resources
CAMP	Citizen Assisted Monitoring Program
CWA	Clean Water Act
DEM	Digital Elevation Model
DWSMA	Drinking Water Supply Management Area
EDA	Environmental Data Access (MPCA)
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
HSG	Hydrologic Soil Group
LA	Load Allocation
LGU	Local Governmental Unit
LID	Low Impact Development
LiDAR	Light Detection and Ranging
MCM	Minimum Control Measure
MDNR	Minnesota Department of Natural Resources
MDH	Minnesota Department of Health
MGS	Minnesota Geological Survey
MIDS	Minimal Impact Design Standards
MnDOT	Minnesota Department of Transportation
MnRAM	Minnesota Routine Assessment Method
MPCA	Minnesota Pollution Control Agency
MRCC	Midwestern Regional Climate Center
MS4	Municipal Separate Storm Sewer System
MSP	Minneapolis/St. Paul International Airport
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NWI	National Wetland Inventory
OHWL	Ordinary High Water Level
P8	Program for Predicting Polluting Particle Passage through Pits, Puddles and Ponds
PWI	Public Waters Inventory
SCS	Soil Conservation Service
SSTS	Subsurface Sewage Treatment Systems

SSURGO	Soil Survey Geographic Dataset
SWCD	Soil and Water Conservation District
SWMP	Surface Water Management Plan
SWPPP	Storm Water Pollution Prevention Program
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
VIC	Voluntary Investigation and Cleanup
VRWJPO	Vermillion River Watershed Joint Powers Organization
WCA	Wetland Conservation Act
WHEP	Wetland Health Evaluation Program
WHPP	Wellhead Protection Plan
WLA	Waste Load Allocation
WMO	Watershed Management Organization
WRAPS	Watershed Restoration and Protection Strategy
WWTP	Wastewater Treatment Plant

Executive Summary

The City of Hastings Watershed Management Plan (WMP or Plan) provides a comprehensive guide to managing stormwater and surface water resources throughout the city. The WMP provides data and other background information on resources, assesses city-wide and specific issues, sets goals and policies for the City and its resources, and lays out an implementation program to achieve the City's goals. The WMP is organized into five major sections, summarized as follows:

Section 1 – Introduction

Section 1.0 of the WMP summarizes the City of Hastings' location, development history, and describes the purpose of the SWMP. The City's 2018-2027 SWMP is the third iteration of the City's WMP and replaces the previous WMP adopted by the City in 2009. The purpose of the WMP is to provide a comprehensive guide to managing stormwater and surface water resources throughout the city. The purpose of the WMP also includes those purposes given in Minnesota Statute 103B.201 for metropolitan water management programs, which include:

- 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 erosion of soil into surface water systems;
- Promote groundwater recharge;
- Protect and enhance fish and wildlife habitat and water recreational facilities; and
- Secure the other benefits associated with proper management of surface and ground water.

This WMP serves as a local water management plan consistent with the requirements of Minnesota Rules 8410.0160 and Minnesota Statutes 103B.235. The WMP was developed consistent with the guidance from the Metropolitan Council, the Vermillion River Watershed Joint Powers Organization (VRWJPO), and the South Washington Watershed District (SWWD).

Section 2 – Goals, Objectives, and Policies

The City developed a number of goals, objectives, and policies to proactively manage its stormwater and surface water resources. The goals and policies are designed to continue to improve the quality and effectiveness of water resource planning and management in the city. These goals and policies have been developed to complement county, regional, and state goals, policies and management activities while minimizing redundancy.

The WMP includes the following goals:

- Preserve and enhance surface water quality of lakes, wetlands, and watercourses in and downstream of the City of Hastings.

- Manage the rate and volume of stormwater runoff to minimize negative impacts to infrastructure, the natural environment, and public and private lands.
- Protect groundwater quality and quantity to preserve it for sustainable and beneficial purposes .
- Preserve and enhance the amount and quality of wetlands and habitats within the city.
- Minimize the risk of flooding to protect public health and safety, minimize adverse environmental impacts, and minimize capital expenditures.
- Develop or improve recreational, fish and wildlife, and open space areas and accessibility in conjunction with water quality improvement projects.
- Protect and conserve water and natural resources by promoting sustainable growth, integrated land use planning, and water resource management.
- Facilitate understanding of water resource and other natural recourses issues and encourage water resource stewardship through programs, educational opportunities, and information.
- Efficiently and responsibly perform the City's stormwater and surface water management responsibilities.

Each goal is supported by objectives and policies. The objectives further clarify the goal and identify criteria by which progress can be measured. The policies outline the actions the City will take in pursuit of these goals. The goals, objectives, and policies are included in their entirety in Section 2.0 of the WMP.

Section 3 – Physical Environment Inventory

Section 3.0 of this Plan contains information about the physical resources in the city that affect, or are affected by, the City's stormwater and surface water management activities. Information presented in Section 3.0 address the following areas:

- Land use
- Climate and precipitation
- Topography and drainage patterns
- Soils
- Geology and groundwater
- Surface waters (lakes, streams, and wetlands)
- City stormwater system
- Water quality
- Water quantity and flooding
- Recreational areas
- Natural areas and habitat
- Potential pollutant sources

Information included in the physical environment inventory is presented as text, tables, and figures. A key update to the land and water resources inventory include the 2013 publication of updated data on extreme precipitation events commonly used in the design of flood control systems. Other changes include revisions to hydrologic soil group delineations, updated land use data, and changes to the MPCA's impaired waters list.

Section 4 – Assessment of Issues and Opportunities

This section of the WMP presents and discusses the issues and opportunities facing the City, organized by various topics. The issues discussed in Section 4.0 are organized into the following topic areas:

- **Water quality** (including stormwater runoff water quality, MPCA impaired waters, total maximum daily load studies, waterbody classification and water quality goals, water quality BMP maintenance, and other water quality issues) – Stormwater runoff conveys pollutants from developed areas to downstream water resources. A combination of regulatory procedures, educational programming, and capital improvements are necessary to protect existing resources and restore those that are already degraded.
- **Water quantity and flood risk** (including floodplain management, hydrologic and hydraulic modeling, and discussion of select local flooding issues) – Many of the most significant historical flooding issues have been addressed by the City. However, development, redevelopment, and changing precipitation patterns place increasing stress on aging stormwater infrastructure.
- **Erosion and sediment control** – Increased sedimentation resulting from urban development may negatively impact water quality, fish and wildlife habitat, and aesthetics. Sediment deposition can also wholly or partially block culverts, manholes, and other stormwater facilities, increasing flood risk and requiring more frequent maintenance of the City's stormwater system.
- **Groundwater** – Consumptive use of groundwater places increased pressure on the bedrock aquifers that the City relies upon for drinking water. In addition, infiltration of pollutants can negatively impact the quality of vulnerable groundwater resources.
- **Wetlands** – (including wetland and shoreland buffers, aquatic invasive species, and wetland classification and inventory) – Diverse wetland systems are critical components of a healthy hydrologic system. Tools to inventory, assess, and regulate wetlands are needed to minimize the negative effects of land development and other human activities in wetlands.

Section 4.0 of the WMP also describes opportunities for the City to address these issues. These opportunities, generally, include:

- Partnerships with watershed management organizations and other entities
- Coordination of stormwater management improvements with redevelopment
- Opportunities provided by agricultural land conversion
- Implementation of low impact development (LID) practices
- Coordination of stormwater management improvements with other City programs (e.g., pavement management, annual infrastructure improvement projects, park improvements)

Section 5 – Implementation Program

The WMP provides a framework and reference for protecting, preserving, and managing the City surface water resources and stormwater management system. An effective implementation program is critical to

ensure that the direction provided in the WMP yields results. Section 5.0 of the WMP summarize key elements of the City's surface water and stormwater implementation program, including:

- National Pollutant Discharge Elimination System (NPDES) permit requirements
- Stormwater system operation and maintenance
- Education and public involvement
- Ordinances and official controls
- Projects and capital improvements

The implementation program is presented in Table 5-1 and Table 5-2 organized as follows:

- Table 5-1 Implementation Program – Ongoing Programs (Education, Regulation, Maintenance)
- Table 5-2 Implementation Program – Capital Projects and Studies

Many of the City's stormwater and surface water management activities are tied to the implementation of the City's Municipal Separate Storm Sewer System (MS4) permit and association Storm Water Pollution Prevention Program (SWPPP). Section 5.0 also describes the roles of the Vermillion River Watershed Joint Powers Organization and South Washington Watershed District with respect to water resource management within the city and activities performed in cooperation with the City.

1.0 Introduction

1.1 Location and History

The City of Hastings (approximate population 23,000 in 2016) is located in the seven county Twin Cities metropolitan area in southeastern Dakota County. The City covers approximately 7,600 acres (11.9 square miles). The City of Hastings is largely bordered on the north and east by the Mississippi River, on the east by Ravenna Township, on the south by Marshan Township, and on the west by Nininger Township. There is a small portion of the City (approximately 170 acres) lying north of the Mississippi River in Washington County. Major highways run through the city, including Trunk Highway (T.H.) 55, U.S. Highway 61, and T.H. 316. Significant water resources in the city include:

- The Mississippi River
- The Vermillion River
- Lake Isabel
- Lake Rebecca

The majority of Hastings, including all area south of the Mississippi River, is located within the jurisdiction of the Vermillion River Watershed Joint Powers Organization (VRWJPO). The small portion of Hastings lying north of the Mississippi River is located within the jurisdiction of the South Washington Watershed District (SWWD). Surface water in Hastings flows generally east and north, either draining directly into the Mississippi River along its north boundary or into the Vermillion River which joins the Mississippi just north of Red Wing, Minnesota.

By 2040, the population of Hastings is forecast to increase to approximately 29,000. The City continues to develop, and annexations are expected in the next 20 years. The City expects to annex areas on the south and west sides of the city by the year 2030, increasing the City's total acreage to approximately 10,500 acres (16.5 square miles).

Current and anticipated future land use within the city is described in Section 3.1 of this Watershed Management Plan (Plan or WMP). More detailed information about expected changes in land use and future development is included in the City's 2018 Comprehensive Plan.

1.2 Purpose and Scope

The City of Hastings Watershed Management Plan (Plan or WMP) provides the City of Hastings with a comprehensive guide to managing water resources throughout the city. This WMP replaces the 2009 City of Hastings Watershed Management Plan (2009 WMP).

Several changes have occurred since the City's 2009 WMP that are addressed by this update, including, but not limited to:

- Changes in current and anticipated future land use
- Modifications to the City's storm water system

- Publication of updated precipitation frequency data (Atlas 14)
- Updates to the SWWD and VRWJPO watershed management plans
- Updates to the Minnesota Pollution Control Agency's (MPCA) Municipal Separate Storm Sewer System (MS4) general permit
- Evolving public and government attitudes, perceptions, and awareness regarding surface water quality management
- Completion of Total Maximum Daily Load (TMDL) studies for waters located within the city or outside of the city that receive drainage from the city
- Updates to the City of Hastings Wellhead Protection Plan (WHPP)

The WMP is a local water management plan meeting the requirements of Minnesota Statutes 103B.235, Minnesota Rules 8410. Minnesota Statutes 103B.201 states that the purposes of the water management programs required by statute are to:

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

The WMP addresses these purposes. The WMP has been developed consistent with the guidance of the Metropolitan Council and the requirements of the VRWJPO Watershed Management Plan (VRWJPO, 2016, as amended), and the SWWD Watershed Management Plan SWWD, 2016, as amended).

1.3 Water Resources-Related Agreements

Per its Stormwater Pollution Prevention Program (SWPPP), the City of Hastings continues to require owners of private stormwater facilities to enter into maintenance agreements with the City to ensure that those facilities continue to function as originally intended (see Section 5.2.1).

The City maintains its membership with the Minnesota Cities Stormwater Coalition (MCSC) for collaborative stormwater management activities.

The City maintains a partnership with Dakota County Soil and Water Conservation District (Dakota SCWD) for participation in the Landscaping for Clean Water Program.

1.4 Plan Update and Amendment Procedures

This WMP will guide the City of Hastings' activities through 2028, or until superseded by adoption and approval of a subsequent WMP. The City will begin the process of updating this plan 1 to 2 years before

its expiration date in coordination with the City's comprehensive planning process. The updated plan will meet the requirements of the applicable Minnesota laws and rules, the VRWJPO, and the SWWD.

The City may revise this WMP through an amendment prior to the scheduled WMP update, if either minor changes are required, or if problems arise that are not addressed in the WMP. However, this WMP remains in full force and effect until an updated WMP is approved by the VRWJPO and SWWD and is adopted by the City.

Any significant changes to this WMP must be approved by the affected watershed management organizations (WMOs). Minor changes to this WMP will not require WMO approval and can be made by City staff, but must be supplied to the WMOs for their information. The City considers minor changes those that do not modify the goals, policies, or commitments identified in the WMP. Examples of minor changes include:

- Inclusion of new or corrected hydrologic modeling results and mapping, as long as the changes do not significantly affect the rate or negatively impact the quality of intercommunity stormwater runoff.
- Inclusion of new/updated water quality monitoring data.
- Minor changes to the City's implementation program, such as added projects, schedule changes, and revised cost estimates, as long as there are no intercommunity impacts of such changes and the changes stem from the goals and policies in the WMP.

If it is unclear whether a proposed WMP change is minor or not, the City will bring the issue to the affected WMOs for their determination. The City's amendment procedure for significant changes to the WMP is as follows:

1. **Preparation of/Request for Amendment** – City staff shall prepare the amendment. If the amendment is not proposed by City staff, a written request for plan amendment must be submitted to City staff. The request shall outline the need for the amendment and additional materials City staff will need to consider before making its decision.
2. **Staff Review of Amendment** – If the amendment was not proposed by City staff, City Staff will make a decision as to the validity of the request and either:
    a. Reject the amendment
    b. Accept the amendment as a minor issue, with minor issues collectively added to the plan at a later date, or
    c. Accept the amendment as a major issue, with major issues requiring an immediate amendment.

    In acting on an amendment request, City staff shall recommend to City Council whether or not a public hearing is warranted.
3. **Council Consideration** – The City Council shall consider the amendment at a regular or special Council meeting. The City Council may give conditional approval of the amendment and submit it for WMO review and approval, or decide not to move forward with the amendment. If the City Council decides to submit the amendment for WMO approval, the council would also need to

determine when/if a public hearing or other public process should be undertaken. Staff recommendations should be considered before decisions on appropriate action(s) are made.

4. **Public Hearing and Council (if needed)** – This step allows for public input based on public interest. Council shall determine when the public hearing should occur in the process. Based on the public hearing, the City Council could approve the amendment.
5. **Watershed Organization Review and Approval** – City staff shall submit the amendment to the VRWJPO and/or SWWD for review and approval. The City must also submit the amendment to the Metropolitan Council and Dakota County and/or Washington County. The review process for an amendment is the same as for the original WMP; the WMOs have 60 days to review and comment on the amendment.
6. **City Council Adoption** – Upon approval by the WMO of the amendment, the City Council may adopt the amendment. Prior to the adoption, an additional public hearing may be held to review the plan changes and notify the appropriate stakeholders.

2.0 Goals, Objectives, and Policies

This section presents the goals and policies for stormwater and surface water management within the City of Hastings. These goals and policies are intended to allow future development and redevelopment while minimizing negative impacts natural resources and capitalizing on opportunities to enhance the environment.

The goals and policies contained in this plan address the problems and issues presented in Section 5.0 and are consistent with the goals of the Vermillion River Watershed Joint Powers Organization (VRWJPO) and the South Washington Watershed District (SWWD). The goals of this plan were established in accordance with the guidelines contained in Minnesota Statutes 103B and Minnesota Rules 8410.

Goals are organized into following topics areas:

- Surface water quality
- Stormwater runoff rate and volume
- Groundwater
- Floodplains
- Wetlands and habitat
- Open space and recreational areas
- Land use management
- Education and Outreach

Each goal is defined by more detailed objectives and is supported by several policies that provide the means for achieving the established goal.

2.1 Surface Water Quality

Goal: Preserve and enhance surface water quality of lakes, wetlands, and watercourses in and downstream of the City of Hastings.

Objectives:

- Improve the quality of surface water runoff reaching the Vermillion River, Mississippi River, Lake Rebecca and Lake Isabel.
- Minimize surface water quality impacts from land-disturbing activities, including new development and redevelopment (urban/rural), road construction, and rural uses.
- Not negatively impacting the City's groundwater source drinking water through its surface water management and regulation activities.
- Meet all applicable water quality standards and regulations as promulgated by the federal government, the State of Minnesota, Dakota County, Washington County, the South Washington Watershed District, the Vermillion River Watershed Joint Powers Organization, , and the Metropolitan Council.

Policies:

1. The City will continue to cooperate with other agencies to monitor lakes, including participation in citizen volunteer monitoring efforts such as the Wetland Health Evaluation Program (WHEP).

2. The City of Hastings will continue to enforcing water quality and stormwater management standards through its City ordinances and its development review and permitting program.

3. The City promotes the use of infiltration, where appropriate, to reduce pollutant loading to downstream water resources, while not contaminating its groundwater source drinking water.

4. The City will use existing natural retention and detention areas for stormwater management to maintain or improve existing water quality to the extent possible.

5. The City will maintain water quality treatment best management practices as necessary to ensure they continue to achieve intended benefits.

6. The City will cooperate with the MPCA and watershed management organizations to take actions to improve the quality of water bodies included on the MPCA impaired waters (303d) list, with the ultimate goal of removal from the impaired waters list.

7. The City will continue to implement all aspects of its NPDES MS4 permit and Stormwater Pollution Prevention Program (SWPPP).

8. The City requires that land disturbing activity equal to or greater than one acre include post-construction stormwater runoff quality measures consistent with the NPDES Construction Stormwater Permit.

9. For land disturbing activity equal to or greater than one acre, the City requires stormwater discharges have no net increase in total phosphorus and total suspended solids from pre-project conditions for new development and a net reduction from pre-project conditions for redevelopment.

10. The City will require project proposers to comply with the City's erosion and sediment control requirements and construction guidelines (Public Works Design Manual and Builders Handbook, as amended) and best management practices outlined in the Minnesota Stormwater Manual (MPCA, as amended).

11. The City will encourage developers to implement water quality BMPs beyond the minimum required.

12. The City will continue to require pre-treatment of stormwater prior to discharge to natural or improved waterbodies.

13. The City will coordinate with adjacent townships, VRWJPO, and Dakota County to address the treatment of stormwater runoff in areas that develop outside the city limits yet discharge to the City's stormwater system.

14. The City will work with the MPCA and other agencies to support the development and implementation of Total Maximum Daily Load (TMDL) studies and Watershed Restoration and Protection Strategies (WRAPS) studies.

15. The City will continue to use water quality modeling of major watersheds to diagnose potential problems, evaluate solutions, and track performance of implemented best management practices.

16. The City will summarize water quality monitoring data, as applicable, and make the data available via its website or other means.

17. As resources allow, the City will provide staff assistance to the SWWD, VRWJPO, the Dakota SWCD, federal, state, and other programs that provide cost share funds for lake shore restoration projects undertaken by landowners.

18. The City will continue to ensure that its ordinances include the applicable rules and performance standards of the VRWJPO (or SWWD in areas north of the Mississippi River).

19. The City will require that stormwater quality BMPs be designed and implemented consistent with guidance and recommendations from the Minnesota Stormwater Manual (MPCA, as amended) or approved alternative.

20. The City promotes the use of the following reference documents to guide application and design of Best Management Practices (BMPs) and Low Impact Development (LID) to achieve the performance standards described in this Plan and applicable City regulatory documents:

    - Minnesota Pollution Control Agency's *Minnesota Stormwater Manual* (http://stormwater.pca.state.mn.us/index.php/Main_Page)
    - Vermillion River Watershed Joint Powers Organization Standards
    - Minimal Impact Design Standards (MIDS) calculator (2013, as amended)
    - Minnesota Department of Health's *Evaluating Proposed Stormwater Infiltration Projects in Vulnerable Wellhead Protection Areas* (MDH, 2007)
    - City of Hastings Public Works Design Manual
    - City of Hastings Builders' Handbook

21. The City will seek opportunities to stabilize and restore eroded drainageways and continue to monitor restored drainageways for erosion problems on public lands.

22. The City will seek opportunities to provide additional water quality treatment by modifying traditional stormwater detention ponds and water quality treatment basins by deepening or adding/changing outlet structures.

23. The City will periodically review its regulatory controls and update them where necessary to remain consistent with applicable federal, state, and local requirements.

24. The City will assess the adequacy of its SWPPP to address applicable TMDLs and will revise its SWPPP if it does not meet the applicable requirements, schedules, and objectives of each TMDL.

2.2 Stormwater Runoff Rate and Volume

Goal: Manage the rate and volume of stormwater runoff to minimize negative impacts to infrastructure, the natural environment, and public and private lands.

Objectives:

- Minimize downstream impacts of runoff from land-disturbing activities including new development and redevelopment, road construction, and rural uses.
- Mitigate or reduce the impact of past increases in stormwater discharge on downstream conveyance systems or receiving water bodies.
- Address erosion problems in the City of Hastings.

Policies:

25. The City will continue to use hydrologic and hydraulic models, current precipitation data, and climate trends to optimize design of stormwater infrastructure.

26. The City will emphasize development of stormwater storage to keep peak rates at or below existing rates of runoff to improve water quality.

27. The City will consider the water quality and water quantity impacts of watershed diversions to avoid negative impacts on downstream waterbodies and its groundwater source drinking water.

28. The City requires that peak runoff rates for proposed land disturbing activities do not exceed the existing peak runoff rates for the 1-year, 10-year, and 100-year 24 hour storm events, or the 100-year 4-day storm event.

29. The City requires that land disturbing activities provide volume control such that there is no increase in runoff volume from the 2-year, 24 hour storm event relative to existing conditions.

30. The City encourages project proposers to reduce runoff rates and volumes beyond the City's minimum requirements.

31. The City encourages the use of existing natural retention and detention areas for stormwater management to minimize flow rates.

32. The City will allow outlets from landlocked basins only when such outlets are consistent with state and federal regulations, and the impacts of such outlets to infrastructure, riparian areas, and habitat have been analyzed and no detrimental impacts result.

33. The City will strive to design its stormwater sewers and storm sewer inlets to provide adequate level of service for the 10-year storm event and adequate level of protection for the 100-yr storm event.

34. The City will coordinate with adjacent townships, VRWJPO, SWWD, and Dakota and Washington Counties to address flood risk reduction in areas that develop outside the city, yet discharge to the City's stormwater system.

35. The City will continue to review the impacts of any proposed development on flowrates and flood elevations.

36. The City will secure easements over floodplains, detention areas, wetlands, ditches, and all other parts of the stormwater system for new developments and redevelopments.

37. The City will require new development and re-development to be compliant with the VRWJPO Stormwater Management and Floodplain Criteria as well as SWWD rules for areas north of the Mississippi River.

38. The City will identify stream corridor reaches for streambank erosion reduction projects, and restore damaged stream banks at priority locations as funding allows, taking advantage of partnerships and cost-sharing whenever possible.

39. The City will provide staff assistance to the Dakota SWCD, Washington Conservation District, federal, state, and local programs that provide cost share funds for streambank restoration projects undertaken by landowners.

40. The City encourages the use of low-impact development techniques and will seek opportunities to implement these techniques as part of development and redevelopment.

41. The City will preserve and increase (where necessary and feasible) the storage capacity of the existing stormwater system as resources allow.

42. The City will continue to require the incorporation of emergency overflow structures (i.e. swales, spillways) into pond outlet structures to prevent undesired flooding or impacts to infrastructure resulting from storms larger than the 100-year (one percent) event or plugged outlet conditions.

43. The City will identify trapped street depressions and prioritize street sweeping and catch basin cleaning in those areas; the City will attempt to provide drainage facilities in areas of trapped street depressions through its reconstruction program.

44. The City will work to address identified gully erosion problems in the City, in coordination with parties (e.g. watershed management organizations).

45. The City will inspect and maintain its Vermillion River levee system to ensure it continues to provide the intended benefits as required by the Army Corps of Engineers.

2.3 Groundwater

Goal: Protect groundwater quality and quantity to preserve it for sustainable and beneficial purposes

Objectives:

- Minimize impacts to base flow of the Vermillion River and its tributaries.
- Minimize reductions in normal water levels of lakes and wetlands, due to increased groundwater appropriations.
- Minimize discharges of fecal coliform bacteria, nitrate, and other pollutants to groundwater.

Policies:

46. The City will consider possible impacts to groundwater in the design and construction of holding ponds, infiltration basins, wetlands, and other stormwater storage and treatment practices.

47. The City will support and assist, as requested, in groundwater research, regulation, and education efforts performed by cooperating entities.

48. The City will promote infiltration of stormwater and groundwater recharge where it is feasible and does not pose a threat to groundwater quality. Infiltration practices should be designed with consideration for the following guidance documents:
    - The Vermillion River Watershed Joint Powers Organization Standards
    - Minimal Impact Design Standards (MIDS) calculator (2013, as amended)
    - Minnesota Department of Health's *Evaluating Proposed Stormwater Infiltration Projects in Vulnerable Wellhead Protection Areas* (MDH, 2007)
    - Minnesota Pollution Control Agency's *Minnesota Stormwater Manual* (http://stormwater.pca.state.mn.us/index.php/Main_Page)

49. The City will continue to implement and update, as needed, the City of Hastings Wellhead Protection Plan and utilize the guidance contained in the Minnesota Department of Health's Evaluating Proposed Stormwater Infiltration Projects in Vulnerable Wellhead Protection Areas (MDH, 2007) and the MPCA's Minnesota Stormwater Manual (MPCA, as amended).

50. The City will promote the proper sealing of all unused wells in the city within the Drinking Water Supply Management Area (DWSMA) according to the Minnesota Department guidance.

51. The City will use the Dakota County Well Management database in plan and permit reviews.

52. The City will provide education (e.g. landowner outreach) in coordination with the City's Wellhead Protection Program.

53. The City will continue to implement all groundwater-related items in the City's SWPPP, including:
    - Discouraging infiltration practices in unsuitable areas
    - Evaluating its groundwater outputs and elevations
    - Performing illicit discharge education, detection, and elimination
    - Developing and implementing its Hazardous Material Spill Response Plan

54. The City will cooperate with federal, state, and local entities to develop and implement collaborative projects and programs to protect and improve groundwater quality (e.g. Hastings Area Nitrate Study future phases).

55. The City will request information from the Minnesota Departhment of Health (MDH) and other entities, as needed, on the location of new registered storage tanks in Hastings and the status of registered storage tanks and leaking underground storage tanks (LUST) cleanups in Hastings.

56. The City will encourage the use of grassed waterways to maximize infiltration where not detrimental to groundwater supplies.

57. The City will collaborate with other agencies in efforts to promote groundwater sustainability.

58. The City will cooperate with Dakota County's efforts to inventory non-functioning and non-compliant subsurface sewage treatment systems (SSTS) and jointly prioritize areas for SSTS upgrades; the City will consider alternatives to upgrade non-compliant SSTS.

59. The City will continue to require connection to the City's sanitary sewer system when available.

60. The City will cooperate with the Minnesota Department of Health (MDH), Dakota County and other agencies to periodically assess the vulnerability of groundwater used for drinking water supplies.

61. The City will periodically review the status of various permits associated with potential contamination sources to allow timely recognition of potential problems that may affect the municipal water supply in compliance with the City's Wellhead Protection Plan.

2.4 Wetlands and Habitat

Goal: Preserve and enhance the amount and quality of wetlands and habitats within the city.

Objectives:

- Protect the functions and values of existing wetlands and fish and wildlife habitat areas.
- Restore or create additional wetland and habitat areas.
- Protect sensitive habitats and communities, and rare species.

Policies:

62. The City will enforce buffer requirements for wetlands, streams and water courses that are consistent with VRWJPO standards and rules for areas south of the Mississippi River and compliant with SWWD rules for areas of the city north of the Mississippi River. Wetland buffer requirements vary according to wetland classification and include:

Wetland Classification	VRWJPO Buffer Width (ft)		SWWD Buffer Width (ft)	
	Average	Minimum	Wetlands > 1 acre	Wetlands < 1 acre
Preserve	50	30	100	75
Manage 1	40	30	75	50
Manage 2	30	25	50	25
Manage 3	25	16.5	NA	NA

Note: the above information is provided as a summary; additional details are included in the VRWJPO standards and SWWD rules.

63. The City will work to achieve no net loss of valuable wooded and native prairie areas, and preserve and enhance natural vegetation to the greatest practical extent.

64. The City of Hastings will work to achieve no net loss of wetland quantity, quality, and biological diversity.

65. The City will avoid or minimize the fragmentation of natural areas and corridors.

66. The City will avoid impacts to locally and regionally significant natural areas when feasible and mitigate unavoidable impacts.

67. The City will act as the Local Governmental Unit (LGU) enforcing the Minnesota Wetland Conservation Act (WCA) and manage wetland activities within the city in compliance with the requirements of WCA.

68. The City will collaborate with other agencies and organizations to develop or enhance wildlife habitat corridors that connect open space, stream corridors, lake buffers, wetland buffers and stormwater management facilities.

69. The City will collaborate with conservation agencies and other organizations to supplement their fish and wildlife habitat protection and enhancement efforts and programs.

70. The City will seek opportunities to enhance or provide new habitat as part of wetland modification, stormwater facility construction, natural resource protection or creation or other appropriate projects.

71. The City will require development and redevelopment applicants to perform a site-specific delineation of the wetland boundary and wetland assessment as part of proposed development

or redevelopment activities, using the Minnesota Routine Assessment Methodology (MnRAM) for Evaluating Wetland Functions, version 3.0 (as updated), or an equivalent methodology.

72. The City will continue to require pre-treatment of stormwater runoff prior to discharge to wetlands.

73. The City will identify priority wetland restoration projects and opportunities to enhance existing wetlands.

74. The City will identify priority habitat, natural area, and migratory corridor restoration opportunities.

75. The City will cooperate with the VRWJPO, SWWD, Dakota and Washington Counties, the Dakota County SWCD, and the Washington Conservation District to identify, rank, and map shoreline areas at lakes and streams, prioritizing disturbed areas and extending the evaluation to undisturbed areas as resources allow or activities require.

76. The City will review projects and plans with an awareness of sensitive habitats and communities, and rare species.

77. The City will minimize water level fluctuation (bounce) in wetlands to prevent adverse habitat impacts.

78. The City will encourage alternative landscaping designs that promotes beneficial habitat and wildlife uses and discourages detrimental wildlife uses.

79. The City will require proposed development applications to include known sensitive habitats and communities, and rare species, and include reasonable measures to avoid impacts to these areas

80. The City will continue to participate in the Wetland Health Evaluation Program (WHEP), as resources allow.

2.5 Flooding and Floodplain Management

Goal: Minimize the risk of flooding to protect public health and safety, minimize adverse environmental impacts, and minimize capital expenditures.

Objectives:

- Reduce risk of flood damage to homes and businesses to minimum practical level.
- Identify and protect floodplains to obtain "no net loss" of floodplain storage.

Policies:

81. The City will maintain or replace stormwater infrastructure to minimize the risk and consequences of stormsewer failure.

82. The City will maintain shoreland and floodplain ordinances that are compatible with existing county and state ordinances, VRWJPO standards, and SWWD rules.

83. The City will manage floodplains to maintain critical 100-year flood storage volumes; the City will require compensatory storage for filling within the floodplain.

84. The City will work to restrict construction of new structures to sites above flood prone areas.

85. The City will maintain floodplain zoning regulations that are consistent with Dakota County water resource plans and ordinances.

86. The City will maximize upstream floodwater storage.

87. The City will remove accumulated sediment from flood storage facilities, as needed, to maintain intended stormwater detention functions.

88. The City will increase infiltration in appropriate floodplain areas through increased vegetated areas and reduced impervious surfaces.

89. The City will require a floodplain use permit for any development, land alteration, or land use change in the floodplain.

90. The City will use available hydrologic data and models to estimate 100-year water levels and floodplains for all water bodies.

91. For new and significantly redeveloped structures located outside the areas subject to the City's Floodplain Ordinance, the City requires that the low opening elevation shall be:
    a. At least 2 feet above the 100-year flood level of adjacent waterways, lakes, ponds, wetlands, drainages, or other stormwater infrastructure, and
    b. At least 3 feet above the seasonal high groundwater elevations for the area; groundwater elevation data may be derived from piezometer data, soil boring data showing mottled or hydric soils, or other sources approved by the City Engineer.

92. For new and significantly redeveloped structures located within the areas subject to the City's Floodplain Ordinance, the City requires that the lowest floor, including basement, be at least one foot above the 100-year flood level and consistent with the City's Floodplain Ordinance, as amended.

93. The City may allow local streets and parking areas to overtop by no more than one foot measured at its deepest point (e.g. the gutter) in the 100-year storm.

94. Where the City has identified potential for flood damage to residential structures , the City will evaluate redesign of storm drainage systems to reduce the risk of flooding in the 100-year storm; improvements may be implemented at time of street reconstruction projects.

95. The City will continue to participate in the National Flood Insurance Program.

96. The City will cooperate with state and federal agencies, as requested, in efforts to update FEMA floodplain mapping.

97. The City will obtain flood and drainage easements to encompass the footprint of the 100-Year flood event and easements for maintenance access and over emergency overflow routes during development and/or building permit processes.

2.6 Open Space and Recreational Areas

Goal: Develop or improve recreational, fish and wildlife, and open space areas and accessibility in conjunction with water quality improvement projects.

Objectives:

- Preserve and enhance natural and recreational areas.
- Promote and improve access to open space and recreational opportunities.
- Maintain natural stream corridor and lake shoreline qualities for recreational users and local residents.
- Partner with others to improve access to public waters, while avoiding impacts of over-use or conflicting uses.

Policies:

98. The City will discourage recreational uses of waterbodies that pose a risk to public health and safety.

99. The City will create and preserve navigational, wading, swimming, fishing, kayaking, and other recreational boating access to public waters, where appropriate.

100. The City will seek opportunities to preserve, restore, and enhance natural areas, shoreland and wetland environments.

101. The City will use native vegetation in local government projects and promote the use of native vegetation in private development open spaces where practical.

102. The City will seek opportunities to connect and enhance existing open spaces, outdoor recreational amenities, and cultural resources.

103. The City will promote appropriate open spaces uses in wellhead protection areas and implement BMPs to reduce nitrogen runoff in City parks and recreational areas within the DWSMA.

104. The City will support efforts to create a continuous trail system along the Vermillion River and its major tributaries.

105. Cooperate with other government units to complete habitat and recreational corridor connections (trails and greenways).

106. The City will encourage alternative landscape designs that:
    a. Increase beneficial habitat, wildlife, and recreational uses; promote infiltration and vegetative water uses
    b. Decrease detrimental wildlife uses (such as beaver dams and goose overabundance) which may damage water control facilities, shoreline vegetation, water quality, or recreational facilities

107. The City will collaborate with agency, non-profit, and volunteer groups for river cleanup activities.

108. The City will collaborate with and/or participate in VRWJPO, SWWD, County, and SCWD projects, programs, or other activities to address river corridor access issues as resources allow.

2.7 Land Use Management

Goal: Protect and conserve water and natural resources by promoting sustainable growth, integrated land use planning, and water resource management.

Objectives:

- Preserve natural resources for use and enjoyment of future generations.
- Maintain opportunities for land development and redevelopment.
- Minimize impacts to water resources resulting from new development and redevelopment, road construction, and other land disturbing activities.

Policies:

109. The City will continue to implement City ordinances and regulatory controls to regulate development, redevelopment, and other land disturbing activities within the city.

110. The City will use the presence of environmentally sensitive natural resource areas to guide land use management decisions, including establishing land use policies and controls.

111. The City will require stormwater best management practices be implemented as part of the development approval process.

112. The City of Hastings will consider potential impacts to sustainable, high-quality surface water resources in its land use planning and the development and implementation of its land use policies and controls.

113. The City requires plans for land disturbing activities to consider and address impacts to local water and natural resources, including cumulative effects, consistent with the City's stormwater management ordinance, SWPPP, and other applicable regulations.

114. The City will periodically review and update its ordinances and official controls as necessary to meet the current requirements of the Federal Government, the State of Minnesota, counties, watershed management organizations, and the Metropolitan Council.

115. The City will encourage development and redevelopment applicants to seek opportunities to provide additional stormwater quality treatment, flood risk reduction, or other water resource benefits in conjunction with their projects, and the City will seek opportunities to provide additional stormwater quality treatment on linear projects when feasible.

116. The City will enhance natural vegetation to the greatest practical extent.

117. The City will evaluate the impacts of any proposed land use/zoning changes on flowrates and flood elevations.

2.8 Education and Public Outreach

Goal: Facilitate understanding of water resource and other natural recourses issues and encourage water resource stewardship through programs, educational opportunities, and information.

Objectives:

- Develop and share information and data related to water resource issues.
- Provide opportunities for community involvement, participation, and access to information.
- Increase community capacity to implement stormwater management best practices.

Policies:

118. The City will assist the VRWJPO, SWWD, and other agencies with development and distribution of educational materials relevant to the City's water resource management goals.

119. The City will collaborate with state and local agencies to assist in data collection efforts and will share City data for use in research and to develop targeted educational messages.

120. The City will continue to distribute the City's Drinking Water Consumer Confidence Report.

121. The City will continue its water quality education programs aimed at civic groups, schools, and other community groups.

122. The City will continue to participate in cooperative water monitoring programs.

123. The City will continue to support and facilitate existing volunteer programs in Hastings including the Citizen Assisted Monitoring Program (CAMP), the Wetland Health Evaluation Project (WHEP), and the Vermillion River Watch program.

124. The City will seek new opportunities to engage volunteers.

125. The City will continue to distribute information through a variety of media, including, but not limited to:
    a. Presentations
    b. Targeted Mailings
    c. City newsletters,
    d. Social Media, including Facebook and Twitter
    e. Hastings Community TV channel

126. City of Hastings web site at www.hastingsmn.gov. The City will develop and/or share educational materials that target public awareness of priority water resource issues; topics may include:
    f. Vegetated buffers
    g. Water conservation
    h. Illicit discharge to storm sewers
    i. Leaf collection
    j. Wildlife habitat
    k. Invasive species and native vegetation

127. The City will encourage residents to practice behaviors that minimize impact to water resources (e.g., rainwater collection and reuse, minimizing the use of pesticides and herbicides, directing gutters to pervious areas).

128. The City will continue to implement the public education elements of its NPDES Municipal Separate Storm Sewer System (MS4) permit, including an annual public meeting to review the City's Stormwater Pollution Prevention Program (SWPPP).

2.9 Administration and Operations Policies

Goal: Efficiently and responsibly perform the City's stormwater and surface water management responsibilities.

Objectives:

- Continue to meet all applicable federal, state, and local requirements for municipal stormwater management.

- Ensure stormwater management systems are maintained while minimizing the total cost of the stormwater system (construction plus maintenance).

Policies:

129. The City will continue to implement permitting programs (e.g., building permit) to ensure compliance with City and other local and state requirements. Note that some activities may require permits in addition to those issued by the City.

130. The City's building inspectors or other City staff will inspect projects for conformance with City permitting requirements, as dictated by the applicable permit(s).

131. The City will continue to require collection of plan review escrow fees to cover the costs of services and to provide oversight and guidance in review of developers' designs and plans for onsite stormwater management practices to meet City of Hastings' standards.

132. The City shall maintain its stormwater management system to ensure the continued effectiveness of stormwater treatment, conveyance, and flood risk reduction functions.

133. The City will continue to implement the stormwater system maintenance best management practices/good housekeeping practices defined in its Municipal Separate Storm Sewer System (MS4) Stormwater Pollution Prevention Program (SWPPP).

134. The City requires developers or permit holders to provide as-built drawings of all ponding areas and designated emergency overflows, and requires a surveyor's certified drawing showing that the elevations of the low floors, low openings, and below the floor HVAC facilities are in conformance with the City's minimum building elevation requirements for such features.

135. The City will maintain and submit annual inspection reports, maintenance reports, and other needed documentation in conformance with the NPDES MS4 permit and applicable requirements of the WMOs.

136. The City will optimize its winter road management practices (e.g., de-icing) to reduce negative environmental impacts while maintaining public safety. The City will consider management strategies resulting from the MPCA's Twin Cities Metro Chloride TMDL, including staff trainings.

137. The City will periodically review its stormwater program funding mechanisms, expenses, and implementation program to promote efficiency and funding adequate to accomplish City goals.

138. The City will pursue cost-share and grant funding opportunities, when applicable.

3.0 Physical Environment Inventory

This section gives an overview of the physical environment of the City of Hastings. It includes information about the City's land use, climate, topography, soils, geology and groundwater resources, surface water resources, drainage patterns, natural areas, , fish and wildlife habitats, recreational areas, and potential pollutant sources located within the city. This information affects decisions about infrastructure, development, and ecological preservation

3.1 Land Use

The City of Hastings contains diverse areas of residential neighborhoods, commercial and industrial developments, schools, churches, County seat and park and recreation facilities. Approximately 70 percent of the city is developed. Much of the undeveloped area within the current city boundary is wetland or preservation area that cannot be developed. Current land use (as of 2010) is presented in Figure 3-1. Estimated future land use (2040) is presented in Figure 3-2. The *City of Hastings 2040 Comprehensive Plan* (comprehensive plan) (City of Hastings, 2018 update) provides detailed information about the historical, existing, and projected land uses in the city.

Land use is an important factor for estimating current or future surface water runoff. The hard or impervious surface areas associated with each land use greatly affect the amount of runoff generated from an area. Stormwater management will be an important consideration in developing areas. In areas that are already developed, redevelopment will provide a significant opportunity to implement stormwater best management practices (BMPs) to can improve water quality, reduce the risk of flooding, or achieve other benefits. The City encourages the use of Low Impact Development (LID) techniques with development and redevelopment, where opportunities allow.

The Mississippi National River and Recreation Area (MNRRA) includes the City of Hastings. The MNRRA Comprehensive Management Plan prescribes a two-tier implementation approach to planning and regulation. Although not required, cities are encouraged to incorporate the MNRRA plan policies. The City of Hastings is already implementing the first-tier recommendations of the MNRRA plan.

3.2 Climate and Precipitation

The climate of Hastings is a humid continental climate, characterized by moderate precipitation, wide daily temperature variations, large seasonal variations in temperature, warm humid summers, and cold winters with moderate snowfall.

The amount, rate, and type of precipitation are important in determining flood levels and stormwater runoff rates and volumes, all of which impact water resources. Average weather imposes little strain on the typical stormwater drainage system. Extremes of precipitation and snowmelt are important for design of flood risk reduction systems. The National Oceanic and Atmospheric Administration (NOAA) has data on extreme precipitation events that can be used to aid in the design of stormwater management and flood risk reduction systems. _

In contrast with stormwater conveyance and flood risk reduction facilities, stormwater quality treatment systems are designed based on the smaller, more frequent storms. These more frequent storms account for the majority of the annual pollutant loadings from urban watersheds (MPCA, 2005b).

NOAA published Atlas 14, Volume 8, in 2013. Atlas 14 is the primary source of information regarding rainfall in the region. Atlas 14 supersedes publications TP-40 and TP-49 issued by the National Weather Bureau (now the National Weather Service) in 1961 and 1964. Improvements in Atlas 14 precipitation estimates include denser data networks, longer (and more recent) periods of record, application of regional frequency analysis, and new techniques in spatial interpolation and mapping. Atlas 14 provides estimates of precipitation depth (i.e., total rainfall, in inches) and intensity (i.e., depth of rainfall over a specified period) for durations from 5 minutes up to 60 days and recurrence intervals of from 1-year to 1000-years.

Runoff from spring snowmelt is significant in this region but is not provided in Atlas 14. The Soil Conservation Service's (now the Natural Resources Conservation Service) National Engineering Handbook, Hydrology, Section 4, presents maps of regional snowmelt runoff volume. Table 3-1 lists selected precipitation and runoff events used for design purposes.

Table 3-1 Selected Precipitation and Snowmelt Runoff Events

Type	Event Frequency	Duration	Depth (inches)
Rainfall	1-year	24 hour	2.46
	2-year	24 hour	2.80
	5-year	24 hour	3.47
	10-year	24 hour	4.16
	25-year	24 hour	5.27
	50-year	24 hour	6.27
	100-year	24 hour	7.39
	10-year	10 day	6.51
	100-year	4 day	8.29
	100-year	10 day	9.83
Snowmelt[1]	10-year	10 day	4.7
	25-year	10 day	5.7
	50-year	10 day	6.4
	100-year	10 day	7.1

Source: NOAA Atlas 14 – Volume 8. Station: Hastings Dam 2 (21-3567).
Hydrology Guide for Minnesota (USDA Soil Conservation Service – NRCS)
(1) Snowmelt depth reported as liquid water.

The frequency (also called recurrence interval or return period) of a given storm event is a function of probability. The recurrence interval or return period describes the average time between events of a given magnitude expected over *extremely long* periods of time. The inverse of the recurrence interval is the

probability of a given event occurring in any single year (e.g., a 100 year event has a 1% chance of occurring in any single year). The return period implies nothing about the actual time sequence of the event. For example, two 100 year events could occur in consecutive years, or even within a single year.

Even with wide variations in climate conditions, climatologists have found four significant climate trends in the Upper Midwest (*Minnesota Weather Almanac,* Seeley, 2006):

- Warmer winters
- Higher minimum temperatures
- Higher dew points
- Changes in precipitation trends – more rainfall is coming from heavy thunderstorm events and increased snowfall

According to NOAA's 2013 assessment of climate trends for the Midwest (NOAA, 2013), annual and summer precipitation amounts in the Midwest are trending upward, as is the frequency of high intensity storms. Higher intensity precipitation events typically produce more runoff than lower intensity events with similar total precipitation amounts; higher rainfall intensities are more likely to overwhelm the capacity of the land surface to infiltrate and attenuate runoff. Precipitation records in the Twin Cities area show that the average annual precipitation has increased (Minnesota Climatology Working Group, 2016). Many of the highest rainfall events ever recorded have occurred since the year 2000.

Additional climate information can be obtained from a number of sources, such as the following:

- For climate information about the Twin Cities metropolitan area: http://www.dnr.state.mn.us/climate/twin_cities/index.html
- Local data available from the Midwestern Regional Climate Center (MRCC): http://mrcc.isws.illinois.edu/CLIMATE/
- For a wide range of Minnesota climate information: http://www.nws.noaa.gov/climate/index.php?wfo=mpx

3.3 Topography and Drainage Patterns

The topography of Hastings is gently rolling, with steep slopes adjacent to the Mississippi River, the Vermillion River, and Sand Coulee. Elevations range from a maximum of over 900 feet in the west part of the city to a minimum of about 675 feet at the Mississippi River. Topography is presented in Figure 3-3.

The northern portion of the city drains into the Mississippi River. The south part of the city drains into the Vermillion River, which discharges into the Mississippi River approximately 10_miles south of Hastings near Red Wing, MN. The urbanization of the city over time has altered the natural topography at a local scale. With these alterations, local drainage patterns have become more defined.

The City lies mostly within the Vermillion River Watershed Joint Powers Organization (VRWJPO); a small portion of the city north of the Mississippi River lies within the South Washington Watershed District

(SWWD). The legal boundaries of these watershed management organizations (WMOs) are shown in Figure 3-3.

For water resource management and planning purposes, the City has further subdivided the drainage area within the VRWJPO into the following major drainage areas:

- Mississippi River Watershed
    - West Mississippi River Subwatershed
    - Central Mississippi River Subwatershed
    - East Mississippi River Subwatershed
- Vermillion River Watershed
    - Northwest Vermillion River Subwatershed
    - West Vermillion River Subwatershed
    - Northeast Vermillion River Subwatershed
    - Southeast Vermillion River Subwatershed
- Sand Coulee Watershed
- South Fringe Watershed

These major watersheds are presented in Figure 3-4. Note that watershed boundaries shown in Figure 3-4 do not align exactly with the jurisdictional boundaries of the WMOs shown in Figure 3-3; the watershed delineations shown in Figure 3-4 are dictated by topography and stormwater infrastructure, while the WMO legal boundaries shown in Figure 3-1 follow parcel boundaries. The nine watersheds shown on Figure 3-4 are further subdivided into smaller subwatersheds for modeling purposes (see figures in the City's 2009 WMP).

The area north of the Mississippi River located within the SWWD has not been divided into subwatersheds due to the limited areas and lack of hydrologic or water quality modeling.

3.3.1 Mississippi River Watershed

The Mississippi River major watershed, on the north side of the city, drains to the Mississippi River, or to the Vermillion Slough. The Mississippi River watershed is further broken down into West, Central, and East Mississippi River subwatersheds, as shown in Figure 3-4. Figure A-1, Figure A-2, and Figure A-3 present the minor subwatersheds and drainage patterns for the West, Central, and East Mississippi River subwatersheds, respectively.

3.3.1.1 West Mississippi River Subwatershed

Figure A-1 presents the minor subwatersheds and drainage patterns for the West Mississippi River subwatershed. The portion of the subwatershed within the city is nearly fully developed. . The following ponds and ponding areas are located in this subwatershed, with the minor watershed prefixes noted:

- **High School Athletics Field Pond (HS-AF)** – outflows from this pond follow a drainageway that discharges into the northwest corner of Feather Stone Pond.

- **Featherstone Pond (FS**) – all but four of the minor watersheds drain to Feather Stone Pond. A well-defined watercourse carries stormwater from the western agricultural areas of the subwatershed, outside of the extent of the 2030 projected development area, to the northwest corner of Feather Stone Pond. The Feather Stone Pond outlet is at the southeast corner of the pond; outflows are carried in a storm sewer pipe south along Pleasant Drive, and then east and south to Northwest Ponding Basin.
- **Summit North Pond (FS-F-SPN**) – this pond discharges via an open channel to the northwest corner of Featherstone Pond.
- **Eagle Bluff Ponds 1 and 2 (RD-19 and RD-7) -** these ponds are located on the north side of County Road 42 and discharge to a storm sewer pipe that flows to the Mississippi River, upstream of the dam.

3.3.1.2 Central Mississippi River Subwatershed

Figure A-2 presents subwatershed and drainage information about the Central Mississippi River subwatershed. All but the extreme western edge of the subwatershed is developed. There are no ponding areas in the eastern (older) downtown portion of this subwatershed. The following water bodies, ponds, and ponding areas are located in this subwatershed, with the minor watershed prefixes noted:

- **Lake Rebecca (LR) –** Lake Rebecca is MDNR public water (#19-0003). The outlet from Lake Rebecca is at the southeast corner of the lake; a channel carries the outflows to the Mississippi River.
- **Cemetery Ravine Ponds 1 – 3 (LR-B)** – these three sedimentation ponds treat the stormwater collected along County Road 42 and discharge around the west side of Lake Rebecca.
- **Northwest Basin (NWB**) – about half of the minor watersheds drain to the Northwest Basin. The Northwest Basin outlet is at the southeast corner of the pond; outflows first follow Highway 55 and then flow north and east, eventually reaching the Mississippi River via storm sewer.
- **Summit South Pond (NWB-DSPS)** – this pond discharges into a storm sewer along 4th Street, with flows eventually reaching the northwest corner of the Northwest Basin.
- **High School South Pond (HS)** – the outflows from this pond flow into the Summit South Pond.
- **Government Center Ponds 1 – 3** (NWB-D) – Government Center Pond 1 is the downstream ponding area in the series; outflows discharge by drainage swale to a storm sewer pipe inlet located on the west side of Whispering Lane, eventually reaching the northwest corner of the Northwest Basin.
- **Pleasant Drive Pond (PP) –** outflows from this pond follow Pleasant Drive, eventually reaching the northwest corner of the Northwest Basin.
- **Wal-Mart Development Pond (WAL2) –** outflows from this pond discharge into the Northwest Basin, though a system of pipes under 4th Street West.
- **Hwy 55/Library Pond (NWB-D-47) –** outflows from this pond discharge into Northwest Basin.

3.3.1.3 East Mississippi River Subwatershed

Figure A-3 presents subwatershed and drainage information about the East Mississippi River subwatershed. This subwatershed is completely developed. About half of the minor watersheds drain

directly into the Mississippi River; these watershed names begin with the prefix MR-. The other half drain into Lake Isabel, MDNR public water (#19-0004); these watershed names begin with the prefix LI-. The outlet from Lake Isabel is at the northeast corner of the lake; the outlet channel carries flows into the Vermillion Slough, eventually reaching the Mississippi River. There are no ponding areas in this subwatershed other than Lake Isabel.

3.3.2 Vermillion River Watershed

The Vermillion River major watershed, on the south side of the city, drains to the Vermillion River. The Vermillion River flows northeasterly from the southwest corner of the city. The minor watersheds that drain directly to the Vermillion River begin with the prefix VR-. The Vermillion River watershed is further broken down into Northwest, West, Northeast and Southeast subwatersheds, as shown on Figure 3-4. Figure A-4, Figure A-5, Figure A-6, and Figure A-7 present the subwatersheds and drainage patterns for the Northwest, West, Northeast, and Southeast Vermillion River subwatersheds, respectively.

3.3.2.1 Northwest Vermillion River Subwatershed

Figure 4-4 presents subwatershed and drainage information about the Northwest Vermillion River subwatershed. This entire subwatershed is nearly completely developed. The Hastings Country Club is in this subwatershed. There are no surface water outlets from the ponds and low areas on the golf course (landlocked). The following ponds and ponding areas are located in this subwatershed, with the minor watershed prefixes noted:

- **Southwest Ponding Basin (SWB)** – the majority of the minor watersheds drain to Southwest Ponding Basin. The Southwest Ponding Basin outlet is a pump station and forcemain that carries water to the Vermillion River.
- **Conzemius Pond (CPB)** – this pond discharges from its southeast corner to a storm sewer system that carries flows to the north side of Southwest Ponding Basin. Under low flow conditions, watersheds CPB-B-30, CPB-B-29, CPB-B-28, and CPB-B-19 discharge north into the Conzemius Pond system. Upstream of Conzemius Pond in watershed SWB-A-22 is a steep ravine that needs to be monitored.
- **Rosemary Pond (RP)** – the outlet from Rosemary Pond is located on the east side of the pond. Outflows are carried east in storm sewers to the west side of Conzemius Pond.
- **14th Street Pond (14P)** – this pond discharges from its east corner to a storm sewer system that carries flows to the northwest side of Rosemary Pond.
- **General Sieben Drive Pond (SDP**) – the outlet from this pond is a short piece of storm sewer that carries flows from the southeast shore of General Sieben Drive Pond to the northwest corner of 14th Street Pond.
- **20th Street Pond (20P)** – the 20th Street Pond outlet is at the northwest corner of the pond. Outflows discharge into the storm sewer system that carries flows from the 17th Street Basin to Conzemius Pond. During large flow events, the outlet of 20th Street Pond acts as an inlet for flood water on 15th Street.
- **17th Street Basin (17P)** – the outlet from this pond is on the east side of the pond. Outflows are carried in the storm sewer system that flows east and north to Conzemius Pond.

- **Stonegate Pond (SMP)** – this pond is made up of two basins, North and South, that act as one pond. The outlet is on the north side of the north pond. Discharges are carried in a storm sewer to the south side of 17th Street Pond.
- **Wyndham Pond (WP)** – the outlet is located at the northeast corner of this pond. Discharges are carried in a storm sewer system to the northwest side of the 17th Street Pond.
- **Carleton Pond (CP)** – the outlet from this pond is at the south end of the pond. Storm sewer carries the outflows to the southwest side of Wyndham Pond.
- **Conzemius Park Berm Storage (SWB-A-22)** – this is the storage area behind the Conzemius Park berm separating the main flow path upstream in the ravine from Conzemius Park.
- **Prairie Ridge Ponds 1-3 (PR-6, PR-1&2, PR-11)** – these ponds were created as part of the Prairie Ridge Development. These ponds discharge into the General Sieben Drive Pond.
- **Zweber Ponding Basin (ZWEB) –** this pond receives stormwater runoff from Zweber Lane and drains into the golf course.

3.3.2.2 West Vermillion River Subwatershed

Figure A-5 presents subwatershed and drainage information about the West Vermillion River subwatershed. The Vermillion River flows through the southern part of this subwatershed. The southwest corner of the Hastings Country Club is in this subwatershed. The watersheds along Pleasant Drive and Southview Drive directly discharge to the Vermillion River

- **Wallin Development Ponds** – several ponds were constructed as part of Wallin Development. These ponds (and the minor watershed prefixes) include the following:
    - **Brooke Court Ponds East and West** (Wall36 and Wall42),
    - **Rivershore Pond** (Wall14),
    - **Timberview Pond** (Wall31),
    - **North Ridge Ponds East and West** (Wall36 and Wall42),
    - **Fallbrooke Pond** (Wall30), and
    - **Greystone Pond** (Wall5),
    - **CR46 Pond** (Wall18) and
    - **Wallin Park Pond** (Wall19).

  These ponds discharge towards the Vermillion River. Additional improvements on specific subwatershed BMPs and features may be performed to achieve increased treatment capacity.

3.3.2.3 Northeast Vermillion River Subwatershed

Figure A-6 presents watershed and drainage information about the Northeast Vermillion River subwatershed. The Vermillion River forms the southern border of this subwatershed. The subwatershed is completely developed. Highway 55/61 runs north-south through the middle of the subwatershed. All of the minor watersheds directly discharge to the Vermillion River. The following ponds and ponding areas are located in this subwatershed, but were not included in the Hastings hydraulic model.

- **East and West Public Works Garage Ponds** – the outlet of these ponds discharge directly into the Vermillion River.

- **SMEAD Manufacturing Pond** – the outlet of this pond to the 10th Street storm sewer system.

3.3.2.4 Southeast Vermillion River Subwatershed

Figure A-7 presents subwatershed and drainage information about the Southeast Vermillion River subwatershed. Most of the subwatershed is developed. The following ponds and ponding areas are located in this subwatershed, with the minor watershed prefixes noted:

- **MnDOT North Pond (VR-T-19)** – the outlet from this pond is a storm sewer that carries discharges north to the Vermillion River.
- **MnDOT East Pond (VR-T-15)** – the outlet from this pond is a storm sewer that carries discharges northwest, into the outlet pipe from MnDOT North Pond.
- **Three Rivers North Pond (VR-T-8)** – a culvert at the north end of this pond discharges water to a storm sewer pipe and drainageway leading to MnDOT North Pond.
- **Three Rivers South Pond (VR-T-20**) – a culvert at the north end of this pond discharges water to Trailer Pond 1.
- **Ditch Storage (DCHS)** – this is a ponding area in a ditch along Highway 61; outflows will be carried in the storm sewer along Highway 61 to the Vermillion River.
- **County Crossroads Future Pond (Rainbow_1)** – the outlet is at the west end of this pond. Discharges from the pond are carried to the Highway 61 drainage ditch, downstream of the Ditch Storage ponding area.
- **County Crossroads Pond (Wallmart_1)** – the outlet is at the west end of this pond. Discharges from the pond are carried to the Rainbow Pond in a storm sewer.
- **36th Street Pond South (36P)** – the outlet is on the west side of this pond. Discharges from the pond flow in the Highway 61 ditch to the Ditch Storage ponding area.
- **Cari Park Pond (CPP)** – the outlet is on the west side of this pond. Outflows are carried in storm sewer to the east end of the 36th Street Pond.
- **Century South Park Pond (CenS65)** – this pond discharges to the south, and through a network of pipes reaches the Vermillion River.
- **Bohlken Drive Pond (Soak38)** – this pond is just upstream of the Vermillion River and receives discharge from upstream developments.
- **Spiral Road Storage Area (VR-T-10-B)** – this pond stores water from Spiral Road and the industrial park before it enters the ravine that drains into the Vermillion River.

3.3.3 Sand Coulee Watershed

The Sand Coulee is an intermittent stream running generally from south to north on the east side of the city and discharging into the Vermillion River. Figure A-8 presents subwatershed and drainage information about the Sand Coulee watershed. . Much of the tributary area of this subwatershed is located outside the current municipal boundary. Development is occurring along Highway 316, and additional industrial development is planned in the Spiral Boulevard area. The remainder of the watershed extends a number of miles south and west, encompassing agricultural land in the townships south of Hastings. The following ponds and ponding areas are located in this watershed, with the minor watershed prefixes noted:

- **Sand Coulee Sedimentation Basin (ESP)—**this pond discharges to the Sand Coulee, an intermittent stream that eventually flows into the Vermillion River.
- **TH 316 East Pond (316)—**the outlet from this pond is on the southeast side; outflows are carried in a storm sewer to the Sand Coulee Sedimentation Basin.
- **TH 316 West Pond (SP4-49)** – the outlet from this pond is on the north side, draining into Martin Court East Pond.
- **Michael Avenue Pond (SP4-25)** – this pond discharges to the north into TH 316 West Pond.
- **Industrial Park Pond (IND-4)** – this pond discharges to the East and then South along Nicolai Ave.
- **South Pines Ponds (SP4-45, SP4-46, SP4-58, SP4-17)** – these ponds (Martin Court North Pond, Martin Court East Pond, Sandpiper Circle Pond, and South Pines Storage Area) were constructed as part of the South Pines IV Development and they discharge to the 316 Pond.
- **Glendale Heights Ponds 1-4 (GH-49, GH-34, GH-43, and GH-7, GH-83)** – these ponds (Voyageur Ponds North and South, Yellowstone Pond, Rushmore Pond and Glacier Pond)were constructed as part of the Glendale Heights Development and they discharge to the east and then south to the Vermillion River.
- The Sand Coulee Scientific and Natural Area is contained within the Sand Coulee Watershed.

3.3.4 South Fringe Watershed

The South Fringe watershed includes the land tributary to an intermittent stream (Wagner Creek) running generally from southwest to northeast that discharges into the Vermillion River. Figure A-9 present watershed and drainage information about the South Fringe watershed. All but the very northeast corner of this subwatershed is located outside of the current municipal boundary. Development is occurring near Vermillion Road. The remainder of the watershed extends a number of miles southwest of the city, encompassing agricultural land in the townships southwest of Hastings. The following ponds and ponding areas are located in this watershed, with the minor watershed prefixes noted:

- **Riverwood Ponds A-H and H1** (Pond A:NWAG-5c, Pond B:WAG-10k, Pond C: WAG-10d, Pond D: WAG-10j, Pond E: WAG-10i, Pond F:WAG-10h, Pond G: WAG-10g, Pond H:WAG-10b, Pond H1:WAG-10a) – these ponds are part of the Riverwood Development, and drain into Wagner Creek, then into the Vermillion River.
- **Melville Circle Pond (CenS-41)** – this pond discharges to the west and into Wagner Creek.
- **36th Street Drainageway Pond (CenS58)** – this pond received stormwater from the Century South development and discharges into Wagner Creek.

3.4 Soils

The general soil type in the Hastings area is the Waukegan-Wadena-Hawick soil complex. These soils are level to very steep, well drained and excessively drained soils formed in silty and loamy sediments over sandy outwash. Exposed bedrock also can be found in scattered locations, especially along the Vermillion River in the eastern part of the city. Additional information about soil types and distributions within the city is available from the *Soil Survey of Dakota County, Minnesota* (NRCS, 2016, as amended) and from the NRCS soil survey is available online at: https://websoilsurvey.nrcs.usda.gov/app/

Soil composition, slope, and land management practices impact water resource management by influencing the rate and volume of stormwater runoff as well as permeability, infiltration rate, and erodibility (i.e., potential for erosion). Infiltration capacities of soils affect the amount of direct runoff resulting from rainfall. Higher infiltration rates result in lower potential for runoff from the land, as more precipitation is able to enter the soil. Conversely, soils with low infiltration rates produce high runoff volumes and high peak discharge rates, as most or all of the rainfall moves as overland flow (runoff).

The Natural Resources Conservation Service (NRCS – formerly the Soil Conservation Service) has established four general hydrologic soil groups. These groups are:

- Group A Low runoff potential—high infiltration rate
- Group B Moderate infiltration rate
- Group C Slow infiltration rate
- Group D High runoff potential—very slow infiltration rate

Combined with land use, the hydrologic soil grouping symbols (A through D) may be used to estimate the amount of runoff that will occur over a given area for a particular rainfall amount.

Figure 3-5 presents the most current hydrologic soil group data for the City of Hastings; the data are based on the Soil Survey Geographic dataset (SSURGO) from the NRCS. According to the soil survey, most of the underlying soils in the city are classified as hydrologic soil group B, with moderate infiltration rates. Some soils are classified as group A, with high infiltration rates.

The soil survey also shows a few locations where the amount of land alteration resulting from development prevents soil identification. As land is developed for urban use, much of the soil is covered with impervious surfaces, and soils in the remaining areas are significantly disturbed and altered. Development often results in consolidation of the soil and tends to reduce infiltration capacity of otherwise permeable soils, resulting in significantly greater amounts of runoff. Figure 3-5 is intended to provide general guidance about the infiltration capacity of the soils throughout the city. However, soils should be inspected on a site-by-site basis as projects are considered. It should also be noted that in many areas of the City of Hastings, limestone bedrock is present at or near the ground surface (see Section 3.5).

3.5 Geology and Groundwater Resources

The bedrock underlying Hastings is part of the Twin Cities Basin, which formed 225-600 million years ago. The Prairie du Chien Group underlies most of the city, with some Jordan Sandstone extending north-south through the center of the city. The bedrock is overlain by a layer of glacial drift. The thickness of glacial drift varies, but is generally less than 50 feet in the eastern and western parts of the city. A buried bedrock valley overlain by up to 300 feet of glacial drift runs north-south approximately under Pine St. More information about geology is available in the *Geologic Atlas of Dakota County* from the Minnesota Geological Survey (MGS, 1990), available at:
http://www.dnr.state.mn.us/waters/programs/gw_section/mapping/platesum/dakocga.html

3.5.1 Bedrock Aquifers

The region is underlain by six major bedrock aquifers: (1) Platteville Limestone, (2) St. Peter Sandstone, (3) Prairie du Chien-Jordan, (4) St. Lawrence-Franconia Dolomite, (5) Wonewoc Sandstone (formerly Ironton-Galesville Sandstones), and (6) Mt. Simon-Hinckley Sandstones. In addition, there are numerous aquifers in the glacial drift.

The City of Hastings relies on groundwater from the Prairie du Chien-Jordan aquifer for its municipal water supply. Hastings' municipal well field consists of six wells ranging from 280 to 400 feet deep and open only to the Jordan Sandstone. Dakota County developed a groundwater model to assist with wellhead protection planning. As part of the modeling, the county determined preliminary capture zones. The City uses this data in updates to its wellhead protection plan (WHPP).

Per state requirements, the City of Hastings maintains a WHPP consistent with Minnesota Department of Health requirements (see Section 4.4.1). The City's wellhead protection plan includes a map of the drinking water supply protection area, which is the administrative boundary for the wellhead protection area. Figure 3-6 shows the delineated wellhead protection areas within the City of Hastings.

In response to high nitrate levels in groundwater, Dakota County performed the Hastings Area Nitrate Study (HANS). The HANS found that the Vermillion River loses water to the groundwater between the Cities of Vermillion and Hastings. In addition, it was determined that the nitrates in the Vermillion River probably enter the groundwater west of Hastings, which impacts the wells in the Hastings area. More than half of the private drinking water wells tested in the HANS had high nitrate levels and 26% of the wells exceeded the drinking water standard of 10mg/L. The Hastings municipal wells ranged from 2.1 to 8.5mg/L. As part of the HANS, Dakota County partnered with the City of Hastings, the Minnesota Department of Health, the Minnesota Department of Agriculture, the Metropolitan Council and the Dakota County Soil and Water Conservation District to identify the nitrate sources and develop an action plan (Dakota County, 2003).

3.5.2 Surficial Aquifers

Surficial aquifers are water-bearing layers of sediment, usually sand and gravel, which lie close to the ground surface. Since the surficial aquifers are more susceptible to pollution, they are generally not used for municipal or public supply wells. The depth of the water table varies across the watershed, but is on the order of tens of feet.

Recharge to the surficial aquifers is primarily through the downward percolation of local precipitation. The ponds, lakes, and wetlands scattered throughout the city recharge the groundwater. Some of these waterbodies are landlocked and their only outlet is to the groundwater. Some surficial aquifers may also be recharged during periods of high stream stage. Surficial aquifers may discharge to local lakes, streams or to the underlying bedrock.

3.6 Surface Waters

3.6.1 MDNR Public Waters

The MDNR designates certain water resources as public waters to indicate those lakes, wetlands, and watercourses over which the MDNR has regulatory jurisdiction. By statute, the definition of public waters includes "public waters basins," "public waters wetlands," and "public waters watercourses." The collection of public waters and public waters wetlands designated by the MDNR is generally referred to as the public waters inventory, or PWI. A MDNR permit is required for work within designated public waters.

The MDNR uses county-scale maps to show the general location of the public waters and public waters wetlands under its regulatory jurisdiction. These maps are commonly known as public waters inventory (PWI) maps. PWI maps also show public waters watercourses and public ditches. The regulatory boundary of these waters and wetlands is called the ordinary high water level (OHWL). The PWI maps and lists are available on the MDNR's website at:
http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html

Figure 3-7 shows the public waters basins, watercourses, and wetlands located within the City of Hastings. There are eight uniquely identified public waters or watercourses partially or completely within the city of Hastings:

- Lake Isabel (MDNR ID 19-0004)
- Lake Rebecca (19-0324 19-0003)
- Lock and Dam#2 Pool (19-0324 19-0005)
- Lock and Dam #3 Pool including Conley Lake (19-0324 25-0017)
- Unnamed lake (Lake Rebecca Wetland, MDNR ID 19-0324)
- Vermillion River
- Sand Coulee flowage

Additionally, there are four uniquely identified, unnamed, public waters wetlands within the city of Hastings:

- Unnamed public waters wetland 19-0327 (Southwest Ponding Basin)
- Unnamed public waters wetland 19-330 (Bullfrog Pond)
- Unnamed public waters wetland 19-331 (Freitage Pond North)
- Unnamed public waters wetland 19-332 (Freitag Pond South)

3.6.2 Lakes

There are three major lakes completely or partially within the City of Hastings:

- Lake Isabel
- Lake Rebecca
- Conley Lake

Lake Isabel is approximately 100 acres in size and located directly east of downtown between the Mississippi River and the Vermillion River. Lake Rebecca is located in the northwest portion of Hastings and is approximately 35 acres. Conley Lake, located east of TH61 in Washington County, is a backwater of the Mississippi River, and is a major marina.

3.6.3 Streams

The City of Hastings contains over 16.3 miles of streams, as delineated by the MDNR, 10.5 miles of which are considered public watercourses. The Mississippi River flows for 3.3 river miles along the northern edge of the city. Other major rivers/streams include 5.8 miles of the Vermillion River, flowing through the center of Hastings, and 1.4 miles of the Sand Coulee flowing from the southern border of Hastings and tributary to the Vermillion River. The remaining delineated streams are unnamed tributaries to the Mississippi River, the Vermillion River, or the Sand Coulee.

The Vermillion Falls are located approximately 700 feet downstream of Highway 61 on the Vermillion River. The falls are located in Vermillion Falls Park, and have a height of 35 feet and it is a highly valued resource feature for the City of Hastings.

Lock and Dam No. 2 is located on the Mississippi River in Hastings. The dam has a 4.4 megawatt power plant owned and operated by the City of Hastings. There is a public observation deck open from dawn until dusk every day from mid-April through late-October.

The Vermillion River, the Sand Coulee, and the Vermillion River unnamed tributaries are within the Vermillion River watershed and are under the jurisdiction of the Vermillion River Watershed Joint Powers Organization (VRWJPO). None of the rivers or streams within the city limits are designated trout streams.

3.6.3.1 VRWJPO Stream Classifications

The VRWJPO and Dakota SWCD classified the streams tributary to the Vermillion River as part of the VRWJPO Rules adopted in 2007. The VRWJPO Rules govern certain land use and alteration activities within the Vermillion River watershed. Within the city of Hastings, the Vermillion River is classified as a conservation corridor. The Sand Coulee Flowage from the city boundary to the confluence with the Vermillion River is classified as an aquatic corridor. All other tributaries to the Vermillion River are classified as water quality corridors. More information on stream classifications and buffer standards is available from the VRWJPO website at: http://www.vermillionriverwatershed.org/about-us/maps/

3.6.4 Wetlands

Wetlands fill a number of roles in the landscape, including improving water quality, providing floodwater retention, and providing wildlife habitat. While some wetland areas in the City were drained or filled as the city developed (prior to the establishment of regulations protecting wetlands), many wetlands remain. Presently, wetlands are protected by the Wetland Conservation Act (WCA, see Section 5.6.4); the City serves as the local government unit (LGU) responsible for administering the WCA.

Nationally, the U.S. Fish and Wildlife Service (USFWS) is responsible for mapping wetlands across the country, including those in Hastings. The USFWS identifies and delineates wetlands, produces detailed

maps on the characteristics and extent of wetlands, and maintains a national wetlands database as part of the National Wetland Inventory (NWI). The NWI is periodically updated based on available imagery. Figure 3-8 presents the wetlands included in the NWI within the City of Hastings.

Additional wetland inventory and assessment has been done by the City, and Dakota SWCD, and VRWJPO. The VRWJPO and Dakota SWCD cooperated to perform an inventory and assessment of wetlands within the Vermillion River watershed published in 2007 (Dakota SWCD, 2007). The Dakota SWCD/VRWJPO wetland inventory project began in 2005 with the objective of inventorying existing and historical wetlands, creating a task force to develop watershed-based wetland assessment methods, assessing existing wetlands for functions and values, and drafting model ordinances for cities and townships.

The Dakota SWCD/VRWJPO inventory used an assessment method adapted from the Minnesota Routine Assessment Method (MnRAM). Wetlands were inventoried using the Minnesota Land Cover Classification System (MLCCS) to quantify the vegetative communities present within each basin. Vegetative and topographic characteristics of each wetland were classified into one of the following categories: isolated wetland, riverine wetland, floodplain wetland, flow-through wetland, and tributary wetland. Baseline wetland function and value data and technical information were determined for each subwatershed. The following wetland functions and values were evaluated: shoreline protection, flood stormwater storage, groundwater interaction, wildlife habitat, water quality protection, greenway connectivity (existing and potential), and recreation/education.

The Dakota SWCD/VRWJPO inventory attempted to identify if the wetland was a stormwater basin or if it was created. Not all of the inventoried wetlands that are used as stormwater ponds are noted as stormwater ponds in the database. The City also requires a site-specific delineation of the wetland boundary and wetland assessment as part of proposed development or redevelopment activities.

Figure 3-9 shows the wetlands from the VRWJPO/SWCD wetland inventory.

3.7 City Stormwater System

Runoff from precipitation is directed to the City's stormwater management system. The City of Hastings' stormwater management system is comprised of a series of lateral and trunk storm sewers, stormwater ponds, and natural water bodies including ponds, lakes, and wetlands, drainage swales, as well as a number of best management practices (BMPs). Figure 3-10 summarizes the City's stormwater system. The City's stormwater system is shown in greater detail in the subwatershed figures presented in Section 4.0. The features shown in Figure 3-10 include stormwater infrastructure located within the city that is under the jurisdiction of other entities, including the Minnesota Department of Transportation (MnDOT), Dakota County, and railroads, as well as private developments. The city's stormwater management system also includes a levee and bypass channel along the Vermillion River constructed by the U. S. Army Corps of Engineers (USACE).

3.7.1 Stormwater Ponds

The City of Hastings utilizes stormwater ponds in order to treat stormwater runoff and reduce stormwater flows. The stormwater ponds fall into three classifications: detention ponds, extended detention ponds, and wet ponds. Detention basins restrict stormwater flow for a short period of time. Between rain events, detention basins usually drain completely and are typically dry. Extended detention ponds restrict flow for a longer period of time, but will eventually drain completely if there is a longer amount of time between storm events. Wet ponds have a permanent pool of water. There are 29 public and 51 private stormwater ponds throughout the city. More information about individual ponds is included in Section 3.3.

3.8 Water Quality

3.8.1 Water Quality Sampling Programs

The City monitors, or cooperates with other state and local entities to monitor, the water quality of lakes, streams, and wetlands located within the city. Past and present water quality monitoring programs occurring in the city include:

- Citizen Assisted Monitoring Program (CAMP) – Metropolitan Council: https://metrocouncil.org/Wastewater-Water/Services/Water-Quality-Management/Lake-Monitoring-Analysis.aspx
- Citizen Lake Monitoring Program (CLMP) – MPCA: https://www.pca.state.mn.us/water/lake-monitoring-0
- Wetland Health Evaluation Program: http://www.mnwhep.org/
- Vermillion River Watch – Dakota SWCD: http://www.dakotaswcd.org/vr_watch.html
- City lake water quality monitoring

Data collected through various water quality monitoring programs is available from the MPCA's Environmental Data Access (EDA) database at: https://www.pca.state.mn.us/quick-links/eda-surface-water-data

The City commissioned a diagnostic study of Lake Isabel in 2006 (Barr, 2006). The study included an assessment of lake water quality based on data collected as part of CAMP, sediment samples, MDNR fisheries information, a MINLEAP water quality model, and various other sources. The study also includes protective and remedial measures for Lake Isabel and the tributary watershed.

3.8.2 MPCA Water Quality Classifications

The federal Clean Water Act (CWA) requires states to adopt water quality standards to protect the nation's waters. To that end, the MPCA developed criteria for Minnesota lakes and streams to establish water quality goals and determine appropriate uses of the lakes and streams, as outlined in the guidance document Guidance Manual for Assessing the Quality of Minnesota Surface Waters for Determination of Impairment: 305(b) Report and 303(d) List (MPCA, 2016).

As part of establishing water quality goals, the MPCA classifies lakes according to depth and ecoregion. The MPCA defines shallow lakes as those having a maximum depth of 15 feet or less or a littoral area (area of lake 15 feet deep or less) of 80 percent or more, while deep lakes include those lakes with a maximum depth above 15 feet and a littoral area of less than 80 percent.

Ecoregions are areas of relative uniformity characterized by distinctive regional ecological factors, including land use, soils, topography and potential natural vegetation (MPCA, 1997). The City of Hastings is located entirely within the Western Corn Belt Plains (WCBP) ecoregion. Water quality standards for streams vary according to stream ecoregions, which differ from lake ecoregions, and intended use classifications. With respect to streams, the City is located in the south stream ecoregion. Note that ecoregion delineations are periodically revised; at the time of the City's 2009 WMP, the North Central Hardwood Forest (NCHF) lake ecoregion covered portions of the city.

MPCA eutrophication water quality standards applicable to deep lakes, shallow lakes, and streams within and WCBP lake ecoregion and south stream ecoregion are summarized in Table 3-2. The MPCA established water quality standards for parameters in addition to those presented in Table 3-2; these standards are published in Minnesota Rules 7050 and are applicable to lakes, ponds, and streams. Standards for several parameters included in Minnesota Rules 7050 vary according to the MPCA-determined designated use of the waterbody (e.g., drinking water, industrial use).

Table 3-2 MPCA Water Quality Standards

Waterbody	MPCA Ecoregion	Waterbody Classification	Total Phosphorus (ug/L)	Chlorphyll a (ug/L)	Secchi Depth (m)	Chloride (mg/L)	*E. coli* (#/100mL)	Total Suspended Solids (mg/L)
NA[1]	WCBP	Deep Lake[2]	65	22	0.9	230	126[2]	
Conley Lake	WCBP	Shallow Lake[2]	90	30	0.7	230	126[2]	--
Lake Isabel	WCBP	Shallow Lake[2]	90	30	0.7	230	126[2]	--
Lake Rebecca	WCBP	Shallow Lake[2]	90	30	0.7	230	126[2]	--
Lake Rebecca Wetland	WCBP	Shallow Lake[2]	90	30	0.7	230	126[2]	--
Vermillion River	South	Stream (Class 2B)	150	35	--	230	126[2]	65
Mississippi River	South	Stream (Class 2B)	150	35	--	230	126[2]	65
Sand Coulee	South	Stream (Class 2B)	150	35	--	230	126[2]	65
NA[1]	South	Stream (Class 2A)	150	35	--	230	126[2]	10

Note: standards presented above are summer average values calculated from June through September (except for *E.coli* and Total Suspended Solids, for which the standard applies from April 1 through October 31). MN Rule 7050.0220 includes water quality standards for additional parameters.

(1) There are no deep lakes or class 2A streams located within the City; these standards are included for reference only.

(2) Classification as deep or shallow is based on MPCA shallow/deep classification; shallow lakes have a maximum depth of less than 15 feet or littoral area greater than 80% of the total lake surface area.

(3) 126 organisms per 100 mL as a geometric mean of not less than five samples within any month, nor shall more than 10% of all samples within a month exceed 1,260 organisms per 100 mL.

3.8.2.1 MPCA Impaired Waters

In compliance with Section 303(d) of the CWA, the MPCA identifies waters that do not meet the applicable water quality standards. The list of impaired waters, sometimes called the 303(d) list, is updated by the MPCA every 2 years. Several waterbodies within and downstream of the City of Hastings have been listed on the MPCA impaired waters (303(d)) list for a variety of impairments. Impaired waters located within the city are listed summarized in Table 3-3 and shown on Figure 3-11. Impaired waters located downstream of the city include:

- Mississippi River (multiple impairments)
- Lake Pepin (impaired due to nutrients/eutrophication)

Waterbodies on the impaired waters list are required to have an assessment completed that addresses the causes and sources of the impairment. This process is known as a total maximum daily load (TMDL) analysis. TMDLs applicable to Hastings are described in Section 4.1.3 (and noted in the footnotes of Table 3-3). The *Vermillion River Watershed Protection and Restoration Strategies* report (MPCA, 2015, as amended) also addresses stressors applicable to the aquatic life impairment (due to fisheries bioassessments) of the Vermillion River.

Table 3-3 Summary of Impaired Waters within the City of Hastings

Waterbody	Impaired Use	Pollutant or Stressor	Year Listed	TMDL Study Target Completion	TMDL Study Approved
Lake Isabel	Aquatic Consumption	Mercury in Fish Tissue	2004	--	2007[1]
Mississippi River (07010206-814)	Aquatic Consumption	Mercury in Fish Tissue	1998	--	2007[1]
	Aquatic Consumption	Mercury in the Water Column	1998	--	2007[1]
	Aquatic Consumption	PCBs in Fish Tissue	1998	2020	--
	Aquatic Consumption	PFOS in Fish Tissue	2008	2025	--
	Aquatic Consumption	PFOS in the Water Colum	2014	2025	--
	Aquatic Life	Total Suspended Solids	2014	--	2015[2]
	Aquatic Recreation	Fecal Coliform	1994	2022	--
	Aquatic Recreation	Nutrients/ Eutrophication	2016	2018	--
Vermillion River (070400001-692)	Aquatic Consumption	Mercury in Fish Tissue	2012	--	2013[3]
	Aquatic Life	Fishes Bioassessments	2012	2023[6]	--
	Aquatic Recreation	Fecal Coliform	1996	--	2002[4]
Vermillion River (070400001-504)	Aquatic Consumption	Mercury in Fish Tissue	1998	--	2007[1]
	Aquatic Consumption	PCBs in Fish Tissue	1998	2020	--
	Aquatic Life	Turbidity	1994	--	2009[5]

(1) Addressed by the *Minnesota Statewide Mercury TMDL* (MPCA, 2007).
(2) Addressed by the South Metro Mississippi River Total Suspended Solids TMDL (MPCA, 2015)
(3) Addressed by 2013 revisions to the *Minnesota Statewide Mercury TMDL* (MPCA, 2007).
(4) Addressed by the *Regional TMDL – Lower Mississippi River Basin in Minnesota* (MPCA, 2002)
(5) Addressed by the *Lower Vermillion River Watershed Turbidity TMDL* (MPCA, 2009).
(6) Addressed by the *Vermillion River Watershed Restoration and Protection Strategies* (MPCA, 2015, amended 2017)

3.8.3 Water Quality Modeling

The City performed water quality modeling (using the P8 computer model) as part of its 2000 WMP update. The model estimated the nutrient loading, by watershed, entering the Mississippi and Vermillion Rivers through stormwater runoff. A more detailed description of the P8 model and model results are presented in the City's 2009 WMP.

Additional water quality modeling has been performed for portions of the City as part of individual projects (e.g., development review). The City plans to update its city-wide water quality model during the lift of this WMP (see Section 5.7).

3.9 Water Quantity/Flooding

The City of Hastings seeks to manage the quantity of water and reduce the risk of flooding within the city. The City limits and regulates development within floodplain areas through its ordinances and policies (see Section 2.5), performs studies and projects to identify and address areas of potential flood risk, and participates in the National Flood Insurance Program (NFIP).

3.9.1 Flood Insurance Studies

The Federal Emergency Management Agency (FEMA) maps the floodplains of larger basins and streams to create community Flood Insurance Studies (FIS) and Flood Insurance Rate Maps (FIRMs). There is an FIS and FIRMs for the City of Hastings. The FEMA-delineated floodplain within the city is shown in Figure 3-12.

The FIS and FIRM mapping, together with the City's floodplain ordinance, allow the City to take part in the federal government's National Flood Insurance Program (NFIP). Homeowners within the FEMA-designated floodplains are required to purchase flood insurance.

In some cases, homes within FEMA-designated floodplains on the FEMA floodplain maps may actually not be in the floodplain. In order to waive the mandatory flood insurance requirements for their homes, residents must remove their homes from the FEMA-designated floodplain by obtaining Letters of Map Amendments (LOMA).

3.9.2 City's Flood Protection System

The U.S. Army Corps of Engineers (USACE) constructed a levee and bypass channel along the Vermillion River in the 1970s. The levee is located in the West Vermillion River subwatershed (see Figure 3-4) immediately upstream of the County Road 47 bridge. The levee was designed to protect homes and businesses located on the north side of the river and upstream of County Road 47. The City of Hastings obtained certification of the levee in accordance with the USACE and continues to maintain this certification though annual inspections and reports. This certification allows the levee to remain eligible for Public Law 84-99 rehabilitation assistance.

Every ponding basin located within the city has been designed as a flood control facility. A partial list of these basins includes:

- Southwest Ponding Basin
- Northwest Ponding Basin
- Conzemius Park Ponding Basin
- 14th Street Ponding Basin
- 20th Street Ponding Basin
- Pleasant Drive Ponding Basin
- General Sieben Drive Ponding Basin

3.9.3 Water Quantity Modeling

Water quantity modeling is necessary to estimate flood levels and determine floodplain extents, design hydraulic structures adequate to meet their intended functions, and assess hydraulic impacts of projects proposed by developers, the City, and the WMOs.

The City of Hastings developed a city-wide hydrologic and hydraulic model as part of its 2000 WMP update. The hydrologic and hydraulic model was significantly updated as part of the City's 2009 WMP update. The comprehensive modeling results from the 2009 model update are included in Section 4 of the City's 2009 WMP. The model results included in the City's 2009 WMP include peak flow rates, storage areas and volumes, and identification of potential issue areas. Note that the model results from the City's 2009 WMP predate the publication of Atlas 14 precipitation data (see Section 3.2) and are based on precipitation data from TP-40 (National Weather Bureau, 1961).

Portions of the model are periodically updated to reflect changes in the City's stormwater management system resulting from new development, redevelopment and storm sewer system improvements. Modeling updates performed since the publication of Atlas 14 precipitation data have incorporated that data (see Section 3.2).

The City will continue to update the model as conditions dictate, including a planned update to the City-wide model included in the implementation of this WMP (see Table 5-2).

3.10 Recreational Areas

The Hastings Parks and Recreation Department maintains a total of 37 parks covering an area of approximately 400 acres. Hastings parks offer baseball, football and soccer fields; softball diamonds; basketball and tennis courts; outdoor skating rinks; playground equipment; sand volleyball court; disk golf course and picnic shelters. There are approximately 30 miles of trails throughout the city of Hastings.

The City maintains a large park on Lake Rebecca with trails and picnic grounds. There is also a fishing pier and a boat launch. The MDNR regularly stocks Lake Rebecca with channel catfish. The City also maintains a small park on the north shore of Lake Isabel with a fishing pier and boat launch; lake access was improved as part of a 2007 project. Boat access to the Mississippi River is available via a public boat launch located in Jaycee Park on Lock and Dam Road.

3.11 Natural Areas and Habitat

Prior to settlement, the City of Hastings was covered by three major natural communities. Brush prairie covered the south and west portions of the City. River bottom forest characterized by elm, ash, cottonwood, silver maple, willow, and aspen trees occupied areas adjacent to the Mississippi River. Oak

openings and barrens (scattered trees and groves of scrubby oaks with some brush and thickets) occupied the central and east part of the City, between the river bottom forest and brush prairie. Natural vegetation in the City has been altered over time by agricultural development and urbanization. According to the map *Natural Communities and Rare Species of Dakota County* (Minnesota County Biological Survey, 1997), several natural communities remain in the City, including:

- **Oak forests** on the south shore of Lake Rebecca, the east side of Vermillion Falls Park, and several areas south of Ravenna Trail
- **Oak woodland** in the east side of Vermillion Falls Park
- **Maple-basswood forest** in the east side of Vermillion Falls Park
- **Dry oak savannah** in the east side of Vermillion Falls Park
- **Floodplain forest (silver maple subtype)** between the Vermillion and Mississippi Rivers east of Lake Isabel
- **Emergent marsh** surrounding and including Bullfrog Pond
- **Dry prairie (barrens subtype)** located southeast of the City in the Hastings Wildlife Management Area (WMA)

More information about these natural vegetation communities is available from the Minnesota Biological Survey map of Dakota County at: http://www.dnr.state.mn.us/eco/mcbs/maps.html

The areas of native vegetation present within the Mississippi River corridor and portions of the Vermillion River floodplain have the ability to support high-value wildlife habitat. Birds listed as federally endangered or threatened that are found along the Mississippi River include bald eagles and peregrine falcons. Additionally, the blue sucker and Higgins' eye mussel are fish and mollusk species that are on the federally endangered or threatened species list that have been found in the Mississippi River near the city.

The Minnesota Biological Survey also maintains records of rare plants and animals present within the Hastings city limits. The survey shows rare plant species in six locations near the Vermillion River and its steep bluffs. The survey shows rare animal species in near Lake Rebecca Park and in the Mississippi River floodplain. The specific locations of rare species are not publically available to promote conservation. More information is available from the MDNR's NHIS website at: http://www.dnr.state.mn.us/nhnrp/nhis.html

During the countywide biological survey completed in 1997, 77 acres of native prairie south of the city were identified as containing very high quality dry prairie. In 2007, the MDNR established this area as the Sand Coulee Scientific Natural Area (SNA), the largest prairie remnant in the county. In addition to the prairie, the Sand Coulee SNA contains areas of dry oak woodland that were once savanna. The area also contains 13 rare species of plants and animals including the James' polanisia, real fritillary butterfly, and gopher snake.

Within the City, there are also several areas classified by the Dakota SWCD as Medium and High Quality Natural Areas as defined by the Dakota County SWCD. The Dakota SWCD classification system evaluated parcels within the Minnesota Land Cover Classification System (MLCCS) according to ecological criteria,

rare plant criteria and rare animal criteria. Figure 3-13 identifies those areas classified by the Dakota SWCD as high priority, medium high priority and low priority natural areas.

3.12 Potential Pollutant Sources

Potential sources of water pollution in the City of Hastings are many and varied. There are permitted sites, hazardous waste generators, and contaminated sites within the city. The MPCA maintains a state-wide database of these sites, which includes permitted sites (air, industrial stormwater, construction stormwater, wastewater discharge), hazardous waste generating sites, leak sites, petroleum brownfields, tank sites, unpermitted dump sites, and sites enrolled in the Voluntary Investigation and Cleanup (VIC) program.

Permitted point source discharges located within the City of Hastings include:

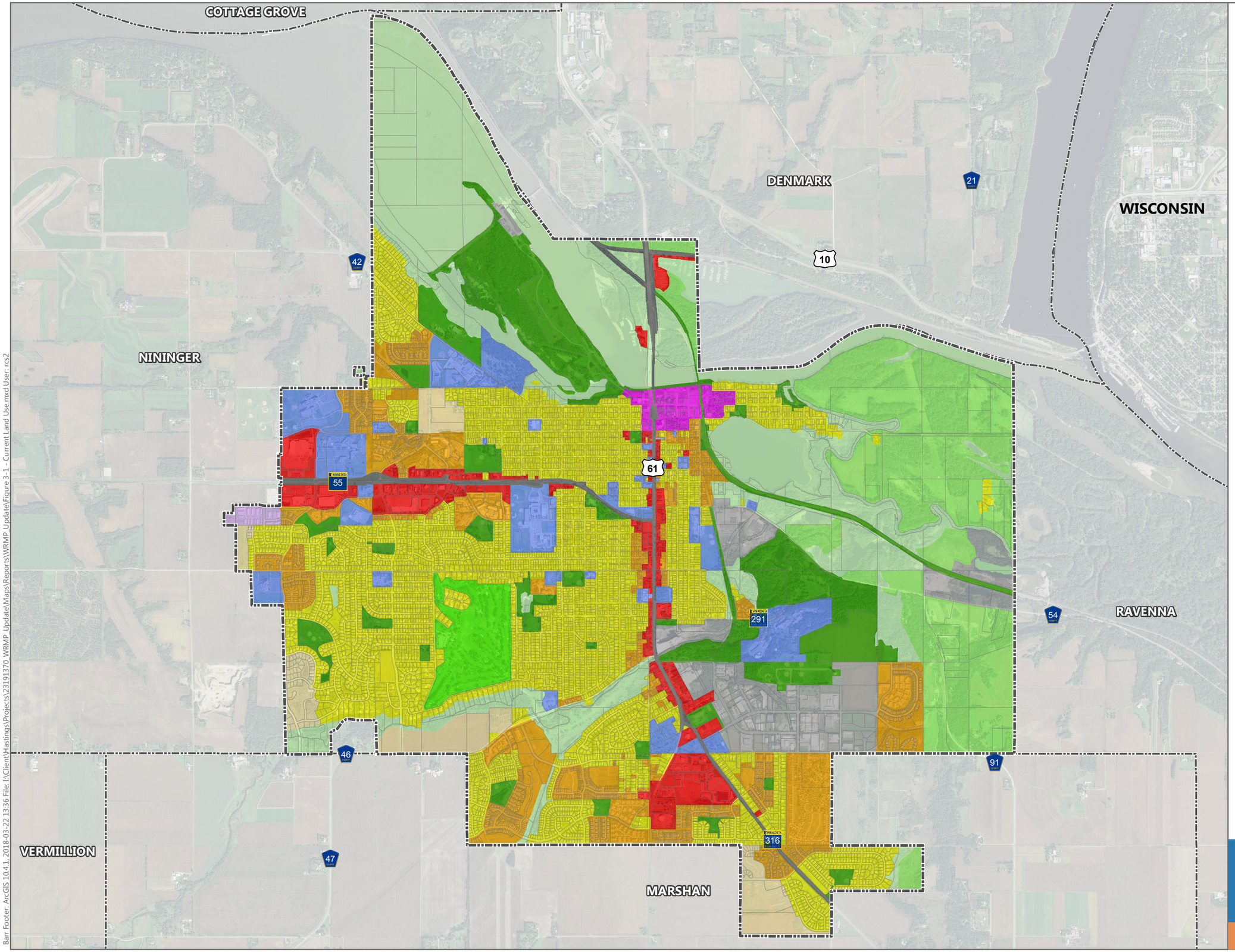
- Metrpolitan Council WWTP serving Hastings, Station ID: MN0029955-SD-1
- Ardent Mills Flour Mill, Station ID: MNG250013-SD-1
- Intek Plastics Inc., Station ID MN0003417-SD-1

Information regarding these and others sources is available online through the MPCA's What's In My Neighborhood program, and is presented in Figure 3-14. The location of potentially contaminated or hazardous waste sites should be considered as sites are redeveloped and BMPs are implemented. The presence of soil contamination at many of these sites, if not removed, may limit or prevent infiltration as a stormwater management option.

In contrast to sites with known hazards, non-point source pollution cannot be traced to a single source or pipe. Instead, pollutants are carried from land to water in stormwater or snowmelt runoff, in seepage through the soil, and in atmospheric transport. Discharge from stormwater pipes is considered a non-point source discharge as the pollutants coming from the pipe are generated across the watershed contributing to the pipe, not at a single location. Point sources frequently discharge continuously throughout the year, while non-point sources discharge in response to precipitation or snowmelt events. For most waterbodies, non-point source runoff, especially stormwater runoff, is the major contributor of pollutants.

Some areas within the city are served by subsurface sewage treatment systems (SSTS). Non-functioning SSTS may be a non-point source of pollutants. Improperly sited, installed or maintained systems may achieve inadequate treatment of sewage. In addition to the public health risks of untreated or inadequately treated sewage (e.g., contamination of wells), sewage contains the nutrient phosphorus, which if discharged into waterbodies can cause excessive algae and aquatic plant growth leading to degradation in water quality. The MPCA implements an SSTS regulatory program to manage the environmental and public health impacts of SSTS.

More information about potential pollutant sources is available from the MPCA website: http://www.pca.state.mn.us/index.php/data/wimn-whats-in-my-neighborhood/whats-in-my-neighborhood.html



Land Use (2005)

- Future Neighborhood
- Low Density
- Medium & High Density Housing
- Mixed Commercial and High Density Residential Land Use
- Commercial, Retail, Service or Office
- Downtown
- Industrial
- Business Park
- Institutional
- Park
- Golf Course
- Agriculture or Very Low Density Housing
- Conservation
- Right of Way
- Parcel Boundary
- Municipal Boundary

Source: City of Hastings, 2018. Dakota County, 2018.

0 1,000 2,000 3,000

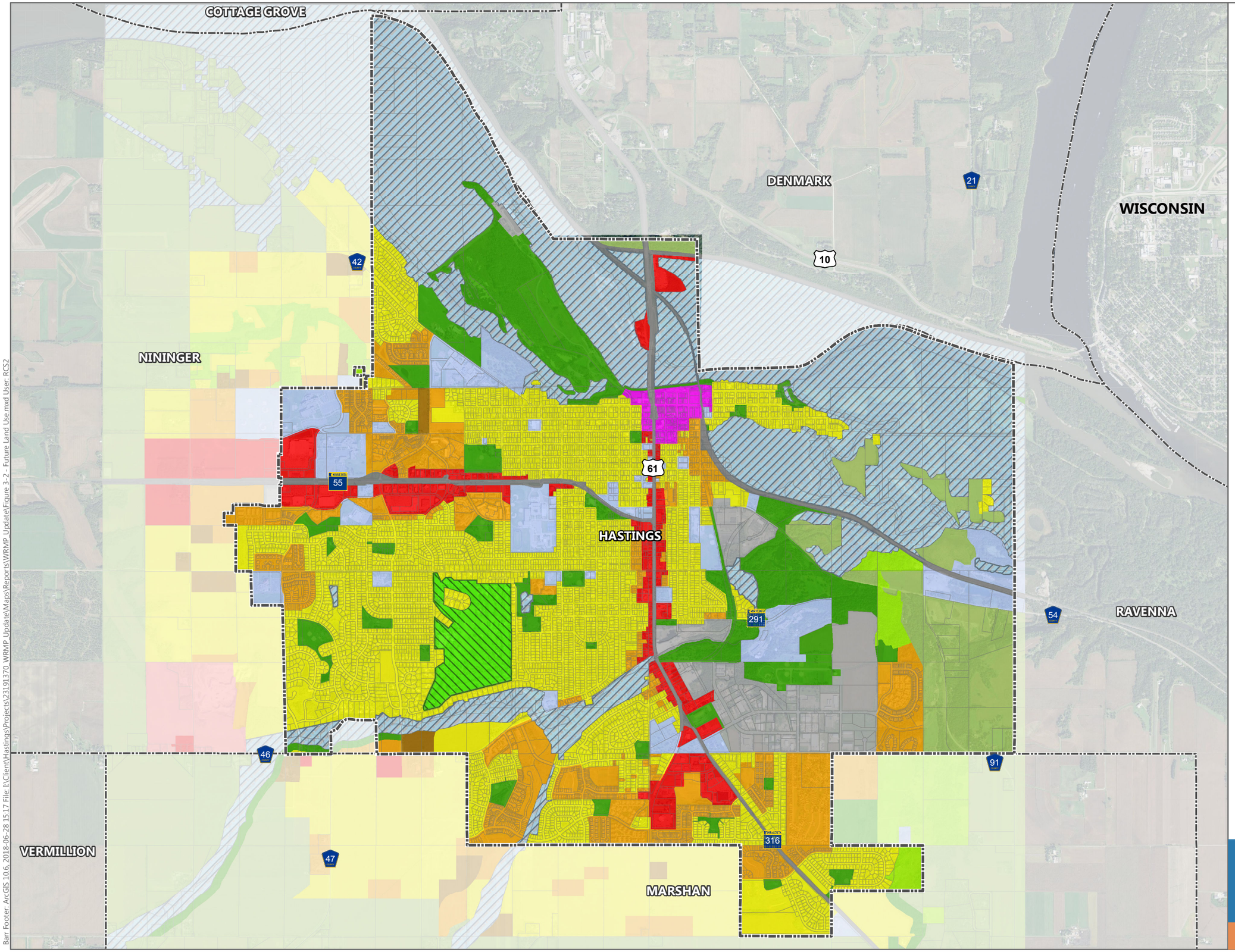
Feet

1 inch = 2,600 feet

CURRENT LAND USE
Water Resources Management Plan
Hastings, MN

FIGURE 3-1

Barr Footer: ArcGIS 10.4.1, 2018-03-22 13:36 File: J:\Client\Hastings\Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-1 - Current Land Use.mxd User: rcs2



Planned Land Use

- Agriculture
- Low Residential
- Medium Residential
- High Residential
- Mixed Use
- Commercial
- Business Park
- Industrial
- Institutional
- Park
- Upland Conservation Area
- Floodplain or Wetland Protection
- Golf Course
- HWY/Rail ROW
- Parcel Boundary
- Municipal Boundary

Source: City of Hastings, 2018. Dakota County, 2018.

0 1,000 2,000 3,000

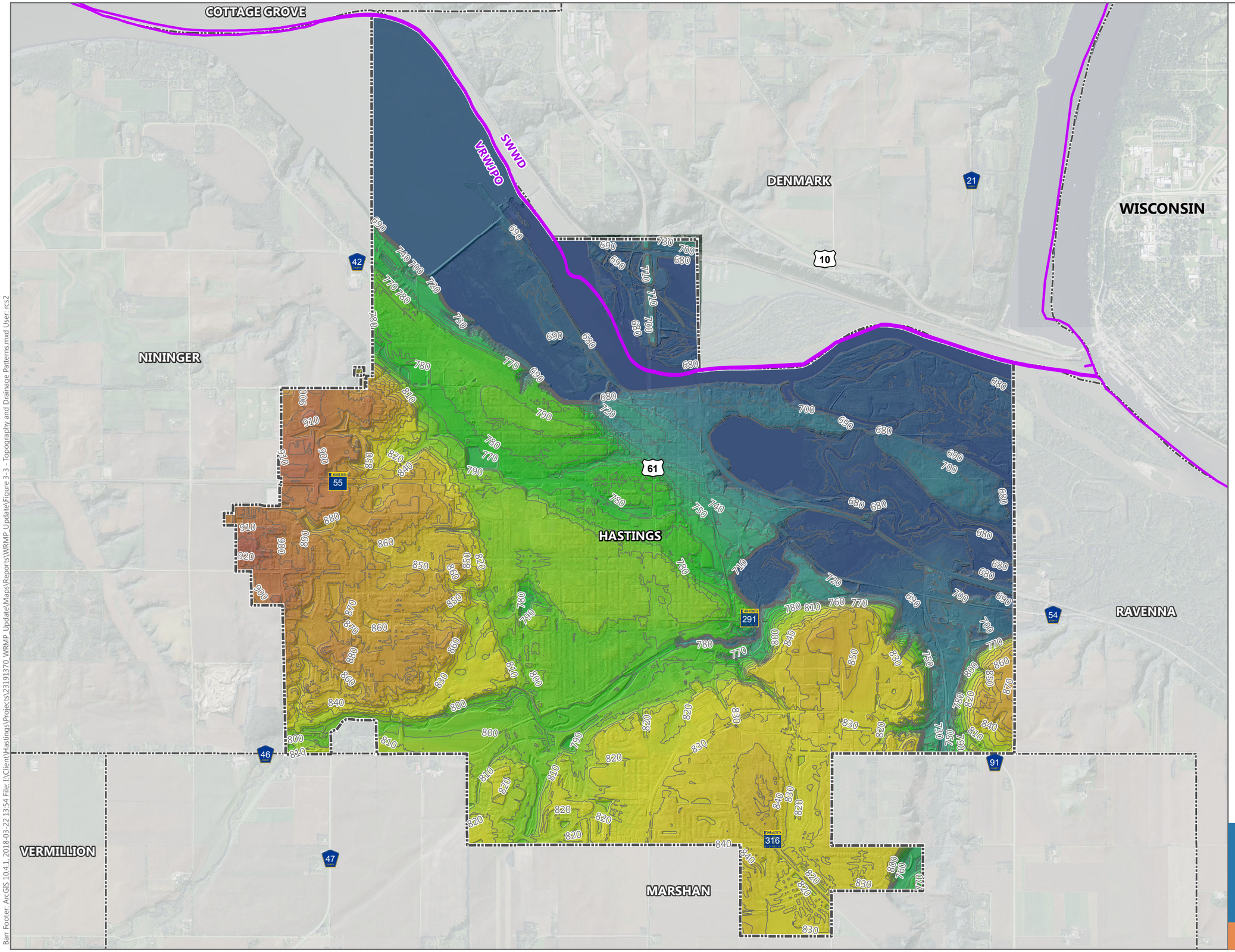
Feet

1 inch = 2,600 feet

FUTURE LAND USE
Water Resources Management Plan
Hastings, MN

FIGURE 3-2

Bar: Footer: ArcGIS 10.6, 2018-06-28 15:17 File: I:\Client\Hastings\Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-2 - Future Land Use.mxd User: RCS2



Watershed Management Districts and Organizations

Municipal Boundary

10-Foot Contour

Elevation (ft)

950

650

Source: Minnesota Department of Natural Resources (MNDNR), Minnesota Elevation Mapping Project, 2011.

0 1,000 2,000 3,000

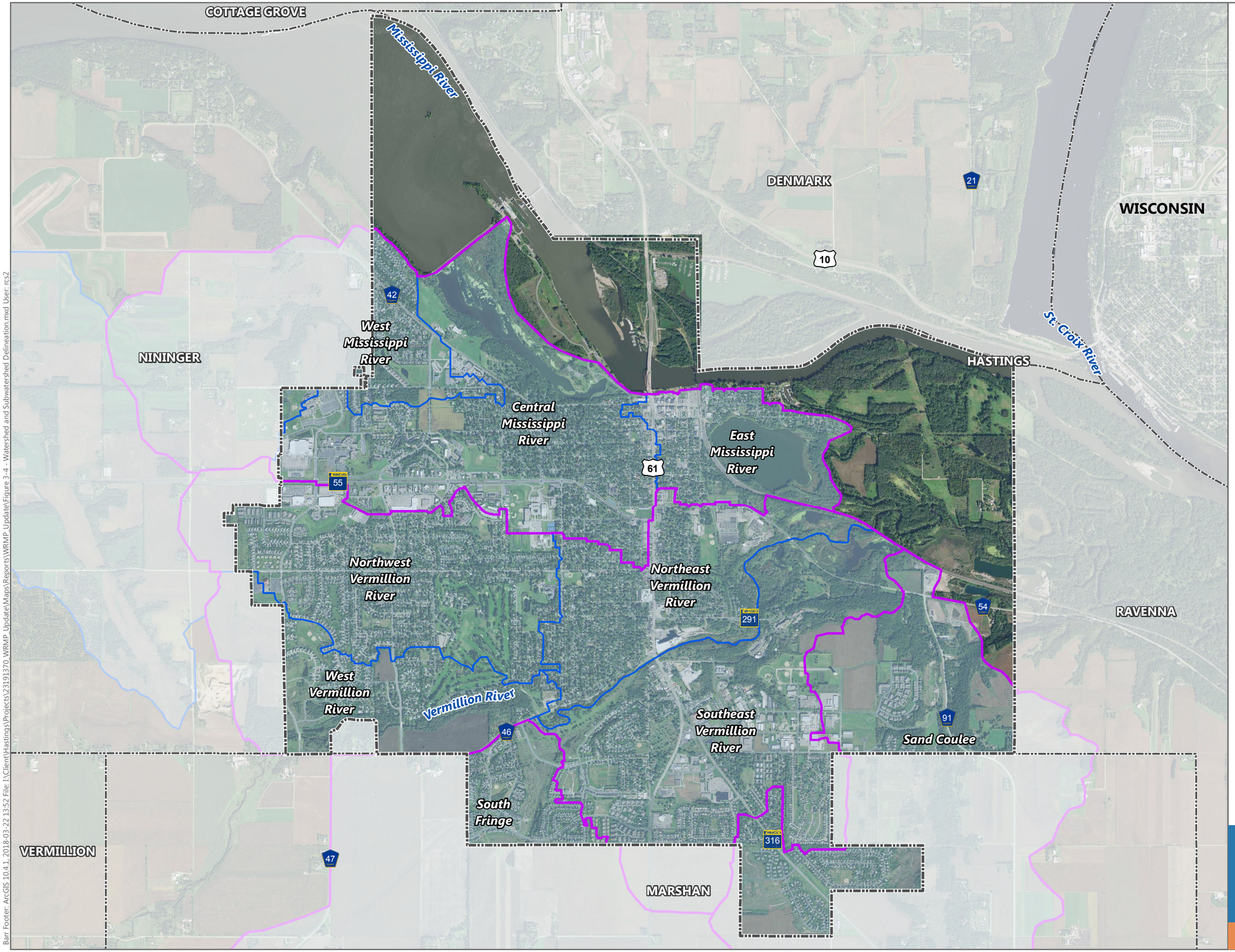
Feet

1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

TOPOGRAPHY AND DRAINAGE PATTERNS
Water Resources Management Plan
Hastings, MN

FIGURE 3-3



Watersheds
Major Watersheds
Municipal Boundary

Source: City of Hastings, 2018. Dakota County, 2018.

N

0 1,000 2,000 3,000
Feet

1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

WATERSHED AND SUBWATERSHED DELINEATION
Water Resources Management Plan
Hastings, MN

FIGURE 3-4

Barr Footer: ArcGIS 10.4.1, 2018-03-22 13:52 File: I:\Client\Hastings\Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-4 - Watershed and Subwatershed Delineation.mxd User: rcs2

COTTAGE GROVE

DENMARK

WISCONSIN

NININGER

HASTINGS

RAVENNA

VERMILLION

MARSHAN

42

10

21

61

55

291

54

46

91

47

316

Hydrologic Group - Dominant Conditions

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not Rated
- Municipal Boundary

Source: Soil Survey Staff, NRCS, USDA. Soil Survey Geographic (SSUGRO) Database. Available online at https://sdmdataaccess.nrcs.usda.gov/. Accessed 2/14/2018.

N

0 1,000 2,000 3,000

Feet

1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

HYDROLOGIC SOIL GROUPS
Water Resources Management Plan
Hastings, MN

FIGURE 3-5

Barr Footer: ArcGIS 10.4.1, 2018-03-22 14:01 File: I:\Client\Hastings\Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-5 - Hydrologic Soil Groups.mxd User: rcs2

COTTAGE GROVE

DENMARK

WISCONSIN

NININGER

HASTINGS

RAVENNA

VERMILLION

MARSHAN

42

21

10

61

55

291

54

46

91

316

47

Well - County Well Index

Wellhead Protection Areas

Municipal Boundary

Source: Minnesota Department of Health (MDH), 2017.

N

0 1,000 2,000 3,000

Feet

1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

WELLHEAD PROTECTION AREAS
Water Resources
Management Plan
Hastings, MN

FIGURE 3-6

Barr Footer: ArcGIS 10.4.1, 2018-03-22 14:26 File: I:\Client\Hastings\Projects\23191370 WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-6 - Wellhead Protection Areas.mxd User: rcs2

COTTAGE GROVE

DENMARK

WISCONSIN

NININGER

HASTINGS

RAVENNA

VERMILLION

MARSHAN

U.S. Lock & Dam #2 Pool (19000599 P)

Unnamed (19032400 P)

Lake Rebecca (19000300 P)

U.S. Lock & Dam #3 Pool (25001799 P)

Conley Lake (25001707 P)

Mississippi River

St. Croix River (82000100 P)

St. Croix River

U.S. Lock & Dam #3 Pool (25001799 P)

Lake Isabelle (19000400 P)

Unnamed (19033100 W)

Unnamed (19033200 W)

Unnamed (19033000 W)

Unnamed (19032700 W)

Vermillion River

42 21 10 55 61 291 54 46 91 47 316

Public Water Inventory Watercourses

Public Waters

Public Wetlands

Municipal Boundary

Source: Minnesota Department of Natural Resources (MNDNR), 2015.

0 1,000 2,000 3,000

Feet

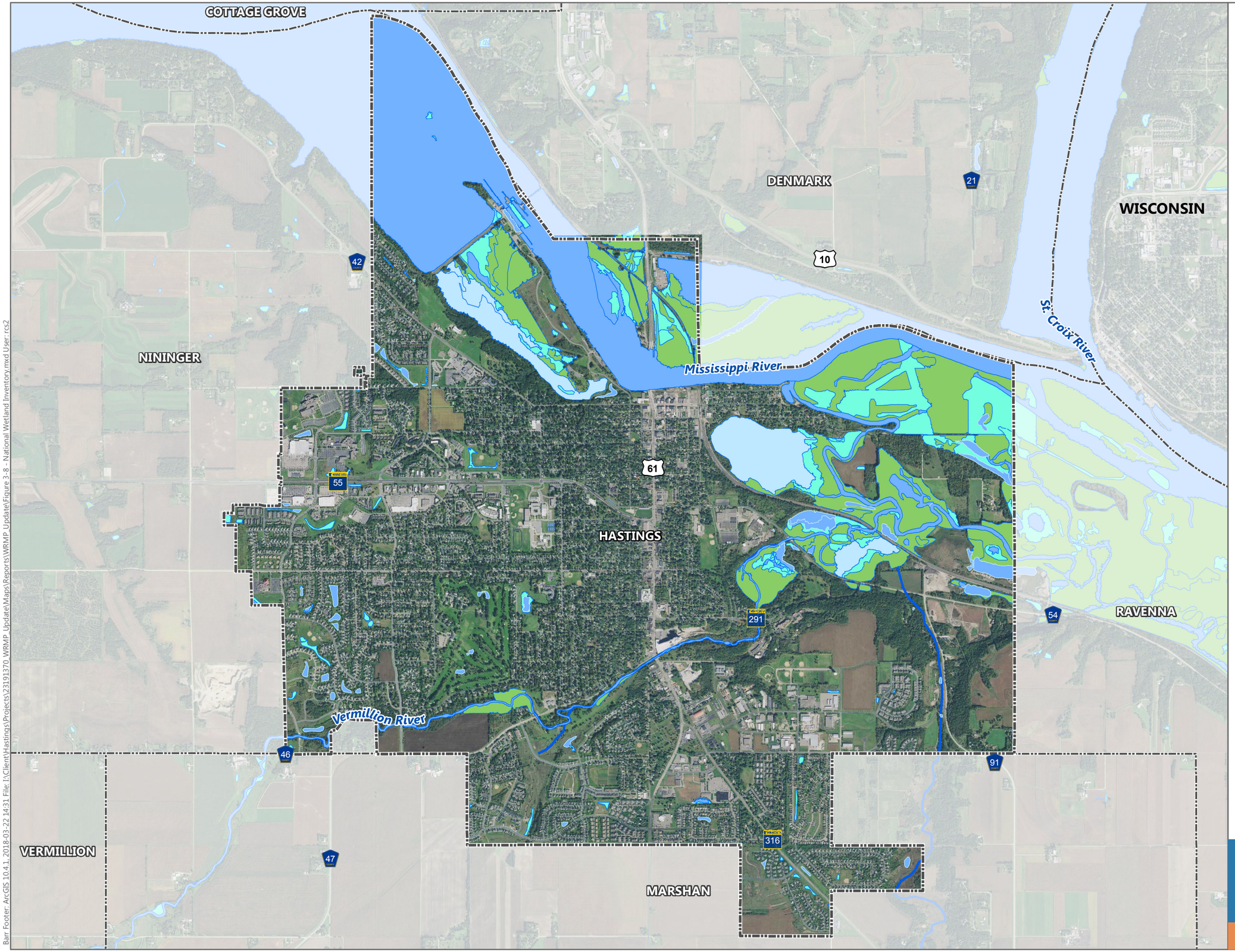
1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

PUBLIC WATERS INVENTORY
Water Resources Management Plan
Hastings, MN

FIGURE 3-7

Barr Footer: ArcGIS 10.4.1, 2018-03-22 14:29 File: I:\Client\Hastings\Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-7 - Public Waters Inventory.mxd User: rcs2



Wetlands (MN DNR NWI East Central Update)

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

Source: Dakota County, 2011

0 1,000 2,000 3,000

Feet

1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

NATIONAL WETLANDS INVENTORY
Water Resources Management Plan
Hastings, MN

FIGURE 3-8

COTTAGE GROVE

DENMARK

WISCONSIN

NININGER

HASTINGS

RAVENNA

VERMILLION

MARSHAN

Mississippi River

St. Croix River

Vermillion River

42

10

21

55

61

291

54

46

91

47

316

Dakota SWCD/VRWJPO Inventoried Wetlands (Wildlife Quality)

- High Quality Wetland
- Medium Quality Wetland
- Low Quality Wetland
- Municipal

Source: Dakota County Soil and Water Conservation District (SWCD) and Vermillion River Watershed Joint Powers Organization (VRWJPO), 2008.

0 1,000 2,000 3,000

Feet

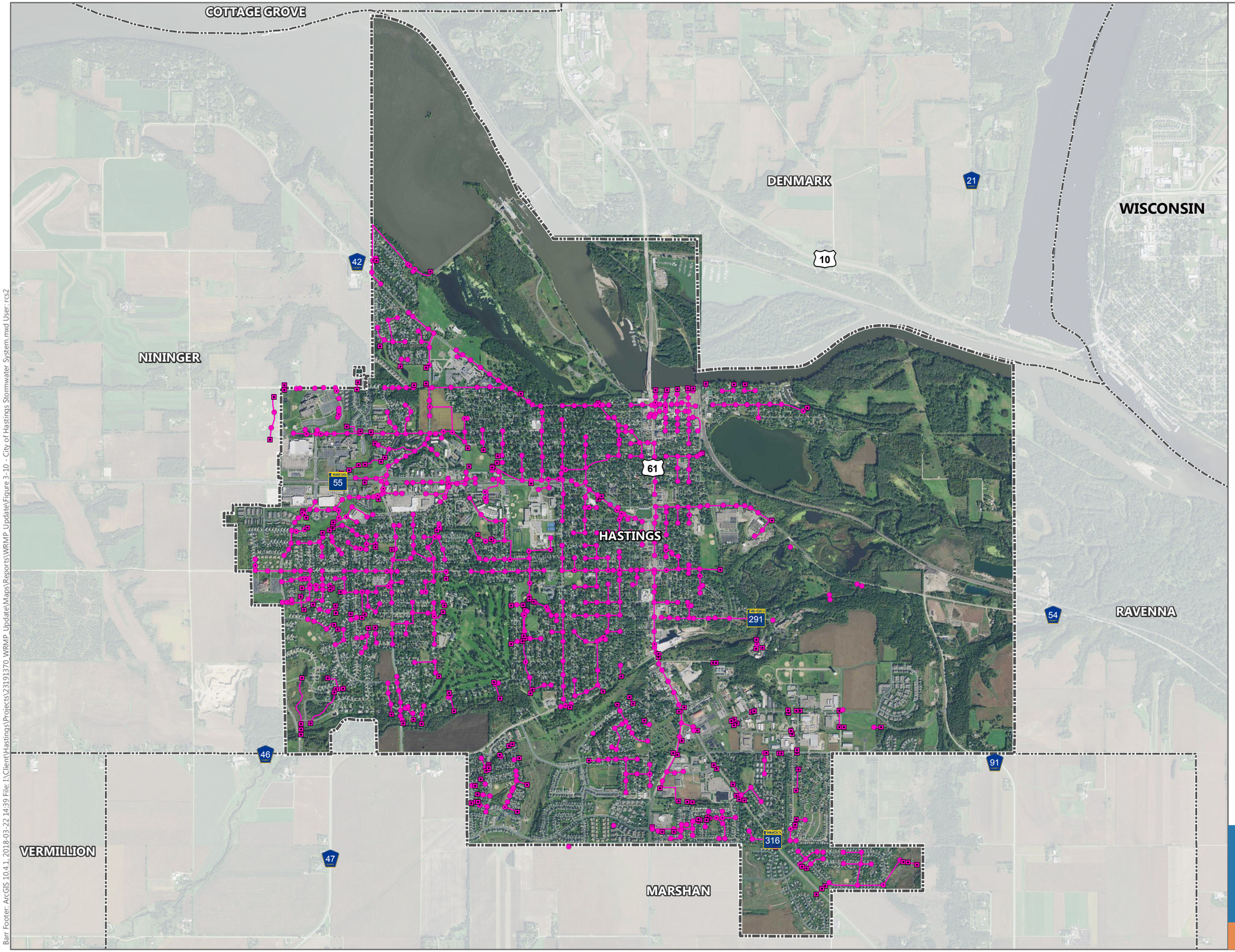
1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

DAKOTA SWCD/VRWJPO
WETLAND INVENTORY
Water Resources
Management Plan
Hastings, MN

FIGURE 3-9

Barr Footer: ArcGIS 10.4.1, 2018-03-22 14:36 File: I:\Client\Hastings\Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-9 - Dakota SWCD-VRWJPO Wetland Inventory.mxd User: rcs2



Catchbasin
Flared End
Manhole
Storm Pipes
Municipal Boundary

Source: City of Hastings, 2009.

N

0 1,000 2,000 3,000

Feet

1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

CITY OF HASTINGS
STORMWATER SYSTEM
Water Resources
Management Plan
Hastings, MN

FIGURE 3-10

Barr Footer: ArcGIS 10.4.1, 2018-03-22 14:39 File: I:\Client\Hastings\Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-10 - City of Hastings Stormwater System.mxd User: rcs2

COTTAGE GROVE

DENMARK

Mississippi River Pool 2
Aquatic Recreation
- Nutrient/eutrophication biological indicators

St Croix River
Aquatic Consumption
- Mercury in Fish Tissue
- PCB in Fish Tissue

Aquatic Recreation
- Nutrient/eutrophication biological indicators

WISCONSIN

Lake Rebecca
Aquatic Consumption
- Mercury in Fish Tissue

NININGER

Mississippi River
Aquatic Consumption
- Mercury in Fish Tissue
- PCB in Fish Tissue

Aquatic Life
- Total Suspended Solids

Vermillion River
Aquatic Consumption
- Mercury in Fish Tissue
- PCB in Fish Tissue

Aquatic Life
- Turbidity

Vermillion River
Aquatic Consumption
- Mercury in Fish Tissue

Aquatic Life
- Fishes Bioassessments

Aquatic Recreation
- Fecal Coliform

HASTINGS

RAVENNA

VERMILLION

MARSHAN

42 55 61 21 10 291 54 46 47 316 91

Impaired Streams (2018 Draft)
Impaired Lakes (2018 Draft)
Municipal Boundary

Source: Minnesota Pollution Control Agency (MPCA), 2018.

N

0 1,000 2,000 3,000
Feet

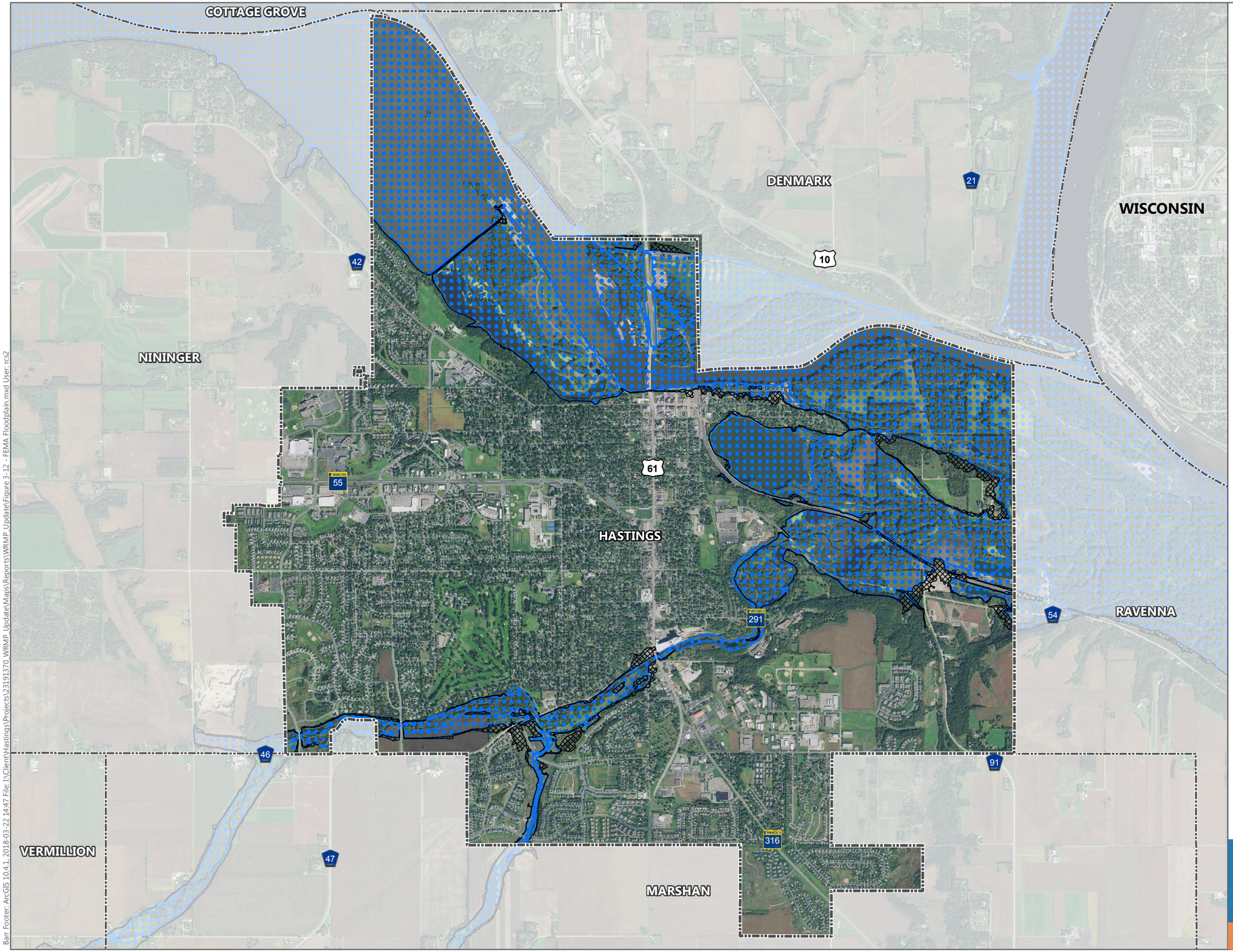
1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

MPCA IMPAIRED WATERBODIES
Water Resources Management Plan
Hastings, MN

FIGURE 3-11

Barr Footer: ArcGIS 10.4.1, 2018-03-22 14:42 File: I:\Client\Hastings\Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-11 - MPCA Impaired Waterbodies.mxd User: rcs2



FEMA Floodplains

- 100-Year Floodplain
- 500-Year Floodplain
- Municipal Boundary

Source: Federal Emergency Management Agency (FEMA), 2016.

N

0 1,000 2,000 3,000

Feet

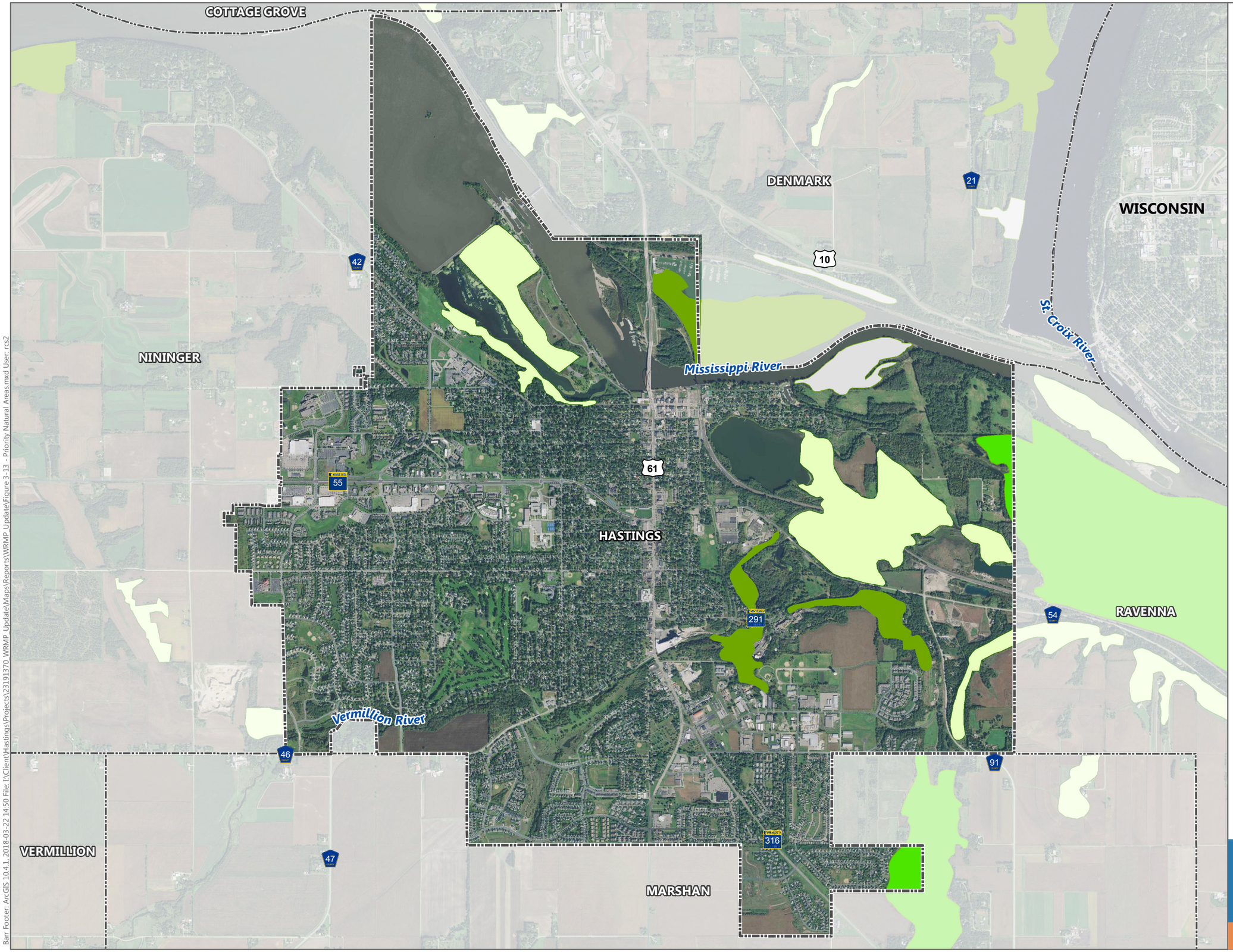
1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

FEMA FLOODPLAIN
Water Resources Management Plan
Hastings, MN

FIGURE 3-12

Barr Footer: ArcGIS 10.4.1, 2018-03-22 14:47 File: I:\Client\Hastings\Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-12 - FEMA Floodplain.mxd User: rcs2



Sites of Biodiversity Significance (MBS)

- Outstanding
- High
- Moderate
- Below
- Municipal Boundary

Source: Minnesota Department of Natural Resources (MNDNR), 2012.

0 1,000 2,000 3,000

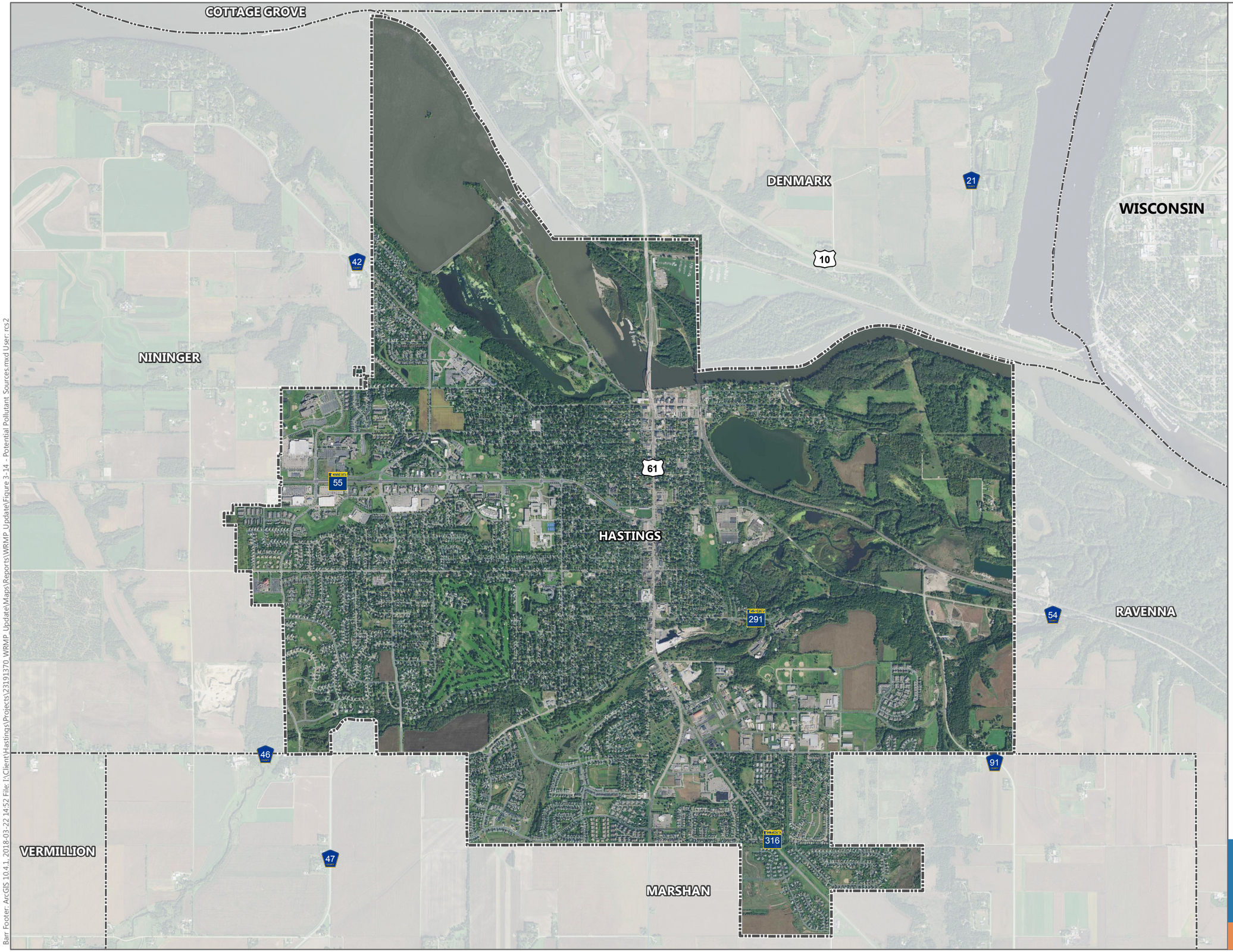
Feet

1 inch = 2,600 feet

PRIORITY NATURAL AREAS
Water Resources Management Plan
Hastings, MN

FIGURE 3-13

Barr Footer: ArcGIS 10.4.1, 2018-03-22 14:50 File: I:\Client\Hastings\1Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-13 - Priority Natural Areas.mxd User: rcs2



Municipal Boundary

Source: Minnesota Pollution Control Agency (MPCA), 2012.

N

0 1,000 2,000 3,000

Feet

1 inch = 2,600 feet

Since 1857 Hastings MINNESOTA

POTENTIAL POLLUTANT SOURCES
Water Resources
Management Plan
Hastings, MN

FIGURE 3-14

Barr Footer: ArcGIS 10.4.1, 2018-03-22 14:52 File: I:\Client\Hastings\Projects\23191370_WRMP_Update\Maps\Reports\WRMP_Update\Figure 3-14 - Potential Pollutant Sources.mxd User: rcs2

4.0 Assessment of Issues and Opportunities

This section of the WMP discusses general and specific issues facing the City of Hastings regarding stormwater and surface water management. This section examines water quality, stormwater runoff rates and volumes (water quantity), erosion and sediment control, as well as the adequacy of existing City programs.

4.1 Water Quality

4.1.1 Stormwater Runoff Quality

Pollutants are discharged to surface waters as either point sources or non-point sources. Point source pollutants discharge to receiving surface waters at a specific point from a specific identifiable source. Discharges of treated sewage from a wastewater treatment plant or discharges from an industry are examples of point sources. Unlike point sources, nonpoint source pollution cannot be traced to a single source or pipe. Instead, pollutants are carried from land to water in stormwater or snowmelt runoff, in seepage through the soil, and in atmospheric transport. All these forms of pollutant movement from land to water make up nonpoint source pollution.

For most water bodies, non-point source runoff, especially stormwater runoff, is a major contributor of pollutants. As urbanization increases and other land use changes occur in the city, nutrient and sediment inputs (i.e. loadings) from stormwater runoff can far exceed the natural inputs to water bodies. In addition to phosphorus and sediment, stormwater runoff may contain pollutants such as chlorides, oil, grease, chemicals (including hydrocarbons), nutrients, metals, litter, and pathogens (e.g., *E. coli* and fecal coliform), which can severely reduce water quality.

For lakes, ponds, and wetlands, phosphorous is the pollutant of major concern. Land use changes resulting in increased imperviousness (e.g., urbanization) or land disturbance (e.g., urbanization, construction or agricultural practices) result in increased amounts of phosphorus carried in stormwater runoff. In addition to stormwater runoff sources, other possibly significant sources of phosphorus include atmospheric deposition, internal loading (e.g., release from anoxic sediments, algae die-off, aquatic plant die-back, and fish-disturbed sediment), and loading from non-functioning subsurface sewage treatment systems (SSTS)

As phosphorus loadings increase, it is likely that water quality degradation will accelerate, resulting in unpleasant consequences, such as profuse algae growth or algal blooms. Algal blooms, overabundant aquatic plants, and the presence of nuisance/exotic species, such as Eurasian watermilfoil, purple loosestrife, and curlyleaf pondweed, interfere with ecological function as well as recreational and aesthetic uses of water bodies. Phosphorus loadings must often be reduced to control or reverse water quality degradation.

The Minnesota Pollution Control Agency (MPCA) is the state regulatory agency primarily tasked with protecting and improving water quality in Minnesota. In its enforcement of the federal Clean Water Act (CWA), the MPCA administers the Municipal Separate Storm Sewer System (MS4) permit program. Subject

to this program, the City is required to maintain an MS4 permit from the MPCA and annually submit an MS4 report to the MPCA. The MPCA also maintains a list of impaired waters (see Section 3.8.2.1). Issues related to impaired waters are described in greater detail in Section 4.1.3.

Typically, ponds are constructed to treat non-point source runoff, removing phosphorus and sediment from the stormwater. Non-point source runoff affects not only the water resources located within Hastings, but also (ultimately) the Mississippi River. As a national "Heritage River," the water quality of the Mississippi River is a local, regional, state, and national concern.

Current City standards require the implementation of various best management practices (BMPs) for development and redevelopment projects consistent with the triggers and performance standards of the Vermillion River Watershed Management Organization (VRWJPO) and the South Washington Watershed District (SWWD). The City may need to revise its performance standards to achieve higher levels of water quality treatment in the future in response to changing WMO, state, or federal requirements or to address impaired waters issues.

4.1.2 National Pollution Discharge Elimination System (NPDES) Storm Water Pollution Prevention Program (SWPPP)

Mandated by Congress under the federal Clean Water Act and implemented in Minnesota through the MPCA, the National Pollutant Discharge Elimination System (NPDES) Stormwater Program is a national program for addressing polluted stormwater runoff. The City of Hastings is federally required to obtain a Municipal Separate Storm Sewer System (MS4) permit for managing non-point source stormwater. The City's MS4 permit addresses how the City will regulate and improve stormwater discharges. The permit must include a Storm Water Pollution Prevention Program (SWPPP) addressing all of the requirements of the permit.

The City of Hasting's NPDES SWPPP addresses six minimum control measures (MCMs) outlined in the permit requirements:

1. Public Outreach and Education
2. Public Participation/Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Control
6. Pollution Prevention/Good Housekeeping

The MPCA reissued the MS4 General Permit in August, 2013. The 2013 update shifted the initial focus on permit program development towards measuring program implementation. The MPCA is in the process of issuing a new NPDES MS4 General Permit, expected in 2018. The 2018 update is expected to include additional requirements tracking performance of water quality ponds and other stormwater management BMPs. Additional information about the MS4 permit program and SWPPP requirements is available from the MPCA website: http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/municipal-stormwater/municipal-separate-storm-sewer-systems-ms4.html#permit

Many of the Best Management Practices (BMP) required in the NPDES permit have already been developed and are in place. The City's SWPPP also incorporates actions to address approved TMDL studies. The complete Hastings SWPPP is available from the City's website at: www.hastingsmn.gov.

4.1.3 Impaired Waters and TMDL Issues

Section 303(d) of the Clean Waters Act (CWA) requires each state to adopt water quality standards and to identify and establish priority rankings for waters that do not meet the water quality standards. The list of impaired waters, sometimes called the 303(d) list, is updated by the state every two years.

The MPCA performs Total Maximum Daily Load (TMDL) studies to address impaired waters. A TMDL is a threshold calculation of the amount of a pollutant that a waterbody can receive and still meet water quality standards. A TMDL study establishes the pollutant loading capacity within a waterbody and develops an allocation between the various contributors, which include point sources, nonpoint sources, and natural background, as well as a margin of safety. As a part of the allocation scheme, a waste load allocation (WLA) is developed to determine allowable pollutant loadings from individual point sources (including loads from storm sewer networks in MS4 communities). A watershed restoration and protection strategy (WRAPS) is similar to a TMDL and may examine other waterbodies in a watershed in addition to impaired waterbodies. Both TMDLs and WRAPSs may result in implementation plans to address water quality issues of the affected waterbodies.

Impaired waters located within the city are summarized in Table 3-3.

Several waterbodies within the city are impaired for aquatic consumption due to mercury in fish tissue. Mercury in Minnesota fish comes almost entirely from atmospheric deposition, with approximately 90 percent originating outside of Minnesota (MPCA, 2008). Because the main source of mercury comes from outside the state and the atmospheric deposition of mercury is relatively uniform across the state, the MPCA has developed a statewide TMDL for mercury.

The City performs several actions to address impairments of the Mississippi River and Vermillion River. These actions are based on the *Regional TMDL of Fecal Coliform Bacterial Impairments in the Lower Mississippi River Basin in Minnesota* (MPCA, 2002, as amended), the L*ower Vermillion River Watershed Turbidity TMDL* (MPCA, 2009), and the *South Metro Mississippi River Total Suspended Solids TMDL* (MPCA, 2015). These actions include:

- Installing sump manholes within annual reconstruct projects
- Continuing the City's street sweeping and other applicable maintenance activities
- Providing TSS and Fecal Coliform education materials in newsletters and social media
- Reviewing opportunities to implement infiltration, extended detention and other water quality improvements
- Maintaining City ordinances compliant with illicit discharge criteria
- Maintaining City ordinances consistent with applicable permit requirements for development and redevelopment activities
- Supporting rainwater garden initiatives

The City's activities in support of approved TMDLs are documented in the City's SWPPP and TMDL annual report. The City may need to incorporate additional activities into its SWPPP in support of future TMDLs. For example, Lake Pepin is on the impaired waters list for excess nutrients. Once the Lake Pepin TMDL is completed, it may impact the City of Hastings, since the area tributary to Lake Pepin includes the city. Load reductions may be assigned to the City, based on the TMDL results.

4.1.4 Metropolitan Council Issues

Local water management plans must be consistent with the Metropolitan Council's *2040 Water Resource Policy Plan* (May, 2015). The plan emphasizes integrating planning for wastewater, water supply, and surface water management. The plan includes surface water management strategies designed to:

- Reduce "nonpoint" and "point" source pollution into receiving waters.
- Decrease stormwater runoff
- Partner with state, federal, and local units of government
- Work with stakeholders to promote protection of water bodies
- Decrease adverse impact on water quality in the region
- Develop target pollution loads for the major watershed basins

The goals, policies, and implementation items included in this Plan have been developed with consideration for the Metropolitan Council's guidance and contribute to the regional water management objections identified by the Metropolitan Council. This Plan is also incorporated into the City's 2018 Comprehensive Plan, which is reviewed and approved by the Metropolitan Council Environmental Services.

4.1.5 City Waterbody Classifications and Water Quality Goals

The City of Hastings has adopted shoreland management classifications for some of the public waters located in the city based on MDNR guidance. Those classifications are include:

1. Lakes:
    a. Natural Environment Lake – Lake Rebecca
    b. Recreational Development Lake – Lake Isabel
2. Rivers and Streams:
    c. Transition Rivers – Mississippi River, Vermillion River
    d. Tributary Streams – Sand Coulee Flowage, all other protected watercourses not specified as Transition Rivers

Lake Rebecca is classified as a "natural environment" lake, whereas Lake Isabel is classified as a "recreational development" lake. With regard to the City's shoreland regulations, natural lakes have stricter development requirements than recreational development lakes. For example, natural lakes require wider lot sizes and longer setbacks for structures and sewage treatment systems than on recreational development lakes. Other public water lakes in the city (ID No. 19-324P and Conley Lake) are not classified according to this system.

More information about MDNR shoreland classifications is available from the MNDR website at: http://www.dnr.state.mn.us/shorelandmgmt/guide/classification.html

The City has also adopted the MPCA's eutrophication water quality standards as the City's water quality goals for applicable waterbodies. These standards are presented in Table 3-2. The MPCA established water quality standards for parameters in addition to those presented in Table 3-2; these standards are published in Minnesota Rules 7050 and are applicable to lakes, ponds, and streams.

4.1.6 Lake Isabel Diagnostic Study

The City of Hastings performed a diagnostic study on Lake Isabel in 2006 in response to resident complaints including poor water clarity, offensive odor, unattractive color, and overall poor appearance. The intent of the study was to provide a process to evaluate lake and watershed management strategies. The *Lake Isabel Diagnostic Study* (Barr, 2006) established general goals for the lake based on discussions at public meetings, including achieving water quality to support current uses, addressing the problems identified above, and maintaining a balanced ecosystem.

Water quality in Lake Isabel has been severely degraded by periodic flooding and sediment loads from the Mississippi River. Water quality data recorded since 1994 indicate hypereutrophic conditions (total phosphorus >57 ug/L, Secchi disc transparency <0.85 meters or 2.7 feet). The data corroborate the observations of the residents. A fish survey of Lake Isabel in 2004 found primarily riverine species, the result of fish migration from the Mississippi River to Lake Isabel during river inflow conditions. The presence of large numbers of carp suggests that rough fish activity may contribute to internal phosphorus loading by disturbing bottom sediments. The *Lake Isabel Diagnostic Study* found that runoff from the immediate watershed contributes a small portion of the total phosphorus load to the lake.

The *Lake Isabel Diagnostic Study* provides recommendations for lake and watershed best management practices. The primary recommendation was the construction of a dike to disconnect Lake Isabel from the Mississippi River during flooding up through the 20-year flood on the river. The planning-level cost estimate of this project was approximately $1,000,000 (in 2006 dollars). If a dike were constructed, the diagnostic study recommended a winter drawdown of Lake Isabel for sediment consolidation. The diagnostic study also noted that an alum treatment may be an effective method to lower phosphorus concentrations in the lake.

In response to the diagnostic study, public access to Lake Isabel was improved and a fishing pier constructed. Limited dredging was performed for an approximately one-acre area of the lake. The City will continue to evaluate the feasibility of further improvements to Lake Isabel.

4.1.7 Subsurface Sewage Treatment Systems (SSTS)

Non-function subsurface sewage treatment systems (SSTS) can be a significant source of pollutants including nutrients and pathogens. Sanitary sewer and water service is provided throughout the city within the Metropolitan Urban Services Area (MUSA), which includes most of the city. The portion of the city outside the MUSA is the rural/rural residential land on the east side of the city. About one or two dozen homes that are outside the current MUSA boundary and an additional Less than ten homes within

the existing MUSA boundary are connected to individual septic systems. . The City will continue to require connection to the City's sanitary sewer system when available and will cooperate with Dakota County's efforts to inventory non-functioning and non-compliant subsurface sewage treatment systems (SSTS).

4.2 Water Quantity and Flood Risk

In a natural, undeveloped setting, the ground is often pervious, which means that water (including stormwater runoff) can infiltrate into the soil. Land development dramatically changes how stormwater runoff moves in the local watershed. The conversion of pervious ground surfaces to impervious materials (e.g., asphalt and concrete) reduces infiltration of water into the soil and increases the rate and volume of stormwater runoff. This can create significant problems for downstream water resources. Further, the reduced amount of infiltration means less water is being recharged into the groundwater system, which can result in decreased baseflows in creeks and streams and, potentially, a loss to the long-term sustainability of groundwater drinking water supplies.

Although both high water levels (flooding) and low water levels are of concern to City residents and City staff, more concern and attention is usually paid to flooding because it presents a greater threat to public health and safety, and can result in significant economic losses.

Flooding may cause other damages that are harder to quantify, including the following:

- Flooding of roads so they are impassable to emergency vehicles and residents
- Shoreline erosion
- Increased pollution due to the inundation of hazardous materials
- Destruction of vegetation, such as grass, shrubs, trees, etc.
- Unavailability of recreational facilities for use by the public (e.g., inundation of shoreline) and/or restricted recreational use of water bodies
- Alterations to mix and diversity of wildlife species as a result of inundation of upland habitats

Of special concern is flooding on landlocked water bodies, which prolongs impacts. Currently, there are no landlocked basin flooding issues within the city. The only landlocked basin in the city of Hastings is the southwest ponding basin, which is actively managed via pumping.

Although less likely to result in significant economic losses, the City recognizes low water levels can also have negative impacts. Possible negative impacts include interference with or diminished recreational use of the water resources through reduced or lost access to the water resource by the public and shoreline residents, reduced aesthetic enjoyment of the water resources (e.g., from mud flats, smells), loss of wildlife habitat, and winterkill of fish. The City cannot control drought, which is the main cause of deleterious low water levels.

The City is responsible for managing flood risk within its jurisdiction. The City also cooperates with the VRWJPO when appropriate to address water quantity issues, including inter-community issues (see also Section 5.3.1).

4.2.1 Floodplain Management and Flood Insurance Studies

Within the City of Hastings, the Federal Emergency Management Agency (FEMA) has mapped the floodplains of larger basins, creeks, and rivers on flood insurance rate maps (FIRMs). FEMA has published these maps as part of a Flood Insurance Study (FIS) encompassing the City of Hastings. The City's FIS, together with the City's floodplain ordinance, allows the City to participate in the federal government's National Flood Insurance Program (NFIP). Homeowners within FEMA-designated floodplains are required to purchase flood insurance. In some cases, homes within FEMA-designated floodplains on the FEMA floodplain maps may actually not be in the floodplain. To waive the mandatory flood insurance requirements for their homes, residents must remove their homes from the FEMA-designated floodplain by obtaining a Letter of Map Amendment (LOMA).

The City manages activities in the FEMA-designated floodplain areas through the Hastings floodplain ordinance. In addition to FEMA-designated floodplains, the City has estimated 100-year water surface elevations based on hydrologic and hydraulic modeling (included in the City's 2009 WMP). The City's 100-year water surface elevations may differ from 100-year water surface elevations shown on FIRMs due to input data, level of detail, and other factors. The City's floodplain ordinance and associated minimum building elevations also consider the floodplains of major waterways, public waters, public waters wetlands, or other wetlands that may not be included within the FEMA-designated floodplain.

As development and redevelopment occur within the city, appropriate rate and volume controls are necessary to avoid creating future flooding issues or exacerbating existing flooding issues. The VRWJPO established rate and/or volume control performance standards applicable to those areas of the city within their respective jurisdictions. The City adopted these performance standards (see Section2.5).

4.2.2 Specific Issues

4.2.2.1 Impacts of Future Conditions on System Capacity

The developed parts of the city have complete stormwater drainage systems in place. Much of the existing drainage system has little or no additional capacity for added stormwater runoff from new developments and redevelopments or changes in precipitation patterns. As areas within the city develop or redevelop, the effect of the proposed projects and future precipitation conditions on the system will need to be determined.

Important issues for the City of Hastings are future development and the associated changes to the drainage system in the South Fringe and Sand Coulee watersheds, both of which will affect the City's stormwater management system. City staff will need to be aware of changes in both the South Fringe and Sand Coulee watersheds. For example, the City will need to know about proposed developments in the upstream townships and changes to upstream culvert and bridge crossings at county and township roads.

A specific area of concern is along two channels from the South Fringe watershed that flow through the Riverwood development. At this location, it is possible that increased flows due to new development upstream may increase the risk of flooding for existing homes if adequate stormwater management is not implemented. Another area of concern is in the Northeast Vermillion Watershed, where new

development upstream of the County Road 47 bridge may result in flows that exceed the design capacity of the current dike and bypass system. It is also important that there be no increases in flowrates entering Hastings from other communities. The VRWJPO maintains a watershed-wide stormwater model to set maximum allowable flow rates at community boundaries, which will help prevent these problems.

In all areas of the city, increasing precipitation amounts and intensities (see Section 3.2) may place additional strain on existing stormwater systems. The City will continue to use its hydrologic and hydraulic modeling to evaluate this issues in its review of development and redevelopment projects.

4.2.2.2 Historical Flooding Issues

In the late 1970s, the City of Hastings experienced large flooding events, especially in the southwest part of the city. In the 14th Street area, several homes flooded and basement foundations caved in. The storms also left behind large amounts of sediment in streets, stormsewers, and pipes. The northwest side of the city also experienced flooding of homes, major erosion, and deterioration of the stormwater system. Flooding also occurred near Highway 55 and Pleasant Drive.

In response to past flooding problems, the City underwent a large stormwater planning effort to address these existing problems and limit the potential for future problems. As the City annexed new lands, additional studies were completed. Since that time, the City has been systematically implementing the identified stormwater initiatives to alleviate the flooding problems. Examples of these initiatives include construction of the Northwest Basin, Featherstone Pond, Southwest Ponding Basin, and the pumped outlet from Southwest Ponding Basin.

A few current flooding issues remain in the city. In the West Vermillion Watershed, existing low homes in the Welch Addition may be prone to flooding from the Vermillion River. In addition, approximately 10 homes along the Mississippi River downstream of the railroad bridge are located in the floodplain and also experience increased risk of flooding. During periods of high water in the Vermillion Slough, six homes are isolated due to overtopping of the East 4th Street bridge, which was constructed to meet only the 10-year flood event.

4.2.2.3 Possible Issues Identified by Hydrologic/Hydraulic Modeling

Concurrent with the development of the City's 2009 WMP, the City performed hydrologic and hydraulic modeling of the City's entire pond and piping system. That modeling effort assumed future land use conditions and used precipitation data from TP-40 (see Section 3.2). The 10-year 1-hour rainfall event was used to analyze the level of service of the City's storm sewer system and the 100-year 1-hour, 12-hour, and 24-hour events were modeled to analyze the level of protection. The model results identified two types of problems in the City's stormwater management system: 1) excessive street flooding, and 2) pond flooding. The analysis found most of the problem areas to be minor, such as localized flooded areas resulting from undersized pipes.

Detailed hydraulic analysis at each location will be necessary to determine appropriate strategies to address flooding problems. Analysis of local flooding issues and any activities necessary to address these

issues will be performed as part of road reconstruction or redevelopment, when possible. Potential flooding issues identified by modeling that remain to be addressed include:

- Mississippi River Watershed
  - Lincoln Street and Jefferson Street
  - 4th Street West between and possibly downstream of Whispering Lane and Pleasant Drive
  - Pine Street between and possibly downstream of 9th Street West and 10th Street West
  - Vermillion Street between and possibly downstream of 5th Street West and 7th Street West
  - State Highway 55 and Westview Drive
  - Character Lane at Highway 61
- Vermillion River Watershed
  - Pine Street between and possibly downstream of 19th Street West and 21st Street West,
  - 15th Street East between and possibly downstream of Tyler Street and Bailey Street,
  - Vermillion Street between and possibly downstream of 11th Street East and 10th Street East, and
  - 10th Street East from Sibley Street to the downstream stormsewer outlet
  - Vermillion Street between and possibly downstream of 24th Street West and 22nd Street West
  - Red Wing Blvd between and possibly downstream of Spiral Street and Vermillion Street
  - 21st Street East and Commerce Drive
  - Spiral Blvd and Red Wing Blvd
  - 31st Street East and Malcom Avenue
  - Downstream of Three Rivers North Pond
  - Downstream of the storm sewer network that drains Commerce Drive.
- Sand Coulee Watershed
  - Pond at the intersection of Spiral Blvd and Nicolai Ave
  - Nicolai Avenue before it discharges into the Vermillion River
  - 37th Street West and Maher Avenue
- South Fringe Watershed
  - Riverwood Ponds C, G, and H

Note that the locations listed herein were identified by hydrologic and hydraulic modeling performed using TP-40 precipitation data that predates more recent Atlas 14 precipitation data (see Section 3.2). Use of Atlas 14 precipitation data in future modeling may identify potential flooding issues additional to those listed herein and/or affect the magnitude of potential issues already identified.

The City will continue to update the model as conditions dictate, including a planned update to the City-wide model included in the implementation of this WMP (see Table 5-2).

4.3 Erosion and Sediment Control

Sediment is a major contributor to water pollution. Stormwater runoff from streets, parking lots, and other impervious surfaces carries suspended sediment consisting of fine particles of soil, dust and dirt. Abundant amounts of suspended sediment are carried by stormwater runoff from actively eroding areas.

Although erosion and sedimentation are natural processes, they are often accelerated by human activities, especially during construction activities. Prior to construction, the existing vegetation on a site intercepts rainfall and slows down stormwater runoff rates, which allows more time for runoff to infiltrate into the soil. When a construction site is cleared and graded, the vegetation (and its beneficial effects) is removed. Also, natural depressions that provided temporary storage of rainfall are filled and graded, and soils are exposed and compacted, resulting in increased erosion, sedimentation, and decreased infiltration. As a result, the rate and volume of stormwater runoff from the site increases (*Minnesota Stormwater Manual*, as amended). The increased stormwater runoff rates and volumes cause increased soil erosion, which releases significant amounts of sediment that may enter the City's water resources.

Regardless of its source, sediment deposition decreases water depth, degrades water quality, smothers fish and wildlife habitat, and degrades aesthetics. Sediment deposition can also wholly or partially block culverts, manholes, and other stormwater facilities, causing flooding. Sediment deposition in detention ponds and wetlands also reduces the storage volume capacity, resulting in higher flood levels and/or reducing the amount of water quality treatment provided. Suspended sediment, carried in water, clouds lakes and streams and disturbs aquatic habitats. Sediment also reduces the oxygen content of water and is a major source of phosphorus, which is frequently bound to the fine particles. Erosion also results in channelization of stormwater flow, increasing the rate of stormwater runoff and further accelerating erosion.

If erosion and sedimentation increase, the City's stormwater management systems (e.g., ponds, pipes) require more frequent maintenance, repair, and/or modification to ensure they will function as designed. Monitoring the stormwater system, including inspection of sediment build-up in stormwater ponds, continues to be an important task for the City. The City is aware of existing erosion and sedimentation problems at various stormwater ponds and pond inlets and actively works to design and budget for solutions as described in the Implementation Plan.

In recognition of these issues, the City of Hastings requires the submittal and approval of erosion control plans for any land-disturbing activity (see Section 5.6). The City has an in-house inspector for smaller building construction activity (typically residential). The City hires an erosion control inspector for mass grading operations. After completion of grading, the City completes a survey of the site. As a result, the City of Hastings has good control of erosion and sedimentation issues during mass grading operations. The City will continue its ongoing review of its erosion control program to evaluate its effectiveness and improve it where possible and feasible. In addition, the VRWJPO reviews projects meeting specific triggers for compliance with WMO erosion and sediment control standards.

In addition to meeting City and WMO requirements, owners and operators of construction sites disturbing one or more acres of land must obtain a National Pollutant Discharge Elimination System

(NPDES) Construction Stormwater Permit from the MPCA. Owners/operators of sites smaller than one acre that are a part of a larger common plan of development or sale that is one acre or more must also obtain permit coverage. A key permit requirement is the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) with appropriate best management practices (BMPs). The SWPPP must be a combination of narrative and plan sheets that: (1) address foreseeable conditions, (2) include a description of the construction activity, and (3) address the potential for discharge of sediment and/or other potential pollutants from the site. The SWPPP must include the following elements:

- Temporary erosion prevention and sediment control BMPs
- Permanent erosion prevention and sediment control BMPs
- Permanent stormwater management system
- Pollution prevention management measures

A project's plans and specifications must incorporate the SWPPP before applying for NPDES permit coverage. The permittee must also ensure final stabilization of the site, which includes final stabilization of individual building lots.

4.3.1 Specific Sediment and Erosion Control Issues

There are three existing and potential future erosion problems in and near the city of Hastings.

1. Increased stormwater runoff from the high school site in the West Mississippi River subwatershed discharges into a ravine that leads into Featherstone Pond. The ravine currently experiences erosion and an unpaved road also experiences erosion and overtopping.

2. In the Sand Coulee watershed, the Industrial Park Pond outlet discharges east to a wooded ravine that leads into the Sand Coulee. Although there are currently no problems and the pond was designed to keep outflow rates down to pre-development conditions, the potential exists for future problems.

These existing and potential erosion problems could be stabilized and restored. Typical stabilization materials could include permanent geotextile erosion control material or riprap accompanied by a properly designed filter material.

4.3.1.1 Lake Rebecca Sediment Control

The City of Hastings constructed a series of three sediment control dikes in a ravine to treat stormwater runoff from County Road 42 before it flows into Lake Rebecca. The sediment control dikes are perforated sheet pile walls that provide extended detention of stormwater and trap large sand particles. . The dikes also require periodic maintenance. The City will continue to evaluate the effectiveness of these dikes and consider modifications, as necessary, to improve performance

4.4 Groundwater

Groundwater is a valuable resource that must be protected from contamination and conserved for sustainable use. Increased population in the Twin Cities metropolitan area has put increased pressure on

these aquifers. In addition, development results in larger impervious areas and more compacted soils, thus decreasing opportunities for infiltration and recharge. The City of Hastings relies on groundwater for its municipal water supply. The City uses municipal water supply wells located in bedrock aquifers (see Section 3.5.1).

Maintaining clean, safe groundwater supplies is critical to human and environmental health and to the economic and social vitality of communities. Groundwater can be contaminated by commercial and industrial waste disposal, landfills, leaking underground storage tanks, subsurface sewage treatment systems (SSTS), accidental spills, feedlots, and fertilizer/pesticide applications. The *Hastings Area Nitrate Study* (HANS, see Section 3.5.1) showed a correlation between agricultural land use and nitrate concentration in the Vermillion River, which is believed to be a source of contamination to the municipal wells.

While infiltration is often a preferred method of stormwater treatment, it may have negative consequences in areas with vulnerable groundwater resources. The City's Wellhead Protection Plan (WHPP, see Section 4.4.1) classified the aquifer vulnerability as "high" or "very-high". In an effort to reduce the potential adverse effects of pollutants from surface infiltration, infiltration practices must be implemented with consideration of guidance provided by the MPCA in its NPDES General Construction Stormwater permit (2013, as amended), MIDS guidance (2013, as amended), and the Minnesota Stormwater Manual.

The City recognizes that surface water resources and groundwater resources are interdependent, although it is extremely difficult to quantify the exchange of water between surface waters and groundwater. The interaction of groundwater and surface water can have negative consequences on either resource. Contaminated groundwater discharged to surface waters may have a direct impact on surface water quality and/or habitat. Declines in groundwater levels may result in decreased water levels in lakes, which may limit recreational use, reduce habitat areas, and result in increased growth of aquatic plants including invasive species (via an increased littoral zone).

4.4.1 Wellhead Protection

The Minnesota Department of Health administers and enforces the Minnesota Water Well Code through its wellhead protection program. This program regulates the installation of new wells, and is intended to prevent contaminants from entering the recharge zones of public well supplies. As part of this program, cities that pump groundwater to supply their residents with drinking water are required to prepare wellhead protection plans (WHPPs).

The City of Hastings has prepared and maintains a current WHPP, most recently updated in 2010. The WHPP delineates drinking water supply management areas (DWSMA) for the City's municipal groundwater wells, assesses the water supply's susceptibility to contamination from activities on the land surface, and establishes management programs, such as identification and sealing of abandoned wells, and education/public awareness programs. The DWSMA represents the boundaries of the recharge area to the well and is the area to be protected and managed by the wellhead protection plan. The City will use its WHPP when evaluating proposed stormwater infiltration BMPs. If a proposed infiltration/discharge is

determined by the City to potentially cause adverse effects to the local drinking water supply, the City will prohibit the construction of the infiltration area or incorporate the necessary BMPs to reduce the identified pollutant(s) prior to infiltrating into the vulnerable portions of the DWSMA. The City's wellhead protection areas are shown in Figure 3-6.

The MDH guidelines for evaluating proposed stormwater infiltration projects in vulnerable wellhead protection areas is available from Minnesota Stormwater Manual website: https://stormwater.pca.state.mn.us/index.php/Stormwater_and_wellhead_protection

4.5 Wetlands

Diverse wetland systems and shoreland areas are critical components of a healthy hydrologic system and positively affect soil systems, groundwater and surface water quality and quantity, wildlife, fisheries, aesthetics, and recreation. Development of land and other human activities can affect the hydrology and ecological functions of wetlands and shoreland areas.

Overloading wetlands beyond their natural capacity with water, sediment, or nutrients can diminish their effectiveness in providing water quality benefits. When land use and upstream hydrologic systems become altered, the hydraulic, sediment, and nutrient loads may increase in magnitude and frequency. These changes may result in tipping the ecological balance to benefit non-native and invasive plant species, thereby reducing the benefits to wildlife, fisheries, amphibians, and humans. Degraded water quality in wetlands can pass on to downstream waters, contributing to degradation of additional resources. Wetlands and shoreland areas provide valuable habitat for many types of wildlife including waterfowl, songbirds, raptors, mammals, fish, and many species of amphibians. By considering habitat benefits or detriments when approaching water resources projects, the City has the opportunity to protect and enhance these benefits.

The overall ecological health of wetland and shoreland areas can be significantly impacted by the presence or absence of vegetated buffers (see Section 3.5.1) and aquatic invasive species (see Section 3.5.2).

4.5.1 Wetland and Shoreland Buffers

Buffers are upland, vegetated areas located adjacent to wetlands and shoreland areas. Many of the hydrologic, water quality, and habitat benefits achieved by wetland and shoreland areas are directly attributable to, or dependent on, the presence of buffers. Vegetation reduces erosion by shielding the soil from rain and binding soil particles with root materials. Vegetation obstructs the flow of runoff, thereby decreasing water velocities, allowing infiltration, and reducing the erosion potential of stormwater runoff. As a physical barrier, vegetation also filters sediment and other insoluble pollutants from runoff. Vegetation scatters sunlight and provides shade, reducing water temperature in the summer, limiting nuisance algae growth, and reducing the release of nutrients from the sediment. Buffers also have habitat benefits; native plants provide the best food and shelter for native wildlife, fish, and amphibians.

The presence of adequate buffers surrounding wetland and shoreland areas is critical to preserving the ecological functions and environmental benefits of downstream waterbodies, including wetlands. Establishing buffers in developed areas may be difficult, as existing structures may be located within the desired buffer area. Redevelopment offers an opportunity to establish adequate buffers in areas that are already developed.

The City of Hastings has established vegetated buffer requirements that are consistent with the requirements of the VRWJPO and SWWD; these requirements are included in Section 2.4.

4.5.2 City Wetland Management

The City serves as the local governmental unit (LGU) responsible for administering the Wetland Conservation Act (WCA). As the LGU, the City's role includes requiring and verifying that all projects impacting wetlands meet the requirements of the WCA. The City implements wetland management performance standards through its stormwater management ordinance and this WMP (see Section 2.4). The City's stormwater management ordinance requires pre-treatment of stormwater runoff prior to discharge into wetlands and the provision of a buffer strip of natural vegetation around all wetlands. The City's wetland management activities are performed consistent with the policies and of the VRWJPO (see Section 5.3.1).

In addition to the existing wetland inventories described in Section 3.6.4, the City requires a site-specific delineation of the wetland boundary and wetland assessment as part of proposed development or redevelopment activities. The City also actively pursues opportunities to restore wetlands and create wetland buffers, when feasible.

4.5.3 Aquatic Invasive Species (AIS)

The term "invasive species" describes plants, animals, or microorganisms that are non-native, overrun or inhibit the growth of native species, and that 1) cause or may cause economic or environmental harm or harm to human health, or 2) threaten or may threaten natural resources or the use of natural resources in the state (Minnesota Statutes Chapter 84D.01). Aquatic invasive species (AIS) is a term given to invasive species that inhabit lakes, wetlands, rivers, or streams. Aquatic invasive species pose a threat to natural resources and local economies that depend on them.

AIS identified in the City of Hastings include:

- Carp – Mississippi River
- Eurasian watermilfoil – Mississippi River, Lake Rebecca
- Zebra mussels – Mississippi River, Lake Rebecca

At the state level, permitting the management of AIS is the responsibility of the MDNR. The City cooperates with the MDNR, WMOs, and Dakota County to address the impacts of AIS at the local level. More information about AIS is available from the MDNR at:
www.dnr.state.mn.us/invasives/aquatic/index.html

4.6 Vermillion River Watershed Joint Powers Organization Identified Issues

The jurisdiction of the Vermillion River Watershed Joint Powers Organization (VRWJPO) overlaps all of the city south of the Mississippi River. Thus, the VRWJPOs efforts to address priority issues may impact the City's management of its stormwater, surface water, and other natural resources. Watershed management issues identified by the VRWJPO are described in Section 5 of the *2016-2025 Vermillion River Watershed Management Plan* (VRWJPO Plan). Briefly, these issues include:

1. Surface water quality is threatened or impaired.
2. Water quality improvement competes with other public, private, and individual priorities. There is a perception that costs of improving water quality are not allocated fairly.
3. Groundwater quality is at risk, with known contamination above health risk limits for nitrate in some areas.
4. Increasing consumption of groundwater threatens the future water supply.
5. Changing precipitation patterns, decreased rainwater infiltration, and increased stormwater runoff have contributed to more intense fluctuations in river flow rate and volume.
6. Public awareness and specific knowledge on the impacts of daily activities and appropriate stewardship is lacking.
7. Several federal, state, and local agencies manage specific aspects of water protection, and limited coordination and communication among these agencies can create inefficiencies and cause confusion.
8. Minnesota's climate is getting warmer and wetter, which poses a threat to water quality, wildlife, and infrastructure.
9. The Vermillion River Watershed JPO is a "young" organization in a dynamically changing landscape and has not always been able to fill gaps and address new opportunities.
10. Sensitive biological resources -- plants, fish, insects, and wildlife -- in the Vermillion River are not as healthy as those in reference rivers.

Section 5 of the VRWJPO Plan describes these issues in greater detail. By incorporating the VRWJPO policies and requirements into the City's WMP, implementation of this WMP will assist in addressing these issues as they apply in Hastings. The City will also cooperate with the VRWJPO when appropriate to address these issues (see Section 5.3.1).

4.7 South Washington Watershed District Identified Issues

The jurisdiction of the South Washington Watershed District (SWWD) overlaps the portion of the city north of the Mississippi River. Thus, the SWWDs efforts to address priority issues may impact the City's management of its stormwater, surface water, and other natural resources. Watershed management issues identified by the SWWD are described in Part II of the 2016 *South Washington Watershed District Watershed Management Plan* (SWWD Plan). Briefly, these issues include:

- Flood damage reduction and mitigation

- Surface water degradation and impairment
- Erosion
- Natural resource protection, restoration, and reconstruction (e.g., wetlands)
- Groundwater sustainability (supply, pollution prevention)
- Climate change
- Information and education (resource assessment, research, modeling, education)
- Efficiency and accountability (progress evaluation, uniform standards, collaboration

Many of the issues identified in the SWWD are priority issues for the City of Hastings and are incorporated into this WMP. Implementation of this WMP will assist in addressing these issues as they apply in Hastings. The City will also cooperate with the SWWD when appropriate to address these issues (see Section 5.3.2).

4.8 Opportunities

The City of Hastings has several distinct opportunities which might assist in implementing this plan. The City will actively pursue these opportunities.

4.8.1 Partnerships

The City of Hastings cooperates with the Dakota SWCD, SWWD, and VRWJPO to address surface water management issues as opportunities allow. The VRWJPO, SWWD, and the Dakota County Soil and Water Conservation District (SWCD) provide technical support and funding for solving various water resource problems and completing water resource projects. These organizations have a long record of working successfully with individual cities toward meeting shared goals. The City will continue to collaborate with these organizations and take advantage of the available benefits. The City will seek opportunities to share information with these organizations and participate in WMO and/or SWCD programs and projects, as requested. Specific opportunities for collaboration include proposed projects included in the BDWMO and VRWJPO capital improvement programs. The City may also benefit by leveraging educational materials and opportunities developed by the WMOs to promote good watershed stewardship among its residents.

4.8.2 Redevelopment

Some areas of the City are fully developed. Opportunities for updating and upgrading the City storm drainage system in these developed areas exist primarily through redevelopment activities. As private and public properties redevelop, the City will implement the policies and programs of this plan. The City will continue to be proactive in using the controls at its disposal to take advantage of the opportunities presented by re-development to improve the city's stormwater systems and implement the policies of this plan.

4.8.3 Agricultural Land Conversion

Urban development of agricultural land typically results in reduced loading of sediment to receiving waters. While the City of Hastings seeks to protect prime farmlands, the conversion of some prime farmland to urban uses will occur as the city develops. Along with the opportunity to apply stormwater

BMPs as part of development, these projects will reduce the amount of agricultural land acting as a source of sediment in stormwater runoff.

4.8.4 Low Impact Development Practices

Existing development, limited space, and poor site conditions (e.g., soil contamination, low infiltration capacity) present in some areas of the city limit opportunities for additional stormwater management infrastructure. To mitigate the difficulty and expense of stormwater infrastructure to serve development and re-development sites, the City will continue to foster sustainable development and work to establish a balance between urban and natural systems. The City will promote the use of low impact development practices (e.g., green roofs, rain gardens, bioswales, pervious pavement, water reuse) throughout the City, where appropriate. These techniques promote water quality improvements and reduction of runoff volumes to receiving waters.

4.8.5 Coordination with Other City Programs

Coordinating stormwater and surface water management activities with other City programs presents an opportunity to increase operational efficiency, reduce costs, and limit the frequency and duration of disruptions to City services. The City's pavement management program, for example, may be coordinated with stormwater management activities so that potentially disruptive maintenance or improvements may be performed simultaneously with road maintenance and reconstruction, minimizing the number of closures.

5.0 Implementation

This section describes the significant components of the City's implementation program to address the issues identified in this Watershed Management Plan (WMP). The primary components of the implementation plan include operation and maintenance of the stormwater system, education and public involvement, funding sources, design standards, ordinance implementation and official controls, and implementation priorities. Implementation items from the City's National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit and associated Stormwater Pollution Prevention Program (SWPPP) are incorporated into this section.

The City of Hastings is responsible for overall management of stormwater and water resources within the city's boundaries. The city's location at the downstream end of watersheds that extend far beyond the city's boundaries (and control), means the City will need to seek cooperation from upstream communities, the Vermillion River Watershed Joint Powers Organization (VRWJPO), South Washington Watershed District (SWWD), and Dakota County to control the effects of upstream development or drainage improvements. The City will continue as the local governmental unit (LGU) responsible for administering the Wetland Conservation Act within the city boundaries, and will continue to implement and enforce its ordinances (as revised) related to water resource management.

5.1 NPDES MS4 Permit

Under the U.S. Environmental Protection Agency's (EPA) Storm Water NPDES Rules, the City of Hastings is required to maintain an MS4 permit for managing non-point source storm water. The City last renewed its MS4 permit in 2013. As part of the permit, the City must also prepare and maintain a SWPPP addressing all requirements of the permit. The SWPPP outlines the appropriate best management practices (BMPs) for the City to control or reduce the pollutants in stormwater runoff to the maximum extent practicable. The City will accomplish this through the implementation of the BMPs outlined within its SWPPP. These BMPs are a combination of education, operation and maintenance, control techniques, system design and engineering methods, and other such provisions that are appropriate to meet the requirements of the NDPES permit.

BMPs have been prepared to address each of the seven minimum control measures as outlined in the rules:

1. Public education and outreach
2. Public participation/involvement
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post-construction stormwater management
6. Pollution prevention/good housekeeping
7. Additional Best Management Practices

Minimum control measure 7 includes additional BMPs added to the City's SWPPP to address impaired waters for which a total maximum daily load (TMDL) study has been completed, and the City's stormwater pond inventory. The SWPPP also incorporates elements of the City's wellhead protection plan (WHPP) and includes measures that will reduce the threat to drinking water to the maximum extent practicable.

For each of these seven minimum control measures, the City's SWPPP identifies appropriate BMPs, along with measurable goals, an implementation schedule, and the persons responsible to complete each measure. Many of the policies included in this SWMP (see Section2.0) directly or indirectly address the minimum control measures. Future NPDES permit revisions, TMDL studies, or other developments (e.g., City modeling efforts) may result in the identification of new or expanded BMPs to address City MS4 permit requirements. The City will identify appropriate BMPs and add them to the City's implementation program and SWPPP, where appropriate.

Prior to June 30 of each year of the five-year permit cycle, the City must hold an annual opportunity to input on the adequacy of the City's SWPPP. The City also receives oral and written statements and considers them for inclusion into the SWPPP. Also prior to June 30, the City must submit an annual report to the MPCA. This annual report summarizes the following:

1. **Status of Compliance with Permit Conditions**. The annual report contains an assessment of the appropriateness of the BMPs and the City's progress toward achieving the identified measurable goals for each of the minimum control measures. This assessment is based on results collected and analyzed, inspection findings, and public input received during the reporting period.
2. **Work Plan**. The annual report lists the stormwater activities that are planned to be undertaken in the next reporting cycle.
3. **Modifications to the SWPPP**. The annual report identifies any changes to BMPs or measurable goals for any of the minimum control measures.
4. **Notice of Coordinated Activities**. A notice is included in the annual report for any portions of the permit for which a government entity or organization outside of the MS4 is being utilized to fulfill any BMP contained in the SWPPP.

The SWPPP BMP implementation program is incorporated into the City's overall stormwater implementation program presented in Table 5-1 and Table 5-2. The City's SWPPP is included in available from the City's website at: www.hastingsmn.gov.

5.2 Stormwater System Operation and Maintenance

The City of Hastings is responsible for construction, operation, and maintenance of city's stormwater management system (e.g., ponds, pipes, channels). Proper maintenance will ensure that the stormwater system continues to function as designed and provides the intended benefits. The City will continue and expand upon its operation and maintenance activities to ensure that the city's stormwater system functions as designed. The City's operation and maintenance program is closely tied with the City's implementation of its NPDES MS4 permit and is incorporated into Table 5-1.

The City's stormwater system includes not only pipes and constructed ponds, but also lakes, wetlands, ditches, swales, and other drainage ways as well as structural pollution control devices. In addition to more typical maintenance measures, maintenance of the stormwater system may also mean maintaining or restoring the ecological characteristics of the natural portions of the stormwater system. The City will regularly inspect and maintain key components of the system. Key components include storm sewer and culvert inlets, overflow drainage swales, stormwater ponding and water quality treatment basins, and riprap-protected banks, storm sewer, and culvert outlets.

Other units of government and private parties are responsible for maintaining stormwater systems under their respective ownerships. For example:

- Minnesota Department of Transportation (MnDOT) is responsible for maintaining the storm sewers located along Highway 55, Highway 61, Highway 316, and Highway 291.
- Dakota County is responsible for maintaining ditches, culverts, storm sewer catch basins and leads in the county roads, such as County Road 42, County Road 47 (Vermillion Road), County Road 54 (Ravenna Trail), and County Road 91 (Glendale Road), but the City is responsible for maintaining the trunk storm sewer lines.

The City will notify the owners of other publicly owned stormwater facilities if scheduled maintenance is needed according to periodic site inspections or maintenance plans on file.

5.2.1 Private Stormwater Facilities

Owners of private stormwater facilities are responsible for maintaining their facilities in proper condition, consistent with the original performance design standards. Responsibilities include removal and proper disposal of all settled materials from ponds, sumps, grit chambers, infiltration basins, and other devices, including settled solids. Owners of private stormwater facilities are required to provide the City with a maintenance plan as part of the project permitting process; the maintenance agreement defines who will perform the maintenance, the type of maintenance, and the maintenance intervals. The City maintains an inventory of these agreements. The City will inspect private stormwater facilities in response to complaints or obvious problems and notify the owners of needed cleaning and repairs.

5.2.2 Inspection and Maintenance of Structural Pollution Control Devices

The City inspects all City-owned structural pollution control devices annually (with the exception of sump manholes). The City's current sump manhole inspection and cleaning schedule may vary from twice per year to biennial inspection and cleaning depending upon condition. To justify an appropriate maintenance schedule for sump manholes, the City will document the number cleaned and inspected as well as the number full of sediment or debris. A map will be developed to identify which devices have been cleaned and inspected annually. If maintenance actions are required for an individual manhole as a result of the first two inspections, the City will increase the number of inspections as required in the NPDES Permit. All other structural pollution control devices will be inspected annually and appropriate maintenance actions will be taken according to the inspections. Addition detail regarding the inspection and maintenance of City stormwater infrastructure is included in the City's SWPPP.

The City is also in the process of developing and maintain an inventory of all pollution control devices in the city, consistent with current and anticipated future requirements of its MS4 permit (see Section 4.1.2). The City will uses available monitoring and modeling data (see Section 4.0) to assess and track the performance of water quality practices, including stormwater management ponds.

5.2.3 Maintenance of Ponding Facilities

Stormwater ponding facilities provide flood risk reduction and water quality benefits. However, if accumulated sediments are not periodically removed, such basins can experience a significant loss in necessary stormwater detention and pollutant removal capacity. If left unattended, these facilities can become overgrown with unwanted vegetation that may further reduce performance and hinder access for periodic maintenance.

The City of Hastings periodically inspects stormwater storage basins and water quality treatment facilities to identify excessive sediment build-up, collected debris, and unwanted vegetation. For sedimentation basins, if 25 percent of the sediment storage volume is filled with sediment, the basin will be dredged to provide its originally designed sediment storage volume.

The City will use inspection data and available water quality modeling (see Section 3.8.3) to prioritize pond maintenance needs. For planning purposes, it is often assumed that delta cleanouts are performed at approximately 10 year intervals, with full pond dredging performed at longer intervals (e.g., 30 years). However, basins that treat runoff from agricultural or developing watersheds may need to be cleaned more frequently due to the increased quantity of sediment loads.

Stormwater ponds that are classified as jurisdictional wetlands fall under the Wetland Conservation Act (WCA) and the maintenance of these wetlands are more regulated. Stormwater ponds that are included in the VRWPJO/SWCD wetland inventory will be evaluated to determine if the pond is a historical wetland that has been used for stormwater treatment prior to the WCA or is a stormwater pond created in upland areas for stormwater treatment. Wetlands used for stormwater treatment prior to WCA must follow the guidelines for maintenance outlined by the WCA. Wetlands that were created in upland areas in order to treat stormwater runoff are maintained as a stormwater basin.

Overflow swales can become steep eroding channels if erosion problems are not addressed. Typical stabilization materials could include permanent geotextile erosion-control material or riprap accompanied by a properly designed filter material. Erosion problems are identified and addressed by the City's maintenance program.

In general, vegetation in existing ponding facilities should be allowed to grow naturally on the side slopes of the basins and should not be mowed. This practice will allow ponding facilities to act like natural wetland areas by providing nearby upland wildlife habitat.

5.2.4 Maintenance of Riprap Areas

Riprap areas along banks, in overflow swales, or around storm sewer or culvert outlets, frequently need maintenance due to poor riprap design, vandalism, natural degradation, or a combination thereof. Riprap

is placed in those locations to prevent damage that would result from highly erosive flow velocities. If not periodically maintained, significant erosion will occur resulting in pipe damage, downstream sediment problems, and potential safety issues. The City will inspect riprap areas as part of its regular outfall inspections (as governed by the MS4 permit) and perform the necessary maintenance.

5.2.5 Street Sweeping

The City of Hastings maintains an active street sweeping program in an effort to reduce the amount of sediment, pollutants, and trash from reaching the storm sewer system and surface waters. The City sweeps City-owned streets a minimum of twice per year: once in early spring and then in the autumn, after leaf fall and on an as-needed basis using both mechanical and regenerative vacuum air sweepers. In the downtown area, City crews sweep the streets at least once a month during the warmer months (April through October). Additional details are included in the City's SWPPP. The City will continue this effective program.

5.2.6 Adequacy of Maintenance Program

The City's current operations and maintenance program, which is based on its SWPPP, is deemed as adequate to meet the conditions of the City's NPDES Permit and to maintain an effective stormwater management system. The City of Hastings will continue to develop, resulting in changes in land use, zoning, and drainage patterns. The City will continue to assess the need for new or expanded maintenance programs o in the future. The City will continue to be assess and revise its stormwater maintenance strategy to remain in alignment with the goals and standards of the VRWJPO, SWWD, Dakota County, and all regulatory agencies.

5.3 Watershed Management Organization Roles and Responsibilities

The City of Hastings is located within two watershed management organizations (WMOs): the Vermillion River Watershed Joint Powers Organization (VRWJPO) and the South Washington Watershed District (SWWD) (see Figure 3-3). Within their respective jurisdictions, each WMO performs roles and responsibilities in accordance with the authority specified in Minnesota Statutes 103B. This section summarizes the role of each WMO within the city.

5.3.1 Vermillion River Watershed Joint Powers Organization

The Vermillion River Watershed Joint Powers Organization (VRWJPO) was formed through a joint powers agreement between Dakota and Scott counties in September 2002. The mission of the VRWJPO is to:

> *Collaboratively providing education, science, and support to restore and protect the Vermillion River Watershed's natural resources for all who live, work, and play within its boundaries.*

To guide the VRWJPO in pursuit of its mission, the VRWJPO developed and adopted its *2016-2025 Vermillion River Watershed Management Plan* (VRWJPO Plan). Development of the VRWJPO included substantial stakeholder engagement to identify and prioritize issues within the watershed (Section 5 of the VRWJPO Plan). To address these issues, the VRWJPO Plan includes the following goals:

A. Protect or restore water quality in lakes, streams, and wetlands.
B. Protect and restore groundwater quality.
C. Maintain a sustainable water supply.
D. Address more intense fluctuations (up and down) in river flow rate and volume.
E. Improve public awareness and stewardship of water resources.
F. Improve watershed resilience to changing precipitation and temperature patterns.
G. Protect or restore sensitive biological resources, such as plants, fish, insects, and wildlife.

Section 6 of the VRWJPO Plan includes objectives and actions to achieve the above goals. Many of these objectives and actions include collaborative efforts between the VRWJPO and other units of government, including Hastings. Prominent among these are efforts to improve or maintain water quality. The VRWJPO also collaborates with municipalities to:

- Provide cost-share grants to cities and residents to implement water quality improvement projects
- Provide assistance to cities in meeting MS4 permit requirements
- Reduce barriers to implementing resource conservation practices
- Promote civic engagement and citizen-based action on water and natural resources issues

The VRWJPO has established performance standards for activities meeting specific triggers (VRWJPO Standards, 2016, as amended). The VRWJPO does not currently implement a permitting program within the City of Hastings but does review projects meeting certain criteria. Land alteration plans with the following conditions are particularly important to the VRWJPO for review:

- Diversions
- Intercommunity flows (upon request from adjoining communities)
- Project site size of 40 acres or more
- Projects that are adjacent to or appear to impact watercourses or unique natural resources

The VRWJPO may also review projects at the request of, and in coordination with, the City. The VRWJPO requires member cities to maintain and implement project review and permitting programs with performance standards at least as stringent as those defined in the VRWJPO Standards (2016, as amended). The City of Hastings developed this WMP with the intent to be consistent with the VRWJPO Plan and VRWJPO Standards.

Cities and townships within the VRWJPO who do not adopt the VRWJPO Standards will lose permitting authority for water related development and projects. The City of Hastings expects to retain jurisdiction and permitting authority over development in Hastings via this WMP policies and any planned revisions to City ordinances.

As part of the VRWJPO Plan, the VRWJPO has established a ten year implementation plan; the implementation plan is subdivided into management plans for each of the VRWJPO's major subwatersheds. In addition to collaborative, watershed-wide activities, proposed activities in the Lower

Main Stem and Mississippi River Direct subwatersheds (which include the City of Hastings) are listed in Sections 7.8 and 7.9 of the VRWJPO Plan and include:

- Riparian buffers
- Urban BMP retrofit opportunities in residential areas of Hastings
- Streambank Stabilization
- Agricultural BMPS in upstream areas
- Ravenna Coulee 1, West Drainage, PP01 Grade Stabilization

Consistent with Minnesota Statutes 103B, the VRWJPO reviews local water management plans for consistency with the VRWJPO Plan. Along with Minnesota Rules 8410, Figure 10.2.1 of the VRWJPO Plan identifies requirements for local plans.

Additional information about the VRWJPO, including the VRWJPO Plan and Standards, is available from the VRWJPO website at: http://www.vermillionriverwatershed.org/

5.3.2 South Washington Watershed District

The South Washington Watershed District (SWWD) was formed in 1993 primarily to address intercommunity flow issues. Since that time, the District's focus has expanded to include flooding, water quality, natural resource, groundwater, and other issues as well as emerging issues such as climate change. The geographic area of the SWWD was expanded in 2010 to incorporate some areas included in the former Lower St. Croix Watershed Management Organization (LSCWMO), including the portion of Hastings north of the Mississippi River (see Figure 3-3).

The mission of the SWWD, presented in its *Watershed Management Plan* (SWWD Plan) is:

> *To manage water and related resources of the District in cooperation with our citizens and communities.*

The SWWD Plan, adopted in October 2016, summarizes the priority issues as well as the programs and actions the SWWD will implement to address these issues. An assessment of issues is included as Part II of the SWWD Plan and is summarized in Section 4.7 of this WMP.

The SWWD Plan includes goals corresponding to each of the identified issues, as well as implementation indicators to evaluate progress in meeting those goals. Part III of the SWWD Plan describes the four primary program areas the SWWD operates to address the issues and goals identified in the SWWD Plan:

- Planning
- Regulatory
- Implementation and Maintenance
- Education and Information

The SWWD has established rules for activities meeting specific triggers (SWWD Rules, 2015, as amended) and implements a permit program. However, the District recognizes that the primary control and determination of appropriate land uses is the responsibility of its municipalities, including the City of

Hastings. The District urges municipalities to develop and maintain local water plans that are consistent with District Rules. Where such a local water plan is adopted, the requirements of the District's Rules which are met by the municipal plan shall be deemed satisfied upon issuance of an appropriate municipal permit, and the municipality shall retain local permitting authority.

The City of Hastings has developed this WMP and its official controls (see Section 5.7) to be consistent with the SWWD Plan and SWWD Rules. Thus, the City of Hastings maintains permitting authority for projects in the city located within SWWD jurisdiction. The City intends to maintain this permitting authority and will update its official controls, as needed, to remain consistent with SWWD requirements.

As part of the SWWD Plan, the SWWD has established a long-range workplan (i.e., implementation plan) that outlines planned future activities including monitoring, studies, BMP maintenance, capital projects, education programs, and other activities. Specific activities and/or projects involving the City of Hastings are not identified. However, the City expects to collaborate with the SWWD in the execution of the SWWD workplan, as opportunities allow.

Additional information about the SWWD, including the SWWD Plan and Rules, is available from the SWWD website at: http://www.swwdmn.org/

5.4 Education and Public Involvement Program

The City of Hastings recognizes the need for public information programs to increase public awareness of stormwater and water resource management issues and promote community capacity to address these issues through best management practices. The City of Hastings maintains various education and communication programs to address water resource issues. The City's education and public involvement program is closely tied with the City's implementation of its NPDES MS4 permit (minimum control measures 1 and 2, specifically) and is designed to be in conformance with the City's NPDES MS4 permit.

The City develops and distributes articles and information regarding water resource management and the City's SWPPP, including information on:

- stormwater issues
- water conservation and reuse
- non-point source pollution
- illicit discharges
- erosion control
- invasive species
- vegetated buffers and shoreline management
- annual public meetings
- local agency contacts
- stormwater website links
- composting and pollution prevention

The City communicates this information through City mailings, newspaper articles, presentations, , social media, notices on the local cable television station, articles in the City newsletter. The City's website provides pages and links devoted to water resource related issues and local contact information for residents to request information on specific topics or to report a stormwater-related infraction. The City's website is located at: http://www.hastingsmn.gov/

The City also works collaboratively with the Dakota County Soil & Water Conservation District (Dakota SWCD),the VRWJPO, and other governmental and non-profit entities (e.g., Hastings Environmental Protectors) in distributing educational materials, hosting presentations, and promoting/supporting outreach programs. Programs include, but are not limited to:

- Volunteer stream monitoring (VRWJPO),
- Citizen Assisted Monitoring Program
- Citizen Lake Monitoring Program
- Wetland Health Evaluation Program (WHEP)
- Landscaping for Clean Water workshops (Dakota SWCD)

The City annually presents an overview of its MS4 program and SWPPP at a city council meeting and holds a public hearing to receive oral and written comments regarding the City's stormwater management activities.

The City periodically reviews its education and public involvement programs to keep this communication up to date and useful.

5.5 Funding of Implementation Program

Several funding sources are available to the City of Hastings to implement this WMP. These funding mechanisms are described in the following sections and include:

- Stormwater Utility Fee
- General Fund
- Special Assessments
- Grants and Cost-shares

The City of Hastings plans to fund its stormwater and surface water management activities primarily through funds generated through its stormwater utility. In the future, the City will be challenged with needing to replace existing stormwater infrastructure that is at or beyond the end of its design life. The current stormwater utility fund is unlikely to provide sufficient funding to address all of the City's stormwater and surface water management responsibilities. Funding for capital improvements within the trunk storm sewer system which serve the older portions of the city may require modifications to current funding mechanisms. Additional funding from the City's general fund, special assessments, grants, and other sources may be also be used to fund the implementation of this WMP, as necessary.

Other potential funding mechanisms not currently used, but available, to the City of Hastings include:

- Ad Valorem Taxes/Stormwater Taxing Districts
- Impact/Development Fees
- Tax Increment Financing

5.5.1 Stormwater Utility Fee

The stormwater utility fee is a fee charged to existing properties that generate runoff discharged to the City's stormwater system. Rates are based on the amount of stormwater runoff generated by the property. The revenues collected are dedicated to the surface water system and are frequently used to pay for operation and maintenance of the system. The fees can be accumulated to pay for such activities, or they can be the revenue stream to pay for bonds sold to initially pay for such activities.

The City intends for the stormwater utility to be the primary source of funding for implementing this WMP. Since the City's 2009 WMP, the City established a stormwater utility fee collection program. The stormwater utility fee provides funding to improve water quality through studies and implementation of improvements. The funds are also used to improve and/or repair the storm sewer system, and for maintenance of water quality ponds. This program is periodically reviewed to determine its adequacy for funding the projects and programs needed. Increases in stormwater utility rates may be required to adequate fund the activities described in this WMP.

5.5.2 General Fund

The City's general fund may be used to augment funds generated by the stormwater utility to finance the City's surface water and stormwater management responsibilities, as needed.

5.5.3 Special Assessments

Per the authority given in Minnesota Statutes 429, Cities may assess benefiting or responsible properties to finance surface water improvements. Special assessments are used to finance special services ranging from maintenance to construction of improvement projects and are levied against properties benefiting from the special services. The philosophy of this method is that the benefited properties pay in relation to the benefits received. The City of Hastings has used special assessments to pay for past stormwater projects, such as installation of new storm sewer systems and replacement of existing storm sewer systems. The disadvantages of using special assessments include the difficulty in determining and proving benefits; inability to assess runoff contributions; and the rigid procedural requirements.

5.5.4 Grants and Cost-share Opportunities

Though subject to budgetary constraints, a number of state and other grant programs are available for surface water management activities. Many grant programs can change frequently in their objectives, the amount of funding available and what the funding can be used for. Cost-sharing opportunities may also reduce the portion of project or program costs carried by the City. There may be opportunities to jointly implement projects in cooperation with neighboring cities, Dakota County, the Dakota SWCD, Washington Conservation District, SWWD, and VRWJPO.

The City periodically reviews its implementation program to identify projects and activities that may be candidates for grants or cost share opportunities; the City pursues these opportunities strategically.

5.5.5 Other Potential Funding Mechanisms

5.5.5.1 Ad Valorem Taxes/Stormwater Taxing Districts

The City of Hastings has not used special taxing authorities to pay for projects, such as special taxing districts (Minnesota Statutes 444.16-444.21). Other special taxing authorities are available, such as Minnesota Statutes 103B.241, which allows the City to levy a tax to pay for projects identified in the City's local water management plan. The City may accumulate these levy proceeds as an alternative to issuing bonds to finance projects. MN Statutes 103B.245 allows the City to establish a watershed management tax district in the city to pay for water management facilities described in the plan (including maintenance). The tax district must be established by ordinance and must be included in the City's plan. Similar to Minnesota Statutes 103B.241, this statute allows the City to either accumulate funds or issue bonds to pay for the projects.

5.5.5.2 Impact Fees/Development Costs

Many cities impose impact fees such as connection charges, building permit fees, etc. to pay for the costs of providing stormwater management services to newly developing areas. Instead of charging impact fees, the City of Hastings requires developers to provide the ponding, storm sewers, etc. that the City requires. Developers are also responsible for enlarging stormwater ponding areas, installing larger pipe, etc. when required, to handle the stormwater runoff from their developments.

5.5.5.3 Tax Increment Financing

The City of Hastings has one tax increment financing (TIF) district (Downtown District). TIF monies are targeted for redevelopment in the district. The City of Hastings has not used TIF in the past and there is only a remote possibility it would be used to help fund stormwater management projects.

5.6 Ordinance Implementation and Official Controls

The City of Hastings actively and progressively manages stormwater to protect life, property, waterbodies within the city, and receiving waters outside the city. The City of Hastings regulates the management of stormwater through this WMP, City ordinances, and other applicable regulatory controls. Collectively, these are referred to as "official controls." The City will continue to implement, and update as needed, the official control the official controls described in this section.

City regulations and land use controls include the following water resource-related plans, ordinances, and standards/guidelines:

- City of Hastings NPDES MS4 permit and Stormwater Pollution Prevention Program—(see Section 5.1
- City of Hastings Wellhead Protection Plan (WHPP)
- City Ordinances including:
    - Floodplain Regulations ordinance (City Ordinances, Chapter 151)

    - Storm Water Management ordinance (City Ordinances, Chapter 152)
    - Shoreland Management ordinance (City Ordinances, Chapter 153)
    - Subdivision Regulations ordinance (Hastings City Ordinances, Chapter 154)
    - Zoning Code ordinance (Hastings City Ordinances, Chapter 155)
- City of Hastings Publi Works Design Manual, addressing:
    - Storm Sewer Design Standards
    - Grading, Drainage, and Erosion Control Design Standards

To ensure that the City's official controls are followed, the City requires permits and/or approvals for land disturbing activities (including developments and redevelopment), depending on the type of activity. City permits and/or approvals that address stormwater and surface water management activities include:

- Site Plan Approval, including:
    - Stormwater Management
    - Erosion and Sediment Control
- Building Permit, including:
    - Excavation/Fill
    - Demolition
    - Relocation
    - Stormwater Management
    - Erosion and Sediment Control
- Floodplain Special Use Permit
- Preliminary Plat Approval, including:
    - Stormwater Management
    - Erosion and Sediment Control

Applicants for building permits, subdivision approvals, or permits to allow land disturbing activities must submit a storm water management plan to the City's Public Works Department as detailed in the City stormwater management ordinance (Chapter 152). No building permit, subdivision approval, or permit to allow land disturbing activities shall be issued until approval of the storm water management plan or a waiver of the approval requirements has been obtained from the City.

Note that the official controls implemented by the City do not replace applicable permit requirements or performance standards imposed by the MPCA, SWWD, VRWJPO, or other regulatory entities, as applicable. Projects with land-disturbing activity of one acre or more must also obtain a National Pollution Discharge Elimination System (NPDES) permit from the MPCA.

The City also actively works with the SWWD and VRWJPO towards accomplishing common goals and adhering to the policies of the watershed management organizations. Both the SWWD and VRWJPO operate permit programs in municipalities that have not established official controls consistent with WMO requirements, standards, or rules. The City of Hastings intends to maintain permitting authority within the city. The City of Hastings seeks to maintain constancy with applicable SWWD and VRWJPO requirements

through the policies and implementation items included in this WMP, including any necessary updates to the City's official controls.

As part of implementing this WMP, the City will revise its official controls, as needed, to be consistent with the VRWJPO Standards (2015, as amended), SWWD Rules (2015, as amended), and the City of Hastings MS4 Permit SWPPP.

5.6.1 Stormwater management Ordinance (Chapter 152)

Section 152 of the Hastings City Ordinances is the City's Storm Water Management Ordinance. This is a comprehensive ordinance that addresses stormwater drainage, water quality, treatment design standards for stormwater detention facilities, temporary and permanent erosion and sediment control, and wetland considerations. The ordinance requires applicants for any land disturbing activity to submit a stormwater management plan via a building permit, site plan approval, or preliminary plat approval. The ordinance describes the application and review process, required plan elements, and plan approval standards. The ordinance applies to activities that disturb more than one-third acre.

Standards for storm sewer design in the city of Hastings are included in the City's Public Work Design Manual. Standards for grading and erosion control are included in the Public Works Design Manual, in the City of Hasting's Builder's Handbook, and the Standard Specification for Construction.

5.6.2 Floodplain Regulations

The City of Hastings' Flood Plain Regulations (Section 151 of the City Ordinances) apply to land located within the Floodway, Flood Fringe, or General Flood Plain Districts, as shown on the City's Official Floodplain Zoning Map. The official floodplain zoning map adopts by reference the *City of Hastings January 1980 Flood Insurance Study* (FIS), prepared by the Federal Insurance Administration, the Flood Insurance Rate Map, the Flood Boundary and Floodway Map, and the June 1971 document *Floodplain Information, Mississippi River and Vermillion River, Hastings, Minnesota*, prepared by the U.S. Army Corps of Engineers. In 2011, Dakota County performed a County-wide floodplain study including the City of Hastings; updates to the FIS went into effect on December 2, 2011.

The floodplain ordinance regulates developments, land alterations and uses within each of the floodplain districts. A floodplain special use permit must be obtained from the Planning Department prior to (1) the construction, addition or alteration of any building or structure; (2) the change of use or change of topography; or (3) the use or change or extension of a nonconforming use.

The ordinance does not apply to other non-designated areas of the city, such as ponding areas, and areas adjacent to stormwater management facilities, which may be flood-prone. These areas, however, are subject to the minimum building elevations and other applicable policies specified in Section 2.0 of this WMP.

5.6.3 Shoreland Regulations

The City of Hastings has a shoreland ordinance (Section 153 of the City Ordinances) that applies to the shorelands of public waters (see Section 3.6.1). The ordinance regulates 1) the use of any shoreland of public waters; 2) lot size and shape; 3) structure use, size, type and location; 4) installation and maintenance of water supply and waste treatment systems; 5) grading and filling; 6) cutting of shoreland vegetation; and 7) subdivision of land. The shoreland ordinance may require a grading and filling permit depending upon the volume of material moved; permit thresholds are more stringent for material on steep slopes or within shore or bluff impact zones

5.6.4 Wetland Regulation

The City of Hastings acts as the Local Governmental Unit (LGU) responsible for administering the Wetland Conservation Act (WCA). As the LGU, the City's role includes requiring and verifying that all projects impacting wetlands meet the requirements of the WCA. The City implements wetland management performance standards through its stormwater management ordinance and this WMP (see Section 2.4). The City's wetland management activities are performed consistent with the policies and of the VRWJPO. As part of its wetland management activities, the City requires a site-specific delineation of the wetland boundary and wetland assessment as part of proposed development or redevelopment activities.

5.7 Implementation Program

The projects, programs, and activities related to the City's surface water and stormwater management responsibilities are summarizes in Table 5-1 and Table 5-2. Many of the implementation items listed in Table 5-1 and Table 5-2 are required per the City's NPDES MS4 permit and incorporated into the City's SWPPP. Table 5-1 and Table 5-2 show planning-level cost estimates, proposed year of implementation, and proposed financing source for each element of the implementation program.

Capital improvements planned for implementation within the life of this WMP are included in Table 5-2. The City will continue to coordinate its stormwater capital improvements with the City's overall 10-year capital improvement plan (CIP). In addition to the 10-year CIP, the City will continue to follow its detailed 5-year CIP to schedule and plan for funding these projects in the near term (i.e., 2019-2023). The City's overall CIP is updated annually by City staff and reviewed and approved annually by the City Council.

5.7.1 Implementation Priorities

The current implementation components are designed to make the best use of available funding, address existing stormwater management issues, and prevent future stormwater management problems. The City's priority system reflects its responsibility to protect the public health, safety, and general welfare of its citizens by addressing problems and issues specific to the city of Hastings. This work falls into three categories:

- **Preventive Work:** This category includes those program elements required to prevent new water resource problems from developing, or to prevent existing problems from worsening. This work may include capital projects, public education and outreach, ongoing implementation of best

management practices, ordinance implementation and any other efforts that may prevent or reduce the potential for future water resource issues. The emphasis is placed on preventing the implementation of future capital improvements that can be avoided by sound management and planning. Regular inspection and maintenance activities associated with the City's MS4 SWPPP, for example, are considered preventative work..

- **Corrective Work:** This category includes program elements designed to correct or minimize the impacts of ongoing water resource or stormwater problems. Examples of corrective work could include increasing of storm sewer capacity in areas experiencing periodic flooding, as well as non-infrastructure projects such as illicit discharge detection and violation enforcement. In some cases, timely corrective work may prevent larger capital expenditure that might become necessary later if correction is delayed.
- **Investigative Projects:** This category includes program elements that involve considerable lead time or background investigation and study, such as data gathering and hydrologic analysis. This work may serve as the basis for pursuing further preventive or corrective work.

The City carries out its implementation program with the intent to achieve the City's goals while promoting efficiency and minimizing cost. Therefore, the City will seek opportunities to coordinate stormwater system repair and/or replacement with its Pavement Management Program, redevelopment opportunities, or other coordinated projects (e.g., park improvements, other utility upgrades). The City may also re-prioritize projects based on the availability of grant funding, cost-share opportunities, or availability of other funding sources that may reduce the City's financial responsibility.

Table 5-1 Implementation Program – Ongoing Programs (Education, Regulation, Maintenance)

Project ID	Project Description	Cost ($)[1]	Funding Source	Contract or City Staff	Year	Notes
O-1	Implement stormwater system maintenance activities per City MS4 SWPPP, including inventory of BMPs	$20,000/year	Stormwater Utility	City Staff, Contractor	Ongoing	SWPPP Minimum Control Measured (MCM) 6
O-2	Implement inspection and enforcement for site erosion controls per City MS4 SWPPP	$0 [2]	Stormwater Utility, permit fees	City Staff	Ongoing	SWPPP MCM 4
O-3	Implement illicit discharge detection and elimination program per City MS4 SWPPP	$0 [2]	Stormwater Utility	City Staff	Ongoing	SWPPP MCM 3
O-4	Implement City project review and permitting program, consistent with City ordinances and SWPPP	$0 [2]	Stormwater Utility, permit fees	City Staff, Consultant	Ongoing	SWPPP MCM 4, 5
O9-5	Implement ongoing aspects of the City's Wellhead Protection Plan, including updating record of SSTS	$2,000/year	Stormwater Utility	City Staff	Ongoing	
O-6	Review and update City ordinances, as needed, to comply with applicable requirements	$5,000	Stormwater Utility	City Staff, Consultant	TBD (assumed 2023)	Periodic review to maintain compliance with MS4 permit and WMO requirements
O-7	Implement ongoing education and public outreach activities consistent with this WMP and City MS4 SWPPP	$1,000/year	Stormwater Utility	City Staff	Ongoing	SWPPP MCM 1, 2
O-8	Serve as LGU for administering the Wetland Conservation Act (WCA)	$0 [2]	Stormwater Utility	City Staff	Ongoing	
O-9	Meet annually with county highway staff, county planning staff, and township officials regarding planned development and redevelopment activities	$0 [2]	Stormwater Utility	City Staff	Ongoing	SWPPP MCM 3
O-10	Update City Watershed Management Plan ahead of 2028 Comprehensive Plan	$40,000	Stormwater Utility,	City Staff, Consultant	2027-2028	Per MN Rules 8410 and Minnesota Statutes 103B.235

(1) Costs presented in 2018 dollars for planning purposes.
(2) Cost is included in other task or includes only staff time included in other budgets.

Table 5-2 Implementation Program – Capital Projects and Studies

Project ID	Project Description	Cost ($)[1]	Funding Source	Contract or City Staff	Year	Notes
P-1	Install stormwater system upgrades performed as part of street reconstruction	$500,000/year (average)	Stormwater Utility, Bonds, Assessments,	City Staff, Contractor, Consultant	Ongoing	Schedule and project needs based on street reconstruction program and stormwater system analysis
P-2	Replace street sweeper	$225,000	Stormwater Utility	City Staff	2019	
P-3	Install rainwater gardens	$50,000/year (average)	Stormwater Utility	City Staff	2018-2027	In conjunction with annual neighborhood reconstruction program when feasible and when grant opportunities are available
P-4	Implement studies to identify any pond dredging needs	$10,000	Stormwater Utility	City Staff, Consultant	2019	
P-5	Periodic pond dredging based on study (in addition to regular SWPPP maintenance)	TBD ($$)[3]	Stormwater Utility	City Staff	TBD (assumed 2020,2025)	Based on results of study to identify pond dredging needs
P-6	Update City-wide water quality model to identify issues and opportunities	$35,000	Stormwater Utility	City Staff, Consultant	2020-2021	
P-7	Perform feasibility studies to evaluate projects to improve water quality, based on results of City-wide modeling	$5,000/year	Stormwater Utility	City Staff, Consultant	2020-2020	Based on results of City-wide water quality modeling
P-8	Update City-wide hydrologic and hydraulic modeling to identify issues and opportunities	$100,000	Stormwater Utility	City Staff, Consultant	2020-2023	
P-9	Perform feasibility studies to evaluate projects to reduce flood risk, based on results of City-wide modeling	$15,000/year	Stormwater Utility	City Staff, Consultant	2024-2028	Based on results of City-wide hydrologic and hydraulic modeling

Table 5-2 Implementation Program – Capital Projects and Studies

Project ID	Project Description	Cost ($)[1]	Funding Source	Contract or City Staff	Year	Notes
P-10	Implement targeted water quality improvement and/or flood risk reduction projects as part of redevelopment or stand-alone City projects	TBD ($$$)[3]	Grants, Developer funds	City Staff, Contractor, Consultant	2021-2027	Schedule and project needs based on redevelopment opportunities and City-wide modeling/feasibility studies
P-11	Evaluate the feasibility of 5-6 water quality and/or flood risk reduction projects identified in cooperation with VRWJPO	$25,000	Stormwater Utility	City Staff, Contractor, Consultant	2018-2019	Includes evaluation of implementation options to maximize benefits; collaborative projects with VRWJPO (e.g., 21st Street Ravine, Vermillion Falls Park bioinfiltration)
P-12	Implement water quality and/or flood risk reduction projects identified through feasibility studies (see item P-11) in cooperation with VRWJPO	TBD ($$)[3]; based on project design and grant funding	VRWJPO, grant funding	City Staff, Contractor, Consultant	2020	Project details TBD based on feasibility studies; performed in collaboration with VRWJPO
P-13	Coordinate with adjacent jurisdictions to implement necessary flood risk reduction measure in areas outside city	TBD ($)[3]	Developer funds	City Staff, Consultant	Ongoing	Performed as needed
P-14	Cooperate with WMOs and other entities to implement habitat and corridor preservation or restoration projects	TBD ($$)[3]	Grants	City Staff, Consultant	TBD	As opportunities and grant funding allow
P-15	Implement wetland restoration and enhancement projects	TBD ($$)[3]	Grants	City Staff, Consultant	TBD	As opportunities and grant funding allow

(1) Costs presented in 2018 dollars for planning purposes.
(2) Cost is included in other task or includes only staff time included in other budgets.
(3) Cost to be determined; TBD costs are presented in relative terms as low ($), medium ($$), or high ($$$).

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