

Surface Water Management Plan



Prepared for the City of Red Wing
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BALMM	Basin Alliance for the Lower Mississippi River in Minnesota
BI	Biotic Index
BMP	Best Management Practice
BWSR	Minnesota Board of Water & Soil Resources
CAMP	Citizen Assisted Monitoring Program
Chl a	Chlorophyll a
CFS	Cubic Feet per Second
CIP	Capital Improvement Program
CLP	Clean Lakes Program
CMP	Corrugated Metal Pipe
CMSPP	Chicago, Milwaukee, St. Paul and Pacific Railroad
CR	County Road
CRWP	Cannon River Watershed Partnership
CSAH	County State Aid Highway
CSMP	Citizen Stream Monitoring Program
CWA	Clean Water Act
CWP	Clean Water Partnership
DO	Dissolved Oxygen
DWSMA	Drinking Water Supply Management Areas
EAW	Environmental Assessment Worksheets
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
EQB	Minnesota Environmental Quality Board
FEMA	Federal Emergency Management Agency
FIA	Flood Insurance Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Studies
FWPCA	Federal Water Pollution Control Act
GIS	Geographic Information System
HSG	Hydrologic Soil Group
IBI	Index of Biotic Integrity
ISTS	Individual Sewage Treatment Systems
LA	Load Allocation
LCA	Local Cooperation Agreement
LCMR	Legislative Commission on Minnesota Resources
LGU	Local Government Unit
LPLA	Lake Pepin Legacy Alliance
LWMP	Goodhue County Comprehensive Local Water Plan

MCM	Minimum Control Measure
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
MN	State of Minnesota
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MS	Minnesota Statutes
MS4	Municipal Separate Storm Sewer System
MSL	Mean Sea Level
NCHF	North Central Hardwood Forest
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NURP	Nationwide Urban Runoff Program
NWI	National Wetlands Inventory
OHWL	Ordinary High Water Level
ORVW	Outstanding Resource Value Water
P8	Program for Predicting Polluting Particle Passage thru Pits, Puddles, & Ponds
PUD	Planned Unit Development
PWI	Public Waters Inventory
RCP	Reinforced Concrete Pipe
RWCP	Red Wing Comprehensive Plan (2007)
RWWMP	Red Wing Watershed Management Plan (2003)
SCS	Soil Conservation Service
SDS	State Disposal System
SRV	Soil Reference Values
SSTS	Subsurface Sewage Treatment System
SWCD	Soil and Water Conservation District
SWCS	Soil and Water Conservation Society
SWMM	US Environmental Protection Agency Storm Water Management Model
SWMP	Surface Water Management Plan
SWPPP	Storm Water Pollution Prevent Plan
TIF	Tax Increment Financing
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
US	United States
USCOE	United States Army Corps of Engineers
USACE	United States Army Corps of Engineers

USDA	United States Department of Agriculture
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound
VRWJPO	Vermillion River Watershed Joint Powers Organization
WCA	Wetland Conservation Act
WHPA	Wellhead Protection Area
WHPP	Wellhead Protection Plan
WLA	Waste Load Allocation
WMO	Watershed Management Organization
WRMP	Water Resources Management Plan
XP-SWMM	XP Software's Storm Water Management Model

Section 1

Introduction

The City of Red Wing is the county seat of Goodhue County in Minnesota. The population was counted as 16,459 in the 2010 census.

Red Wing began as a riverfront trading center and was first platted in 1853. The area contains dense concentrations of ancient village sites, earthworks, and mounds. The City is situated along the Mississippi River, surrounded by 300-foot-high limestone bluffs. This rugged terrain forced early development to occur adjacent to the rivers and streams, and along the accessible ravines and ridges. Current development is concentrated in these same areas.

All of the land in the City of Red Wing eventually drains to the Mississippi River. The Mississippi **River's wide floodplain periodically floods large portions of land** within the City limits. Besides the Mississippi River, three major streams drain the Red Wing area in a southwesterly to northeasterly direction: the Cannon River, Hay Creek, and Spring Creek. These streams drain mostly through the southern portion of the west Red Wing area and created wide areas subject to flooding. More than 40% of the City's **flat land is located within designated floodplains, making** the land unsuitable for most urban uses. Adding in wetlands and steep slopes, over 54% of the land area within the Red Wing City limits is undevelopable.

In general, existing development is concentrated in the southeastern part of the City and along or near Highway 61. The Prairie Island Indian Community, including the Prairie Island Casino, is located in the northwest corner of the City. The City's **future land use plan is** discussed in **Section 3**.

Hay Creek, Trout Brook, and Spring Creek in the southern part of the City, and Bullard Creek downstream of the City limits are Minnesota Department of Natural Resources (MDNR) designated trout streams, per Minnesota Rules 6264.0050. MDNR-designated trout streams exhibit the characteristics necessary for supporting a trout population. The Cannon River is designated as an Outstanding Resource Value Water (ORVW).

This plan covers the following five major watersheds in and near the City of Red Wing:

1. Mississippi River
2. Bullard Creek
3. Hay Creek
4. Spring Creek
5. Cannon River

These five watersheds are shown on **Figure 3.9.1**.

Section 4 describes the drainage requirements and recommended system improvements for each of these watersheds.

1.1 LOCATION AND HISTORY

The location of Red Wing was under Spanish and French ownership until 1803 when the United States bought the land lying west of the Mississippi River from France under the so-called “Louisiana Purchase.”

According to historical records, Father Louis Hennepin, an explorer and Franciscan priest, arrived here shortly after April 11, 1680. He was the first European to visit the territory. On September 18, 1805, Col. Zebulon M. Pike, a US Army officer, landed here and held a conference with an Indian chief called **Hupahuduta (meaning “a swan’s wing dyed in red,” which he carried as an emblem of his chieftaincy)**. On June 30, 1823, US Army officer Major Stephen Harriman Long made his second visit to this site and suggested the name Red Wing for the village. The location was known by several designations: **Proymueche (meaning “mountain in the water”)** and Hemminnicha and Hham-**necha (these meaning “wood, water, and hill”)**.

Under a treaty made at Mendota on July 29, 1851, Europeans were allowed to build homes on the west bank of the river starting in 1853. A European settlement began, and in 1857 Red Wing was incorporated as a city.

A significant governmental change occurred on June 1, 1971, when the City of Red Wing and Burnside Township were consolidated into a new municipality known as Red Wing. This action combined the land area and human resources of these two communities into one unified government to maximize governmental service to the area.

Red Wing Facts

<i>Established</i>	1857
<i>Total area</i>	41-square miles
<i>Population</i>	16,459 (2010)

The City is located in a valley surrounded by various bluffs; to the north, the Mississippi River flows past its levee. Many parks are located within the City limits including **the Soldiers’ Memorial Park**. This park is sited on top of Sorin Bluff which is over a 1,000 feet above sea level and easily accessible.

Red Wing ranks as one of the leading manufacturing cities in Minnesota. Here, products such as shoes, pottery, leather, vegetable oil, safety items, and robotics are made. Within the corporate limits of the City is a nuclear power plant with two 550 megawatt units. Red Wing is also the home of Red Wing Shoes, S.B. Foot Tanning Company, Riedell Ice and Roller Skates, Red Wing Stoneware, and several other manufacturers. Treasure Island Resort & Casino is on the nearby Prairie Island Indian Community.

The National Trust for Historic Preservation, which annually names 12 US communities to its distinctive destinations list, added Red Wing in 2008. The City was added for its “impressive architecture and enviable natural environment.”

Red Wing is connected to Wisconsin by the Red Wing Bridge (officially named the Eisenhower Bridge) which carries US Route 63 over the Mississippi River and its backwaters. The city is the seat of Goodhue County, a rich agricultural territory known for production of farm products.

1.2 REGULATORY BACKGROUND AND HISTORY

This Surface Water Management Plan (SWMP) reflects numerous water resource-related state and federal mandates that the City must meet. As state and federal laws have changed over the years, the role of the City in water resource management has also changed. The following paragraphs provide the background and history of some of these mandates (references: **“Minnesota Environment,” Minnesota Pollution Control Agency (MPCA)**, Volume 7, Number 1 – Summer 2007; and **the MPCA’s website:** <http://www.pca.state.mn.us>).

In **1945**, the Minnesota State Legislature authorized a new state Water Pollution Control Commission because too many communities were dumping raw sewage into lakes and rivers. **One of the Commission’s jobs was to encourage communities to build wastewater treatment plants to stop the flow of raw sewage into rivers and lakes.** Three years later, in **1948**, the United States (US) Congress enacted the Federal Water Pollution Control Act (FWPCA), in response to the threat that polluted water posed to the public health and welfare.

In **1967**, the Minnesota Legislature created the Minnesota Pollution Control Agency in response to oil spills and other major environmental incidents. Its mission was to protect the air, land, and waters of the state.

Five years later, in **1972**, the US Congress enacted amendments to the FWPCA to address the growing public awareness and concern for controlling water pollution. This act became known as the Clean Water Act (CWA). Amendments to the CWA in **1977** addressed **“point source”** facilities, such as municipal sewage plants and industrial facilities. The National Pollutant Discharge Elimination System (NPDES) became the program for regulation of point source pollution. **As a “delegated permitting authority,” the MPCA issues combined State Disposal System (SDS) and NPDES stormwater permits.**

In **1987**, the Minnesota Legislature enacted laws to control polluted runoff, broadening **attention from “point” source to “nonpoint” source pollution, which is the movement of pollutants from land to water, typically in stormwater or snowmelt runoff from streets, lawns, construction sites, farms, etc.** Also in 1987, state regulatory authority for this program was delegated from the US Environmental Protection Agency (EPA) to the MPCA and an amendment to the federal Clean Water Act required implementation of a two-phase comprehensive national program to address stormwater runoff.

In **1990**, the EPA promulgated regulations establishing the Phase I Stormwater Program. The Phase I federal regulations required two general categories of stormwater discharges to be covered under a NPDES stormwater permit: 11 regulated categories of industrial activity including construction activity that disturbs five or more acres of land, and municipal separate

storm sewer systems (MS4s) serving populations of 100,000 or more (including Minneapolis and St. Paul).

In **1994 and 1995**, the MPCA promulgated rules to establish the Phase I Stormwater Program at the state level. Under Phase I, Minneapolis and St. Paul obtained individual permits and designed and implemented stormwater programs. By **1999**, the Phase II federal regulations were promulgated, which expanded the scope of the NPDES Stormwater Program to include smaller MS4s in urbanized areas, construction activities that disturb between one and five acres of land, and smaller municipally owned industrial activities. The MPCA then promulgated rules related to the Phase II federal regulations to fulfill federal NPDES delegation responsibilities. The rules establish the NPDES stormwater permit requirements for regulated MS4s, construction, and industrial activities.

In **2002**, the MPCA began identifying surface water resources that are impaired for their identified uses such as swimming and aquatic habitat. As required by the Clean Water Act, if a water body is included on the impaired waters list, it triggers an analysis called a total maximum daily load (TMDL) study. **The TMDL analysis determines the impaired water body's capacity to** assimilate specific pollutants and still meet water quality standards. A TMDL also develops an allocation scheme among the various contributors—point sources, nonpoint sources, and natural background—as well as a margin of safety. Section 303(d) of the CWA requires each state 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 states every two years.

Then in **2003**, Phase II of the NPDES program began. Phase II is a broader program that includes smaller construction sites, municipally owned or operated industrial activity, and many more municipalities (MS4s). Regulated parties under the Phase II program must develop stormwater pollution prevention plans to address their stormwater discharges and determine the **appropriate pollution prevention practices or “best management practices” to minimize** pollution for their specific site. Each of the three permit types—construction, industrial, MS4—has distinct requirements and some regulated parties may be required to have more than one permit. In the same year, the MPCA issued a General Permit for municipalities with populations over 10,000 (MS4 permit). **The permit requires cities to comply with six “minimum control measures,” which include public education, public outreach, illicit discharge detection and elimination, construction site stormwater runoff control, post-construction stormwater management, and pollution prevention/good housekeeping measures.** Approximately 200 MS4s in Minnesota were mandated by the Phase II federal regulations to have NPDES permit coverage; these include municipalities located within the boundaries of an urbanized area.

In **2005**, Red Wing was designated as a mandatory regulated Municipal Separate Storm Sewer System (MS4) for the National Pollution Discharge Elimination System (NPDES) requirements per Minnesota Rule, part 7090.1010. Red Wing Public Works responded with:

- Designation of a SWPPP manager.
- Education of City staff.
- Development of the new City Code Division 57: Storm Water Management Regulations (adopted December 11, 2006).
- Preparation of the required SWPPP including rigorous self-assessment.
- Implementation of the six minimum control measures that the NPDES Phase II permit requires:
 1. Public Education and Outreach
 2. Public Involvement and Participation
 3. Illicit Discharge Detection, and Elimination
 4. Construction Site Runoff Control
 5. Post Construction Runoff Control
 6. Pollution Prevention and Good Housekeeping.

The Minnesota Pollution Control Agency (MPCA) reissued the MS4 General Permit in August 2013. The last MS4 General Permit issued was to address the new federal Phase II National Pollutant Discharge Elimination System (NPDES) stormwater regulations for small MS4s. These federal rules identified an iterative process for improved stormwater management where MS4 programs are strengthened with each five-year permit cycle. The current permit shifts from the initial focus on permit program development to measuring program implementation. For the next MS4 General Permit reissuance (2018), the MPCA will need to comply with the new federal NPDES stormwater rules expected to be final in the near future.

1.3 NEED FOR THE PLAN

The evolving process outlined above makes the development of this Plan important for meeting all the current requirements and position the City for continuing changes. This Plan will assist the City of Red Wing in meeting the specific requirements in the MS4 General Permit. **Revisions to the City's Plan will be necessary as the General Permits are reissued and TMDL study impacts are incorporated.**

The Plan also addresses the following functional needs:

- Updating the Citywide quantitative surface water hydrologic and hydraulic model
- Development of a water quality model

- Planning for improvements and rehabilitation
- Updating goals and policies
- Inclusion of a water resource inventory
- Positioning the City to take advantage of grant opportunities
- **Providing background information for refinement of the City’s Stormwater Utility Program**

1.4 PLAN PURPOSE & SCOPE

The City of Red Wing’s SWMP is a local water management plan prepared by the City to optimize expenditures while protecting water resources and meeting **the requirements of the City’s** National Pollution Discharge Elimination System (NPDES) Discharge Permit.

This SWMP will guide the City of Red Wing in protecting, preserving, and managing its surface water resources and stormwater system. This plan will assist the City in meeting the requirements of its Phase II program NPDES Permit and Storm Water Pollution Prevention Program (SWPPP).

The Plan **presents detailed modeling of the City’s** stormwater system for hydrology, hydraulics, and quality and detailed implementation plans. It **presents a comprehensive list of the City’s goals** and policies relating to surface water.

The purposes and benefits of surface water management programs include:

- Protecting, preserving, and using natural surface and groundwater storage and retention systems.
- Minimizing public capital expenditures needed to correct flooding and water quality problems.
- Identifying and planning for means to effectively protect and improve surface and groundwater quality.
- Establishing uniform local policies and official controls for surface and groundwater management.
- Preventing erosion of soil into surface water systems.
- Promoting groundwater recharge.
- Protecting and enhancing fish and wildlife habitat and water recreational facilities.

1.5 PLAN ORGANIZATION

The Red Wing Surface Water Management Plan (SWMP) **sets the course for the City’s** management of the water resources and stormwater within the City. The SWMP sets goals and policies for the City and its resources, provides data and other background information, outlines the applicable regulations, assesses Citywide and specific issues, and lists implementation tasks to achieve the goals. It also provides information regarding the funding of the implementation program. The SWMP is organized into six major sections, summarized as follows:

Executive Summary

The Executive Summary provides basic information about the City's **natural setting and** summarizes the highlights of the SWMP, including the SWMP purpose and scope, goals, policies, and implementation tasks.

Section 1.0 – Introduction

This section provides general background on the City's **history and the background for the plan** itself, including the regulatory history and related issues.

Section 2.0 – Goals and Policies

Section 2 presents the City's water resource vision in the form of its goals and policies.

Section 3.0 – Physical Environment Inventory

Section 3 provides technical information describing the surface and subsurface conditions of the City. Most of Section 3 presents a Citywide inventory, including land use, climate and precipitation, topography, soils, geology, groundwater, MDNR public waters, wetlands, surface water resource monitoring information, floodplain information, unique features and scenic areas, pollutant sources, and major basins and overall drainage patterns. Section 3 also includes a number of maps, such as Citywide maps of land use, MDNR public waters, wetlands, and drainage basins, and maps showing the drainage patterns for each major drainage basin.

Section 4.0 – Stormwater System Analyses

This section presents the hydrologic and water quality modeling performed to analyze the City's systematic needs related to stormwater quantity and quality management. It also presents the water quality modeling done to examine nutrient-loading issues.

Section 5.0 – Regulatory Environment

Section 5 is organized to present the City, regional, and state programs and regulations that apply to water resource management in Red Wing. This is intended to be a resource for City staff, residents, and developers living and working in Red Wing.

Section 6.0 – Assessment of Opportunities and Issues

Section 6 assesses the issues, challenges, and problems the City faces in managing stormwater on behalf of the public. Citywide and specific issues and problems are presented and discussed. **This section discusses the adequacy of the City's ordinances and official controls, the City's classification system, the City's education and public involvement program, maintenance of the stormwater system, groundwater protection, and the City's funding programs.** It also examines opportunities that exist for solving these issues.

Section 7.0 – Implementation Program

Section 7 describes the significant components of the City's SWMP implementation program, including its NPDES Phase II MS4 permit, operation and maintenance of its stormwater system, education and public involvement, funding, ordinance implementation and official controls, implementation priorities, and a detailed implementation plan.

Section 8.0 – References

This section lists the documents and other references used in the preparation of the Plan.

1.6 PLAN UPDATE AND AMENDMENT PROCEDURES

This Surface Water Management Plan (SWMP) will guide the City of Red Wing's activities until superseded by adoption and approval of a subsequent SWMP.

The City may revise this SWMP through an amendment prior to updating the plan, if either minor changes are required, or if problems arise that are not addressed in the SWMP. Any significant changes to this SWMP must be approved by the Red Wing City Council. Minor changes to this SWMP will not require City Council approval and can be made by City staff, but must be supplied to the City Council for their information. Minor changes are those that do not modify the goals, policies, or commitments identified in the SWMP. Examples of minor changes include:

- ◆ Inclusion of new or corrected hydrologic modeling results and mapping.
- ◆ Inclusion of new/updated water quality monitoring data.
- ◆ Minor changes to the 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 SWMP.

The City's amendment procedure for significant changes to the SWMP is as follows:

1. City staff preparation and review of SWMP amendment.
2. City Council consideration of SWMP amendment. The City Council would determine the need for a public hearing of the amendment and process to be followed.
3. Input from advisory commissions, including Planning and Sustainability, may be requested by the City Council.
4. City Council adoption of SWMP amendment.

Section 2

Goals and Policies

2.1 INTRODUCTION

The City of Red Wing actively and progressively manages stormwater to protect life, property, and water bodies within the City, as well as receiving waters outside of the City. This Plan section presents the City's long- and short-term goals and policies that guide these efforts. Goals are provided for water quality, water quantity, groundwater, wetlands and habitat, floodplains, open space and recreation areas, land use management, education, and interagency cooperation. Goals propose the desired end; policies provide the means to achieve the goals; and objectives and actions guide implementation of the policies. The capital-improvement-planning process discussed in **Section 7** provides detail on more specific actions.

2.2 WATER QUALITY

Goal *Protect and enhance surface water quality in the City of Red Wing.*

- | | |
|-----------------|--|
| Policies | <p>2.2.1 Responsibility for enforcing water quality and stormwater management standards will be assumed by the City of Red Wing.</p> <p>2.2.2 The City of Red Wing will implement stormwater management practices that work to treat stormwater runoff as close to the source as practical in order to limit runoff reaching tributaries and the Mississippi River (RWCP '07).</p> <p>2.2.3 The City of Red Wing supports and promotes a reduction in runoff rates and volumes due to new development.</p> <p>2.2.4 Use of existing natural retention and detention areas for stormwater management to maintain or improve existing water quality will be achieved to the extent practical.</p> <p>2.2.5 Land use planning, policies, and controls that maintain sustainable, high-quality surface water resources are supported by the City of Red Wing; the City's review, permitting, and enforcement processes for construction activities will be used.</p> <p>2.2.6 The City of Red Wing intends to meet or exceed all water-related regulations or policies that apply as promulgated or adopted by the federal government and the state of Minnesota.</p> <p>2.2.7 The City will manage its water resources so that the beneficial uses of streams, wetlands, ponds, and lakes remain available to the community.</p> <p>2.2.8 The City of Red Wing will work with the counties, townships, and upstream landowners (outside the City's jurisdiction) to encourage upstream pollutant reduction in areas closer to the source of such pollutants.</p> <p>2.2.9 The City will work to maintain, protect, and improve trout stream habitat and protect the natural characteristics of other waterways.</p> |
|-----------------|--|

Surface Water Quality Objectives

OBJECTIVE 1 – *Maintain or improve water quality of streams, lakes, and wetlands relative to current conditions.*

Action 1 – Implement all aspects of Red Wing’s NPDES MS4 permit SWPPP.

Action 2 – Require development to comply with the conditions and policies of the SWPPP.

Action 3 – Require development to comply with and follow best management practices (BMPs) for erosion and sedimentation control as specified in the MPCA’s *Minnesota Stormwater Manual* (2005), as may be amended.

Action 4 – Require compliance with the City Stormwater Management Regulations ordinance (**Division 57 of the Zoning Ordinance**).

Action 5 – Consider implementation of BMPs beyond the minimum required.

Action 6 – Cooperate with the MPCA and other agencies to develop and implement Total Maximum Daily Load (TMDL) studies on all impaired water bodies.

Action 7 – Actively participate in the TMDL process, including but not limited to participation in public meetings, education, and liaison activities.

Action 8 – Continue with an aggressive program of street sweeping and vacuum cleaning of settlement devices and manholes.

Action 9 – Continue a program of water quality education aimed at civic groups, schools, and other community groups.

Action 10 – Promote stormwater retention through infiltration practices and demonstration projects where soil conditions allow and where not detrimental to groundwater supplies.

OBJECTIVE 2 – *Maintain, protect, and improve trout stream habitat and protect the natural characteristics of other waterways.*

Action 1 – Require infiltration or modified dry ponds (e.g., “extended detention basins”) with filtered bottom withdrawal in trout stream watersheds instead of wet detention or dry detention basins to prevent temperature increases (See **Section 5.1.1.2**).

Action 2 – Consider channel modifications for projects in watersheds that include a trout stream tributary that currently experiences erosion and/or sedimentation problems., **Action**

3 – Require project proposers to consider methods for reducing the amount of impervious surface on the project site.

Action 4 – Require that project proposers preserve all trees and shrubs within 50 feet of the top of the stream bank for trout streams where feasible.

Action 5 – Encourage bioretention BMPs that use plants and soils to remove pollutants from stormwater such as shallow, vegetated depressions along parking lots and roads to hold and infiltrate stormwater in trout stream watersheds.

Action 6 – Consider porous pavement and/or reinforced sod where feasible.

Action 7 – Consider “stormceptors” and other water quality treatment devices where other BMPs are not feasible.

OBJECTIVE 3 – *Achieve treatment and infiltration criteria for stormwater from on site for new development, public projects, and redevelopment consistent with the MS4 General Permit.*

Action 1 – Promote stormwater retention through infiltration practices and demonstration projects where soil conditions allow and where not detrimental to groundwater supplies

Action 2 – Promote bioretention BMPs that use plants and soils to remove pollutants from stormwater such as shallow, vegetated depressions along parking lots and roads (e.g., tree trenches) to hold stormwater and allow it to infiltrate or drain slowly to natural water bodies.

Action 3 – Consider porous pavement and/or reinforced sod where feasible.

Action 4 – Consider stormceptors and other water quality treatment devices where other BMPs are not feasible.

OBJECTIVE 4 – *Ensure stormwater management systems are maintained while minimizing the total cost of the stormwater system (construction plus maintenance).*

Action 1 – Use regional water quality treatment facilities as the prime method to attain the City’s water quality goals.

Action 2 – In addition to regional facilities, implementation of BMPs will be required for specific areas and for construction sites throughout the City and its tributary watersheds.

Action 3 – Require development to comply with and follow all BMPs for erosion and sedimentation control as specified in the MPCA’s *Minnesota Stormwater Manual* (2005), as may be amended.

Action 4 – Promote stormwater retention through infiltration practices and demonstration projects, where soil conditions allow and where not detrimental to groundwater supplies.

Action 5 – Extended detention basins with filtered bottom withdrawal will be constructed at bottoms of ravines, just upstream of trout streams, to provide water quality treatment just prior to discharge to the trout stream.

Action 6 – Stormwater detention basins will be provided upgradient of bluffs to protect other waterways by preventing uncontrolled discharge over steep slopes.

Action 7 – Require compliance with the City's Stormwater Management Regulations ordinance (**Division 57 of the Zoning Ordinance**).

Action 8 – Require development to comply with the conditions and policies of the City's SWPPP.

Action 9 – Require that temporary and permanent stormwater basins incorporate recommendations from the MPCA's *Minnesota Stormwater Manual* (2005, as amended)

Action 10 – Monitor emerging technologies for protecting the trout streams including reducing thermal impacts to streams from stormwater runoff.

Action 11 – Implement and refine (as needed) stormwater management system maintenance standards.

Action 12 – Continue inspection program for identification of maintenance problems and illicit discharge detection.

OBJECTIVE 5 – *Continue to meet or exceed all water-related regulations that apply as promulgated by the federal government, and the state of Minnesota.*

Action 1 – Involve appropriate agencies in the development of this Plan.

Action 2 – Adopt and implement this Plan.

Action 3 – Update City ordinances where necessary to meet current requirements of the federal government, and the state of Minnesota.

Action 4 – Implement all aspects of Red Wing's NPDES MS4 permit SWPPP.

Action 5 – Cooperate with the MPCA and other agencies to implement applicable Total Maximum Daily Load (TMDL) reduction strategies on all impaired water bodies, including but not limited to those on the 303(d) list.

Action 6 – Track contaminant load reduction achieved by implemented BMPs.

2.3 WATER QUANTITY

Goal *Manage the rate and volume of runoff entering rivers, streams, lakes, and wetlands within the City of Red Wing.*

Policies

2.3.1 The City of Red Wing will continue to rigorously enforce its stormwater regulations in **Division 57 of the Zoning Ordinance**.

2.3.2 The City will implement stormwater management practices that work to treat stormwater runoff as close to the source as possible (**RWCP '07**).

2.3.3 The City of Red Wing will place a high priority on providing 100-year level of protection for the City's **stormwater system**.

2.3.4 The City will require new stormwater systems to provide a 100-year level of protection and existing systems to be upgraded to a 100-year level of protection as needed.

2.3.5 The City will require new stormwater systems to provide a 10-year level of service and existing systems to be upgraded as needed to provide a 10-year level of service.

2.3.6 The City of Red Wing will consider options to maximize stormwater infiltration and surface filtration to minimize need for underground stormwater infrastructure (**RWCP '07**).

2.3.7 The City will require stormwater management practices that maintain runoff volumes on greenfield developments and reduce runoff volumes on redevelopment sites (**RWCP '07**).

2.3.8 The City will use regional detention areas, where practical and physically possible, as opposed to individual on-site detention to reduce flooding, control discharge rates, and provide necessary storage volume.

2.3.9 Stormwater will be managed to minimize erosion.

Surface Water Quantity Objectives

OBJECTIVE 1 – *Minimize downstream impacts of runoff from land-disturbing activities including new development and redevelopment, road construction, and rural uses.*

Action 1 – Plan for and design storage basins to accommodate runoff from fully developed watersheds without increase in flow rates at subwatershed outlets according to this Plan.

Action 2 – Promote stormwater retention through infiltration practices and demonstration projects where soil conditions allow and where not detrimental to groundwater supplies.

Action 3 – Require compliance with the City's Stormwater Management Regulations ordinance (**Division 57 of the Zoning Ordinance**).

Action 4– Provide funding for staff time or contracted services to provide oversight and guidance in review of developers’ designs and plans for onsite stormwater management practices to meet City of Red Wing standards.

OBJECTIVE 2 – *Provide a 100-year level of protection for new stormwater systems.*

Action 1 – Require a minimum building elevation of 2 feet above the 100-year flood elevation for waterways and basins with pipe outlets.

Action 2 – Require a minimum building elevation of 5 feet above the 100-year flood level for landlocked basins.

Action 3 – Require a minimum building elevation of 3 feet above the highest local groundwater level.

Action 4 – Require all lowest entry elevations (i.e., windows, window wells, walkout elevations) for buildings adjacent to overflow swales and/or conveyance channels be at least 2 feet above the 100-year flow elevation of the swale or channel at the point where the swale or channel is closest to the building.

OBJECTIVE 3 – *Mitigate and reduce the impact of past increases in stormwater discharge on downstream conveyance systems.*

Action 1 – Continue to identify stream corridor reaches for streambank erosion reduction projects and restore damaged stream banks at priority locations, taking advantage of partnerships and cost-sharing whenever possible.

Action 2 – Collaborate with Soil and Water Conservation Districts (SWCD), federal, state, and local programs to cost share for streambank restoration projects undertaken by landowners.

Action 3 – Seek opportunities in partnership with other units of government to retrofit existing developments and sites under redevelopment with low-impact development techniques.

OBJECTIVE 4 – *Manage ravines, ditches, creeks, and other waterways as potential natural resource areas to protect their natural characteristics as well as their stormwater conveyance capabilities.*

Action 1 – Require infiltration or modified dry ponds (e.g., extended detention basins) with filtered bottom withdrawal in trout stream watersheds.

Action 2 – Extended detention basins with filtered bottom withdrawal will be constructed at bottoms of ravines, just upstream of trout streams, to provide water quality treatment just prior to discharge to the trout stream.

Action 3 – Stormwater detention basins will be provided upgradient of bluffs to protect other waterways by preventing uncontrolled discharge over steep slopes.

OBJECTIVE 5 – *Address ravine and gully erosion problems in the City of Red Wing.*

Action 1 – Work cooperatively with other government entities to address identified ravine erosion problems in the City.

2.4 GROUNDWATER

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

Policies

2.4.1 Groundwater quality shall not be sacrificed to manage surface water and holding ponds, wetlands, and other water storage areas must be designed to protect groundwater in the City of Red Wing.

2.4.2 Infiltration of stormwater and resulting groundwater recharge will be promoted where it is feasible and does not pose a threat to groundwater quality.

2.4.3 The City will implement practices to conserve, to the fullest extent possible, water derived from underground aquifers (**RWCP '07**).

Groundwater Objectives

OBJECTIVE 1 – *Protect groundwater quality and quantity.*

Action 1 – Complete Phase II of the Red Wing Wellhead Protection Plan and manage groundwater in a manner consistent with the Wellhead Protection Plan.

Action 2 – Work with the Minnesota Department of Health to ensure that abandoned wells are properly sealed according to the Minnesota Department of Health Well Code.

Action 3 – Promote stormwater retention through infiltration practices and demonstration projects where soil conditions allow and where not detrimental to groundwater supplies.

Action 4 – Develop and implement the City of Red Wing Water Conservation Plan.

OBJECTIVE 2 – *Eliminate discharges of fecal coliform bacteria and minimize discharges of nitrate and other pollutants to groundwater and surface waters within the City of Red Wing.*

Action 1 – Cooperate with the county’s efforts to inventory failing and noncompliant septic systems and jointly prioritize areas for septic system upgrades.

Action 2 – Use the Goodhue County well management database in plan and permit reviews and provide education.

OBJECTIVE 3 – *Promote groundwater conservation.*

Action 1 – Promote the use of cisterns and rain barrels in Red Wing.

Action 2 – Promote the Leadership in Energy and Environmental Design water-conserving building practices such as low-flow toilets, automatic faucets, and rainwater capture.

Action 3 – Promote stormwater retention through infiltration practices and demonstration projects where soil conditions allow and where not detrimental to groundwater supplies.

OBJECTIVE 4 – *Support and assist in groundwater research, regulation, and education.*

Action 1 – Collaborate with state and local agencies to provide groundwater-monitoring data for use in research and in developing targeted educational messages.

2.5 WETLANDS AND HABITAT

Goals *Maintain and enhance, where possible, the functions and values of existing wetlands and habitats within the City.*

2.5.1 The City of Red Wing will work to achieve no net loss of wetland quantity, quality, or biological diversity.

2.5.2 Avoidance of direct or indirect wetland disturbance will be required for all developments and land-disturbing activities, in accordance with state and federal requirements.

Policies

2.5.3 Wetlands will be protected from chemical, physical, biological, or hydrological changes so as to prevent significant adverse impacts to the following designated wetland uses: maintaining biological diversity, preserving wildlife habitat, providing recreational opportunities, erosion control, groundwater recharge, low-flow augmentation, stormwater retention, stream sedimentation, and aesthetic enjoyment, as specified in Minnesota Rules 7050.

2.5.4 Fragmentation of natural areas and corridors will be avoided when feasible.

2.5.5 Impacts to locally and regionally significant natural areas will be avoided when feasible or mitigated when possible.

2.5.6 Runoff must not be discharged from new outfalls directly into wetlands without pre-settlement of the runoff. The City will pursue opportunities to retrofit existing outfalls to achieve pre-settlement prior to discharge into wetlands.

Wetlands and Habitat Objectives

OBJECTIVE 1 – *Protect existing wetlands and fish and wildlife habitat areas and promote the development of additional habitat areas.*

Action 1 – Support the Goodhue County Soil and Water Conservation District’s role as the local governmental unit enforcing the Minnesota Wetlands Conservation Act.

Action 2 – Inform potential developers of the MDNR public waters and Corps Section 404 permit programs.

Action 2 – Require compliance with the City's Stormwater Management Regulations Ordinance (**Division 57 of the Zoning Ordinance**).

Action 3 – Require a 25-foot-wide protective buffer strip of natural vegetation surrounding all wetlands.

Action 4 – 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.

Action 5 – Collaborate with conservation agencies and other organizations to supplement their fish and wildlife habitat protection and enhancement efforts and programs.

OBJECTIVE 2 – *Protect sensitive habitats and communities and rare species.*

Action 1 – Review projects and plans with an awareness of sensitive habitats and communities and rare species.

OBJECTIVE 3 – *Assist in public education efforts regarding the fish and wildlife in the City.*

Action 1 – Assist other agencies with development and distribution of educational materials or support programs that provide information on the fish and wildlife resources of the City of Red Wing.

2.6 FLOODPLAINS

Goal *Manage and protect the floodplains of the City from encroachment.*

Policies

2.6.1 The natural function of the floodplain as a floodwater storage area should be protected from encroachment.

2.6.2 The City will work to maintain no net loss of floodplain storage.

2.6.3 Floodplains will be managed to maintain critical 100-year flood storage volumes.

2.6.4 The City will work to restrict construction of new structures to sites above the regulatory flood protection elevation.

2.6.5 The City will continue to enforce its floodplain zoning ordinance (Division 52).

2.6.6 Upstream floodwater infiltration and storage should be maximized.

2.6.7 Infiltration in appropriate floodplain areas should be increased through increased vegetated areas and reduced impervious surfaces.

Floodplain Objectives

OBJECTIVE 1 – *Reduce flood damage to homes and businesses as much as practical.*

Action 1 – Require a minimum building elevation of 2 feet above the 100-year flood elevation for waterways and basins with pipe outlets .

Action 2 – Require a minimum building elevation of 5 feet above the 100-year flood level for landlocked basins.

Action 3 – Require a minimum building elevation of 3 feet above the highest local groundwater level.

Action 4 – Require all lowest-entry elevations (i.e., windows, window wells, walkout elevations) for buildings adjacent to overflow swales and/or conveyance channels be at least 2 feet above the 100-year flow elevation of the swale or channel at the point where the swale or channel is closest to the building.

Action 5 – Minimize uncertainties and flood damage adjacent to landlocked ponds by planning for some form of outlet.

OBJECTIVE 2 – *Identify and protect floodplains.*

Action 1 – Continue participation in the National Flood Insurance Program.

Action 2 – Cooperate and coordinate with Goodhue County’s FEMA floodplain mapping updates as needed.

Action 3 – Obtain flood and drainage easements and easements for maintenance access and emergency overflow routes during development and/or building permit processes.

OBJECTIVE 3 – *Limit floodplain alterations to obtain "no net loss" of floodplain storage and include the preservation, restoration, and management of floodplain wetlands.*

Action 1 – Require compensatory storage for filling or structures within the floodplain.

OBJECTIVE 4 – *Adopt shoreland and floodplain ordinances that are compatible with existing county and state ordinances.*

Action 1 – Review the status of Red Wing floodplain and shoreland ordinances.

Action 2 – Make changes to ordinances as needed.

2.7 OPEN SPACE AND RECREATIONAL AREAS

Goal *Develop or improve recreational, fish and wildlife, and open space areas and accessibility in conjunction with stormwater improvement projects.*

Policies

2.7.1 Impacts to regionally and locally important natural areas should be avoided (**RWCP '07**).

2.7.2 Fragmenting natural areas and natural wildlife corridors should be avoided or minimized (**RWCP '07**).

2.7.3 Natural areas, shoreland, and wetland environments will be preserved, restored, and enhanced wherever possible.

2.7.4 Existing open spaces, outdoor recreational amenities, and cultural resources will be connected and enhanced whenever possible (**RWCP '07**).

2.7.5 Use of native vegetation should be considered for local government projects and private development of open spaces.

2.7.6 Encourage needed infrastructure features, such as stormwater ponds and infiltration beds, to be designed as natural open space amenities for the surrounding neighborhoods (**RWCP '07**).

Open Space and Recreational Areas Objectives

OBJECTIVE 1 – *Enhance open space and recreational opportunities in conjunction with stormwater improvements (RWCP '07).*

Action 1 – Consider the above Policies of **Section 2.7** when reviewing development proposals.

Action 2 – Review and revise City ordinances if needed for consistency with the above Policies.

Action 3 – Work with developers to develop stormwater infrastructure designed as natural open space amenities for the surrounding neighborhoods.

Action 4 – Design public stormwater infrastructure to be natural open space amenities for the surrounding neighborhoods.

OBJECTIVE 2 – *Maintain natural stream corridor and lake shoreline qualities for recreational users and local residents.*

Action 1 – Maintain shoreland and floodplain ordinances that are compatible with existing city, county, and state standards.

2.8 LAND USE MANAGEMENT

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

Policies

2.8.1 The presence of environmentally sensitive natural resource areas should guide land use management decisions.

2.8.2 The impacts of land-disturbing activities on water resources, including cumulative impacts, should be considered for each proposed activity before the activity occurs.

2.8.3 Prevent new development from occurring on the steep slopes and avoid leaving open cuts on the bluff sides (**RWCP '07**).

2.8.4 Stormwater BMPs must be identified as part of the development approval process.

2.8.6 The City will encourage and support use of green building techniques that minimize stormwater runoff (i.e., green roofs, incorporation of cisterns that store water for future landscaping needs, or other mechanisms) (**RWCP '07**).

2.8.9 The City will encourage and support new neighborhood designs to treat stormwater runoff on-site by implementing neighborhood bio swales, infiltration ponds, and rain gardens (**RWCP '07**).

Land Use Management Objectives

OBJECTIVE 1 – *Require land-disturbing activities including new development and redevelopment, road construction, and other uses within the City of Red Wing to address impacts on water resources, including cumulative impacts.*

Action 1 – Require development plans to consider impacts on local natural resources and corresponding receiving waters.

Action 2 – Continue to regulate land-disturbing or development activities on slopes of 25% or more.

Action 3 – Require compliance with the City of Red Wing Zoning Ordinance.

Action 4 – Implement all aspects of Red Wing’s NPDES MS4 permit SWPPP.

Action 5 – Require development to comply with the conditions and policies of the SWPPP.

Action 6 – Require development to comply with and follow BMPs for erosion and sedimentation control as specified in the MPCA’s *Minnesota Stormwater Manual* (2005), as may be amended.

Action 7 – Encourage implementation of BMPs beyond the minimum required.

Action 8 – Promote stormwater retention through infiltration practices and demonstration projects where soil conditions allow and where not detrimental to groundwater supplies.

2.9 EDUCATION

Goal *Offer programs, educational opportunities and information that facilitate an understanding of water resource issues in the City of Red Wing and downstream.*

Policy **2.9.1** *The City will work to heighten community stormwater awareness through education and training.*

Education Objectives

OBJECTIVE 1 – *Develop information and data for educational and other purposes.*

Action 1 – Collaborate with other agencies toward expanding and improving the water-related data available.

OBJECTIVE 2 – *Provide opportunities for community involvement and access to information.*

Action 1 – Continue to support and facilitate existing volunteer programs in Red Wing

Action 2 – Seek new opportunities for collaboration with volunteer groups.

Action 3 – Continue to distribute information through the Red Wing web site at <http://www.red-wing.org/>.

2.10 INTERAGENCY COOPERATION

Goal *Cooperate with other jurisdictions to address stormwater issues originating outside Red Wing.*

Policy **2.9.1** The City of Red Wing will work with the county, adjoining townships, and/or upstream landowners regarding control of stormwater flows that enter the City from outside the City's legal boundary.

INTERAGENCY OBJECTIVES

OBJECTIVE 1 – *Address upstream stormwater management practices for new development outside Red Wing.*

Action 1 – The City will partner with the county, adjacent townships and/or upstream landowners outside the City's jurisdiction to reduce pollutant loadings.

Action 2 – The City will exercise its 2-mile extraterritorial authority over subdivision development to ensure proper stormwater management of stormwater flows that enter the City from outside the City's legal boundary.

2.11 SANITARY SEWER

Goal *Prevent stormwater from entering the sanitary sewer system.*

Policy **2.3.1** The City will minimize inflow and infiltration to the sanitary sewer system from stormwater and groundwater.

2.3.2 The City will not allow new roof drain leader connections to the sanitary system and will seek to eliminate existing roof drain leaders.

SANITARY SEWER OBJECTIVES

OBJECTIVE 1 – *Eliminate stormwater and groundwater flow to the sanitary sewer.*

Action 1 – The City will seek to identify and remedy inflow and infiltration to the sanitary sewer system.

Action 2 – The City will prohibit new roof drain leader connections to the sanitary sewer and seek to eliminate existing connections.

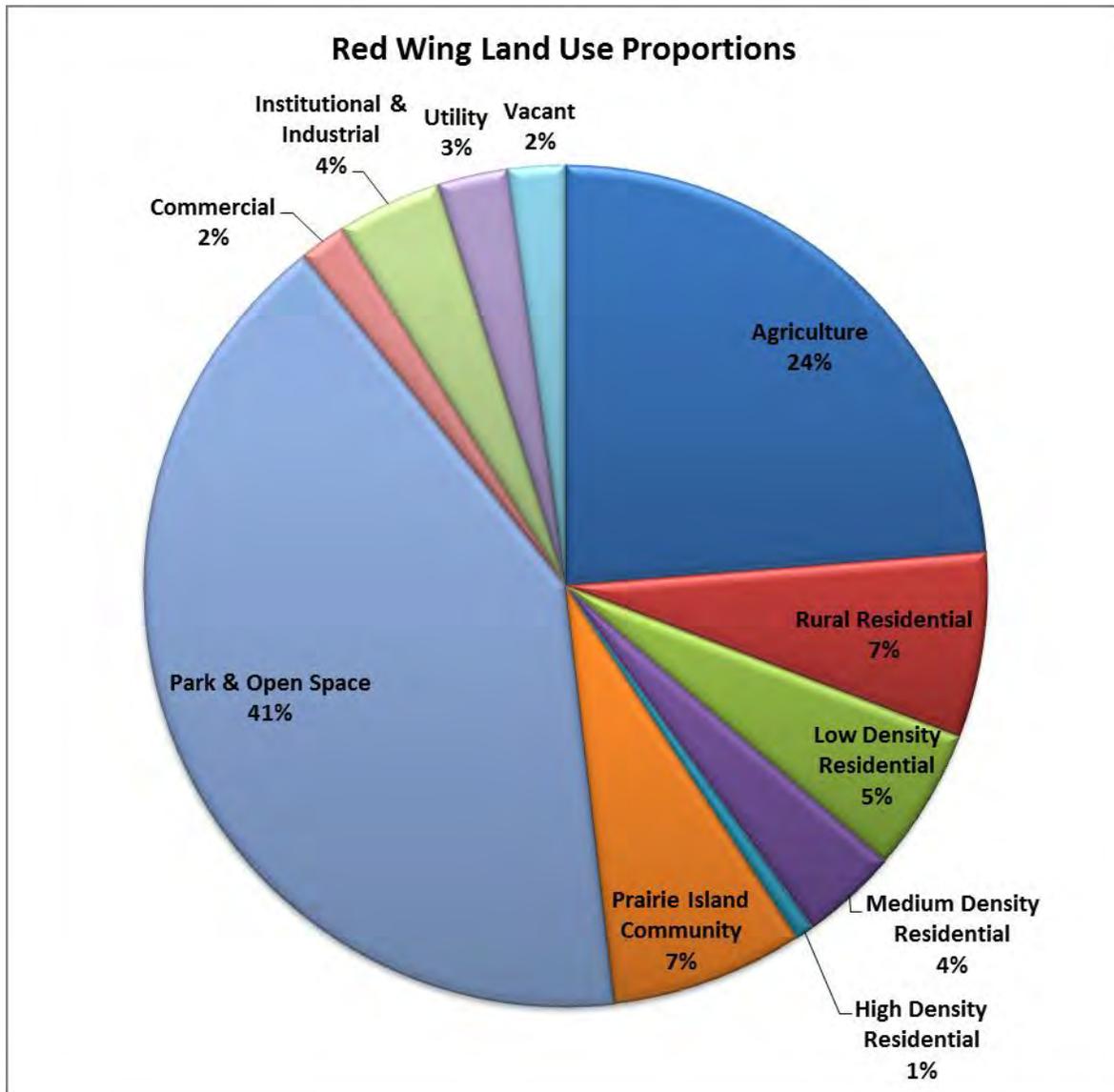
Section 3

Physical Environment Inventory

3.0 Physical Environment Inventory

3.1 LAND USE

Land use describes the type of development on a piece of land or the function it serves. This includes natural as well as developed areas. Existing land use for each parcel in the City of Red Wing is presented in **Figure 3.1.1** (large figures are located after the text sections) and summarized by land use type below.



Proportion of the Total Area of the City of Red Wing for each Land Used Category.

In general, existing development is concentrated in the southeastern part of the City and along or near Highway 61. The Prairie Island Indian Community, including the Prairie Island Casino, is located in the northwest corner of the City.

More than 40% of the City's **flat land is located within designated floodplains, making** the land undevelopable for most urban uses. Adding in wetlands and steep slopes, roughly half of the land area within the Red Wing City limits is undevelopable.



Aerial view of the City of Red Wing

The City of Red Wing developed its current Comprehensive Plan in 2007. The Plan calls for maintaining the desirable aspects of the City and lays out principles for future development. Overall, the Comprehensive Plan principles will help reduce stormwater runoff and improve water quality. The goal of preserving a network of green infrastructure figures prominently in the Comprehensive Plan. This means strengthening existing methods and using new approaches to protect and manage open spaces and public waters.

The Comprehensive **Plan envisions Red Wing's green infrastructure** as a linked system that maintains ecological integrity, provides public access, and preserves scenic character and important views including green corridors and linear parks. Anticipated future land use is presented in

Figure 3.1.2. Principles for the Plan that are applicable to stormwater management are included in **Section 2: Goals and Policies.**

3.2 CLIMATE AND PRECIPITATION

Because of its location near the center of the North American continent, Red Wing—along with the rest of Minnesota—has a continental climate, meaning it experiences a wide variation in climate conditions (e.g., droughts and floods, heat and cold).

Historical climate data from the Red Wing Dam #3 weather station (1981–2010) is summarized below (National Climatic Data Center, 2014). The mean annual temperature in Red Wing is 45.5°F. Mean monthly temperatures vary from 14.9°F in January to 72.4 F in July (1981–2010). Extreme temperatures recorded were a high of 103°F on July 14, 1995, and a low of -36°F on January 19, 1970, and February 1, 1996. For the period 1948-2012, the median date for the latest occurrence of freezing temperatures is April 19, while the median date for the first autumn frost is October 9. The typical frost-free period (growing season) is approximately 170 days.

Table 3-2-1 summarizes precipitation data for the Red Wing Dam #3 station. Average total annual precipitation (1981-2010) is 30.5 inches. From 1948-2012, precipitation has ranged from a low of 18.33 inches in 1976, to a high of 41.05 inches in 2002. The mean monthly precipitation has varied from 4.42 inches in June to 0.70 inches in February. From May to September, the growing season months, the average rainfall (1981–2010) is 19.5 inches at Red Wing or about 64 percent of the average annual precipitation. Average annual lake evaporation is about 30 inches.

Average annual snowfall (1981–2010) is 35.4 inches at the Red Wing Dam #3 station; the maximum snowfall is 89 inches during the 1961–1962 season.

Average weather imposes little strain on the typical stormwater drainage system. Extremes of precipitation and snowmelt are important for design of flood control systems. The National Weather Service has data on extreme precipitation events that can be used to aid in the design of flood control systems. The amount, rate, and type of precipitation are important in determining flood levels and stormwater runoff rates, all of which impact water resources. In urbanized watersheds, shorter duration events tend to play a larger role in predicting high-water levels in basins. Shorter-duration events are generally used by hydrologists to study local issues (sizing catch basins, storm sewer pipes, etc.) Longer-duration events are generally used by hydrologists to study regional issues, such as predicting high-water levels for regional basins and basins that have no outlets (landlocked), or that have small outlets relative to their watershed size.

Early spring snowmelt and concurrent rainstorms are significant in this region. The volumes of runoff generated, although they occur over a long period, can have significant impacts where the contributing drainage area to a lake or pond is large and the outlet is small (or there is no outlet). Extremes of snowmelt most often affect major rivers, landlocked basins, and the design of large

stormwater storage areas, while extremes of precipitation most often affect the design of conveyance facilities.

In contrast with stormwater drainage facilities, stormwater quality treatment systems are designed based on smaller, more frequent storms. These more frequent storms account for the majority of the annual pollutant loadings from urban watersheds. Analysis of rainfall data from Minneapolis measurements found that approximately 90 percent of the storms produced 1.05 inches or less of rainfall (*MN Stormwater Manual*, 2005).

Red Wing Area Climate Facts	
Mean annual temperature	45.5° F
Average annual precipitation	30.5 inches
Average annual snowfall	35.4 inches
Average annual lake evaporation	30 inches

Source: *Western Regional Climate Center (2014)*

Until recently, the major sources of information regarding rainfall in the region are publications TP-40 and TP-49 issued by the National Weather Bureau (now the National Weather Service) in 1961 and 1964. The National Oceanographic and Atmospheric Administration (NOAA) recently published Atlas 14, Volume 8. Atlas 14 contains updated precipitation data for Minnesota and supersedes TP-40 and TP-49. 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 and intensity for durations from 5 minutes up to 60 days.

Runoff from spring snowmelt is also important in this region, and 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 runoff volume. **Table 3-2-2** lists many of the precipitation and runoff events used for design purposes.

Even with wide variations in climate conditions, climatologists have found four significant climate trends in the Upper Midwest (see right).

According to the Soil and Water Conservation Society's (SWCS) 2003 report on climate change, total precipitation amounts in the United States (and in the Great Lakes region) are trending upward, as are storm intensities. Precipitation records in the Twin Cities area show the annual average precipitation has increased, as shown in the following examples:

Upper Midwest Climate Trends
1. Warmer winters
2. Higher minimum temperatures
3. Higher dew points
4. Changes in precipitation trends <i>(more rainfall from heavy thunderstorm events; increased snowfall)</i>

Source: *Minnesota Weather Almanac*, Seeley, 2006.

- Minneapolis-St. Paul Airport station – the average annual precipitation has increased from 28.32 inches (1961–1990 average) to 30.61 inches (1981–2010 average), an 8.1% increase (data from the Climatology Working Group website: <http://climate.umn.edu/>).

- St. Paul station – the average annual precipitation has increased from 30.30 inches (1961–1990 average, from the Minnesota Department of Natural Resources [MDNR] State Climatology Office) to 33.45 inches (1981–2010 average), a 10.4% increase (data from the Climatology Working Group website: <http://climate.umn.edu/>).

Comparison of precipitation depths between TP-40 and Atlas 14 indicates increased precipitation depths for more extreme events (e.g., the 100-year, 24-hour event at the Red Wing Dam #3 station increased from 6.0 inches to 7.5 inches). As noted by the SWCS, increased storm intensities result in increased soil erosion and increased runoff. The **Minnesota Pollution Control Agency’s** (MPCA) global warming website states that increased flooding could also result from more intense precipitation events: <http://www.pca.state.mn.us/hot/globalwarming.html>.

Climate information can be obtained from a number of sources, such as the following websites:

- For Atlas 14 precipitation data by location: http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html
- For a wide range of Minnesota climate information: <http://climate.umn.edu/>
- For other Minnesota climate information: <http://www.dnr.state.mn.us/climate/index.html>

Table 3-2-1. Precipitation Summary—Red Wing Dam #3 Station

Averages: 1981-2010 Extremes: 1948-2012

Month	Total Precipitation, Inches				Snow, Inches	
	Mean	High—Yr	Low—Yr	1-Day Max	Mean	High—Yr
Jan	0.71	2.68 1967	0.06 2003	1.30 1/25/1967	8.5	36.0 1982
Feb	0.74	2.62 1981	0.00 1987	1.46 2/29/2012	6.7	27.9 1962
Mar	1.76	4.23 1998	0.23 1994	1.85 3/14/1990	6.3	44.6 1951
Apr	2.81	6.62 1975	0.37 1987	3.58 4/28/1975	1.5	18.0 1983
May	3.56	6.39 1970	0.70 1992	3.18 5/16/1968	0.0	2.2 1954
Jun	4.13	10.95 2012	0.63 1988	6.37 6/15/2012	0.0	-
Jul	3.79	10.87 1987	0.90 2007	6.24 7/1/1978	0.0	-
Aug	4.30	10.37 2007	0.84 2003	3.60 8/3/1956	0.0	-
Sep	3.70	9.37 1992	0.38 1952	7.07 9/16/1992	0.0	-
Oct	2.27	6.45 2009	0.03 1952	1.96 10/7/1992	0.1	2.5 1987

Month	Total Precipitation, Inches				Snow, Inches	
	Mean	High—Yr	Low—Yr	1-Day Max	Mean	High—Yr
Nov	1.79	4.76 1975	0.00 1976	2.65 11/10/1975	3.4	20.0 1983
Dec	0.94	2.53 1982	0.00 1986	1.35 12/25/1982	8.9	31.0 2010
Annual	30.5	41.05 2002	18.33 1976	7.07 9/16/1992	35.4	89 1961/62

Source: Western Regional Climate Center Website (<http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?mn6822>)

Table 3-2-2. Selected Statistical Precipitation and Runoff Events

Type and Frequency	Duration	Amount (Inches)
Rainfall		
10 year	24 hour	4.3
25 year		5.4
50 year		6.4
100 year		7.5
25 year	10 day	8.0
50 year		9.0
100 year		10.1
Runoff (snowmelt)		
10 year	10 day	4.7
25 year		5.7
50 year		6.4
100 year		7.1

Source: Atlas 14, Volume 8 and *Hydrology Guide for Minnesota* (USDA Soil Conservation Service)

3.3 TOPOGRAPHY

Red Wing is situated along the Mississippi River, surrounded by limestone bluffs which rise steeply above the river. The City is characterized by valleys and ravines that reach down from the bluff tops to the river valley. The change in grade from the **river's edge to the high point of Red Wing** spans more than 400 feet.

The area around and including Red Wing was not covered with ice during the last glacial period (Wisconsinan) and does not exhibit the large and often distinct glacial features seen in most of the rest of Minnesota. The topography reflects the long period of erosion that has worked the land for over 100,000 years, characterized by well-developed valleys and ravines that work steadily down from the bluff tops to the base level at the Mississippi River.

Slopes here can be steep and usually have long reach within the well-developed dendritic (resembling the pattern made by branches of a tree or veins of a leaf) watershed systems. Runoff can develop increasing energy as it travels down these systems.

Figure 3.3.1 shows topographic contours mapped for Red Wing.



Hillside development in Red Wing

3.4 DRAINAGE PATTERNS

All of the land in the City of Red Wing eventually drains to the Mississippi River. The Mississippi River's wide floodplain periodically floods large portions of land within the City limits. Besides the Mississippi River, three major streams drain the Red Wing area in a southwesterly to northeasterly direction: the Cannon River, Hay Creek, and Spring Creek. These streams drain mostly through the southern portion of the west Red Wing area and created wide floodplain areas subject to flooding. More than 40% of the City's flat land is located within designated floodplains, making the land undevelopable for most urban uses. Adding in wetlands and steep slopes, over 54% of the land area within the Red Wing City limits is undevelopable.

3.4.1 Mississippi River Watershed

The downtown and easternmost portions of the City are directly tributary to the Mississippi River. A small portion of the southernmost corner of the City is tributary to Bullard Creek, which flows easterly and then northerly into the Mississippi River.

3.4.2 Cannon River Watershed

A large part of the western and northwestern part of the City is tributary to the Cannon River, which flows easterly into the Mississippi River.

3.4.3 Hay Creek Watershed

On the south central side of the City, including western downtown, the land is tributary to Hay Creek, which flows northerly into the Mississippi River.

3.4.4 Spring Creek Watershed

The southwestern part of the City is tributary to Spring Creek, which flows northeast into the river.

3.4.5 Bullard Creek Watershed

The Bullard Creek watershed is generally located south and east of the Red Wing City limits. The northwest corner of the Bullard Creek watershed is located in the very southeast corner of the City.

These watersheds are shown on **Figure 3.9.1**.

3.5 SOILS

Soil composition, slope, and land management practices determine the impact of soils on water resource issues. Soil composition and slope are important factors affecting the rate and volume of stormwater runoff. The shape and stability of aggregates of soil particles, expressed as soil structure, influence the permeability, infiltration rate, and erodibility of soils. Slope is important in determining stormwater runoff rates and **the soil's susceptibility to erosion**.

Infiltration capacities of soils affect the amount of direct runoff resulting from rainfall. The higher the infiltration rate for a given soil, the lower the runoff potential. Conversely, soils with low infiltration rates produce high runoff volumes and high peak discharge rates. Four general soil hydrologic groups have been established by the Natural Resources Conservation Service (NRCS). 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 grouping symbols (A-D) are used to estimate the amount of runoff that will occur over a given area for a particular rainfall amount. The most current soils data for Red Wing are based on the Soil Survey Geographic dataset (SSURGO) from the NRCS.

Urbanization changes the character of soil, typically resulting in decreased infiltration rates. As land is developed for urban use, much of the soil is covered with impervious surfaces, and soils in the remaining areas can be significantly 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. Grading, plantings, and tended lawns tend to dominate the landscape in urbanized areas and may become more important factors in runoff generation than the original soil type.

The soil types present within the City of Red Wing are shown by hydrologic group in **Figure 3.5.1**. Most of the City's **upland area** is mapped as Group B soils. Group B/D classed soils are mapped at the bottoms of valleys and ravines along the Cannon and Mississippi Rivers. These low infiltration soils are in areas near the surface water table where saturated conditions offer little capacity for infiltration, regardless of the soil properties. Class A soils occupy a small area of the City and are localized along stream and valley margins well above the water table.

There are many different soil types within each hydrologic group. The NRCS SSURGO soil data show that the soils in the City of Red Wing primarily consist of Calco silt loam, Meridian silt loam, the Frontenac-La Crescent soil complex, and the Timula-Mt Carroll soil complex.

Calco Silt loam is found at the bottom of river valleys and flooded areas in Red Wing. It is ponded or frequently flooded and very poorly drained. It has moderately high to high permeability and very high available water capacity.

Meridian silt loam is typically found on the margins of valley bottoms. It is classified as a well-drained soil and typically grades from silty loam to gravelly sand with depth. Permeability of this soil is moderately high to high and available water capacity is moderate.

Frontenac-La Crescent complex consists of steep, very well-drained soils on valley sides. These soils formed in loess and residuum from limestone. (Loess is a predominantly silt-sized sediment, formed by the accumulation of wind-blown dust.) Permeability and available water capacity are moderate. Erosion hazard is high for this soil complex.

Timula-Mt Carroll complex consists of well-drained soils on upland bluff tops and stream benches. It formed in loess. Permeability is moderate and available water capacity is very high. Erosion hazard is high for this soil complex.

It should be noted that these soil units are named for the major soil types present but contain many unique soil types in varying amounts and patterns.

3.6 GEOLOGY AND GROUNDWATER RESOURCES

The landscape of Goodhue County reflects a long and complex interaction of erosion and deposition under climatic conditions that have varied from subtropical to glacial. The materials found at the land surface range in age from bedrock formed approximately 500 million years ago to sediments that are accumulating today. In much of the county, the present landscape is strongly influenced by the configuration of the underlying bedrock surface.

One of the most prominent features on the landscape is a network of valleys cut into the bedrock. Most of these valleys are oriented north-south or east-west; the valley floors slope downward to join the valley presently occupied by the Mississippi River. There are roughly 3,866 acres of 30% steep slopes in the City. This number is roughly 6-square miles or 1/7 of the City's **total area**.

The tributary valleys contain a significant thickness of sediment and were once deeper than they are now. **According to the Minnesota Geologic Survey's *Goodhue County Geologic Atlas* (1998)**, the sediment in the valley of the Mississippi River is more than 350 feet thick in places. The topography of the land surface between the valleys is similar to the underlying bedrock surface in many places. This is particularly true where that bedrock is covered by less than 50 feet of glacial sediment—as it generally is in the northern half of the county. At least half of the southern part of the county has more than 50 feet of glacial drift overlying bedrock, and in some areas the thickness of these deposits exceeds 250 feet.

Bedrock generally is exposed at the land surface or lies directly beneath unconsolidated deposits of Cretaceous and Quaternary age (***Goodhue County Geologic Atlas*, 1998**). Bedrock is the consolidated sandstone, limestone, and shale that are exposed on the steep bluffs along the Mississippi River and its tributaries, in rock quarries, and along road cuts in the area. The rocks form distinguishable layers and include the Jordan Sandstone, Decorah Shale, and St. Lawrence Formation.

The bedrock layers were deposited as sediments in a shallow sea that covered southeastern Minnesota and the surrounding region 520–350 million years ago. Some unconsolidated clay and sand of Cretaceous age (about 100 million years old) have been described in the Minnesota Geologic ***Survey's Goodhue County Geologic Atlas* (1998)**. Very small, isolated pockets of Cretaceous sediments (derived from weathered Paleozoic bedrock) may be present in depressions like sinkholes. Such pockets were once mined for pottery clay.

Goodhue County is endowed with geologic resources useful to its residents. The demand for particular resources has changed over time as needs and the technology to satisfy them have changed. Historically, the geologic formations of the county provided stone for building, lime for mortar, and clay for pottery, brick, and tile. Currently, crushed rock, sand, and gravel are extracted, mostly for building roads.

Possibly the most widely known of resources around Red Wing is the clay that was mined there, due to the reputation of the stoneware, dinnerware, and other pottery manufactured from it. Accounts of the history of the industry from the Goodhue County Historical Society indicate that the clay was used for pottery at least as early as 1862. By the late 1800s, the clay was mined in commercial quantities and was later used to manufacture sewer pipe as well as stoneware. The clay and associated sediments have been assigned to the Ostrander member of the Cretaceous Windrow Formation (Austin, 1963). The industry declined because the known deposits were mined out, and suitable replacements could not be found. The pottery operation continued for some time by importing clay from Ohio and elsewhere. Sewer pipe was manufactured in Red Wing until 1972.

Karst features are large voids and cavities that form when water dissolves limestone bedrock. Because of the rapid flow rates that water can achieve through these voids, karst features can present problems for human activity and can make aquifers and receiving waters susceptible to pollution. The *Goodhue County Geologic Atlas* (1998) shows “no” to “low” to “moderate” probability for karst features within the City of Red Wing. No karst features are mapped where the limestone bedrock is completely eroded or lies below the surface waters such as the Cannon River valley. As the land rises up the limestone bluffs the probability of karst features increases. This is an important aspect of the local geology to consider in the design of stormwater facilities and for assessment of pollution susceptibility.

3.6.1 Groundwater Resources

The tributary system leading to the Mississippi River in the Red Wing area has dramatically eroded the bedrock and glacial sediment. This erosion has significantly increased the permeability of the bedrock units through the development or enhancement of fractures and sometimes solution-enlarged (karst) cavities. Therefore, geologic formations that are not typically used as aquifers (water sources) can often be utilized around the Red Wing area. This can also make groundwater in this area more susceptible to contamination from surface water sources.

The *Goodhue County Geologic Atlas* (1998) maps the area around and including Red Wing as having a high to very high sensitivity for contamination to the surficial aquifers from above. This is based on the estimation that surface water may reach the surficial aquifers within a time span of hours to years. Care should be exercised when managing surface water that may contain contaminants harmful to drinking water, especially in the vicinity of supply wells. **The City of Red Wing’s five municipal are not located in surficial aquifers.**

Two types of aquifers are present in the City of Red Wing: surficial (Quaternary) aquifers and bedrock aquifers. The following paragraphs provide general information about the aquifers in the City. For more information refer to the *Goodhue County Geologic Atlas* (Minnesota Geologic Survey 1998).

The Red Wing fen is calcareous fen located south of the Cannon River, in Section 21, Township 113N, Range 15W. The Goodhue County Biological Survey map (1995) shows this fen. A calcareous fen is the result of springs arising from limestone aquifers. Minnesota Rules 7050 identifies all the

calcareous fens in the state and classifies them as “outstanding resource waters.” The Minnesota Department of Natural Resources (MDNR) is responsible for protection of calcareous fens. A special section of the Wetland Conservation Act and Rules pertain to calcareous fens.

3.6.1.1 Surficial (Quaternary) Aquifers

The surficial aquifers in the Red Wing area are composed of Quaternary-age water-bearing layers of sediment, usually sand and gravel, which lie close to the ground surface. Recharge to the surficial aquifers is primarily through the downward percolation of local precipitation. Some surficial aquifers may also be recharged during periods of high stream stage. In the Red Wing area, these surficial aquifers are formed primarily by river deposits. Surficial aquifers may discharge to local streams, lakes, or to the underlying bedrock.

A surficial aquifer is a water-bearing layer usually consisting of unconsolidated sediment (e.g., sand and gravel) that is close to the surface. Rain and snowmelt are the primary sources of recharge to a surficial aquifer.

The highest yielding surficial aquifers are generally located in buried bedrock valleys. Many private drinking water wells were constructed in surficial aquifers, especially those constructed prior to the promulgation of the first state Well Code in 1974. Since the surficial aquifers are more susceptible to pollution, they are not used for municipal or public supply wells.

A bedrock aquifer is a layer of bedrock that is porous enough to contain water in the spaces between rock grains and in fractures.

3.6.1.2 Bedrock Aquifers

There are two primary bedrock aquifers within Red Wing’s borders, the Eau Claire Aquifer and the Mt. Simon Aquifer. These are far-reaching sandstone aquifers that serve the potable water needs of people, farms, and industries across much of the upper Midwest. The Eau Claire aquifer is a low-yielding aquifer used only for domestic purposes on a local scale; it is generally considered a confining layer. Red Wing has five municipal wells that are supplied by the Mt. Simon Aquifer. Like all communities that rely on underground aquifers, Red Wing has a vested interest in conserving the water drawn from them and cleansing surface water before it recharges them.

3.6.1.2 Water Supply and Wellhead Protection

Red Wing has two well fields containing a total of five active municipal water supply wells. The East Well Field includes Well 7-1 (unique number 216020), Well 7-2 (151565), and Well 7-3 (686251). The West Well Field includes Well 8-1 (686252) and Well 8-2 (686258). Locations of these wells are shown on **Figure 3.6.1**. These wells are completed in the Mt. Simon Sandstone. Well 7-1 is also open to 20 feet of the overlying Eau Claire Formation but since this length is only about 7% of the total open interval, contribution from the Eau Claire Formation is considered negligible. Wells 7-1, 7-3, and 8-1 slightly penetrate the Proterozoic-age Fond Du Lac Formation that underlies the Mt. Simon Sandstone, while Well 7-2 is open to 45 feet of Fond Du Lac Formation. Contributions from

the Fond Du Lac Formation are also considered negligible due to the much lower transmissivity of this unit compared to the Mt. Simon sandstone.

In compliance with the Minnesota Wellhead Protection Rules (MN Rules 4720.5100 through 4720.5590), the City delineated a wellhead protection area (WHPA) and a Drinking Water Supply Management Area (DWSMA). The Minnesota Department of Health approved these delineations in December 2013. These areas are shown in **Figure 3.6.1**.

3.7 FOREST RESOURCES AND NATIVE VEGETATION

Pre-settlement data available from the MDNR classifies vegetation in the City of Red Wing around the year 1895 as prairie, river bottom forest, hardwood forest, and oak openings and barrens. Pre-settlement vegetation in the far north of the City was primarily prairie. From there, the pre-settlement vegetation trends from deciduous hardwood forest north, to oak openings and barrens on the south. The river valleys were covered in river bottom forests at that time.

Tallgrass prairie was restricted primarily to broader ridge tops, where fires could spread, but also occurred on steep slopes with south or southwest exposure to the sun. Oak openings occur on rich, dry-mesic to mesic soils and are dominated by grasses, forbs, brush, and scattered large trees of mostly bur and white oak. Oak openings have less grass and more forbs and woody shrubs than prairie, but more grass and fewer forbs than forests.

The deciduous hardwood forests would have occurred mainly along the bluff tops. This forest was part of a small area of hardwood forests probably protected from fire within a region that was covered predominantly by frequently burned oak savannas and prairies. The river bottoms forest designation **is used on the MDNR's pre-settlement** maps for nearly all floodplain and river bottom forests, some of which may have flooded every year and some infrequently. The dominant overstory species comprising the river bottom forests include elm, ash, cottonwood, box elder, silver maple, willow, aspen, and hackberry. Today, remnants of the native forests still exist, primarily along the bluff tops and slopes as oak savanna or oak forests. They often occur with small areas of dry prairie. There are also large areas of emergent marsh and flood plain forest in the valley bottoms of the Cannon and Mississippi Rivers.

Red Wing maintains a large urban forest of street trees and trees on private lands. This urban forest has a positive impact on wildlife, the urban heat island effect, and human comfort. It also has an important impact on stormwater management as the trees protect ground cover from the erosive force of raindrops and take up water from the soils. This reduces negative effects of stormwater runoff.

Urban forests are under stress from climate changes which have impacts on tree diseases and hardiness around the world. Red Wing actively monitors new research and works with other communities to mitigate the disease and hardiness problems that are rapidly spreading through the region.



Red Wing from Barn Bluff

3.8 MDNR PUBLIC WATERS

Public waters

Public waters are all water basins and watercourses that meet the criteria set forth in Minnesota Statutes, Section 103G.005, subd. 15 that are identified on Public Water Inventory maps and lists authorized by Minnesota Statutes, Section 103G.201.

Public waters wetlands

Public waters wetlands include all type 3, type 4, and type 5 wetlands (as defined in U.S. Fish and Wildlife Service Circular No. 39, 1971 edition) that are 10 acres or more in size in unincorporated areas or 2 ½ acres or more in size in incorporated areas (see Minnesota Statutes Section 103G.005, subd. 15a and 17b).

The MDNR designates certain water resources as public waters to indicate those lakes, wetlands, and watercourses over which it has regulatory jurisdiction. By statute, the definition of public waters **includes “public waters” and “public waters wetlands”** (see box at left).

The MDNR uses county-scale maps to show the general location of the public waters and public waters wetlands (lakes, wetlands, and watercourses) under its regulatory jurisdiction. These maps are commonly known as Public Waters

Inventory (PWI) maps. The regulatory “boundary” of these waters and wetlands is called the ordinary high water level (OHWL). PWI maps are available on a county-by-county basis from the MDNR’s website (http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html).

3.8.1 Streams and Creeks

Red Wing’s surface water is primarily in the form of streams and rivers. The Vermillion River, Cannon River, Spring Creek, Bullard Creek, and Hay Creek are the four primary tributaries that reach the Mississippi River in Red Wing. Of these, Hay Creek, Bullard Creek, and Spring Creek have reaches that are designated by the state of Minnesota as protected for trout habitat. The Cannon River is designated by the state of Minnesota as a Wild and Scenic River, and the portion of the river within the City of Red Wing is classified as “scenic.” **Table 3-8-1** lists the Minnesota public waters and watercourses included in the state inventory and identifies the trout-designated reaches.

Trout need cool water to reproduce successfully. The streams in this area often rise from springs and, thus, are cool in summer and winter. The limestone and alluvial soils in drainages make the streams hard, nonacidic, alkaline and very productive. These streams produce frequent hatches of mayflies, caddis flies, and midges—all providing food for trout.

Trout streams in the area face problems often related to erosion of sediment from urban and agricultural areas. Fence-to-fence farming on the uplands and pasturing of the river bottoms contribute to land erosion and sedimentation of the streambeds. This fine sediment covers the gravel runs and riffles that trout need to spawn and invertebrates need to survive. The clearing of shoreline trees can also remove the underwater root wads and fallen trees in which trout find cover from current and predators.

In urban areas stormwater runoff warmed by contact with paved surfaces can cause increases in stream temperatures. Direct surface runoff in developed areas should be minimized, with infiltration used wherever possible to manage stormwater in trout stream watersheds.

Because the chemistry and productivity of these streams are good, trout respond well to some kinds of habitat improvement. For example, the use of planks and boulders to build artificial overhanging banks increases big-fish cover, as does the placement of boulders in channels. Wing dams and other current deflectors can keep silt from key areas.

Table 3-8-1 List of Minnesota Public Water Watercourses in the City of Red Wing

NAME	TROUT STREAM DESIGNATION
Cannon River	NO
Hay Creek	YES, full reach and tributaries
Mississippi River	NO
Spring Creek	YES, upper reach and tributaries

NAME	TROUT STREAM DESIGNATION
Trout Brook	YES, tributary to Hay Creek
Vermillion River	NO
Bullard Creek (outside the City with watershed in Red Wing)	YES, lower reach and tributaries

The watercourses that run through Red Wing provided the energy that formed the bluff and valley topography of the area and give Red Wing its trademark setting. Areas adjacent to the streams and rivers have long been centers of human habitation, supplying food and water for thousands of years.

3.8.1 Lakes and Wetlands

Because of the bluff and valley topography of Red Wing all of the lakes and wetlands within the City are located in the floodplain areas of the low valleys (**Figure 3.8.1**). Most are located on the floodplains of the Mississippi River. Where the Cannon River and Spring Creek meet the Mississippi the resulting delta has provided sites for large wetlands and small lakes. The low areas at the mouth of the Vermillion River also are dotted with wetlands and open water.

Table 3-8-2 lists the Minnesota Public Water Basins (lakes) and Wetlands included in the state inventory, and **Figure 3.8.2** shows the locations of the public waters by name.

Table 3-8-2 List of Minnesota Public Water Basins in the City of Red Wing

BASIN NAME	MDNR NUMBER	MDNR CLASS	SURFACE AREA (AC)
Buffalo Slough	25002500 P	Public Water Basin	105
Goose Lake	25000500 P	Public Water Basin	56
Lower Rattling Springs	25002100 P	Public Water Basin	179
Pickrel Slough (Sturgeon Lake)	25002600 P	Public Water Basin	4318
U.S. Lock & Dam #3 Pool	25001700 P	Public Water Basin	1370
U.S. Lock & Dam #4 Pool	79000500 P	Public Water Basin	4396
Brunner Lake	25000600 W	Public Water Wetland	30
Cannon Lake	25001200 W	Public Water Wetland	36
Jones Lake	25000800 W	Public Water Wetland	34
Larson Lake	25001600 W	Public Water Wetland	333
Red Wing Pottery Pond	25003800 W	Public Water Wetland	8
Spring Creek Wetland	25001100 W	Public Water Wetland	798
Unnamed	25002700 W	Public Water Wetland	176
Upper Round Lake	25001000 W	Public Water Wetland	41

3.9 STORMWATER DRAINAGE SYSTEM

3.9.1 Mississippi River Watershed

The Mississippi River watershed and the subwatersheds that comprise it are shown in **Figure 3.9.1**. This watershed comprises the land in the City of Red Wing that drains directly to the Mississippi River without flowing first into another creek or river.

The Mississippi River watershed includes the downtown and the eastern developed parts of the City. The watershed is mostly developed, with land use consisting of medium- and high-density residential, commercial, industrial, and public uses.

Most of the developed areas of the Mississippi River watershed are served by storm sewers. Subwatersheds within this watershed were delineated and named according to the location of the outlet from the subwatershed. For example, the Plum Street subwatershed is so named because the outlet for the stormwater system is at Plum Street. All of the subwatersheds ultimately discharge to the Mississippi River.

There are 14 stormwater outlets in Red Wing that discharge directly to the Mississippi River. The storm sewer network watersheds were named according to the street names closest to the discharge points. For example, the Plum Street (PLS) system watershed ultimately discharges at or near Plum Street and the Mississippi River.

Two storm sewer network subwatersheds west of the downtown area also discharge directly into the Mississippi River. These subwatersheds are separated from the rest of the Mississippi River watershed by the Hay Creek watershed. Nine subwatersheds east of the downtown area also discharge into the Mississippi River but are served by few, if any, storm sewer systems.

3.9.2 Bullard Creek Watershed

The Bullard Creek watershed is generally located south and east of the City limits. The Bullard Creek subwatershed within the Red Wing City limits is shown on **Figure 3.9.1**.

The northwest corner of the Bullard Creek watershed is located in the very southeast corner of the City of Red Wing. However, future development may expand to the south and east to include larger parts of the Bullard Creek watershed. The high school is located in this watershed. Other land uses in this watershed within the City limits include park land, industrial/office uses, institutional land, and small amounts of low-density residential and agricultural uses. Almost all of the Bullard Creek watershed outside the City of Red Wing is located within the Richard J. Dorer Memorial Hardwood State Forest.

Bullard Creek flows generally easterly to the Mississippi River. The Bullard Creek subwatershed is partially served by City storm sewer systems. Much of this subwatershed drains overland to one of

the many ravines that lead to Bullard Creek. Bullard Creek discharges into the Mississippi River at the town of Wacouta, a few miles east of Red Wing.

Several reaches of Bullard Creek are designated as protected trout stream by the MDNR (**Figure 3.8.2**).

3.9.3 Hay Creek Watershed

Only a very small portion of the Hay Creek watershed is located within the Red Wing City limits. From the Red Wing City limits, the Hay Creek watershed extends south and southwest (**Figure 3.9.1**).

Within the City limits, this watershed covers the west end of the City and includes the Red Wing Country Club, technical college, Twin Bluff Junior High School, and the Bench Street Wastewater Treatment Facility. Effluent from the Bench Street wastewater treatment facility is pumped to an interceptor leading to the main wastewater treatment plant and is discharged with the effluent from the main plant directly to the Mississippi River. General land uses in this watershed are varied (within Red Wing) with low-density residential more common in the eastern part and industrial/commercial uses more common in the western part. As is true for all of Red Wing, there are large areas designated as park land. The very western end of the Riverfront development plan, the eastern half of the Tyler Road/US 61 development plan, and the west end of the Pioneer Road/Highway 58 area development plan are within this watershed. Outside the City limits, the watershed is mostly agricultural, with much of it designated as state forest land.

Hay Creek flows northerly through the central part of the City of Red Wing, discharging to the Mississippi River floodplain through the Canadian Pacific (CP) Railroad grade. Trout Brook enters Hay Creek upstream of where Hay Creek crosses Featherstone Road. The portion of the Hay Creek watershed within the Red Wing City limits is served by the City's **stormwater system**. The stormwater system is comprised of storm sewers, culverts, ditches, ravines, creeks, and streams (Trout Brook and Hay Creek).

Nearly all of both Hay Creek and Trout Brook are designated as protected trout streams by the MDNR (**Figure 3.8.2**).

3.9.4 Spring Creek Watershed

Less than half of the Spring Creek watershed is within the City limits of Red Wing. From the Red Wing City limits, the Spring Creek watershed extends south (see **Figure 3.9.1**).

Within the City limits, the general land uses in this watershed include low-density residential, industrial/office, park, and agricultural, with smaller amounts of commercial, medium-density residential, and institutional uses along Highway 61. The western end of the Tyler Road/U.S. 61 development is within the Spring Creek watershed. Outside the City limits, the watershed is mostly agricultural, with much of it designated as state forest land.

From the south City limits of Red Wing, Spring Creek flows north through the southwest part of the City. The creek jogs east downstream of its crossing with Mill Road, and then flows north/northeasterly, generally following Spring Creek Avenue. Spring Creek discharges to the Mississippi River floodplain through the CP Railroad grade downstream of Highway 61.

The majority of the Spring Creek watershed within the Red Wing City limits drains through natural drainage ways (i.e., ravines, creeks, and streams) with some culverts. City storm sewer systems are concentrated in the developed areas along and near Highway 61, at the northern (downstream) end of the watershed. **The City's storm sewer system in this watershed will likely expand as development continues.** The Spring Creek watershed includes one subwatershed, Spring Creek Road (SCR), which is served by City storm sewer systems.

The lower reaches of Spring Creek are designated as protected trout streams by the MDNR (**Figure 3.8.2**).

3.9.5 Cannon River Watershed

The Cannon River watershed has an area of 1,440-square miles. **Figure 3.9.1** shows the location of the Cannon River watershed. A very small portion of the Cannon River watershed is within the City limits of Red Wing. The remainder of the Cannon River watershed extends west from the City limits. Within the City limits, the general land uses in this watershed include industrial/office, park, agricultural, low-density residential, and institutional, with a small amount of medium-density residential use along Highway 61. The Cannon Valley Trail is located in this watershed.

The Cannon River has been designated by the state of Minnesota as a Wild and Scenic River, and the portion of the river within the City of Red Wing is classified as “scenic.” The City established shoreland regulations for the Cannon River area that are generally more restrictive than other shoreland rules (Chapter 15 of the Red Wing City ordinances).

From Red Wing's west City limits, the Cannon River flows east and discharges to the Mississippi River. The majority of the Cannon River watershed within the Red Wing City limits drains through natural drainage ways (i.e., ravines, creeks, and streams), with some culverts and small storm sewer systems along and near Highway 61.

3.10 WATER QUALITY

The rivers, streams, ponds, lakes, and wetlands in the City of Red Wing are an important community asset. These resources supply aesthetic and recreational benefits, in addition to providing wildlife habitat and refuge. The City recognizes the need to assure adequate water quality in the water bodies within its jurisdiction and takes steps to protect these resources. The City of Red Wing will manage the City's **water resources so that the beneficial uses of rivers, lakes, streams, ponds, and wetlands remain available to the community.** Such beneficial uses may include aesthetic appreciation, wildlife habitat protection, nature observation, canoeing, boating, and adjacent uses such as hiking and biking.

The lakes in Red Wing are located in the Mississippi River floodplain and are not very accessible; whereas, the rivers and streams are more readily accessible for recreational use. Hay Creek is a very popular trout fishing creek; in addition to the usual summer fishing season, there is a winter season for Hay Creek. The Cannon Valley Trail brings many people to the Cannon River for recreational activities such as biking and hiking; the river also provides good smallmouth bass fishing.

When natural areas become urbanized, stormwater runoff from impervious areas such as new roads, highways, industries, retail areas, and housing areas collects and conveys pollutants to adjacent water basins at above-natural rates. In addition to flooding concerns, numerous studies have documented the adverse or accelerated water quality impacts associated with converting land from its native, undisturbed state to urban and even agricultural land uses. Outflow from urbanized areas significantly accelerates the natural degradation of our lakes, streams, and rivers.

As land develops, the amount of impervious cover of the watershed increases, which results in higher phosphorus loads delivered from the watershed into the receiving water body. Consequently, the City considers areas that will be undergoing significant future development to be **“hot spots” in terms of phosphorus** loading. Phosphorus and suspended sediments are recognized as being particularly detrimental to the health of lakes and streams. As a result, the City is promoting measures to reduce the influx of these pollutants to its water bodies. Many other pollutants are transported by the same processes that convey phosphorus. Therefore, phosphorus reduction measures for stormwater runoff may also reduce the flow of other pollutants to area resources.

The City’s **watershed management and land development policies** are directed mainly at controlling the amount of phosphorus and sediment that is carried by runoff from the watershed. High phosphorus levels in streams and lakes lead to algal proliferation. Abundant algae reduces water clarity, may impair fish habitat, can cause scum and odor problems, and is generally considered unsightly. Water quality monitoring shows that controlling phosphorus levels is the key to controlling algal growth in most Minnesota water bodies.

Controlling suspended sediment inflows is important to reducing phosphorus loads. Suspended sediment carried by stormwater runoff typically consists of fine particles of soil, dust, dirt, organic material, and undissolved fertilizer. Suspended sediment loads can also carry heavy metals, oils, and other pollutants. High volumes of suspended sediment can be the result of:

- Erosion from agricultural land.
- Runoff from City streets, buildings, parking lots, and other impervious areas, which washes accumulated sediment from those areas.
- Runoff from urban areas with higher flows and higher velocities, which in turn causes channel and swale erosion.
- Runoff from construction sites with poor erosion and sediment control or with poorly maintained sediment control facilities.

Sediment clouds streams and lakes, thereby disturbing or destroying aquatic and other wildlife and their habitats. It is also a major source of phosphorus because dissolved phosphorus frequently attaches to small sediment particles. As a result, many of the City's **standards are** aimed at preventing or slowing the transport of fine soil, dust, and dirt particles into streams, waterways, and lakes.

The City intends to use regional water quality treatment facilities as its prime method to attain its water quality goals. However, in addition to regional facilities, implementation of best management practices will be necessary for specific areas and for construction sites throughout the City and its tributary watersheds.

3.10.1 State Listed Impaired Waters

The federal Clean Water Act (CWA) requires states to adopt water quality standards to protect the **nation's waters**. Water quality standards designate beneficial uses for each water body and establish criteria that must be met within the water body to maintain the water quality necessary to support its designated use(s). Section 303(d) of the CWA requires each state to identify and establish priority rankings for waters that do not meet the water quality standards. The list of impaired waters, or sometimes called the 303(d) list, is updated by the state every two years.

Table 3-10-1 below lists the impaired waters within the City of Red Wing and **Figure 3.10.1** shows their locations. More detailed information regarding the status of impaired waters is provided in **Table 6-1-1**.

Table 3-10-1 Summary of the MPCA Impaired Waters List for the City of Red Wing*

NAME	IMPAIRED USE	CONTAMINANT(S)
Cannon River	Aquatic life, Aquatic recreation, Aquatic consumption	Turbidity**, PCB, E-coli
Hay Creek	Aquatic life, Aquatic recreation	Turbidity, E-coli
Mississippi River	Aquatic life, Aquatic consumption	Turbidity, PCB, Mercury**
Spring Creek	Aquatic life, Aquatic recreation	Turbidity, E-coli
Vermillion River	Aquatic life, Aquatic consumption	Turbidity**, PCB, Mercury**
Bullard Creek (outside but with watershed in City)	Aquatic recreation	E-Coli
Lake Pepin (downstream of the City)	Aquatic recreation	Nutrients/Eutrophication

*2014 MPCA Draft Impaired Waters List

** Approved TMDL

For impaired water bodies, the CWA requires the development of a total maximum daily load (TMDL). A TMDL is a threshold calculation of the amount of a pollutant that a water body can receive and still meet water quality standards. A TMDL establishes the pollutant loading capacity within a water body and develops an allocation scheme amongst the various contributors, which include point sources, non-point 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), and a load allocation (LA) establishes allowable pollutant loadings from non-point sources and natural background levels, such as from sediments, in a water body.

3.10.2 Citizen Stream Monitoring Program (CSMP)

The CSMP program is run by the MPCA. Through this program, volunteers and City staff monitor the water quality of local water bodies and submit collected data and samples to the MPCA to be analyzed. In Red Wing the Cannon River, Spring Creek, and Hay Creek have been monitored. About once a week during the summer, volunteers visit an established spot on a nearby stream and measure transparency, stream stage, appearance, and recreational suitability. This data can be valuable for comparative purposes, especially where chemical data is lacking.

3.10.3 Water Quality Data Sources

Water quality data for water resources within and around the City of Red Wing is collected by various entities, including the Minnesota Pollution Control Agency (MPCA), United States Geological Survey (USGS), Cannon River Partnership and others. Several agencies (e.g., MPCA, US Environmental Protection Agency) maintain databases which include water quality data collected multiple public entities. Water quality data is publicly available from the following online sources:

- MPCA Environmental Data Access:
<http://www.pca.state.mn.us/index.php/data/index.html>
- USGS Water Quality Data for the Nation:
<http://waterdata.usgs.gov/nwis/qw>
- US Environmental Protection Agency STORET water quality database:
http://www.epa.gov/storet/dw_home.html

3.11 WATER QUANTITY / FLOODING

Flood damage to buildings and developed areas in the City of Red Wing occurs mainly along the small tributaries to the Mississippi River, rather than along the Mississippi River itself.

The City of Red Wing enforces a floodplain zoning ordinance (Floodplain Overlay District – Division 52 of the Zoning Ordinance) in conformation with MDNR requirements. This ordinance was updated in 2009 and is aimed at meeting the requirements of the rules and regulations of the National Flood

Insurance Program codified as 44 Code of Federal Regulations Parts 59–78, as amended, and maintaining **the community’s eligibility in the National Flood Insurance Program**. It references the floodplain as defined by the *Flood Insurance Study (FIS) for the Goodhue County and Incorporated Areas* published by the Federal Emergency Management Agency (FEMA) in 2009.

The FIS, together with the City’s floodplain ordinance, allow the City to take part in the federal government’s flood insurance program. The City of Red Wing floodplain ordinance applies to those areas covered by the FIS.

The current FIS was preceded by the 1978 and 1999 Red Wing Flood Insurance Studies. The hydrologic and hydraulic analyses for the March 29, 1978, FIS report and September 29, 1998, Flood Insurance Rate Map (FIRM), were prepared by Barr Engineering for the Flood Insurance Agency under Contract No. H-3799 and completed in June 1977. The hydrologic and hydraulic analyses for the January 6, 1999, FIS revision were prepared by the USACE, St. Paul District, for FEMA, under Inter-Agency Agreement No. EMW-91-E-3529, Project Order No. 4A. This work was completed in October 1993.

The most recent FIS was completed in 2009 and covers all of Goodhue County including the incorporated areas of the cities in the County. This countywide FIS revises and updates the FISs/FIRMs, for the geographic area of Goodhue County including unincorporated areas; the cities of Bellechester, Cannon Falls, Dennison, Goodhue, Kenyon, Lake City, Pine Island, Red Wing, Wanamingo, and Zumbrota; and the Prairie Island Indian Community. This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Flood risk data developed by the FIS for various areas of the county is used to establish actuarial flood insurance rates.

A City-wide floodplain map is included in this document as **Figure 3.11.1**. A more detailed FIS for the City of Red Wing may be obtained from the MDNR, City offices, or the map services center at the FEMA website (<http://msc.fema.gov/>).

3.12 RECREATIONAL AREAS

Parks, trails, and natural resources are defining elements in the quality of life of a community. Red Wing’s **unique** setting heightens the importance of preserving natural resources, recreation, and connections. **Much of Red Wing’s** parkland, like Colvill Park and Barn Bluff, provides important **cultural links to Red Wing’s past**. The way parkland landscapes are managed can have a profound effect on the quality and quantity of stormwater runoff. Parks and open spaces also have benefits for stormwater quality and volume control by maintaining permeable green space and tree canopy.

A primary goal of the Red Wing Comprehensive Plan (2007) is to integrate parks, trails, and open space into the fabric of Red Wing. With the goal of integrating recreation and nature—making both accessible—the **Plan’s** vision is for a system of parks, open spaces, and places connected with trails, pathways, and green corridors. The Plan also calls for the preservation of natural resources such as

Hay Creek, Spring Creek, the bluffs, the Cannon River, the Mississippi River, as well as scenic resources such as the rural character of Highway 19.

The City currently has 37 parks (excluding Mississippi National Golf Links) totaling 687 acres or roughly 1.1-square miles. Recreational fishing abounds on the numerous rivers, streams, and lakes in the City and region, including Spring Creek, Hay Creek and Bullard Creek (which are all designated trout streams). Red Wing Wildlife League lands, the Billings-Tomfohr Conservation Area, and various other locales provide areas for hunting, with some limited to bow hunting.

Biking and mountain biking are enjoyed in numerous locations, including the Cannon Valley Trail, Memorial Park, and Mississippi National Golf Links. Trails can also be used for cross-country skiing during the winter months. Memorial Park provides an opportunity to play disc golf on top of Sorin's Bluff. Bird watching is available in many areas within the City, including the chance to see bald eagles along the Mississippi River, especially near the mouth of the Cannon River and across from Colvill Park.



John Rich Park in Red Wing

3.13 FISH AND WILDLIFE HABITAT

The City of Red Wing has a history of appreciation for and protection of habitat. The City acts as a steward for key areas along the Mississippi River floodplain which are City of Red Wing parkland or preserve. Some of these areas include Bay Point Park, which encompasses 200 acres of land on the

Mississippi River and Hay Creek; an adjacent 2,800 acres of wildlife preserve is owned and managed by the Red Wing Wildlife League. Other City parks such as Barn Bluff, Memorial Park, and Covill Park are examples of parkland habitat with the City.

Within the Mississippi River floodplain conservation easements also preserve important river bottom habitat at Trenton Island and the Izaak Walton League Easement. Upland of the river conservation areas protect habitat at the Billings Tomfohr, and River Bluff Business Park conservation easements.

Several streams that flow through Red Wing have healthy fish populations and are stocked with trout by the MDNR. Stocking enhances the existing fishery and habitat of the designated trout streams, adding value to these natural areas.

Spring-fed Red Wing Pottery Pond at Pottery Pond Park has been stocked with various game fish since 2001 by the MDNR, including bluegill, crappie, and rainbow trout. The pond is a popular fishing location for children and adults and provides habitat for wildlife.

3.14 UNIQUE FEATURES AND SCENIC AREAS

Through its Natural Heritage and Nongame Research Program, the MDNR collects, manages, and interprets information about nongame animals, native plants, and plant communities. The program is closely tied with the MDNR's **Minnesota County Biological Survey, which identifies and locates** rare natural resources. The information presented below summarizes the MDNR data survey within the City of Red Wing.

The MDNR's **Minnesota County Biological Survey for** Goodhue County (Dunevitz and Epp 1995) shows an assortment of natural areas and natural communities within the City of Red Wing. **Figure 3.14.1** shows these areas and locations. Three state-protected areas exist within the City: the Richard J. Dorer Memorial Hardwood State Forest, the Cannon River Turtle Preserve, and the Cannon Junction State Forest Unit.

The Cannon River is designated by the state of Minnesota as a Wild and Scenic River and the portion of the river within the City of Red Wing is classified as **“scenic.”** The City established shoreland regulations for the Cannon River area that are generally more restrictive than other shoreland rules (Chapter 15 of the Red Wing City ordinances).

The Richard J. Dorer Memorial Hardwood State Forest includes bluffs of the Great River Road of the Mississippi River and a number of state water trails. This state forest features six recreational areas, seven campgrounds, and one day-use area. It is unique in that the state does not own most of the land and not all of the land is forested at present. The state forest also represents what used to be forested land.

The Cannon River Turtle Preserve Scientific and Natural Area covers 909 acres and is located on the lower Cannon River. It contains floodplain forest, dominated by silver maple and cottonwood.

American elm was formerly the most important species in this floodplain forest. The site provides habitat for the state-threatened wood turtle, which nests on the river's sand bars. While it is mostly found in the northeastern states, the wood turtle is rarely abundant anywhere. Low reproductive potential and loss of habitat combine to make the species vulnerable.

The Red Wing fen is a calcareous fen located south of the Cannon River in Section 21, Township 113N, Range 15W. The Goodhue County Biological Survey map (1995) shows this fen. A calcareous fen is the result of springs arising from limestone aquifers. Minnesota Rules 7050 identifies all the **calcareous fens in the state and classifies them as “outstanding resource waters.”** The MDNR is responsible for protection of the calcareous fens and a special section of the Wetland Conservation Act and Rules pertain to calcareous fens.

The *Natural Communities and Rare Species of Goodhue County* map (MDNR, 1995) also shows areas of oak forest and woodland, maple-basswood forest, dry prairie, and large areas of emergent marsh and floodplain storage as natural plant communities within the borders of Red Wing. Numerous indications for rare plants and animals are shown mapped in these natural communities.

3.15 POLLUTANT SOURCES

Figure 3.15.1 shows the locations of existing and potential pollutant sources within the City of Red Wing. **The sources include those sites listed in the MPCA’s Master Entity System, leaking underground storage tanks, existing above-ground and underground storage tanks, and hazardous waste generators.** Many of these sites have been cleaned up or are in the clean-up process. Information regarding specific sites should be directed to Goodhue County or the MPCA.

Section 4

Stormwater System Analyses

As part of the development of this Surface Water Management Plan (SWMP), the stormwater infrastructure in the City of Red Wing was evaluated using both a hydrologic and hydraulic model as well as a water quality model. The hydrologic and hydraulic model was used to evaluate the existing capacity of the storm sewer system, establish flood elevations in the existing ponding areas in the City, determine areas where flooding might be an issue (when the City is fully developed), and to help identify and evaluate potential projects to include in the implementation plan (**Section 7**). The details about the hydrologic and hydraulic modeling are summarized in **Sections 4.1 – 4.6** below. The water quality model was used to estimate the existing pollutant loading from the watersheds and to determine the pollutant removal efficiencies of the existing best management practices (BMPs) within the City. The details of the water quality modeling are summarized in **Sections 4.7 – 4.8** below.

4.1 HYDROLOGIC AND HYDRAULIC MODELING METHODS

The US Environmental Protection Agency’s Storm Water Management Model (SWMM), with a computerized graphical interface provided by XP Software (XP-SWMM), was chosen as the surface water computer modeling package for this study. XP-SWMM uses rainfall and subwatershed information to generate runoff that is routed simultaneously through pipe and overland flow networks. The flow in the entire system is modeled for each time increment simultaneously before the model moves on to the next time increment. This is different from other models that calculate runoff by subwatershed for the entire duration of the storm before moving to the next subwatershed. Simultaneous routing in XP-SWMM allows the model to account for flows in pipes, flows detained in ponding areas, the effects of backwater conditions (such as surcharging at catch basins and backflow through pipes), and the complexity of routing overflows in directions different than the pipes convey, all of which occur in the project area.

Data inputs required to develop an XP-SWMM model include: (1) pipe locations, sizes, types, materials, and elevations, (2) storage basin elevation, volume, and outflow characteristics, (3) surface flow characteristics (overflow swale geometry, length and slope of gutters, etc.), (4) watershed characteristics (area, slope, land use, imperviousness, etc.), and (5) rainfall amount and distribution.

4.1.1 Hydrologic Modeling Input

4.1.1.1 Subwatershed Characteristics

Subwatershed Area

Drainage subwatersheds from the 1999 Red Wing Watershed Management Plan were updated to reflect existing conditions. Updates to the subwatershed drainage divides were delineated using current 2-foot contour topographical and storm sewer network information provided by the City of Red Wing (**Figure 3.3.1**). For areas outside of the City boundaries, the 30-meter resolution

USGS National Elevation Dataset (Gesch et al. 2009) was used. Existing watershed boundaries from the 1999 Red Wing Watershed Management Plan were delineated using USGS quadrangle topographic maps (7.5-minute series). The use of a more refined topographical dataset allowed for increased accuracy in watershed divides. The subwatersheds were grouped into five major watersheds: Cannon River, Spring Creek, Hay Creek, Bullard Creek, and the Mississippi River. Subwatershed areas were calculated for each subwatershed and the boundaries were used to calculate the other parameters discussed in the following sections.

Land Use, Land Cover, and Impervious Data

All land use practices within a subwatershed impact the quantity of runoff generated. Each land use generates a different quantity of runoff due primarily due to the resulting land cover and the amount of impervious area within that subwatershed. The impervious areas input into the XP-SWMM computer models to generate runoff must be, by definition, hydraulically connected to the drainage systems being analyzed. This direct, or connected, impervious percentage includes driveways, rooftops, and parking areas that are directly connected to the storm sewer system. Runoff from the portion of a rooftop draining onto adjacent pervious areas would not be considered as directly connected impervious area.

Current and future (2030) City-defined land use zoning information (**Figure 3.1.1 and Figure 3.1.2**) for the study area are available. Zoning information, however, may not accurately represent current watershed development because it assumes that the entire watershed is fully developed to the intended land use. A more accurate representation of current watershed imperviousness is the 2011 National Land Cover Dataset (NLCD) developed by the U.S. Geological Survey (USGS). The NLCD calculates average imperviousness over a 30 meter by 30 meter grid. The imperviousness of each subwatershed used in the XP-SWMM model was determined as a spatial average of the NLCD over that subwatershed. The average impervious area of each subwatershed determined from the 2011 NLCD may include impervious areas that are not directly connected. Thus, use of the NLCD may overestimate the hydraulically connected impervious area to some degree. Despite this, it remains the best data source for calculating impervious area inputs to the XP-SWMM model.

Subwatershed Width and Slope

Subwatershed “width” in XP-SWMM is defined as twice the length of the main drainage channel, with adjustments made for subwatersheds that are skewed (i.e., where the areas on both sides of the main drainage channel are not equal). Subwatershed width was calculated using Arc View scripts developed by Barr Engineering. The average slope (foot/foot) for each subwatershed was also estimated using Arc View spatial analyst and the topological information provided by the City of Red Wing.

XP-SWMM generates runoff from each of the subwatersheds by approximating them as nonlinear reservoirs. **The runoff rates are computed as the product of velocity (from Manning’s equation based on the difference between total depth and depression storage and the average subwatershed slope), depth, and width (flow area).** If overland flow is visualized as running down slope, off an idealized,

rectangular subwatershed, then the width of the subwatershed is the physical width of overland flow. The lateral flow per unit width is computed and multiplied by the width to obtain the runoff rate.

Infiltration Properties

Goodhue County soil surveys published by the USDA National Resource Conservation Service (USDA NRCS, previously known as the Soil Conservation Service [SCS]) were used to determine the hydrologic soil group (HSG) classifications of the soils within the study area (**Figure 3.5.1**). The predominant soil types mapped in the study area are SCS Type B (sandy loam soils) with other soils (A/D and B/D) also present. The NRCS SSURGO soils dataset has been updated since modeling was performed, and supersedes the Goodhue County soil survey (see **Section 3.5**). The SSURGO data identifies soil types and HSG classifications that are similar to the Goodhue County soil survey data used in model development.

Infiltration is the movement of water into the soil surface. For a given storm event, the infiltration rate will tend to vary with time. At the beginning of the storm, the initial infiltration rate is at a maximum due to typically drier soil surface full of air spaces. As the storm event continues, the infiltration rate gradually decreases as the soil air spaces fill with water. For long duration storms, the infiltration rate will eventually reach a constant value, the minimum infiltration rate. The Horton infiltration equation was used to simulate this variation of infiltration rate with time.

Composite Horton infiltration parameters were input into the model for each subwatershed based on soil types discussed in **Section 3.5** and are shown in **Table 4-1-1** using guidelines established in the **SWMM user's manual**. Horton infiltration input parameters include: F_c (minimum or ultimate value of infiltration capacity), F_o (maximum or initial value of infiltration capacity) and k (decay coefficient).

Depression Storage Data and Roughness Coefficient

Depression storage inputs were developed for the subwatersheds within the study area. They represent the initial losses caused by such things as surface ponding, surface wetting, and interception before runoff is produced. The model handles depression storage differently for pervious and impervious areas. The water stored as pervious depression storage is subject to both infiltration and evaporation. For all subwatersheds the impervious depression storage was assumed to be 0.06 inches, and pervious depression storage was set at 0.17 inches. **Manning's equation requires a roughness coefficient (Manning's "n") to calculate flow rates. Manning's "n" for impervious areas was set to 0.015 and for pervious areas 0.2.**

Table 4-1-1 Horton Infiltration Parameters

HYDROLOGIC SOIL GROUP	F _o (in/hr)	F _c (in/hr)	k (1/sec)
A	5	0.38	0.00115
B	3	0.23	0.00115
C	2	0.10	0.00115
D	1	0.03	0.00115

4.1.1.2 Rainfall Data

Two storms were evaluated for each of the watersheds: the 10-year, 24-hour storm and the 100-year, 24-hour storm. The 10-year, 24-hour rainfall (4.2 inches), and the 100-year, 24-hour rainfall (6.0 inches) amounts for the study area were taken from the *Hydrology Guide for Minnesota* (USDA, 1975). Both storm events used the SCS type II rainfall distribution. Note that design storm rainfall amounts published in Atlas 14, Volume 8 supersede the Hydrology Guide for Minnesota (see **Section 3.2**), but were not available when modeling was performed.

4.1.2 Hydraulic Modeling Input

4.1.2.1 Storm Sewer Pipe Network

Updates to the existing storm sewer pipe information were provided by the City of Red Wing. Pipe invert elevations and lengths of pipe improvements since the 1999 Red Wing Watershed Management Plan were provided in GIS format. The new pipe information was imported into the existing model and all information from existing pipes was checked for consistency. Entrance and exit loss coefficients between 0.2 and 1 were calculated and added to the model for each storm sewer pipe and the Manning’s “n” of each pipe was set to 0.012.

4.1.2.1 Storm Sewer Tunnels

Tunnels carved into the rock beneath the City were constructed for stormwater conveyance. Three tunnel systems were surveyed by the City. The wetted perimeter, cross sectional area and surface width were calculated at various depth increments for each surveyed segment of tunnel. The results were imported in the SWMM model as a user-defined conduit. Parameters from the 1999 model for other tunnel sections not recently surveyed were kept. A Manning’s “n” value of 0.018 was entered for all tunnel segments. The cross-sectional areas for the surveyed tunnel sections are displayed in **Figure 4.1.1**. Locations of the cross-sectional measurements are shown in **Figure 4.1.2**.

4.1.2.3 Overland/Gutter Flow Network

Overland flow was modeled in areas where the storm sewer network currently does not exist. Street gutter flow was modeled in areas where street flow was expected. Trapezoidal channels were used for overland flow with lengths, widths, and slope of the channel calculated using the 2-foot topological data. A Manning’s “n” of 0.04 was applied to overland flow over pervious surfaces. A Manning’s “n” of 0.014 was applied to overland flow over impervious surfaces such as streets and gutters.

4.2 MODELING RESULTS FOR THE MISSISSIPPI RIVER WATERSHED

The Mississippi River watershed and the subwatersheds that comprise it are shown in detail in **Figures 4.2.1 – 4.2.3**. This watershed includes City lands that drain directly to the Mississippi River. The Mississippi River watershed includes the downtown and the eastern developed parts of the City. Most of the buildable areas of the watershed are largely developed, with land use consisting of medium- and high- density residential, commercial, industrial, and public uses. There also exists a significant amount of undeveloped park land, including Memorial Park, Barn Bluff, and the Mississippi National Golf Course.

4.2.1 Drainage Patterns

Most of the developed areas of the Mississippi River watershed are served by storm sewers. Subwatersheds were delineated and named according to the location of the outlet from the subwatershed. For example, the Plum Street subwatershed is so named because the outlet for the stormwater system is at Plum Street. All of the subwatersheds ultimately discharge to the Mississippi River.

There are 14 stormwater outlets that discharge directly to the Mississippi River. The storm sewer network watersheds were named according to the street names closest to the discharge points. For example, the Plum Street (PLS) system watershed ultimately discharges at or near Plum Street and the Mississippi River. From east to west, the 14 storm sewer network subwatersheds modeled for this project are:

Fourth Street (4ST)	East Avenue (EA)	Levee Road 3 (LR3)
Bluff Street (BLS)	Levee Road 5 (LR5)	Levee Road 2 (LR2)
Potter Street (PS)	Levee Road 4 (LR4)	Levee Road 1(LR1)
Plum Street (PLS)	Jackson Street (JCS)	Withers Harbor Drive 1 (WHD1)
Bush Street (BS)	Jefferson Street (JS)	

Three storm sewer network subwatersheds west of the downtown area also discharge directly into the Mississippi River. These subwatersheds are separated from the rest of the Mississippi River watershed by the Hay Creek watershed. The names of these networks are listed below:

Fairview Lane (FL)	Tyler Road (TR)	Danforth Avenue (DA).
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Seven subwatersheds east of the downtown area also discharge into the Mississippi River, but are served by few, if any, storm sewer systems. From east to west, these subwatersheds are: Mississippi River 3 (MR3), MR6, MR12, MR8, MR1, MR2, and MR14. Peak stormwater runoff rates and volumes were determined for these subwatersheds, but no hydraulic analyses were performed. There are currently no detention ponds in these subwatersheds.

4.2.2 Flood Protection Concerns

In 2003, City staff identified areas of known flooding on Plum Street and Bush Street where there is insufficient storm sewer capacity. XP-SWMM model results indicate that flooding of street intersections may be a problem during the 10-year, 24-hour storm event. Flooding was assumed to be a problem when model results showed the volume of surface flooding to be at

least one-half acre-foot (the estimated volume required to fill an intersection). Problem areas during the 100-year, 24-hour storm event were also identified.

Figure 4.2.4 and **Figure 4.2.5** show both the areas of known flooding and problem areas detected through the modeling efforts in the Mississippi River system (based on 10-year, 24-hour and 100-year, 24-hour storm results). Results from the 10-year, 24-hour storm event show flooding in the Plum Street, Bush Street and Fourth Street storm sewer systems. Flooding modeled in the downtown area along Plum Street, Bush Street, and North Park Street between West Third Street and West Fifth Street matches with observed flooding by the City in 2003.

Other areas of flooding found in the model, but not observed by City staff during 2003 are located along Bush Street and South Park Street, between Tenth Street and Twelfth Street; along Bush Street at Fifteenth Street; and on East Fifth Street near Centennial Street. In the western part of the Mississippi River watershed results, from the 10-year, 24-hour storm event suggest flooding occurs in the Fairview Lane watershed on South Service Drive. Flooding identified in model results but not observed in 2003 may be due to the use of current impervious areas within the model (as represented by 2011 NLCD dataset), which may not be consistent with land use conditions present in 2003. Overall, the use of the 2011 NLCD to calculate imperviousness may overestimate the runoff from the watershed in areas where much of the imperviousness is not directly connected, and may result in the flow in all downstream components of the conveyance system from being overestimated.

4.2.3 Stormwater System Results

The 10-year and 100-year event flood analyses were performed for the Mississippi River watershed. **Table 4-2-1** lists the modeled flood bounce (water level rise) for the ponds in this watershed. **Table 4-2-2** presents watershed information and the results of the 10-year and 100-year flood analyses for each of the minor watersheds shown on **Figures 4.2.1 – 4.2.3**.

Table 4-2-1 Mississippi River Watershed Modeled Pond Flood Elevations

Major Watershed	Sub-watershed	XP-SWMM Minor Watershed ID	Normal Water Elevation (ft)	10-Yr, 24-Hr Water Elevation (ft)	100-Yr, 24-Hr Water Elevation (ft)
MR	FL	3aFL	790.3	791.2	791.3
MR	FL	3bFL	742	747.0	749.4
MR	MR	1DA_Pnd	697	699.8	701.1
MR	TR	5TR	748	749.6	750.3
MR	TR	8TR	802	806.2	809.9

Table 4-2-2 Mississippi River Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
BC	BC1	193.08	24.7	2.1	494.8	3.4	837.0
BC	BC2	110.05	10.1	1.8	354.0	3.0	576.6
4ST	14ST	10.48	27.9	2.2	37.8	3.6	62.3
4ST	24ST	6.52	29.9	2.3	25.9	3.6	41.7
4ST	34ST	2.2	37.1	2.5	10.7	3.9	16.2
4ST	44ST	2.62	51.7	2.9	13.6	4.3	20.2
4ST	54ST	8.58	42	2.6	34.0	4.0	54.2
4ST	74ST	4.54	43.7	2.7	21.8	4.1	33.2
4ST	84ST	2.78	28.4	2.3	15.5	3.6	22.5
4ST	94ST	7.77	11.7	1.9	40.0	3.1	59.7
4ST	104ST	4.78	20.6	2.1	25.7	3.4	37.8
4ST	114ST	30.51	9.3	1.8	133.7	3.0	211.2
4ST	124ST	4.27	47.7	2.8	19.9	4.2	30.6
4ST	134ST	1.84	44.1	2.7	10.2	4.1	14.8
BLS	1BLS	3.38	78.9	3.5	19.2	5.2	27.7
BLS	2BLS	4.23	65.2	3.2	23.0	4.7	33.6
BLS	3BLS	2.57	50.5	2.8	12.6	4.3	19.1
BLS	4BLS	4.55	78.3	3.5	25.0	5.2	36.5
BLS	5BLS	2.84	63.5	3.1	15.0	4.7	22.1
BLS	6BLS	7.67	45.6	2.7	33.8	4.1	52.7
BLS	7BLS	14.06	24.6	2.2	69.4	3.5	105.1
BLS	8BLS	9.55	32.8	2.4	50.7	3.7	74.8
BLS	9BLS	3.42	43.2	2.6	15.9	4.1	24.4
BLS	10BLS	6.56	39.7	2.6	33.9	4.0	50.4
BLS	11BLS	4.19	31.6	2.4	23.2	3.7	33.7
BLS	12BLS	5.88	24.1	2.2	26.0	3.5	40.8
BLS	13BLS	11.58	48.7	2.8	57.1	4.2	86.3
BLS	14BLS	1.13	53.5	2.9	6.4	4.4	9.2
BS	1BS	6.79	31.1	2.4	33.3	3.7	50.5
BS	2BS	3.01	28.9	2.3	14.8	3.6	22.4
BS	3BS	4.04	69.3	3.3	22.0	4.9	32.2
BS	4BS	6.19	85.8	3.7	35.5	5.4	50.9
BS	5BS	7.42	82.8	3.6	40.5	5.3	59.1

Table 4-2-2 Mississippi River Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
BS	6BS	7.58	90.9	3.8	40.8	5.5	59.8
BS	7BS	3.87	94.3	3.9	22.3	5.7	31.9
BS	8BS	6.02	81.1	3.6	34.1	5.2	49.2
BS	9BS	6.38	36.1	2.5	30.4	3.8	46.6
BS	10BS	1.27	58.4	3.0	7.1	4.5	10.3
BS	11BS	7.13	42.7	2.6	32.6	4.0	50.4
BS	12BS	3.06	10.4	1.9	16.3	3.0	24.1
BS	13BS	8.07	27.8	2.3	35.8	3.6	56.2
BS	14BS	8.78	14.9	1.9	29.3	3.1	48.3
BS	15BS	5.9	30.7	2.3	25.7	3.7	40.5
BS	16BS	5.63	32.6	2.3	26.2	3.6	40.7
BS	17BS	7.29	35.7	2.5	32.9	3.8	51.2
BS	18BS	15.27	18.7	2.0	58.7	3.3	96.3
BS	19BS	10.56	17.3	2.0	43.8	3.2	70.4
BS	20BS	6.52	25.2	2.2	27.0	3.5	43.2
BS	21BS	4.99	35.2	2.5	25.1	3.8	37.8
BS	22BS	3.1	13.2	1.9	16.0	3.1	23.9
BS	23BS	3.66	29.7	2.3	19.7	3.6	28.9
BS	24BS	2.36	92.9	3.9	13.4	5.6	19.3
BS	25BS	2.62	9.9	1.8	9.0	3.0	14.8
EA	1EA	2.01	81.6	3.6	11.6	5.3	16.6
EA	3EA	13.3	73.2	3.3	70.9	4.9	105.3
EA	5EA	4.83	61	3.1	24.3	4.6	36.4
EA	6EA	5.7	53.7	2.9	27.8	4.4	42.1
EA	7EA	10.47	42	2.6	55.1	4.0	81.5
EA	8EA	4.34	59.7	3.1	23.8	4.6	34.7
EA	9EA	1.08	79.2	3.5	6.2	5.2	8.9
FL	1FL	12.77	30.1	2.3	52.7	3.6	84.7
FL	3aFL	19.59	4.5	1.6	67.2	2.7	109.2
FL	3bFL	14.98	14.1	1.9	55.6	3.1	92.4
FL	3FL	6.32	41.5	2.5	27.4	3.9	43.6
FL	4FL	3.91	51.1	2.7	20.1	4.1	30.5
FL	5FL	2.1	69.6	3.3	11.2	4.9	16.5

Table 4-2-2 Mississippi River Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
FL	6FL	2.76	48.6	2.8	11.9	4.2	18.5
FL	7FL	8.85	37.1	2.3	37.0	3.6	60.7
FL	8FL	5.34	65	3.1	26.9	4.6	40.9
FL	9FL	3	32.1	2.1	15.1	3.4	23.3
FL	10FL	4.86	62.2	3.1	24.8	4.7	37.0
FL	11FL	3.05	46.9	2.7	14.1	4.2	21.7
FL	12FL	3.62	33.8	2.4	16.0	3.8	25.1
FL	13FL	10.2	54	2.9	54.2	4.4	79.9
FL	14FL	21.57	33.8	2.3	79.6	3.6	132.2
JCS	1JCS	8.77	41	2.5	47.6	3.9	69.8
JCS	2JCS	17.48	65.2	3.2	91.6	4.7	135.7
JCS	3JCS	4.19	48.1	2.8	21.9	4.2	32.5
JCS	4JCS	4.68	75.1	3.4	26.3	5.1	38.1
JCS	5JCS	5.75	23.6	2.2	30.0	3.5	44.5
JCS	6JCS	6.3	26.7	2.2	32.1	3.5	48.1
JCS	7JCS	3.46	24.3	2.1	18.1	3.3	26.9
JCS	8JCS	8.99	37.7	2.4	44.7	3.8	67.8
JCS	9JCS	2.81	54.1	2.9	15.4	4.4	22.5
LR5	1LR5	6.76	15.4	2.0	34.0	3.2	51.2
LR5	2LR5	22.17	21	2.1	90.4	3.4	145.7
LR5	3LR5	6.05	44.7	2.7	29.1	4.1	44.4
LR5	4LR5	2.08	67	3.2	11.8	4.8	17.0
LR5	5LR5	7.36	56.7	3.0	39.5	4.5	58.0
LR5	6LR5	14.21	58.5	3.0	78.0	4.5	113.7
LR5	7LR5	1.08	82.2	3.6	6.2	5.3	8.9
LR5	8LR5	4.05	48.2	2.8	19.4	4.2	29.6
LR5	9LR5	9.39	32.5	2.4	47.8	3.7	71.6
LR5	12LR5	11.17	58.9	3.0	56.4	4.5	84.5
PLS	1PLS	3.02	89.2	3.8	17.4	5.5	24.9
PLS	2PLS	6.36	92.8	3.9	36.3	5.6	52.2
PLS	3PLS	4.94	89.2	3.8	27.7	5.5	40.1
PLS	4PLS	12.33	68.7	3.3	67.9	4.9	98.8
PLS	5PLS	3.39	37.1	2.5	17.5	3.9	26.1

Table 4-2-2 Mississippi River Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
PLS	7PLS	5.23	39.1	2.6	26.9	3.9	40.1
PLS	8PLS	4.22	38.9	2.5	16.9	3.9	26.9
PLS	9PLS	3.65	37.6	2.5	18.8	3.9	28.1
PLS	10PLS	1.4	40	2.6	7.7	4.0	11.2
PLS	11PLS	3.04	30.2	2.3	15.6	3.7	23.3
PLS	12PLS	2.94	14.7	2.0	15.3	3.2	22.8
PLS	13PLS	2.16	26.7	2.3	11.8	3.6	17.3
PLS	14PLS	17.57	26.2	2.2	79.2	3.5	123.7
PLS	15PLS	5.72	42.6	2.6	28.5	4.0	42.9
PLS	16PLS	3.39	36.1	2.2	15.6	3.6	24.9
PLS	17PLS	7.39	37.1	2.5	35.8	3.9	54.5
PLS	18PLS	6.93	35.9	2.5	30.6	3.8	47.9
PLS	19PLS	2.55	39.8	2.6	13.3	4.0	19.8
PLS	20PLS	1.29	43.8	2.7	7.0	4.1	10.2
PLS	22PLS	17.04	22.9	2.2	80.7	3.4	124.1
PLS	23PLS	79.06	6.5	1.7	285.8	2.9	470.2
PLS	24APLS	12.91	4.5	1.7	57.4	2.8	90.6
PLS	24BPLS	5.18	12.7	1.7	23.6	2.8	37.5
PLS	24CPLS	4.8	37.7	2.2	18.4	3.6	31.4
PLS	24PLS	21.35	22.4	2.0	92.9	3.3	148.8
PLS	25PLS	6.7	32.9	2.2	21.0	3.5	35.7
PLS	26PLS	5.94	22.6	2.1	28.7	3.4	43.8
PLS	27APLS	8.45	14.5	1.9	32.5	3.1	53.9
PLS	27PLS	8.27	24.1	2.1	39.5	3.3	61.2
PLS	28PLS	54.47	6.1	1.7	202.0	2.8	339.8
PLS	35PLS	4.2	34.9	2.5	22.5	3.8	33.0
PLS	36PLS	29.81	3.4	1.7	122.1	2.8	197.9
PLS	37PLS	6.04	10.7	1.9	30.0	3.0	45.4
PLS	39PLS	23.71	11.4	1.9	91.0	3.1	150.1
PLS	40PLS	13.35	6	1.7	61.9	2.9	96.0
PLS	41PLS	43.45	16.1	1.8	78.6	3.1	139.6
PLS	42PLS	19.42	6.9	1.8	80.6	2.9	129.9
PLS	43PLS	35.31	14.4	1.8	67.4	3.0	120.5

Table 4-2-2 Mississippi River Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
PLS	44PLS	13.2	17.8	2.0	48.9	3.2	81.1
PLS	45PLS	397.5	8.1	1.7	938.8	2.9	1661.2
PLS	46PLS	68.34	10.1	1.8	192.6	3.0	326.6
PLS	52PLS	4.76	38	2.5	22.8	3.9	34.9
PLS	53PLS	3.67	40.4	2.6	19.0	4.0	28.3
PLS	54PLS	3.48	46	2.7	15.5	4.1	24.1
PLS	55PLS	3.55	29.6	2.3	16.3	3.6	25.3
PLS	56PLS	7.99	50.2	2.8	42.9	4.3	63.0
PS	1PS	0.62	90.5	3.8	3.6	5.5	5.1
PS	2PS	4.18	84.3	3.7	23.7	5.3	34.1
PS	3PS	5.17	84.8	3.7	28.3	5.4	41.3
PS	4PS	0.91	81.7	3.6	5.2	5.3	7.5
TR	1TR	16.2	64.7	3.2	86.8	4.8	127.4
TR	2TR	5.22	69.5	3.2	29.3	4.8	42.4
TR	3TR	8.49	74.8	3.4	48.1	5.0	69.3
TR	4TR	5.09	28.9	2.1	24.2	3.3	38.1
TR	5TR	20.94	69.1	3.2	113.2	4.8	166.4
TR	6TR	0.81	70.5	3.2	4.5	4.8	6.6
TR	7TR	4.67	63.1	3.0	25.9	4.5	37.9
TR	8TR	119.13	24.3	2.1	360.5	3.4	609.7
TR	9TR	4.89	21.6	1.9	23.7	3.2	36.7
TR	10TR	7.51	48.5	2.7	38.6	4.2	57.8
MR	1DA	14.06	19.9	2.0	43.1	3.3	71.5
MR	1DA_Pnd	7.27	59.8	3.0	38.5	4.5	57.2
MR	1JS	13.77	48.9	2.8	71.5	4.2	106.5
MR	1LR1	1.64	37.9	2.5	8.7	3.9	12.8
MR	1LR2	0.99	0	1.5	5.0	2.5	7.6
MR	1LR3	52.8	46.5	2.7	242.2	4.2	373.7
MR	1LR4	13.44	74	3.4	69.9	5.0	103.7
MR	1WHD	2.6	13.9	1.9	14.0	3.1	20.5
MR	MR1	64.21	12.4	1.9	215.1	3.1	351.0
MR	MR2	63.36	6.6	1.7	224.5	2.9	366.1
MR	MR3	529.89	1.2	1.5	1233.2	2.7	2214.8

Table 4-2-2 Mississippi River Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
MR	MR6	682.72	1.2	1.4	1085.7	2.6	2092.5
MR	MR8	102.97	7.6	1.8	340.2	2.9	549.2
MR	MR12	124.15	14.3	1.8	343.1	3.1	582.3
MR	MR14	54.62	2.6	1.7	188.1	2.8	299.3

4.3 MODELING RESULTS FOR THE BULLARD CREEK WATERSHED

The Bullard Creek watershed is generally located south and east of the City limits. The Bullard Creek subwatersheds within the Red Wing City limits are shown on **Figure 4.3.1**. The northwest corner of the Bullard Creek watershed is located in the very southeast corner of the City of Red Wing. However, future development may expand to the south and east to include larger parts of the Bullard Creek watershed. The new high school is located in this watershed. Other land uses in this watershed within the City limits include parkland, industrial/office uses, institutional land, and small amounts of low-density residential and agricultural uses. Almost all of the Bullard Creek watershed outside the City of Red Wing is agricultural, and is located within the Richard J. Dorer Memorial Hardwood State Forest.

4.3.1 Drainage Patterns

Bullard Creek flows generally easterly to the Mississippi River. The Bullard Creek subwatershed is partially served by City storm sewer systems. Much of this subwatershed drains overland to one of the many ravines that lead to Bullard Creek. Bullard Creek discharges into the Mississippi River at the town of Wacouta, a few miles east of Red Wing.

4.3.2 Flood Protection Concerns

There are no known existing flooding problems in this watershed and model results do not indicate any flooding problems. Flooding would be assumed to be a problem if model results showed the volume of surface flooding to be at least one-half acre-foot (the estimated volume required to fill an intersection), which did not occur in this watershed.

4.3.3 Stormwater System Results

The 10-year and 100-year flood events were analyzed for the portion of the Bullard Creek watershed that is served by the City's **storm sewer system**. Because very little system infrastructure exists within the Bullard Creek watershed, information and the hydrologic results of the 10-year and 100-year flood analyses are shown with the results for the Mississippi River watershed results in **Table 4-2-2** (labeled BC). A detailed hydraulic analysis of the storm sewer in this subwatershed was not performed.

4.4 MODELING RESULTS FOR THE HAY CREEK WATERSHED

Figure 4.2.3 shows the overall location and **Figure 4.4.1** shows the detail of the Hay Creek watershed. Only a very small portion of the overall watershed is located within the Red Wing City limits, in the central part of the City. From the Red Wing City limits, the Hay Creek watershed extends south and southwest.

Within the City limits, this watershed covers the southeast portion of the City and includes the golf course, technical college, Twin Bluff Junior High School, Twin Bluff Park and the Bench Street Wastewater Treatment Facility. General land uses within Red Wing in this watershed are varied with low-density residential more common in the eastern part and industrial/commercial uses more common in the western part. As is true for all of Red Wing, there are large areas designated as parkland. The very western end of the Riverfront development plan, the eastern half of the Tyler Road/U.S. 61 development plan, and the west end of the Pioneer Road/Highway 58 Area Development Plan are within this watershed. Outside the City limits, the watershed is mostly agricultural, with much of it designated as state forest land.

4.4.1 Drainage Patterns

Hay Creek flows north through the central part of the City of Red Wing, discharging to the Mississippi River floodplain through the Canadian Pacific (CP) Railroad grade. Trout Brook enters Hay Creek upstream of where Hay Creek crosses Featherstone Road. Both Hay Creek and Trout Brook are MDNR-designated trout streams, per Minnesota Rules 6264.0050.

The portion of the Hay Creek watershed within the Red Wing City limits is served by the City's stormwater system. The stormwater system is comprised of storm sewers, culverts, ditches, ravines, creeks, and streams (Trout Brook and Hay Creek).

The Hay Creek watershed is made up of 12 subwatersheds that are served by City storm sewer systems that discharge into Hay Creek. From north to south the subwatersheds are:

Withers Harbor Drive 2 (WHD2)	Hay Creek Valley Road 2 (HCVR2)
Withers Harbor Drive 3 (WHD3)	Hay Creek Valley Road 3 (HCVR3)
Cleveland Avenue (CL)	Hay Creek Valley Road 4 (HCVR4)
Brick Avenue (BA)	Hay Creek Valley Road 5 (HCVR5)
Featherstone Road (FSR)	Hay Creek Valley Road 7 (HCVR7)
Hay Creek Valley Road 1 (HCVR1)	Pioneer Road (DITCH)

There are 12 subwatersheds in the Hay Creek watershed that are served by few, if any, storm sewer systems. From north to south along Hay Creek the subwatersheds are as follows: Hay Creek 7 (HC7), HC8, HC5, HC4, HC10, HC11, HC9, HC6, HC2, HC, HC12 and Trout Brook 1 (TB1). Peak stormwater runoff rates and stormwater runoff volumes were determined for these subwatersheds, but no hydraulic analyses were performed.

4.4.2 Flood Protection Concerns

The City of Red Wing Flood Insurance Study (FIS) (Federal Emergency Management Agency, 2009) shows the flood profile and floodplain for Hay Creek from the Canadian Pacific Railroad (CP) line, upstream to the City limits. It also shows the flood profile and floodplain for Trout Brook. The floodplain of both creeks is generally contained between Bench Street South and Hay Creek Valley Road, with some portions of Hay Creek Valley Road shown in the floodplain.

Further upstream in the watershed, in the south part of the City, flooding problems have been experienced on Halstrom Drive, near Burton Street and Gernentz Lane. City staff also identified a flooding problem along Pioneer Road. XP-SWMM model results indicate that flooding of street intersections may be a problem during the 10-year, 24-hour storm event. Flooding was assumed to be a problem when model results showed the volume of surface flooding to be at least one-half acre-foot (the estimated volume required to fill an intersection). Problem areas during the 100-year, 24-hour storm event were also identified. **Figure 4.4.2** shows the areas of known flooding and problem areas detected through the modeling of the Hay Creek system (based on 10-year, 24-hour and 100-year, 24-hour storm results). Results from the 10-year, 24-hour storm event show flooding in the Brick Avenue storm sewer system. Model results do not show flooding in the Pioneer Road storm sewer system for the 10-year event, although flooding was observed by the City in 2003.

4.4.3 Stormwater System Results

The 10-year and 100-year flood events were analyzed for the portions of the Hay Creek watershed that are served by the City's **storm sewer system**. Results for the ponds in the Hay Creek watershed are shown in **Table 4-4-1**. **Table 4-4-2** presents watershed information and the results of the 10-year and 100-year flood analyses for each of the minor watersheds shown on **Figure 4.4.1**.

Table 4-4-1 Hay Creek Watershed Modeled Pond Flood Elevations

Major Watershed	Sub-watershed	XP-SWMM Minor Watershed ID	Normal Water Elevation (ft)	10-Yr, 24-Hr Water Elevation (ft)	100-Yr, 24-Hr Water Elevation (ft)
HC	BA	16bBA	789	790.6	791.7
HC	BA	25BA_Pnd	854	861.5	861.6
HC	DITCH	11DITCH	962.3	967.4	968.4
HC	DITCH	12DITCH	1014	1021.5	1023.5
HC	HC	FrancePnd	1009.1	1012.3	1014.8
HC	HC	HC4	740	747.6	748.4
HC	HC	OGrovePond	1005	1009.8	1012.7

Table 4-4-2 Hay Creek Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
BA	1BA	2.12	9.9	1.6	7.4	2.7	13.0
BA	2BA	25.46	21.5	1.9	98.5	3.1	167.0
BA	3BA	4.92	20.9	2.1	26.2	3.3	38.7
BA	4BA	4.44	29.3	2.2	22.6	3.5	34.0
BA	5BA	65.39	16.5	1.7	187.7	2.9	320.8
BA	6BA	8.86	26.5	2.1	43.7	3.3	67.1
BA	7BA	22.18	15.8	1.8	77.5	3.0	131.9
BA	8BA	16.8	25.2	2.0	51.9	3.2	90.7
BA	9BA	16.31	18.9	1.9	50.5	3.1	85.6
BA	10BA	4.85	22.8	1.9	20.5	3.1	33.7
BA	11BA	3.05	27.1	2.0	14.3	3.3	22.7
BA	12BA	8.28	34	2.4	32.4	3.7	52.2
BA	13BA	58.27	18.8	1.8	208.8	3.0	366.2
BA	14BA	16.95	39.8	2.5	75.2	3.9	117.6
BA	15BA	2.08	38.3	2.4	10.2	3.8	15.7
BA	16BA	53.37	5.8	1.4	147.7	2.5	262.2
BA	16bBA	64.03	12.6	1.8	211.2	3.0	349.4
BA	17BA	48.76	16.1	1.8	196.5	3.0	325.0
BA	25BA	37.7	19.3	1.8	150.3	3.0	254.4
BA	25BA_Pnd	39.59	6.9	1.7	140.1	2.8	232.1
BA	26BA	17.11	71.4	3.3	94.3	4.9	137.4
CLA	1CL	5.23	39.4	2.5	23.7	3.9	36.8
CLA	2CL	13.77	38.3	2.4	36.0	3.8	58.2
CLA	3CL	2.59	42.5	2.6	10.4	4.0	16.6
CLA	4CL	1.44	39.8	2.5	7.7	3.9	11.3
CLA	5CL	18.12	45.2	2.5	78.9	3.9	126.1
DITCH	HC_DITCH	327.12	6	1.2	409.6	2.3	824.8
DITCH	1DITCH	83.55	8.2	1.5	207.0	2.6	372.9
DITCH	2bDITCH	32.89	15.9	1.8	113.0	3.0	194.6
DITCH	2cDITCH	34.4	12	1.7	133.1	2.9	223.7
DITCH	2DITCH	16.7	30.6	2.1	54.5	3.4	94.0
DITCH	3DITCH	16.08	26.6	2.1	69.9	3.3	113.1
DITCH	4DITCH	10.26	19.1	1.8	36.0	3.0	63.8

Table 4-4-2 Hay Creek Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
DITCH	5DITCH	4.85	27.4	2.0	21.5	3.3	34.8
DITCH	6DITCH	6.69	21.7	1.8	24.2	3.1	42.1
DITCH	7DITCH	4.12	29.8	2.1	17.1	3.4	28.3
DITCH	8DITCH	29.74	11.4	1.7	84.0	2.9	143.8
DITCH	9ADITCH	19.15	9.2	1.7	56.0	2.9	94.5
DITCH	9DITCH	25.11	11.9	1.8	87.4	3.0	146.1
DITCH	11DITCH	10.53	5.6	1.7	38.0	2.9	62.4
DITCH	12DITCH	13.92	28.7	2.3	52.4	3.6	85.6
DITCH	13DITCH	12.68	45.1	2.7	50.4	4.1	80.0
DITCH	14DITCH	12.27	30.5	2.3	49.8	3.6	80.0
DITCH	15DITCH	55.41	13.2	1.7	169.7	2.9	284.9
DITCH	16DITCH	72.68	14.2	1.7	180.9	2.9	317.3
DITCH	17DITCH	29.53	16.6	1.8	114.5	3.0	191.5
DITCH	18DITCH	68.83	17.1	1.9	218.9	3.2	361.9
DITCH	19DITCH	35.96	18.5	2.0	124.1	3.2	208.3
HCVR7	1HCVR7	22.88	7.6	1.6	86.9	2.8	147.0
HCVR7	2HCVR7	15.64	33.1	2.4	74.1	3.7	113.7
HCVR7	3HCVR7	3.48	34.1	2.4	16.5	3.8	25.3
HCVR7	4HCVR7	3.57	43.3	2.7	18.1	4.1	27.1
HCVR7	5HCVR7	15.11	18.1	1.9	52.1	3.1	89.7
HCVR7	6HCVR7	8.31	44.8	2.7	41.9	4.1	62.9
HCVR7	7HCVR7	3.65	21.6	1.9	18.3	3.2	27.9
HCVR7	8HCVR7	4.39	29.1	2.1	21.8	3.4	33.4
HCVR7	9HCVR7	12.05	43.9	2.5	56.8	3.9	88.4
HC	2WHD	3.88	69.1	3.3	21.8	4.9	31.5
HC	3WHD	27.59	25.5	2.0	77.0	3.3	133.5
HC	FrancePnd	15.94	34.5	2.3	70.7	3.6	113.2
HC	FSR	8.02	15.7	1.8	36.9	3.0	58.3
HC	HC	2826.62	0.6	1.2	1976.6	2.3	4114.8
HC	HC3	23702.57	0.7	0.6	3373.7	1.4	6999.5
HC	HC4	56.65	37.6	2.4	226.0	3.8	363.8
HC	HC5	144.12	15.4	2.1	399.8	3.5	665.7
HC	HC6	254.96	10.4	2.0	824.0	3.2	1329.0

Table 4-4-2 Hay Creek Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
HC	HC7	40.58	33.4	2.4	171.7	3.7	272.7
HC	HC8	68.36	16.8	1.9	233.4	3.1	395.0
HC	HC9	261.47	1.3	1.4	584.3	2.6	1071.4
HC	HC10	47.9	22.2	1.9	151.9	3.1	263.4
HC	HC11	43.57	7.9	1.7	148.0	2.8	242.3
HC	HC12	310.2	8.9	1.6	729.8	2.8	1300.8
HC	HCVR1	3.75	13.9	1.8	17.8	3.0	27.7
HC	HCVR2	26.28	32.1	2.3	103.1	3.6	168.6
HC	HCVR3	10.65	29.8	2.1	52.3	3.4	80.9
HC	HCVR4	12.92	15.7	1.8	59.0	2.9	93.9
HC	HCVR5	44.56	19.5	1.9	158.4	3.1	269.9
HC	OGrovePond	4.22	23.2	2.2	20.7	3.4	31.5
HC	TB1	1071.78	0.3	1.4	2049.0	2.6	3861.8

4.5 MODELING RESULTS FOR THE SPRING CREEK WATERSHED

Figure 4.2.3 shows the overall location and **Figure 4.5.1** shows the detail of the Spring Creek watershed used in the XP-SWMM modeling. Less than half of the Spring Creek watershed is within the City limits of Red Wing. From the Red Wing City limits, the Spring Creek watershed extends south. Within the City limits, the general land uses in this watershed include low-density residential, industrial/office, park, and agricultural, with smaller amounts of commercial, medium-density residential and institutional uses along Highway 61. The western end of the Tyler Road/U.S. 61 Development Plan is within the Spring Creek watershed. Outside the City limits, the watershed is mostly agricultural, with much of it designated as state forest land.

4.5.1 Drainage Patterns

From the south City limits of Red Wing, Spring Creek flows north through the southwest part of the City. The creek jogs east downstream of its crossing with Mill Road and then flows north/northeasterly, generally following Spring Creek Avenue. Spring Creek discharges to the Mississippi River floodplain through the CP railroad grade downstream of Highway 61. Spring Creek, a MDNR-designated trout stream, per Minnesota Rules 6264.0050 flows from the south Red Wing City limits to the north section line of Section 34, Township 113N, Range 15W (just downstream of Peaceful Ridge Road crossing).

The majority of the Spring Creek watershed within the Red Wing City limits drains through natural drainage ways (i.e., ravines, creeks, and streams), with some culverts. City storm sewer systems are concentrated in the developed areas along and near Highway 61, at the northern (downstream) end of the watershed. **The City's storm sewer system in this watershed will likely expand as development continues.**

The Spring Creek watershed includes one subwatershed, Spring Creek Road (SCR), that is served by City storm sewer systems. Detailed modeling was performed for this watershed. The remaining 20 subwatersheds are served by few, if any, storm sewer systems. These subwatersheds are: SC1, SC10, SC2, SC7, SC4, SC3, SC9, SC5, SC8, SC6, SC12, SC11, SC, Johnson Avenue (1JA and 2JA), Highway 61 (1H61), Motel Avenue (1MA), Spates Avenue 2 (1SA2), and Industrial Park Road (1bIPR and 1IPR,). Peak stormwater runoff rates and stormwater runoff volumes were determined for these subwatersheds, but no hydraulic analyses were performed.

4.5.2 Flood Protection Concerns

The City of Red Wing FIS shows the flood profile and floodplain for Spring Creek from the CP railroad upstream to the Peaceful Ridge Road crossing. From this road crossing upstream to the City limits, the FIS shows only the approximate floodplain and gives no flood elevations. The FIS shows a small portion of Spring Creek Avenue in the Spring Creek floodplain. In the upstream portion of the watershed the FIS also shows other roads within the approximate floodplain.

There are no known existing flooding problems in this watershed and model results do not indicate any flooding problems for the 10-year, 24-hour or the 100-year, 24-hour storm events.

Flooding would be considered to be a problem if model results showed the volume of surface flooding to be at least one-half acre-foot (the estimated volume required to fill an intersection).

4.5.3 Stormwater System Results

The 10-year and 100-year flood events were analyzed for the portions of the Spring Creek watershed that are served by the City’s storm sewer system. **Table 4-5-1** lists the modeled flood bounce for the single existing pond in the Spring Creek watershed. **Table 4-5-2** summarizes the results of the 10-year and 100-year flood analyses for each of the minor watersheds shown on **Figure 4.5.1**.

Table 4-5-1 Spring Creek Watershed Modeled Pond Flood Elevations

Major Watershed	Sub-watershed	XP-SWMM Minor Watershed ID	Normal Water Elevation (ft)	10-Yr, 24-Hr Water Elevation (ft)	100-Yr, 24-Hr Water Elevation (ft)
SC	SC	BigSkyPnd	876	880.5	882.7

Table 4-5-2 Spring Creek Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
IPR	1bIPR	196.01	5.3	1.6	454.9	2.8	758.0
IPR	1IPR	85.67	38	2.5	249.4	3.9	377.2
JA	1JA	19.14	23	2.1	51.5	3.4	80.8
JA	2JA	11.77	29.9	2.3	28.1	3.6	45.4
SCR	1SCR	17.19	7.3	1.7	47.4	2.9	73.6
SCR	2SCR	10.48	20.8	2.1	32.2	3.4	47.1
SCR	3SCR	20.31	8.7	1.6	56.0	2.8	87.3
SCR	4SCR	5.69	22.5	2.1	17.4	3.4	25.5
SCR	5SCR	5.36	21.6	2.1	16.3	3.4	24.0
SCR	6SCR	3.81	26.8	2.3	11.7	3.6	17.2
SCR	7SCR	4.47	29.1	2.2	12.2	3.5	19.1
SCR	8SCR	2.94	32.2	2.4	9.1	3.7	13.3
SCR	9SCR	0.61	13.5	1.9	1.8	3.1	2.7
SCR	10SCR	3.81	18.3	2.0	10.8	3.3	16.6
SCR	11SCR	1.57	13.7	1.9	4.8	3.1	7.0
SCR	12SCR	1.78	15.9	1.8	5.2	3.0	7.8
SCR	13SCR	3.56	56.7	3.0	11.3	4.5	16.3
SCR	14SCR	1.49	12.7	1.6	4.3	2.8	6.5
SCR	15SCR	1.91	21.5	1.9	5.6	3.1	8.4
SCR	16SCR	2.89	31.6	2.3	8.9	3.6	13.0
SCR	17SCR	10.43	40.9	2.4	31.6	3.8	46.8
SCR	18SCR	8.69	21.1	2.0	26.3	3.2	38.7
SCR	19SCR	9.48	21.8	1.9	27.1	3.1	41.5
SCR	20SCR	4	71.6	3.3	12.6	4.9	18.3
SCR	24SCR	4.31	40.6	2.5	13.4	3.9	19.5
SCR	25SCR	5.92	56.3	3.0	18.3	4.5	26.9
SC	1H61	8.79	23.9	2.0	25.1	3.3	38.4
SC	1MA	11.38	21.7	2.0	26.5	3.3	43.5
SC	1SA2	15.76	15.3	2.0	46.9	3.2	70.1
SC	BigSkyPnd	11.37	18	2.0	34.0	3.3	50.6
SC	SC	10320.89	0.5	1.0	3775.7	2.1	8000.9
SC	SC1	80.15	42	2.6	223.8	4.0	344.0
SC	SC2	314.98	8.8	1.6	646.4	2.8	1124.0

Table 4-5-2 Spring Creek Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
SC	SC3	481.54	2	1.4	727.3	2.6	1360.6
SC	SC4	106.78	13.3	1.8	254.9	3.0	418.9
SC	SC5	263.53	0.9	1.4	323.7	2.6	625.3
SC	SC6	1488.19	0.4	1.4	1715.0	2.5	3354.9
SC	SC7	221.05	0.8	1.4	465.2	2.5	814.5
SC	SC8	550.72	0.9	1.4	626.0	2.6	1216.8
SC	SC9	294.88	0.2	1.4	544.5	2.6	976.0
SC	SC10	42.83	41.2	2.6	118.7	4.0	183.0
SC	SC11	330.7	0.6	1.5	707.0	2.7	1214.1
SC	SC12	532.57	0.5	1.3	589.2	2.5	1158.1

4.6 MODELING RESULTS FOR THE CANNON RIVER WATERSHED

Figure 4.2.3 shows the overall location and **Figure 4.6.1** shows the detail of the Cannon River watershed used in the XP-SWMM modeling. The Cannon River watershed encompasses 1,440-square miles, with a very small portion within the City limits of Red Wing. The rest of the Cannon River watershed extends west from the City limits. Within the City limits, the general land uses in this watershed include industrial/office, park, agricultural, low-density residential, and institutional, with a small amount of medium-density residential use along Highway 61. The Cannon Valley Trail is located in this watershed.

The Cannon River has been designated by the state of Minnesota as a Wild and Scenic River. The portion of the river within the City of Red Wing is classified as “scenic.” The City established shoreland regulations for the Cannon River area that are generally more restrictive than other shoreland rules (Chapter 15 of the City ordinances). The City wishes to maintain the Cannon River floodplain area in its natural state.

4.6.1 Drainage Patterns

From Red Wing’s western City limits, the Cannon River flows east through the western part of the City and discharges to the Mississippi River. The majority of the Cannon River watershed within the Red Wing City limits drains through natural drainage ways (i.e., ravines, creeks, and streams), with some culverts and small storm sewer systems along and near Highway 61. Six subwatersheds in the Cannon River watershed are served by City storm sewer systems. Detailed modeling was performed for these six subwatersheds:

Lee Street (LS)	Spates Avenue 1 (SA1)
Cannon View Drive (CVD)	Kings Wood Drive (KW)
Fern Avenue (FA)	Camp Pearson Rd (HT)

The following seven subwatersheds in the Cannon River watershed are served by few, if any, storm sewer systems: Cannon River (CR), CR1, CR3, CR2, Luverne Drive (LD), Moundview Drive (MVD1), and Juniper Drive (1JD). Peak stormwater runoff rates and stormwater runoff volumes were determined for these subwatersheds, but no hydraulic analyses were performed.

4.6.2 Flood Protection Concerns

The City of Red Wing FIS shows only the approximate floodplain for the Cannon River (no flood elevations determined). The floodplain is generally contained between the Cannon Valley Trail (old railroad grade) on the north and Collischan Road and Green Spring Road on the south. The FIS shows a large section of Highway 61 and the Cannon Valley Trail in the Cannon River approximate floodplain.

No problem areas were detected through the modeling efforts in the Cannon River system (based on 10-year, 24-hour and 100-year, 24-hour storm results). Flooding would be indicated when model results showed the volume of surface flooding to be at least one-half acre-foot (the

estimated volume required to fill an intersection). There are no known field-identified existing flooding problems in this watershed.

4.6.3 Stormwater System Results

The 10-year and 100-year flood events were analyzed for the portions of the Cannon River watershed that are served by the City’s storm sewer system. **Table 4-6-1** lists the modeled flood bounce for ponds in the Cannon River watershed. **Table 4-6-2** summarizes the results of the 10-year and 100-year flood analyses for each of the minor watersheds shown on **Figure 4.6.1**.

Table 4-6-1 Cannon River Watershed Modeled Pond Flood Elevations

Major Watershed	Sub-watershed	XP-SWMM Minor Watershed ID	Normal Water Elevation (ft)	10-Yr, 24-Hr Water Elevation (ft)	100-Yr, 24-Hr Water Elevation (ft)
CR	HT	1HT	743.9	745.9	746.8
CR	HT	2HT	753.5	754.9	755.6
CR	HT	3HT	775.9	779.1	779.2
CR	KW	1KW	817	823.2	828.6
CR	KW	2KW	844	849.2	852.9
CR	KW	3KW	934	935.1	935.8

Table 4-6-2 Cannon River Watershed Modeled Runoff

Sub-watershed	XP-SWMM Minor Watershed ID	Drainage Area (acres)	Percent Impervious	10-Year, 24-Hour Storm		100-Year, 24-Hour Storm	
				Total Runoff Depth (in)	Peak Runoff Flow (cfs)	Total Runoff Depth (in)	Peak Runoff Flow (cfs)
CVD	1CVD	7.82	22.4	2.6	20.9	4.1	32.5
CVD	2CVD	6.16	26.6	2.6	15.9	4.1	24.9
CVD	3CVD	3.4	31.9	2.7	10.4	4.2	15.4
FA	1FA	8.39	30.9	2.7	25.9	4.1	38.0
FA	2FA	3.69	40.4	2.7	11.4	4.1	16.7
FA	3FA	10.76	42	2.7	33.1	4.1	48.7
HT	1HT	27.33	9.7	2.1	77.6	3.4	119.0
HT	2HT	37.45	15.9	2.3	97.7	3.6	154.6
HT	3HT	12.8	39.2	2.9	39.5	4.4	58.0
KW	1KW	24.95	26.8	2.2	69.6	3.5	107.4
KW	2KW	20.39	18.2	2.2	60.8	3.5	90.8
KW	3KW	13.12	37.4	2.6	40.1	4.0	59.2
KW	KW_out	13.13	38.1	2.8	41.3	4.3	59.8
LS	1LS	12.46	19.9	2.7	35.5	4.1	54.1
LS	2LS	1.79	15.8	2.6	5.6	4.0	8.1
SA1	1SA1	5.33	36.9	2.6	16.1	4.0	23.9
SA1	2SA1	3.11	45.6	2.6	9.6	4.0	14.1
SA1	3SA1	9.2	27.5	2.6	24.6	4.0	38.3
CR	1JD	30.71	24.4	2.3	88.0	3.7	134.4
CR	1LD	5.76	19.9	2.7	17.7	4.1	26.1
CR	CR	34665.82	0.7	0.8	8561.5	1.9	17441.3
CR	CR1	286.24	2.3	1.7	588.2	2.9	1013.4
CR	CR2	188.99	0.2	1.6	408.5	2.8	697.0
CR	CR3	164.96	13	2.0	350.1	3.3	587.8
CR	MVD1	39.08	34.8	2.9	111.7	4.4	169.4

4.7 WATER QUALITY MODELING METHODS

The City of Red Wing was modeled using the P8 Urban Catchment Model, or Program for Predicting Polluting Particle Passage thru Pits, Puddles, and Ponds, (P8) which is commonly used for predicting the generation and transport of stormwater runoff and pollutants in urban watersheds. The model tracks the movement of particulate matter (fine sand, dust, soil particles, etc.) as it is carried along by stormwater runoff traveling over land and pavement. Particle deposition in ponds along the way is also tracked, so that the model can estimate the amount of pollutants carried by the particles that eventually reach a water body.

The P8 model for the City of Red Wing was developed for the existing land use and watershed conditions only. The P8 model inputs were developed based on the information compiled for the development of the hydrologic and hydraulic model (XP-SWMM), when available, as discussed in **Section 4.1**. P8 version 3.4 was used for the water quality analysis.

4.7.1 Water Quality Modeling Input

4.7.1.1 Subwatershed Characteristics

Subwatershed Area

The drainage subwatersheds used for the XP-SWMM modeling were also utilized for the P8 water quality modeling. Watersheds were merged into larger drainage basins based on the location of existing stormwater ponds. The P8 subwatersheds are grouped into the five major watersheds: Cannon River, Spring Creek, Hay Creek, Bullard Creek, and the Mississippi River. Subwatershed areas were calculated for each subwatershed and the boundaries were used to calculate the other parameters discussed in the following sections.

Land Use and Impervious Data

All land use practices within a subwatershed impact the quantity of runoff generated. Each land use generates a different quantity of runoff due primarily to the amount of impervious area within that subwatershed. The impervious areas input into the P8 model to generate runoff were based on the same land use assumptions used in the XP-SWMM modeling, including watershed percent imperviousness based on the 2011 NLCD (see **Section 4.1.1**). It is assumed that the impervious percentage reflects the directly connected impervious fraction, or the fraction of impervious surface that is hydraulically connected to the stormwater system. This assumption may overestimate pollutant loading, as runoff from some impervious areas is likely intercepted by pervious areas where it is detained or infiltrated prior to reaching the storm sewer network.

The impervious surface depression storage was assumed to be 0.06 inches and the impervious runoff coefficient was assumed to be 0.95 for all the P8 subwatersheds.

Curve Number

The pervious curve number (a measure of how easily water can percolate into the soil) was also determined for each P8 subwatershed. Data from the Goodhue County Soils Survey (NRCS 1976) **was used to determine the hydrologic soil group (HSG), which serves as an indicator of a soil's** infiltration capacity. For any areas of undefined soils, the soils were assumed to be the same HSG as the surrounding soils. Data from the NRCS Soil Survey Geographic dataset (SSURGO) is the most current soils data for the study area, but was not available at the time of model development.

A pervious curve number was selected for each P8 subwatershed based upon soil types, existing land use, and hydrologic conditions (e.g., if soils are Type B and pervious areas are comprised of grassed areas with 50% to 75% cover, then a Curve Number of 69 would be selected). An overall composite pervious curve number was determined by weighting the areas for the given soil groups within each subwatershed.

Rainfall and Temperature Data

The P8 model requires hourly precipitation and average daily temperature data, either for a single storm event or for a long-term climatic period. To evaluate the existing watershed pollutant loading conditions for Red Wing, a continuous simulation of watershed runoff was performed using precipitation and temperature data from the National Weather Service station at the Minneapolis-St. Paul International Airport. To estimate the average annual watershed runoff and pollutant loading, the P8 model was run from 1/1/1955 through 1/1/2005.

Pollutant and Particle Data

The P8 model also requires pollutant and particle information to evaluate the pollutant loading from the watershed and removal by the stormwater best practices. To evaluate the existing watershed conditions, the NURP 50 particle file was used. The NURP 50 particle file was developed as part of the National Urban Runoff Program (NURP), a research program of the U.S. Environmental Protection Agency that provides default parameters for several water quality components, based upon calibration to median, event-mean concentrations reported by NURP (Athayede et al. 1983).

4.7.1.2 Pollutant Removal Device Information

The P8 water quality model can predict the pollutant removal efficiency for a variety of treatment practices such as detention ponds and infiltration basins. The model can also be used to simulate pollutant removal from alternative BMPs such as underground treatment devices. **The modeled treatment practices are referred to as pollutant removal “devices” in the P8 model.**

The stormwater BMPs included in the existing conditions P8 model include those water bodies that were identified by the City of Red Wing. All of the BMPs included in the P8 model are ponds.

Ponds

Water quality ponds (also called wet ponds) are the most common BMP within the City of Red Wing. The “dead” storage volume (storage below the normal water level) is an important factor in the pollutant removal efficiency of water quality ponds. As such, it is important to represent this volume as accurately as possible. Record drawings, if available, were used to develop the storage volumes for the ponds being modeled in P8. For ponds where record drawings were not available from the City, the area at normal water level was determined based on comparison to aerial photos, and the depth of the dead storage pool was assumed to be 2 feet. The flood pool, or volume above the normal water level to the emergency overflow, was determined based on record drawings and other information provided by the City of Red Wing, the area of the GIS shapefile identifying pond locations and sizes, or LiDAR data.

Information on the pond outlet configurations were based on the record drawings, if available, or from the City of Red Wing’s GIS storm sewer database.

As mentioned above, the dead storage volume significantly impacts the pollutant removal efficiency of water quality ponds. All water quality treatment devices include a parameter called the particle scale removal factor. The default value for this factor is 1.0; however, values less than 1.0 can be assumed to account for poor hydraulic design (e.g., the outlet located near the inlet) or the depth of the dead storage pool—with deeper pools often having better pollutant removal efficiency. For this modeling, we assumed that the particle scale removal factor for ponds with a permanent pool depth less than 2.0 feet equal to 0.3. For ponds with depths of 2.0 to 3.0 feet, the particle scale removal factor was assumed to be 0.6. And for ponds 3.0 feet or deeper, the particle scale removal factor was the same as the default parameter of 1.0.

Pipes

For watersheds that do not drain to a pond, the pipe “device” in P8 was used to route the water downstream. The only parameter entered for the pipe devices is the time of concentration, which was assumed to be 0.5 hours. There is no pollutant removal associated with a pipe device.

4.8 WATER QUALITY MODELING RESULTS

This section summarizes the results of the existing conditions P8 water quality modeling that was performed for the City of Red Wing. **Figures 4.8.1** and **4.8.2** summarize the P8 watersheds, total suspended solids (TSS), and total phosphorous (TP) loading and removal efficiencies for existing ponds within the project area. **Table 4-8-1** contains information on each subwatershed, as well as values for TSS and TP loading and removals.

The Mississippi River watershed is approximately 3,490 acres, primarily consisting of developed land use, including downtown Red Wing. This watershed contains five detention pond BMPs treating 5% of the total watershed area; all other areas within this watershed drain directly to the Mississippi River without treatment. Annual pollutant loading for the Mississippi River watershed is consistent with industrial and urban areas. All five detention ponds provide

removal of total suspended solids (TSS) and total phosphorous (TP), two indicator pollutants. Annual removal efficiencies were approximately 50–80% and 20–50% for TSS and TP respectively. NURP removal rates are 80–90% and 60% of TSS and TP respectively; the detention pond with removal rates closest to NURP values is in the 8TR subwatershed. Higher removal efficiencies are associated with greater pond depth.

The Bullard Creek watershed, approximately 300 acres, drains directly to the Mississippi River without treatment. This area is roughly half developed with impervious building and pavement; the remaining area is wooded or grassy. Annual pollutant loading for this watershed is consistent with mixed land use.

The Hay Creek watershed is approximately 30,620 acres. Land use is primarily wooded area but does include a portion of developed industrial urban area. Hay Creek watershed contains six detention ponds which treat 0.7% of the total watershed area. Annual pollutant loading for this watershed is lower than that of the Mississippi River watershed because it contains more pervious areas. France Pond achieves TSS and TP efficiencies of 80% and 50% respectively, owing to its high depth. These rates are comparable to the NURP removal rates. The remaining five detention ponds resulted in TSS and TP removal efficiencies ranging from 40–80% and 10–50% respectively. The two detention ponds with lowest removal efficiencies, 12DITCH and HC4, are both dry or near dry (0–1 foot of dead storage).

The Spring Creek watershed is approximately 15,520 acres in size. The watershed is primarily undeveloped with the majority of the watershed being woods and agricultural; the estimated annual pollutant loading rates are typical of this type of land use. The watershed contains only one BMP, Big Sky Pond, which treats 0.4% of the total Spring Creek watershed. Model results indicate this pond can achieve 76% and 49% removal efficiency for TSS and TP respectively.

The Cannon River watershed, at 35,20 acres, is the largest within the P8 study area. The watershed is primarily undeveloped with mostly agricultural land use. A 150-acre portion in the northeast is developed and contains six detention ponds. These shallow ponds contain 1–2.12 feet of dead storage and resulted in TSS and TP removal efficiencies ranging from 30–60% and 15–30% respectively.

Table 4-8-1 Summary of Existing Conditions P8 Modeling Results for the City of Red Wing

SUB-WATER SHED	TOTAL AREA [acres]	IMPERVIOUS [%]	BMP ⁴ TYPE	AVG ANNUAL TP LOAD ^{1,2} [lbs/year]	ANNUAL TP LOADING RATE ^{1,2} [lbs/acre/year]	ANNUAL TP REMOVAL ^{1,2} [lbs/year]	ANNUAL TP REMOVAL EFFICIENCY ^{1,2,3} [%]	AVG ANNUAL TSS LOAD ^{1,2} [lbs/year]	ANNUAL TSS LOADING RATE ^{1,2} [lbs/ac/year]	ANNUAL TSS REMOVAL ^{1,2} [lbs/year]	ANNUAL TSS REMOVAL EFFICIENCY ^{1,2,3} [%]
Mississippi River Watershed											
24ST	87	24.1	PIPE	47	0.5	0	0	14,750	170	0	0
14BLS	82	43.3	PIPE	72	0.9	0	0	22,376	274	0	0
1PS	11	84.6	PIPE	17	1.6	0	0	5,428	499	0	0
45PLS	466	8.4	PIPE	125	0.3	0	0	39,291	84	0	0
41PLS	111	14.2	PIPE	41	0.4	0	0	12,925	116	0	0
5PLS	422	21.0	PIPE	203	0.5	0	0	63,720	151	0	0
25BS	147	41.1	PIPE	124	0.8	0	0	38,701	262	0	0
9EA	42	60.5	PIPE	49	1.2	0	0	15,347	368	0	0
1LR4	13	74.0	PIPE	19	1.4	0	0	5,946	441	0	0
1JCS	62	47.2	PIPE	58	0.9	0	0	18,226	294	0	0
12LR5	84	41.2	PIPE	71	0.8	0	0	22,156	263	0	0
3aFL	20	4.5	POND	4	0.2	1	29	1,115	57	569	51
3bFL	15	14.1	POND	5	0.3	3	35	1,509	101	1,246	61
1FL	88	42.3	PIPE	74	0.8	0	0	23,169	262	0	0
8TR	119	24.3	POND	64	0.5	32	50	20,100	169	15,916	79
5TR	21	69.1	POND	28	1.3	6	21	8,613	411	4,527	53
1TR	53	57.1	PIPE	58	1.1	0	0	18,194	344	0	0
1DA	14	19.9	PIPE	6	0.5	0	0	1,998	142	0	0
1DA_Pnd	7	59.8	POND	8	1.2	4	43	2,647	364	1,949	74
MR1	64	12.4	PIPE	22	0.3	0	0	6,808	106	0	0
MR12	124	14.3	PIPE	45	0.4	0	0	14,169	114	0	0
MR14	55	2.6	PIPE	9	0.2	0	0	2,890	53	0	0
MR2	63	6.6	PIPE	15	0.2	0	0	4,745	75	0	0
MR3	530	1.2	PIPE	78	0.1	0	0	24,794	47	0	0
MR6	683	1.2	PIPE	98	0.1	0	0	31,025	45	0	0
MR8	103	7.6	PIPE	26	0.3	0	0	8,245	80	0	0
TOTAL	3,487	15.6		1,367	0.4	45	3.3	428,887	123.0	24,208	6
Bullard Creek Watershed											
BC2	303	19.4	PIPE	225	0.7	0	0	43,767	144	0	0
Hay Creek Watershed											
HCVR2	26	32.1	PIPE	17	0.7	0	0	5,459	208	0	0

Table 4-8-1 Summary of Existing Conditions P8 Modeling Results for the City of Red Wing

SUB-WATER SHED	TOTAL AREA	IMPERVIOUS	BMP ⁴ TYPE	AVG ANNUAL TP LOAD ^{1,2}	ANNUAL TP LOADING RATE ^{1,2}	ANNUAL TP REMOVAL ^{1,2}	ANNUAL TP REMOVAL EFFICIENCY ^{1,2,3}	AVG ANNUAL TSS LOAD ^{1,2}	ANNUAL TSS LOADING RATE ^{1,2}	ANNUAL TSS REMOVAL ^{1,2}	ANNUAL TSS REMOVAL EFFICIENCY ^{1,2,3}
	[acres]	[%]		[lbs/year]	[lbs/acre/year]	[lbs/year]	[%]	[lbs/year]	[lbs/ac/year]	[lbs/year]	[%]
HCVR5	45	19.5	PIPE	19	0.4	0	0	6,098	137	0	0
12DITCH	27	36.5	POND	20	0.8	2	11	6,310	237	2,605	41
11DITCH	11	5.6	POND	2	0.2	0	2	731	69	310	7
9ADITCH	19	9.2	PIPE	5	0.3	0	0	1,634	85	0	0
9DITCH	25	11.9	PIPE	8	0.3	0	0	2,468	98	0	0
1DITCH	514	15.5	PIPE	187	0.4	0	0	58,853	115	0	0
16BA	192	15.2	PIPE	67	0.3	0	0	21,020	109	0	0
16bBA	64	12.6	POND	21	0.3	10	46	6,497	101	4,792	74
25BAPnd	40	6.9	POND	9	0.2	3	33	2,816	71	1,543	55
HC7	1,002	21.9	PIPE	481	0.5	0	0	150,822	151	0	0
HC4	57	37.6	POND	43	0.8	1	2	13,581	240	2,376	17
HC10	91	15.3	PIPE	33	0.4	0	0	10,327	113	0	0
HC9	261	1.3	PIPE	33	0.1	0	0	10,640	41	0	0
HC	2,827	0.6	PIPE	366	0.1	0	0	116,208	41	0	0
TB1	1,072	0.3	PIPE	130	0.1	0	0	41,163	38	0	0
France	16	34.5	POND	11	0.7	5	50	3,444	216	2,747	80
OGrove	4	23.2	POND	2	0.5	1	29	695	165	396	57
HC3	24,325	0.8	PIPE	3192	0.1	0	0	1,012,880	42	0	0
TOTAL	30,617	2.1		4,648	0.2	22.0	0.5	1,471,646	48	14,769	1
Spring Creek Watershed											
SC1	254	32.7	PIPE	173	0.7	0	0	54,134	214	0	0
SC2	382	11.1	PIPE	109	0.3	0	0	34,492	90	0	0
SC7	221	0.8	PIPE	23	0.1	0	0	7,249	33	0	0
SC4	107	13.3	PIPE	37	0.3	0	0	11,594	109	0	0
SC3	482	2.0	PIPE	64	0.1	0	0	20,446	42	0	0
SC9	295	0.2	PIPE	35	0.1	0	0	11,131	38	0	0
SC5	264	0.9	PIPE	34	0.1	0	0	10,929	41	0	0
SC8	551	0.9	PIPE	76	0.1	0	0	24,027	44	0	0
SC6	1,487	0.4	PIPE	191	0.1	0	0	60,616	41	0	0
SC12	10,853	0.5	PIPE	1431	0.1	0	0	453,579	42	0	0
SC11	331	0.6	PIPE	44	0.1	0	0	13,869	42	0	0
11PR	282	15.3	PIPE	104	0.4	0	0	32,811	116	0	0

Table 4-8-1 Summary of Existing Conditions P8 Modeling Results for the City of Red Wing

SUB-WATER SHED	TOTAL AREA [acres]	IMPER-VIOUS [%]	BMP ⁴ TYPE	AVG ANNUAL TP LOAD ^{1,2} [lbs/year]	ANNUAL TP LOADING RATE ^{1,2} [lbs/acre/year]	ANNUAL TP REMOVAL ^{1,2} [lbs/year]	ANNUAL TP REMOVAL EFFICIENCY ^{1,2,3} [%]	AVG ANNUAL TSS LOAD ^{1,2} [lbs/year]	ANNUAL TSS LOADING RATE ^{1,2} [lbs/ac/year]	ANNUAL TSS REMOVAL ^{1,2} [lbs/year]	ANNUAL TSS REMOVAL EFFICIENCY ^{1,2,3} [%]
BigSky	11	18.0	POND	5	0.4	2	49	1,557	137	1,189	76
TOTAL	15,518	1.7		2,327	0.1	2.4	0.1	736,435	47	1,189	0
Cannon River Watershed											
3KW	13	37.4	POND	10	0.8	2	18	3,179	242	1,440	45
2KW	20	18.2	POND	9	0.4	3	31	2,804	138	1,588	57
1KW	25	26.8	POND	14	0.6	7	23	4,526	181	3,721	50
3HT	26	38.6	POND	20	0.8	5	13	6,304	243	3,423	34
2HT	37	15.9	POND	14	0.4	4	27	4,516	121	2,349	52
1HT	27	9.7	POND	7	0.3	9	16	2,320	85	3,653	33
CR1	286	2.3	PIPE	44	0.2	0	0	14,067	49	0	0
CR3	34,691	0.9	PIPE	4916	0.1	0	0	1,555,359	45	0	0
CR2	189	0.2	PIPE	20	0.1	0	0	6,412	34	0	0
TOTAL	35,315	1.0		5,056	0.1	29.4	0.6	1,599,487	45	16,173	1
Total for Area Modeled in P8⁵											
TOTAL	85,240	2.2		13,623	0.2	99	0.7	4,280,223	50	56,338	1

¹ - Total Phosphorous (TP) and Total Suspended Solids (TSS) calculated using nurp50.p8p particle file in P8.

² - Subwatershed loading and Best Management Practice (BMP) calculated for individual subwatersheds. Results do not represent cumulative removals of BMPs in series.

³ - Removal efficiencies improve for increasing depth. Most ponds in the P8 model area had depths of two feet or less. NURP removal rates are 80–90% and 60% for TSS and TP respectively.

⁴ - BMP type based on P8 devices. Subwatersheds with a BMP type identified as "Pipe" currently do not receive water quality treatment.

⁵ - This includes area outside of the City of Red Wing Municipal Boundary.

Section 5

Regulatory Framework

This section describes the regulatory framework within which the City of Red Wing operates. It provides details of the programs and regulations that affect water resources management within the City, along with a general overview of other federal, state, and local programs that govern surface water management in the City of Red Wing.

These plans, ordinances, and programs are intended as a resource for staff, residents, and people doing business in Red Wing. They also serve here to deliver a complete guide to **Red Wing's** water resources program for reviewers and others.

The details presented here represent these programs as they stand as of the date of this Plan. Some of these programs will certainly change. Users of this section should check the City's web site at <http://www.red-wing.org> to locate any revisions to the following programs.

5.1 CITY OF RED WING REGULATORY FRAMEWORK

This section describes the City's existing and proposed ordinances and programs that affect water resources. Topics covered include stormwater management, grading and erosion control, shoreland regulation, floodplain regulation, wetland management, building permits, and fertilizer regulations. The City Ordinances relating to stormwater are included in this Plan as **Appendix A**.

5.1.1 Stormwater Management

Stormwater management in the City of Red Wing is regulated under the City of Red Wing Code of Ordinances Chapter 11: Division 57. The City's stormwater management regulations seek to limit the negative impacts from poorly sited development or incompatible activities and regulate activities that may have negative impacts on water quality, runoff rates and volumes, and environmentally sensitive areas. The City of Red Wing's stormwater management regulations contain specific design standards and requirements for temporary and permanent erosion and sediment control, minimum building elevations, stormwater detention and treatment facilities, wetlands, trout streams, inspection and maintenance, lawn maintenance, and vegetation removal.

Compliance with the City's **stormwater management regulations is evaluated through a** Stormwater Management Plan review. In order to obtain a building permit and/or grading permit, a Stormwater Management Plan review is required for all projects disturbing more than 1 acre of land. Additional standards apply for projects within the Cannon River watershed, which is designated as an Outstanding Resource Value Water by the Minnesota Pollution Control Agency (MPCA). Those standards are included in the National Pollutant Discharge Elimination System (NPDES) Permit which is issued by the MPCA.

5.1.1.1 Stormwater Management Plans and Review Procedure

For all projects disturbing more than 1 acre of land, a Stormwater Management Plan must be submitted to the City of Red Wing Zoning Administrator. Materials to be included in the stormwater plan submittal are described in detail in Division 57 and include the following:

- Existing site map
- Computations
 - Hydrologic computations from each subwatershed
 - Water quality computations
 - Computations demonstrating trout stream standard compliance (if applicable)
- Site construction plan
- Plan of final site conditions

Stormwater Management Plans submitted to the zoning administrator are forwarded to the City engineer for review and comment. Stormwater Management Plans for projects that disturb less than 1 acre are processed as a Certificate of Compliance as per Division 90 of the Zoning Code. Stormwater Management Plans for projects disturbing 1 acre or more are processed as a Conditional Use Permit.

Approval of a Stormwater Management Plan expires 1 year after the date of approval unless construction has commenced according to the approved plan. An extension may be requested from the zoning administrator, and a plan may be revised in the same manner as originally approved. A Stormwater Management Plan may be conditionally approved pending reasonable and necessary conditions to comply with the stormwater management regulations.

For Stormwater Management Plans that require a Conditional Use Permit, the applicant must submit an agreement to comply with the conditions of the plan (e.g., construct physical improvements, dedicate easements). This agreement must be accompanied by a bond, letter of credit, or cash deposit to cover the cost of complying with the agreement. The Red Wing City Council will determine (or designate a city official to determine) the adequacy of the agreement and bond. Projects requiring a Certificate of Compliance do not require a bond, but the Certificate of Occupancy may be withheld for projects that have not complied with the permit conditions of the project.

5.1.1.2 Stormwater Management Standards

Stormwater management standards are presented in detail in Division 57 and address the following areas:

- Site dewatering
- Waste and material disposal
- Tracking of sediment

- Drain inlet protection
- Site erosion control
- Criteria for permanent detention facilities
- Wetlands
- Trout streams
- Steep slopes
- Catch basins
- Drain leaders
- Inspection and maintenance
- Models/methods/computations
- Watershed management plans/groundwater management plans
- Easements
- Building elevations

Permanent stormwater detention facilities are subject to specific standards. Stormwater detention facilities for new development must be sufficient to limit peak flows in each subwatershed to those that existed before the development for the 100-year storm event or the 10-year post-development discharge, whichever is less. Applicants must evaluate the potential use of regional facilities as a means of reducing on-site treatment, as well as the use of natural features as a means of stormwater detention. Stormwater management practices are prioritized in the following sequence:

1. Natural infiltration and runoff on-site
2. Flow attenuation by use of open vegetated swales and natural depressions
3. Stormwater retention facilities
4. Stormwater detention facilities

Stormwater detention facilities are required to include water quality treatment features and should be designed according to **the most current technology as reflected in the MPCA's *Minnesota Stormwater Manual*** (MPCA, 2005, as amended). Minimum design requirements are listed in Division 57. Additional requirements applicable to wetlands (see **Section 5.1.5**) and trout streams (see **Section 5.4**) are listed in Division 57. Although the Cannon River Management ordinance, City of Red Wing Code of Ordinances Chapter 11: Division 53 does not specifically address stormwater management, there are other special requirements in the ordinance that may indirectly affect stormwater management.

In addition to the general requirements of the stormwater ordinance, the following best management practices (BMPs) apply to proposed projects located within trout stream watersheds.

1. Required use of infiltration or modified dry ponds (e.g., “**extended detention basins**”) with filtered bottom withdrawal. Whenever stormwater detention is required in trout stream watersheds, infiltration basins or extended detention basins must be installed instead of wet detention basins. To prevent temperature increases, no standing water is allowed in new stormwater detention basins. The basin designs include:
 - a) Volume to retain one inch of runoff from new impervious area created by the project, when infiltration is used.
 - b) Use of a multi-tiered outlet that includes a low-flow outlet to detain runoff from the 1-year, 24-hour rainfall event for a period of 1½ to 2 days.
 - c) Requirement that the bottom of the basin be located above the groundwater table; if not, under drains must be used to ensure that infiltration is not limited by high groundwater levels.
2. Use of bioretention stormwater BMPs that use plants and soils to remove pollutants from stormwater and incorporate shallow, vegetated depressions along parking lots and roads. These hold stormwater for short periods of time, allowing it to infiltrate or drain slowly to natural water bodies. If well-drained soils are present, infiltration basins or rainwater gardens designed to contain a volume equivalent to one inch of runoff from impervious areas is encouraged as an alternative to an extended detention basin.
3. “**Stormceptors**” and other water quality treatment devices that remove sediment from stormwater may be used in place of other BMPs.
4. Porous pavement and/or reinforced sod should be considered where feasible (i.e., for overflow parking lots).
5. If the proposed project includes a trout stream tributary that currently experiences erosion and/or sedimentation problems, the project proposer must work with the City to consider channel modifications that will also address the existing erosion and/or sedimentation problem.
6. Protect and replace riparian tree canopies. Where feasible, the project proposer must preserve all trees and shrubs within 50 feet of the top of the stream bank to provide shade for the trout stream. All stormwater detention facilities shall include planting of new trees and/or preservation of existing trees to provide shade. This helps minimize water temperature increases in the detention facility.
7. Project proposers must consider methods for reducing the amount of impervious surface on the development site including:
 - a) Reduce road widths.
 - b) Eliminate paving in the center of cul-de-sacs.
 - c) Reduce of sidewalk widths.
 - d) Allow and provide for shared parking.
 - e) **Create a smaller building “footprint”** through use of two-story buildings.
 - f) Install semipermeable/permeable paving.

The City will update its stormwater management requirements included in City Ordinances Chapter 11 Division 53 and Division 47 as appropriate to remain consistent with the 2013 updates to the MS4 General Permit and Construction Stormwater Permit.

5.1.2 Grading and Erosion Control

The City of Red Wing requires Grading and Erosion Control Permits as part of Division 57 of the Zoning Ordinance (see **Appendix A**). A Grading and Erosion Control Permit is required for projects that raise or lower the ground elevation, remove topsoil, alter the contours of the land, or utilize, disturb, or remove more than 50 cubic yards of earthen material (less on steep slopes and in shoreland bluff areas). Normal farming and agricultural practices are exempt from obtaining a permit. Single family residential construction is also exempted but must follow the approved grading plan for the subdivision (or Conditional Use Permit if the area to be graded is greater than 1 acre).

Erosion Control and Sediment Plan review by the City prior to issuing a Grading and Erosion Control Permit is required for any activity disturbing more than 1 acre of land or where slopes exceed 13% (City Code Chapter 11: Division 55). The plan must address both temporary and permanent erosion control. Land-disturbing activities and exemptions are defined in the City's stormwater management ordinance (Division 57). Property owners submit permit applications to the zoning administrator for approval or denial following review by the building inspection and engineering departments.

Grading projects not requiring a Conditional Use Permit will be processed as a Certificate of Compliance. If the area to be graded is less than 1 acre, the project proposer will be required to install temporary erosion and sediment controls at locations as directed by the City engineer or his/her representative. The City may seek assistance from the Goodhue County Soil and Water Conservation District (Goodhue County SWCD) or consultants to review erosion control plans.

An Erosion and Sediment Control Plan is part of the Stormwater Management Plan submittal and must accompany an application for a Grading and Erosion Control Permit. An Erosion and Sediment Control Plan must include a set of BMPs or equivalent measures designed to control surface runoff and erosion and to retain sediment on-site during land-disturbing activities. The City engineer will review the Grading and Erosion Control Plan. The plan must include temporary erosion and sediment controls as directed by the City engineer (or designated representative) if the area to be graded is less than 1 acre. If the area to be graded is 1 acre or more, an NPDES Construction Stormwater Permit issued by the MPCA (see **Section 5.3.5**) is required.

General grading and erosion standards are included in the City's stormwater management regulations (Division 57). Those standards address:

- Site dewatering.
- Waste and material disposal.
- Tracking.

- Drain inlet protection.
- Site erosion control.

Site erosion control standards specify that:

1. Channelized runoff from adjacent areas passing through the site shall be diverted around disturbed areas, if practical. Otherwise, the channel shall be protected as described below. Sheetflow runoff from adjacent areas greater than 10,000-square feet in area shall also be diverted around disturbed areas, unless shown to have resultant runoff rates of less than 0.5 cubic feet/sec. across the disturbed area for the 1-year storm. Diverted runoff shall be conveyed in a manner that will not erode the conveyance and receiving channels.
2. All activities on the site shall be conducted in a logical sequence to minimize the area of bare soil exposed at any one time. If at all possible, grading operations that disturb existing vegetation or ground cover shall be placed to minimize the area of bare soil exposed at any one time.
3. Runoff from the entire disturbed area on the site shall be controlled by meeting either subsections (a) and (b) or (a) and (c) below:
 - a. All disturbed ground left inactive for 14 or more days shall be stabilized by seeding and mulching, or sodding (only available prior to September 15), or by mulching, covering, or other equivalent control measures.
 - b. For sites with more than 1 acre disturbed at one time, or if a channel originates in the disturbed area, one or more temporary or permanent sedimentation basins shall be constructed. Each sedimentation basin shall: (1) have a surface area of at least 1% of the area draining to the basin, (2) be at least 3 feet deep, and (3) be constructed in accordance with accepted design specifications. The sedimentation basins shall be maintained regularly and sediment shall be periodically removed to maintain a depth of 3 feet. The basin discharge rate shall also be sufficiently low as to not cause erosion along the downstream discharge channel or the receiving water.
 - c. For sites with less than 1 acre disturbed at one time, sedimentation basins are still encouraged. However, at a minimum, silt fences, straw bales, or equivalent control measures shall be placed along all side slope and downslope sides of the site. If a channel or area of concentrated runoff passes through the site, silt fences shall be placed along the channel edges to reduce sediment reaching the channel. Silt fences placed in concentrated flow channels perpendicular to the flow direction shall be backed by snow fence and support posts that are no more than 4 feet apart. The use of silt fences, straw bales, or equivalent control measures must include a maintenance and inspection schedule.

4. Any soil or dirt storage piles containing more than 10-cubic yards of material should not be located with the downslope toe of the pile less than 25 feet from a roadway or drainage channel. If remaining for more than 7 days, dirt stockpiles shall be stabilized by mulching, vegetative cover, tarps, or other means. Erosion from piles which will be in existence for less than 7 days shall be controlled by placing straw bales or silt fence barriers around the pile. If exposed for more than 7 days, soil or dirt storage piles from in-street utility repair or construction located closer than 25 feet of a roadway or drainage channel must be covered with tarps or suitable alternative control; storm drain inlets must be protected with straw bale or other appropriate filtering barriers.
5. A performance bond, letter of credit, or cash deposit shall be required for Stormwater Management Plans that require a Certificate of Compliance if the proposed project is located partially or wholly within a trout stream.

Additional standards exist for specific districts. City of Red Wing Code of Ordinances Chapter 11: Division 50 (Shoreland Management): (1) prohibits placing fill or excavated materials in a manner that creates an unstable slope, (2) specifies maximum allowable slopes for different uses (e.g., 25% for trails), and (3) requires that plans to place fill and excavated materials on steep slopes (13% or greater) must not create finished slopes of 30% or greater. For projects located within the Cannon River land use districts, stricter standards apply and grading permits must be approved by the City Council, not the zoning administrator. Management regulations specific to the Cannon River district are described in Division 53 and include regulations pertaining to grading, filling, and alteration of beds of public waters.

5.1.3 Shoreland Management

City of Red Wing Code of Ordinances Chapter 11: Division 50 (Division 50) of the City's zoning ordinance addresses lake and shoreland management and contains the City's MDNR-approved shoreland ordinance. The Shoreland Ordinance, called the Lake and Shoreland Management Overlay District, applies to the shorelands of MDNR-designated public waters that are within the City and larger than 10 acres in size. **The ordinance defines "shoreland" as:** (1) land within 1,000 feet of the ordinary high water level (OHWL) of a MDNR-protected water, (2) land within 300 feet of a river or stream, or (3) the extent of a floodplain of a river or stream. **Table 5-1-1** lists the shoreland classifications for the lakes and streams under the jurisdiction of the Shoreland Ordinance.

The ordinance regulates development and other land alterations in shoreland areas. Special requirements are placed on shoreland alterations, including vegetation alterations, grading, filling, and stormwater management. Stormwater management requirements include limitations on the percentage of impervious area for each zoning designation and preferred use of existing natural drainage ways, wetlands, and vegetated land for stormwater management. When existing features are not sufficient to adequately manage stormwater, stormwater management designs that use surface drainage, vegetation, and infiltration rather than buried pipes and constructed materials and facilities must be considered. Newly constructed stormwater outfalls to public waters must provide for filtering or settling of suspended solids and skimming of surface debris prior to discharge.

A grading permit is required for movement of 10-cubic yards of material or more on steep slopes (>13%) or in Shoreland Bluff Impact Zones (shoreland bluffs and areas within 30 feet of shoreland bluffs). This threshold is less than the 50-cubic yard threshold in non-shoreland areas. Specific requirements for topographic alterations, grading, and filling in shoreland districts are provided in Division 50.

The shoreland ordinance specifies design criteria for structures in addition to any requirements imposed by floodplain regulations (see **Section 5.1.4**). Where floodplain regulations do not apply, minimum floor or flood-proofed elevations are determined as:

1. For lakes—At least 3 feet higher than the OHWL or highest known water level, whichever is greater.
2. For rivers and streams—At least 3 feet above the flood of record, if data are available. Otherwise, at least 3 feet above the OHWL or at an elevation established by a technical evaluation to determine the effects of the proposed construction on flood stages and flood flows. In all cases, technical evaluations must be done by a qualified engineer or hydrologist consistent with parts 6120.5000 to 6120.6200 governing management of floodplain areas. If multiple approaches are used the highest elevation must be used.

Additional design criteria and standards applicable to shoreland areas and not specified herein are detailed in Division 50. The Cannon River is a state-designated “scenic” river in the City of Red Wing. To protect the river in its present condition, the City enacted the Cannon River Management Ordinance (Division 53), which contains regulations that are generally more restrictive than the City’s Shoreland Ordinance.

Table 5-1-1. Shoreland Classifications for City of Red Wing Water Bodies.

Shoreland Classification	Water Body Name	MDNR-Public Waters #
Natural Environment Lakes:	Goose Lake	25-0005
	Brunner Lake	25-0006
	Birch Lake	25-0009
	Spring Creek Lake	25-0011
	Cannon Lake	25-0012
	Devils Lake	25-0013
	Larson Lake	25-0016
	Sturgeon Lake	25-0017 01
General Development Lakes:	U.S. Lock & Dam No. 3 Pool	25-0017 00
	U.S. Lock & Dam No. 4 Pool	79-0005
Transition Rivers:	Vermillion River—From Red Wing city limits to confluence with Mississippi River in Section 11, T113N, R15W	N/A
Tributary Rivers:	All other non-classified watercourses as shown on county protected waters inventory and map	N/A

5.1.4 Floodplain Regulations

The City of Red Wing's Floodplain Regulations (City of Red Wing Code of Ordinances Chapter 11: Division 52) cover floodplain management (see **Appendix A**). The floodplain regulations apply to land located within the Floodway, Flood Fringe, or General Flood Plain Districts. These districts are shown on the City zoning map. The Floodway and Flood Fringe Districts correspond to those areas designated as Floodway and Flood Fringe on **the City of Red Wing's** 2009 Flood Boundary and Floodway Map, and Flood Insurance Rate Map (FIRM), and are contained in the City of Red Wing Flood Insurance Study (FIS). The General Floodplain District corresponds to those areas designated as unnumbered "A Zones" on the FIRM. The Red Wing FIRM shows floodplain boundaries for the Mississippi River, the Cannon River, Hay Creek, and Spring Creek (see **Figure 3.11.1**). The ordinance does not apply to other non-designated areas of the City which may be flood-prone.

The Floodplain Ordinance regulates developments, land alterations, and uses within each of the floodplain districts. The Floodway District has the most stringent requirements. For example, the ordinance prohibits construction of homes in the floodway and any type of use (fill, structures, etc.) that will cause any increase in the flood stage. In the Flood Fringe District, all structures must be at or above the regulatory flood protection elevation (generally, 1 foot above the 100-year flood elevation), and filling is allowed only as a conditional use. In the General Flood Plain District, the 100-year flood peak discharge, water surface profile, and floodway must be determined and approved by the City Council. The FIS, together with the Floodplain Ordinance, allows the City **to take part in the federal government's flood insurance program.**

The City's **stormwater management regulations require lowest floor elevations of buildings to be** at least 2 feet above the 100-year flood level for the adjacent lake or pond. It also requires the lowest entry elevation of buildings to be at least 2 feet above the 100-year flood elevation of the swale or channel near the building in question. Unlike the City's **floodplain ordinance, which** only applies to the floodplain areas currently identified on the Red Wing FIS, these requirements apply to all flood-prone areas.

5.1.5 Wetlands Management

The City of Red Wing manages wetlands in accordance with the requirements of the Wetland Conservation Act (WCA) and the standards presented in the City's **Stormwater Management Ordinance**. The Goodhue County SWCD currently serves as the local governmental unit (LGU) responsible for administering the WCA in the City of Red Wing. As part of administering the WCA rules, designated LGUs are responsible for reviewing and approving wetland delineations and wetland functional value determinations. The LGU issues exemptions, no-loss or replacement-plan determinations for drainage, excavation or filling activities in wetlands.

Figure 3.8.1 shows the wetlands located within the City of Red Wing identified on the National Wetlands Inventory (NWI) map. The NWI map shows that most of the wetlands are located in the floodplains adjacent to the Mississippi River, Cannon River, Spring Creek, and Hay Creek. There may be additional wetlands located in the City that are not shown on the NWI map. The City's **Stormwater Management Ordinance requires a wetland delineation be performed as part**

of a Stormwater Management Plan submittal to prevent improper management of previously unmapped wetlands. If proposed City projects are located within wetlands, the City of Red Wing will involve the appropriate regulatory agencies in the planning of these projects, including the U.S. Army Corps of Engineers (USACE), the Minnesota Department of Natural Resources, the Minnesota Board of Water and Soil Resources, and the LGU (Goodhue SWCD).

Although wetlands are not prohibited to be used as stormwater detention basins, wetland use as stormwater basins constitutes an impact that must be permitted and mitigated under WCA and the USACE regulations, both of which require wetland impact avoidance and minimization evaluations. The City of Red Wing's Stormwater Management Ordinance (see **Appendix A**) includes standards for wetlands. These standards require pre-settlement of stormwater runoff prior to discharge to wetlands as well as a 25-foot wide buffer strip of natural vegetation around both wetlands and detention basins.

Additional federal, state, regional, and local regulations pertaining to wetland management are described in greater detail in **Section 5.2.4** and include the following:

- Section 10 of the Rivers and Harbors Act
- Sections 401 and 404 of the Clean Water Act
- MDNR Public Waters Program
- Wetland Conservation Act of 1991 (WCA)
- State Water Quality Standards, Minnesota Rules 7050

5.1.6 Building Permits

The City has a building permit program. All building permit applications are reviewed and approved/denied by the City building official. For grading activities disturbing less than 1 acre (such as an individual homesite), the building inspection department requires an erosion control inspection before framing of the building begins. The department supplies a generic erosion control plan to the permittee. The City's **stormwater management** regulations require more extensive erosion and sediment controls for larger projects.

5.1.7 Fertilizer Regulations

The City of Red Wing's **stormwater management regulations contain lawn fertilizer regulations** that forbid placement of fertilizer on impervious surfaces, drainage ways, or within buffer areas of wetlands or detention basins. The City's **stormwater management regulations contain limits** on the phosphorus content in the fertilizer; these limits have been superseded by the Minnesota Phosphorus Lawn Fertilizer Law (Minnesota Statutes 18C), which prohibits the use of fertilizers with greater than 0.67% phosphate by weight, except in limited circumstances. More information is available from the Minnesota Department of Agriculture:

www.mda.state.mn.us/protecting/waterprotection/phoslaw.aspx.

5.2 REGULATORY PROGRAMS AFFECTING THE CITY

There are several programs at the state and federal level which require the City of Red Wing to implement controls to manage stormwater and/or protect water resources. Key programs affecting the City are described in this section of the Plan.

5.2.1 National Pollution Discharge Elimination System (NPDES) Program

The City of Red Wing is included in a group of communities with populations greater than 10,000 that are federally required to obtain a Municipal Separate Storm Sewer System (MS4) Permit for managing non-point source stormwater. The Phase II National Pollution Discharge Elimination System (NPDES) Permit Program requires cities such as Red Wing to file a Phase II NPDES MS4 Permit with the Minnesota Pollution Control Agency (MPCA), which addresses how the City will regulate and improve stormwater discharges. The permit must include a Stormwater Pollution Prevention Program (SWPPP) addressing all of the requirements of the permit. The City of Red Wing submitted its most recent permit application in 2014. The City's **SWPPP** is described in **Section 5.2.2**.

In Minnesota, the NPDES Program is administered by the MPCA (see **Section 5.2.2**). The NPDES Program also includes the NPDES General Stormwater Permit for Construction Activity, the NPDES General Industrial Stormwater Permit Program, and the Subsurface Sewage Treatment System (SSTS) regulations (7080 Rules).

5.2.1.1 MS4 General Permit Reissuance

The MPCA reissued the MS4 General Permit in August, 2013. The current permit shifts from the initial focus on permit program development to measuring program implementation. The main issues addressed in the reissued MS4 General Permit include:

- Impaired waters and total maximum daily loads (TMDLs).
- Construction stormwater erosion and sediment control.
- Post-construction BMP operations and maintenance.
- Mapping and inventory of the stormwater system.
- SWPPPs and coordination with local water plans.
- Non-degradation/anti-degradation.
- Minimum control measures for education.

Changes to the MS4 General Permit include revisions to the above requirements. The most significant revisions include:

- Inventory of all ponds, wetlands, and lakes
- Post-construction stormwater standards including no net increase in total phosphorus, total suspended solids, or volume from new development

- Post-construction stormwater standards including a net reduction in total phosphorus, total suspended solids, and volume from redevelopment
- Inventory of facilities that contribute pollutants to stormwater discharges
- Procedures and schedule to determine treatment effectiveness of stormwater ponds
- Additional documentation requirements for minimum control measures

These revisions are described in the *Revisions to the MS4 SWPPP Requirements* 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>

5.2.2 City of Red Wing Stormwater Pollution Prevention Program (SWPPP)

The Phase II NPDES MS4 Permit must include a SWPPP addressing all of the requirements of the MPCA's permit. The City of Red Wing's current NPDES Phase II MS4 SWPPP addresses six *minimum control measures* (MCMs) outlined in the permit requirements. The City of Red Wing has already developed and put into place many of the BMPs required in the NPDES Permit. The MCMs required by the permit are:

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 SWPPP identifies issues related to the above minimum measures. In several instances, the City's SWPPP references the **Stormwater Management Ordinance** (see **Section 5.1.1.1**) as the primary means to address construction site runoff control and post-construction stormwater runoff. The SWPPP is designed to address these issues, thereby minimizing the discharge of pollutants into the City's **stormwater system**, protecting and enhancing water quality, and satisfying the appropriate requirements of the Clean Water Act of 1984 (as amended).

The City is not subject to any load reductions resulting from completed total maximum daily load studies (TMDLs, see **Section 5.2.3**). Future load reduction requirements resulting from TMDLs will have to be addressed in **Section VI of the City's SWPPP**. The complete SWPPP is presented in **Appendix B** of this plan.

5.2.3 Total Maximum Daily Load (TMDL) Allocations

The federal Clean Water Act (CWA) requires states to adopt water quality standards to protect **the nation's waters**. Water quality standards designate beneficial uses for each water body and

establish water quality criteria that must be met within the water body to maintain its designated use(s). Section 303(d) of the CWA requires each state to identify and establish priority rankings for waters that do not meet the water quality standards. The list of impaired waters is updated by the state every 2 years. The impaired waters list is sometimes referred to as the 303(d) list; the 303(d) list includes only the subset of impaired waters for which a total maximum daily load (TMDL) study has not yet been approved.

For impaired water bodies, the CWA requires the development of a TMDL study. A TMDL is a threshold calculation of the amount of a pollutant that a water body can receive and still meet water quality standards. A TMDL establishes the pollutant loading capacity within a water body and develops an allocation scheme amongst the various contributors which include point sources, non-point sources, natural background sources, and adds a margin of safety. As 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). A load allocation (LA) is developed that establishes allowable pollutant loadings from non-point sources and natural background levels in a water body.

The City of **Red Wing's** SWPPP requires the City to review the impaired waters list to identify any TMDLs that may affect the City's **MS4** Permit. For completed TMDLs with applicable waste load allocations, the City must perform the following actions and document these actions in the **City's SWPPP**:

- Identify the location(s) of discharge(s) from the **City's system to the impaired waters**.
- Develop a contributing factors list and, if possible, a map of the contributing factors.
- Identify BMPs that contribute to achieving the WLA
- Document progress towards meeting the WLA and an estimation of the date the WLA will be achieved.

Impaired waters within or downstream of the City of Red Wing include Hay Creek, Spring Creek, the Cannon River, the Mississippi River, the Vermillion River, and Lake Pepin. These waters are listed in **Table 3-10-1, Table 6-1-1**, and shown in **Figure 3.10.1**. Currently, there are no completed TMDLs with WLAs applicable to the City.

5.2.4 Wellhead Protection and Groundwater Management

The City of Red Wing relies on groundwater for its municipal water supply; the City's municipal well system consists of five wells within the Mt. Simon aquifer. The municipal water supply system is maintained and operated by the City of Red Wing Public Works Department..

In 1998, the Minnesota Department of Health (MDH) enacted Rule 4720, which requires all public water suppliers that obtain their water from wells to prepare, enact, and enforce wellhead protection plans. A wellhead protection plan (WHPP) is intended to protect drinking water from being polluted by managing potential sources of contamination. In compliance with the Minnesota Wellhead Protection Rules (MN Rules 4720.5100 through 4720.5590), the City completed Part 1 of its WHPP in 2013, including the delineation of a wellhead protection area

(WHPA) and a Drinking Water Supply Management Area (DWSMA). The City of Red Wing expects to complete Part 2 of the WHPP in 2014. The WHPP will include recommendations and/or regulations for protection of source water within the City of Red Wing.

While the MDH is the official state agency responsible for addressing environmental health matters related to groundwater, various other agencies have groundwater management and protection roles. Groundwater resources are further regulated by Goodhue County (via the SWCD). The MDNR regulates groundwater usage rate and volume as part of its charge to conserve and manage the waters of the state. The MPCA administers and enforces laws relating **to pollution of the state's waters, including groundwater**. The Minnesota Geological Survey provides a complete account of the state's groundwater resources.

5.2.4 Wetland Conservation Act and Wetland Management

In addition to the City and county requirements, wetland management within the City of Red Wing is also governed by the following federal, state, regional, and local regulations. These regulatory programs are described in this section.

Federal regulatory programs include the following:

Section 10 of the Rivers and Harbors Act—The U.S. Army Corps of Engineers (USACE) is responsible for this program, which regulates the placement of structures and/or work in, or affecting, navigable waters of the United States. This may be applicable to public waters and wetlands located along the Mississippi River (see **Figure 3.8.2**)

Section 404 of the Clean Water Act—The USACE has primary responsibility for administering the program but the Environmental Protection Agency (EPA) can appeal to a higher USACE authority or veto a USACE decision. This program regulates excavation of wetlands and the discharge of dredged or fill material into waters of the United States, which includes wetlands (see **Section 5.3.9**).

Section 401 of the Clean Water Act—Activities which require a Section 10, Section 404, or Federal Energy Regulatory Commission Permit must first obtain Section 401 Water Quality Certification from the MPCA stating that the activity conforms to state water quality standards (see **Section 5.3.9**).

State regulatory programs addressing wetlands include the following:

MDNR Public Waters Program, Minnesota Statutes 103G (see **Section 5.3.3** of this plan)—The MDNR is the responsible agency for administering this program.

Wetland Conservation Act of 1991 (WCA)—LGUs are responsible for administering the rules. The intent of the WCA is to promote no net loss of wetlands. The WCA rules regulate excavation in some wetlands, and draining and filling activities in all wetlands, except MDNR public waters and public waters wetlands. The WCA rules (Minnesota Rules 8420) require that wetland impacts in this region be replaced at a minimum replacement ratio of 2:1 in non-agricultural areas. Local units of government may have stricter wetland regulations. The MDNR

is included in enforcement of the WCA and is responsible for identification, protection and management of calcareous fens. The WCA has been amended several times. The current WCA rule was effective August 2009 with subsequent WCA statute changes effective in August 2011 and June 2012.

As part of administering the WCA rules, the designated LGUs are responsible for reviewing and approving the wetlands delineations and wetland functions and value determinations. The Goodhue County SWCD is the LGU responsible for administering the WCA within the city limits and in unincorporated areas of the county adjoining the City. **Figure 3.8.1** shows the wetlands in the City, as identified by the National Wetland Inventory (NWI) update facilitated by the MDNR.

State Water Quality Standards, Minnesota Rules 7050—The MPCA is the responsible agency. The rules include water use classifications and water quality standards for wetlands that are narrative rather than numerical. The rules include a mitigative process to protect wetlands from significant adverse impacts and to maintain nondegradation of designated wetland uses. Although not prohibited, the MPCA discourages the use of wetlands for stormwater treatment. In the few projects where the requirements of the WCA are not as comprehensive as MPCA water quality standards, the Phase II NPDES MS4 Permit requires the LGU to make a determination that will also satisfy Minn. R. 7050.0186.

5.3 OTHER AGENCY ROLES AND RESPONSIBILITIES

Along with the City of Red Wing, various units of government are involved in regulating water resource related activities. The regulatory roles and responsibilities of the following entities as they pertain to water resources are described in this section:

- Goodhue County
- Minnesota Department of Natural Resources (MDNR)
- Minnesota Board of Water and Soil Resources (BWSR)
- Minnesota Pollution Control Agency (MPCA)
- Minnesota Department of Health (MDH)
- Minnesota Environmental Quality Board (EQB)
- Minnesota Department of Transportation (MnDOT)
- Army Corps of Engineers (USACE)

5.3.1 Goodhue County

Counties (including Goodhue County) have a wide variety of duties. The **county's** responsibilities directly related to the City of Red Wing include:

- Levying and collecting taxes for the City.

- Construction and maintenance of county highways/roads.

More information is available at the Goodhue County website: <http://www.co.goodhue.mn.us>

5.3.2 Goodhue County Soil and Water Conservation District

Goodhue County SWCD assumes a range of environmental and water resource related duties, including:

- Groundwater management.
- Implementation of the Wetland Conservation Act (WCA).
- Development and implementation of the *Goodhue County Comprehensive Local Water Plan 2010-2020*.

Goodhue County delegates the development and implementation of its *Comprehensive Local Water Plan* (LWMP) to the SWCD. The purpose of the local plan is to address existing and potential water resource related issues in Goodhue County and how water resources can be protected, sustained, and enhanced. The plan addresses several issues divided into the following categories:

- Urban/Residential Water Quality
 - Erosion and Sediment Control
 - Septic System Compliance
 - Groundwater Protection
 - Impaired Waters
- Rural/Agricultural Water Quality
 - Erosion and Sediment Control
 - Feedlot Water Quality Improvement
 - Nutrient Management
 - Impaired Waters

The LWMP includes implementation items aimed at achieving the goals outlined for each of the topics listed above. These include conducting public education efforts, seeking and providing funding for implementing BMPs, providing technical assistance to municipalities, and other items. Actions targeting groundwater issues include assisting municipalities in wellhead protection plan (WHPP) development, feedlot inspection on a rotating schedule, identification of subsurface sewage treatment systems (SSTS), developing a baseline of groundwater nitrate concentrations, and others.

More information, including the most recent LWMP is available at the Goodhue County SWCD website: <http://www.goodhueswcd.org/>

5.3.3 Minnesota Department of Natural Resources (MDNR)

The MDNR Division of Ecological and Water Resources (Eco) manages water resources through a variety of programs related to lakes, rivers and streams, watersheds, wetlands, groundwater, and climate. MDNR Eco administers the Public Waters Work Permit Program, the Water Appropriation Permit Program, and the Dam Safety Permit Program. MDNR Fisheries administers the Aquatic Plant Management Control Permit Program and other fishery related permits.

Public Waters

The MDNR's Public Waters Work Permit Program (Minnesota Statutes 103G) requires a MDNR Public Waters Permit for work below the OHWL that will alter or diminish the course, current, or cross-section of any public waters or public waters wetlands, including lakes, wetlands, and streams. **For lakes and wetlands, the MDNR's jurisdiction extends to designated U.S. Fish and Wildlife Service Circular #39 Types 3, 4, and 5 wetlands which are 10 acres or more in size in unincorporated areas, or 2.5 acres or more in size in incorporated areas.** The program prohibits most filling of public waters and public waters wetlands for the purpose of creating upland areas. The Public Waters Work Permit Program was amended in 2000 to reclassify public waters and to make the administrative program more consistent with the WCA administrative program. Under certain conditions, work can be performed below the OHWL without a Public Waters Work Permit. Examples include docks, watercraft lifts, beach sand blankets, ice ridge removal/grading, riprap, and shoreline restoration. The City of Red Wing cooperates with this program by referring project proposers to the MDNR. The MDNR public waters in the City of Red Wing are listed in **Table 3-8-2** and shown in **Figure 3.8.2** of this plan.

The MDNR classifies sections of Spring Creek Hay Creek, and Bullard Creek as Trout Streams (see **Figure 3.8.2**). The MDNR places additional fishing restrictions on designated trout streams and encourages landowners to contract with the MDNR to establish easements along trout stream corridors. These easements generally encompass 66 feet of land and water on either side of the stream centerline, permit angler access, and allow the MDNR to conduct habitat improvement activities as necessary.

The Red Wing fen is a MDNR-protected calcareous fen located south of the Cannon River, in Section 21, Township 113N, Range 15W. The Goodhue County Biological Survey map (1995) shows this fen. A calcareous fen is the result of springs arising from limestone aquifers. Minnesota Rules 7050 identifies all the calcareous fens in the state and classifies them as “**outstanding resource waters.**” The MDNR is responsible for protection of the calcareous fens. A special section of the Wetland Conservation Act and Rules pertain to calcareous fens.

Groundwater

The MDNR regulates groundwater usage rate and volume as part of its charge to conserve and use the waters of the state. For example, suppliers of domestic water to more than 25 people or applicants proposing a use that exceeds 10,000 gallons per day or 1,000,000 gallons per year must obtain a Water Appropriation Permit from the MDNR. Appropriation Permits from the

MDNR are not required for domestic uses serving less than 25 persons for general residential purposes. The MDNR is also responsible for mapping sensitive groundwater areas, conducting groundwater investigations, addressing well-interference problems, and maintaining the observation well network.

Dam Safety

The MDNR administers the state's Dam Safety Program (MN Rules 6115.0300 – 6115.0520), which applies to all impoundments that pose a potential threat to public safety or property. Dams 6 feet or lower in height and dams that impound 15 acre-feet or less of water are exempt from the rules. Dams less than 25 feet high that impound less than 50 acre-feet of water are also exempt, unless there is a potential for loss of life. The dam safety rules require that the downstream impacts of a dam failure be analyzed under high-flow conditions (i.e., greater than a 100-year flood).

Future stormwater ponding areas could potentially come under the jurisdiction of the dam safety rules. If so, it is likely that the City would encourage modified pond designs or multiple ponds so that the ponding project would not come under the jurisdiction of the dam safety rules.

Other Regulations

In addition to permit programs, the MDNR oversees the Floodplain Management Program, the Public Waters Inventory Program, the Shoreland Management Program, the Flood Damage Reduction Grant Program, the Wild and Scenic Rivers Program, various surface and groundwater monitoring programs, and the Climatology Program. The MDNR is involved in enforcement of the Wetland Conservation Act (WCA) and is responsible for identifying, protecting, and managing calcareous fens.

More information is available at the MDNR website: <http://www.dnr.state.mn.us>

5.3.4 Minnesota Board of Water and Soil Resources (BWSR)

BWSR oversees the state's watershed management organizations (joint powers, county and watershed district organizations, county water managers) and Soil and Water Conservation Districts, and administers the Wetland Conservation Act.

More information is available at the BWSR website: <http://www.bwsr.state.mn.us>

5.3.5 Minnesota Pollution Control Agency (MPCA)

The MPCA administers the State Discharge System/National Pollutant Discharge Elimination System (NPDES) Permit Program (point source discharges of wastewater), the NPDES General Stormwater Permit for Construction Activity, the NPDES General Industrial Stormwater Permit Program, the NPDES Phase I and Phase II Storm Water Permit Program, and the subsurface sewage treatment system (SSTS) regulations (7080 Rules). **The MPCA also reports the state's "impaired waters"** to the U.S. Environmental Protection Agency. Spills should be reported directly to the MPCA.

The Minnesota Pollution Control Agency (MPCA) administers and enforces laws relating to **pollution of the state's waters, including groundwater**. The MPCA monitors ambient groundwater quality and administers SSTS design and maintenance standards. The Tanks and Spills Section of the MPCA regulates the use, registration, and site cleanup of underground and above-ground storage tanks. The MPCA is responsible for administering the programs regulating construction and reconstruction of SSTS. The MPCA requires an inspection program for SSTS that meets MPCA standards. Minnesota Rules 7080 govern administration and enforcement of new and existing SSTS.

The MPCA resumed selective administration of the Section 401 of the Clean Waters Act – Water Quality Certification Program in 2007. The program is primarily administered by the U.S. Army Corps of Engineers (USACE). Section 401 Certification is required to obtain a federal permit for any activity that will result in a discharge to navigable waters of the United States. Formal applications for 401 Certification must be sent to the MPCA.

More information is available at the MPCA website: <http://www.pca.state.mn.us>

Guidance for Dredged Materials (Stormwater Pond Maintenance)

The MPCA considers material excavated below the OHWL of waterbasins, watercourses, public waters, or public waters wetlands (as defined by Minnesota Statutes 103G.005) to be dredged material. Dredged material is defined as waste and regulated by the MPCA. The MPCA provides guidance for the management of dredged material on its website:

<http://www.pca.state.mn.us/index.php/water/water-types-and-programs/wastewater/dredged-materials-management.htm>

In 2012, the MPCA developed specific guidelines for the removal of sediment from constructed collection and conveyance systems. Guidance for the removal of sediment from municipal stormwater ponds differs from guidance for other dredged materials in three primary ways:

1. Permits are not required when performing routine maintenance on stormwater conveyance and collection systems;
2. The MPCA does not need to be notified of sediment removal activities. The MPCA recommends that cities keep records and documentation of sediment removal projects, and;
3. BMPs have been revised to include guidance from cities that have experience doing sediment removal projects.

Sediment dredged from municipal stormwater structures is still subject to disposal restrictions depending upon the presence of contaminants. The MPCA requires testing for 17 carcinogenic polyaromatic hydrocarbons (cPAHs), non-carcinogenic PAHs, arsenic, and copper. **The MPCA's** guidance documents provide guidance for collecting samples and testing sediment, and calculating chemical concentrations relative to soil reference values (SRVs). The number of samples to be collected depends on the surface area of the pond.

Management options vary according to the level of contamination present in the excavated material, and include:

1. **Level 1 (Residential Use)** – If all metal, cPAHs, and noncarcinogenic PAH concentrations in the sediment are below the SRV values specified for residential disposal (and provided in the MPCA guidance), the dredged sediment does not present an unacceptable risk to humans and is suitable for use or reuse on properties with residential or recreational use categories
2. **Level 2 (Industrial Use)** – If all metal, cPAHs, and noncarcinogenic PAH concentrations in the sediment are below the SRV criteria for level 2 disposal (but do not meet all residential SRV criteria), the dredged sediment is suitable for use or reuse on properties with an industrial use category.
3. **Level 3 (Regulated Solid Waste)** – If any metal, cPAHs, or noncarcinogenic PAH concentrations in the sediment exceed the Level 2 SRV criteria, the dredged material is characterized as having significant contamination and must be managed specifically for the contaminants present. Depending on the types and concentrations of contaminants, sediment may need to be disposed of at a Municipal Solid Waste (MSW) landfill that has an industrial solid waste management plan.

More detailed information regarding the disposal of sediment from stormwater ponds is available from the MPCA website: <http://www.pca.state.mn.us/index.php/view-document.html?gid=18075>

5.3.6 Minnesota Department of Health (MDH)

The MDH is the official state agency responsible for addressing all environmental health matters, including drinking water protection. The MDH administers the Well Management Program, the Wellhead Protection Program, and the Safe Drinking Water Act rules. The MDH also issues fish consumption advisories. The MDH is responsible for preventing pollution of water supplies to ensure safe drinking water sources and limit public exposure to contaminants. Through implementation of the federal Safe Drinking Water Act, the MDH conducts the Public Water Supply Program, which allows the MDH to monitor groundwater quality and train water supply system operators. The 1996 amendments to the federal Safe Drinking Water Act require **the MDH to prepare source water assessments for all of Minnesota's public water systems and to make these assessments available to the public.**

Through its Well Management Program, the MDH administers and enforces the Minnesota Water Well Code, which regulates activities such as well abandonment and installation of new wells. The MDH also administers the Wellhead Protection Program, which is aimed at preventing contaminants from entering public water supply wells.

The Wellhead Protection Program rules (Minnesota Rules 4720.5100 to 4720.5590) went into effect in 1997. These rules require all public water suppliers that obtain their water from wells to prepare, enact, and enforce wellhead protection plans (WHPPs, see **Section 5.2.4**). The MDH

prepared a prioritized ranking of all such suppliers in Minnesota. Regardless of the ranking, Rules 4720 require all public water suppliers to have initiated wellhead protection measures for the inner wellhead management zone prior to June 1, 2003. If a city with an existing WHPP drills a new well and connects it to the distribution system, the WHPP must be amended. If a city does not have an existing WHPP, construction of a new well may trigger the immediate development of a WHPP.

Wellhead protection plans include: delineation of groundwater “capture” areas (wellhead protection areas), delineation of drinking water supply management areas (DWSMA), an assessment of the water supply’s susceptibility to contamination from activities on the land surface, management programs such as identification and sealing of abandoned wells, and education/public awareness programs. As part of its role in wellhead protection, the MDH developed the guidance document “Evaluating Proposed Stormwater Infiltration Projects in Vulnerable Wellhead Protection Areas” (MDH 2007).

See the Minnesota Department of Health website for more information about these programs: <http://www.health.state.mn.us/divs/eh/water/index.html>

5.3.7 Minnesota Environmental Quality Board (EQB)

The EQB administers the state’s Environmental Review Program, including Environmental Assessment Worksheets (EAW) and Environmental Impact Statements (EIS).

More information is available at the EQB website: <http://www.eqb.state.mn.us>

5.3.8 Minnesota Department of Transportation (MnDOT)

The MnDOT is responsible for major maintenance and reconstruction of storm sewer infrastructure associated with state highways. In the City of Red Wing, these locations include US Highway 61, Highway 19, and Highway 58.

More information is available at the MnDOT website: <http://www.dot.state.mn.us>

5.3.9 U.S. Army Corps of Engineers (USACE)

Within the City of Red Wing, the U.S. Army Corps of Engineers (USACE) owns and operates Lock and Dam #3 along the Mississippi River upstream of Red Wing. Per MDNR Rules, the USACE is responsible for maintenance of the dam.

The USACE also administers several regulatory permit programs, including Section 10 of the Rivers and Harbors Act Permit Program, the Section 404 Permit Program, and Section 401 Certifications. The USACE updated Section 10 of the Rivers and Harbors Act Permit and the Section 404 Permit in March 2012 in order to streamline the requirements of the Clean Waters Act (CWA). The updated permits provide expedited review of projects that have minimal impact on the aquatic environment. These projects may include linear transportation projects, bank stabilization activities, residential development, commercial and industrial development, aids to

navigation, and some maintenance activities. Permit programs are described briefly in this section. More information is available at the USACE website: <http://www.usace.army.mil>

Section 10 of the Rivers and Harbors Act—The USACE is responsible for this program which regulates the placement of structures and/or work in, or affecting, navigable waters of the United States.

Section 404 - Authorizations—The Federal Clean Water Act requires that anyone who wants to discharge dredged or fill material into U.S. waters including wetlands must first obtain a Section 404 Permit from the USACE. Examples of activities that require a Section 404 Permit include: construction of boat ramps, placement of riprap for erosion protection, placing fill in a wetland, building a wetland, construction of dams or dikes, stream channelization, and stream diversion.

When Section 404 Permit applications are submitted to the U.S. Army Corps of Engineers, the applications are typically posted for the U.S. Fish and Wildlife Service, the U.S. Forest Service, the U.S. EPA, and other federal agencies to review and provide comments. The Corps of Engineers evaluates permit requests for the potential impact to various functions and values of the wetland.

Section 401 - Water Quality Certifications—Section 401 Certification is required to obtain a federal permit for any activity that will result in a discharge to navigable waters of the United States. The program is primarily administered by the USACE along with the MPCA. A Section 401 Water Quality Certification may be granted if the applicant demonstrates that the proposed activity “will not violate Minnesota’s water quality standards or result in adverse long-term or short-term impacts on water quality.” Greater protection is given to a category of waters designated as Outstanding Resource Value Waters. The waters in this category have received this designation because of their exceptional value. These waters include such groups as scientific and natural areas; wild, scenic, and recreational river segments; and calcareous fens.

Section 6

Assessment of Opportunities and Issues

6.0 Assessment of Opportunities and Issues

This section assesses the issues, challenges, and problems the City faces in managing stormwater on behalf of the public. Citywide and specific issues and problems are discussed (and listed in **Table 6-6-2**). This section discusses the adequacy of the City’s ordinances and official controls, the City’s classification system, the City’s education and public involvement program, maintenance of the stormwater system, groundwater protection, and the City’s funding programs. It also examines opportunities that exist for solving these issues.

6.1 WATER QUALITY PROBLEMS AND ISSUES

6.1.1 Stormwater Runoff Quality Issues

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, 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. All these forms of pollutant movement from land to water make up non-point source pollution.

For lakes, ponds, and wetlands, phosphorous is typically the pollutant of major concern. Point sources of phosphorus typically come from municipal and industrial discharges to surface waters, whereas non-point sources of phosphorus come from urban runoff, construction sites, subsurface sewage treatment systems (SSTS), and, in agricultural areas, from fields and feedlots. Point sources frequently discharge continuously throughout the year, while non-point sources (with the exception of SSTS) discharge in response to precipitation or snowmelt events.

POLLUTANTS
<i>Point Source vs. Non-Point Source</i>
<p><i>Point source</i> pollutants discharge to surface waters at a specific point from a specific identifiable source.</p>
<p><i>Non-point source</i> 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.</p>

For most water bodies, non-point source runoff—especially stormwater runoff—is a major contributor of phosphorus. 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 the **City’s water bodies**. In addition to phosphorus, stormwater runoff may contain pollutants such as oil, grease, chemicals, nutrients, metals, litter, and pathogens, which can severely reduce water quality.

Land use changes resulting in increased imperviousness (e.g., urbanization) or land disturbance (e.g., urbanization, construction, or agricultural practices) also result in increased amounts of phosphorus carried in stormwater runoff. In addition to watershed (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 failing 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's (MPCA) Stormwater Program is designed to reduce the pollution and damage caused by stormwater runoff. Mandated by Congress under the federal Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) Stormwater Program is a national program for addressing polluted stormwater runoff. Minnesota regulates the disposal of stormwater through State Disposal System (SDS) Permits. The MPCA issues combined NPDES/SDS Permits for construction sites, industrial facilities, and municipal separate storm sewer systems (MS4s). **Through the MPCA's MS4** Program, the City of Red Wing is required to obtain a NPDES Phase II (MS4) Stormwater Permit.

Current City standards require implementation of water quality treatment best management practices (BMPs) for development projects, but in the future, the City may need to achieve higher levels of water quality treatment than is currently required.

6.1.2 NPDES Stormwater Pollution Prevention Plan (SWPPP)

The City of Red Wing is included in a group of communities with populations greater than 10,000 that are federally required to obtain a Municipal Separate Storm Sewer System (MS4) Permit for managing non-point source stormwater. The Phase II NPDES permitting process requires cities such as Red Wing to file a Phase II NPDES Permit with the MPCA, which addresses how the City will regulate and improve stormwater discharges. The permit must include a SWPPP addressing all of the requirements of the permit.

The Red Wing Public Works Department has managed the permit application process, including identifying issues and developing implementation measures to address the issues. The framework for **developing the City's NPDES Phase II Permit application and plan was the City's** previous City of Red Wing Watershed Management Plan, adopted in 1999 and revised in 2003. Red Wing's **NPDES Phase II SWPPP** addresses six minimum control measures (MCMs) outlined in the permit requirements. All of the BMPs required in the NPDES Permit have already been developed and are in place. The six MCMs required by the permit are:

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 SWPPP identifies issues related to the above-minimum measures and more. It is designed to address these issues, **thereby minimizing the discharge of pollutants into the City's stormwater** system, protecting and enhancing water quality, and satisfying the appropriate requirements of the Clean Water Act of 1984 as amended. The complete Red Wing SWPPP is presented in **Appendix C**.

6.1.3 MS4 Reissued NPDES MS4 General Permit Requirements

The MPCA has recently reissued the MS4 General Permit. The permit focus shifts from permit program development to increasing emphasis on measured progress and beginning some of the implementation measures. The City has submitted its permit renewal application and the permit has been issued. Some of the requirements of the reissued MS4 permit are identified below:

- Revisions to Division 57 (Zoning Code) with more stringent construction related erosion controls, and post-construction controls to reduce volume, total phosphorus, and total suspended solids;
- Formalize enforcement response procedures;
- Submittal of additional information on all stormwater ponds and outfalls;
- Develop inventory of all City facilities that could contribute pollutants to stormwater discharges; and
- Increased level of inspection of stockpiles, and storage and material handling facilities.

The TMDL studies underway on the South Metro Mississippi River and Lake Pepin were not **complete at the time the City's MS4 permit was reissued. Suspended solids and nutrient reduction** strategies included in the implementation phase of these studies will be reflected in future **reissuances of the permit, if applicable to the City. The MPCA's nutrient reduction strategy may also** impact City stormwater quality requirements.

6.1.4 Impaired Waters and TMDL Issues

The federal Clean Water Act (CWA) requires states to adopt water quality standards to protect the **nation's waters**. Water quality standards designate beneficial uses for each water body and establish criteria that must be met within the water body to maintain the water quality necessary to support its designated use(s). Section 303(d) of the CWA requires each state 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 2 years.

Impaired waters within or downstream from the City of Red Wing include Hay Creek, Spring Creek, Bullard Creek, the Cannon River, the Mississippi River, the Vermillion River, and Lake Pepin.

Table 6-1-1 below lists the impaired waters within Red Wing or that receive stormwater downstream from the City, the affected MPCA designated use, the pollutant or stressor that is not meeting the MPCA water quality criteria, and the MPCA target for starting and completing the TMDL process.

For impaired water bodies, the CWA requires the development of a total maximum daily load (TMDL). A TMDL is a threshold calculation of the amount of a pollutant that a water body can receive and still meet water quality standards. A TMDL establishes the pollutant loading capacity within a water body and develops an allocation scheme amongst the various contributors which include point sources, non-point sources, and natural background levels, 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). A load allocation (LA) establishes allowable pollutant loadings from non-point sources and natural background levels in a water body.

The TMDL Plans listed as previously approved in **Table 6-1-1** have been consulted in preparing this SWMP and appropriate elements have been included. Where TMDL Plans are not completed the SWMP will likely need to be amended to incorporate future TMDL requirements.

Table 6-1-1 Summary of the MPCA Impaired Waters List for the City of Red Wing*

Reach Name	Reach Description	Year Listed	River ID#	Affected Use	Pollutant or Stressor	TMDL Plan Approved	TMDL EPA ID	WLA (lbs)	Target TMDL Start	Target TMDL Complete
Cannon River	North branch of split to Vermillion R	2004	07040002-646	Aquatic life	Turbidity	2007	32490	N/A		
Mississippi River	St. Croix River to Chippewa R (WI)	1998	07040001-531	Aquatic consumption	Mercury in fish tissue	2008	32414	N/A		
Mississippi River	St. Croix River to Chippewa R (WI)	2004	07040001-531	Aquatic consumption	Mercury in water column	2008	32414	N/A		
Vermillion River	Vermillion R/ Slough, Hastings Dam to Mississip	1998	07040001-504	Aquatic consumption	Mercury in fish tissue	2008	32414	N/A		
Vermillion River	Vermillion R/ Slough, Hastings Dam to Mississip	1994	07040001-504	Aquatic life	Turbidity	2009	37631	N/A		
Bullard Creek	T112 R14W S10, west to T113 R4W S36, north	2012	07040001-526	Aquatic recreation	<i>Escherichia coli</i>				2011	2014
Cannon River	Belle Cr to split near mouth	2010	07040002-501	Aquatic recreation	<i>Escherichia coli</i>				2011	2015
Cannon River	Belle Cr to split near mouth	2012	07040002-501	Aquatic consumption	PCB in fish tissue				2012	2025
Cannon River	North branch of split to Vermillion R	2012	07040002-646	Aquatic consumption	PCB in fish tissue				2012	2025
Hay Creek	T111 R15W S4, west line to Mississippi R	2012	07040001-518	Aquatic recreation	<i>Escherichia coli</i>				2011	2014
Lake Pepin	Lake	2002	Lake ID: 25-0001-00	Aquatic recreation	Nutrient/Eutrophication, Biological				2011	2015
Mississippi River	St. Croix River to Chippewa R (WI)	1998	07040001-531	Aquatic life	Total Suspended Solids			25% of 2002 load**	2005	2014
Mississippi River	St. Croix River to Chippewa R (WI)	2002	07040001-531	Aquatic consumption	PCB in fish tissue				2002	2016
Spring Creek	T113 R15W S27, south line to Spring Creek Lake	2008	07040002-571	Aquatic life	Turbidity				2011	2015
Spring Creek	T112 R15W S18, west to T113 R15W S34, north	2010	07040002-569	Aquatic life	Turbidity				2011	2015
Spring Creek	T112 R15W S18, west to T113 R15W S34, north	2014	07040002-569	Aquatic recreation	<i>Escherichia coli</i>				2011	2015
Vermillion River	Vermillion R/Slough, Hastings Dam to Mississip	1998	07040001-504	Aquatic consumption	PCB in fish tissue				1998	2025

*2014 MPCA Draft Impaired Waters List

** TMDL not yet approved; waste load allocation in draft TMDL is 25% of 2002 loading (see Section 6.3.1)

6.2 TROUT STREAMS

Southeastern Minnesota has the **state's** highest density of trout streams. The City of Red Wing recognizes the special opportunities and issues that the MDNR-designated trout streams present for the City. The City and the MDNR place high value on the trout stream resources, and they wish to protect, preserve and improve these resources. The MPCA requires measures to avoid **new or expanded discharge to trout waters in the City's SWPPP**.

The key characteristics of trout habitat include a stable supply of cold water (which usually comes from springs and seeps), high oxygen concentrations, riparian shade, and food sources (MDNR, 1996). Temperatures higher than 15-21°C (60-70°F) threaten the health of trout. According to Kohler and Hubert (1993), most cold water fish do not tolerate summer temperatures above 22°C (72°F) and fish growth declines rapidly at temperatures above 20°C (68°F). Trout need higher oxygen levels than other types of fish (MDNR 1996). Kohler and Hubert (1993) state that oxygen concentrations should be at least 8 mg/l for rearing and 10 mg/l for egg and larval development. Since trout streams are cold water streams fed by groundwater, the water quality of the trout streams and their continued ability to support a trout population are closely tied to the quantity and quality of the groundwater.

Schueler (1995) found that when the amount of impervious cover in a trout stream's watershed reached approximately 10%, the diversity of the trout and macroinvertebrate populations declined. The impervious cover causes water temperatures to rise, which also causes oxygen concentrations to decline. Galli (1990) found that typical stormwater BMPs installed to mitigate other water quality impacts cause water temperatures to rise anywhere from about 3°F (infiltration basins) to 9°F (wet detention ponds). Other threats to trout populations include removal of riparian trees, streambank erosion, and channelization which remove the places trout need to rest, feed, and spawn (MDNR 1996). Elimination of streamside vegetation also results in the removal of food inputs for the fish.

Residential lot sizes of 0.5 acre to 1.0 acre translate to about 10% to 20% impervious cover. Land outside the area receiving city services (sewer and water) will usually have <10% impervious cover, whereas land within the area receiving city services will usually have >10% impervious cover (MDNR 1996).

The City of Red Wing recognizes that as development continues the stream corridors, shorelines, **and watersheds of the City's trout** streams will require special protection. This will create opportunities for the City to work with other units of government and the public to create standards for the protection of these unique water resources. It will be important for the City of Red Wing to involve the Lake City MDNR staff and other interested parties in trout stream issues. **Section 5.1** and the **City's** stormwater management regulations present stormwater management design standards for projects located in trout stream watersheds.

To protect streams from the negative impacts associated with development, the document “Site Planning for Urban Stream Protection” (Schueler 1995) presents a stream protection strategy consisting of the following elements:

- Zone land according to its watershed.
- Protect sensitive areas from development.
- Establish stream buffer network.
- Modify zoning and subdivision codes to reduce creation of impervious cover.
- Limit the disturbance and erosion of soils during construction.
- Treat the quantity and quality of stormwater runoff (install BMPs).
- Maintain stream protection infrastructure.

Through its stormwater management regulations, the City requires the application of special BMPs for projects located within trout stream watersheds. Some of these BMPs include: (1) **installation of modified dry ponds (“extended detention basins”) instead of wet detention or dry detention ponds** to prevent water temperature increases, (2) use of bioretention methods such as rainwater gardens to promote infiltration, (3) preservation of the riparian tree canopy, and (4) reductions in the amount of impervious surface created. One of the main purposes of these BMPs is to promote infiltration to reduce nonpoint source pollution and thermal pollution to the trout streams. This differs from traditional storm sewer and curb and gutter systems, which protect property by quickly draining stormwater away from buildings, but which increase nonpoint source pollution.

Current accepted technologies to mitigate stormwater runoff include the creation of retention and detention ponds that reduce runoff rates, thereby allowing for sedimentation to occur within the ponds. Although stormwater ponds are an important stormwater cleaning and storage technology, they are only partially effective in removing stormwater pollutants. Nutrients, heavy metals, and oils may not be effectively treated in this system. Stormwater ponds are designed to function on a neighborhood and regional scale; they can be more effective if used in combination with local filtering, infiltration, and other BMPs. These filtering structures (bioretention) treat stormwater at its source (i.e., near impermeable surfaces). These systems allow for a number of pollution abatement processes to occur including:

- Sedimentation.
- Binding of pollutants such as heavy metals and nutrients to soils.
- Vegetative breakdown of oils and uptake of nutrients.
- Reduction in runoff rate.
- Infiltration.

Rainwater gardens, a type of bioretention, create depressions that accept stormwater runoff from nearby hard surfaces and become neighborhood amenities through careful landscape

design. They are built to be an attractive element of the landscape by incorporating elegant structures such as stone retaining walls and wooden fences, and by incorporating flowering perennials and shrubs. Rainwater gardens add interest to neighborhoods and provide butterfly and bird habitat.

The City will encourage project proposers to consider the above suggestions for reducing the amount of impervious surface and promoting infiltration of stormwater runoff, as well as protecting sensitive stream corridors. **Section 2.2 presents the City's** goals and policies pertaining to trout streams.

6.3 WATERSHED IDENTIFIED ISSUES

Three major watersheds cover parts of Red Wing: the Mississippi River, the Cannon River, and a small area of the Vermillion River. Issues for these watershed areas are described below.

6.3.1 Mississippi River

Lake Pepin is a natural lake downstream of Red Wing on the Mississippi River. It is part of the Zumbro River watershed and the Mississippi River-Lake Pepin watershed in the Lower Mississippi River Basin. About 48,634-square miles including Red Wing, the Upper Mississippi, St. Croix, and Minnesota Rivers, drain into the Lake Pepin watershed. The lake is on the impaired waters list and the ongoing TMDL study is slated for completion soon. It is expected that pollutant loading reductions will be required for all the cities that eventually drain to Lake Pepin. Red Wing may need to adjust this Plan to implement these expected future requirements.

The South Metro Mississippi River, from St. Paul to upper Lake Pepin, is impaired by turbidity, meaning the water contains too much sediment to meet the state water quality standard. The South Metro Mississippi TMDL Project, designed to address this issue, includes the Upper Mississippi River, Minnesota River, Cannon River and St. Croix River basins, as well as small rivers and streams in southeast Minnesota that flow directly into the Mississippi. Based on input from a Science Advisory Committee, extensive research, and 22 years of water monitoring data, the MPCA recommended the following reductions in the amounts of sediment flowing into the Mississippi:

- 60% from the Minnesota River during high and very high flows and 50% during average and low flows
- 50% from the Cannon River
- 20% from the Upper Mississippi River
- 25% from urban runoff
- 20% from smaller rivers and streams in Minnesota and Wisconsin that flow directly into the river

MS4 permittees will be deemed by MPCA to be achieving their waste load allocation if they are in compliance with their NPDES Permit SWPPP. The TMDL implementation plan will describe a suite of BMPs that can be incorporated into the SWPPP and will meet the waste load allocation by achieving an estimated 25% reduction from a baseline of 2002 loads.

6.3.2 Cannon River Wild and Scenic River Designation

From the northern city limits of Faribault to its confluence with the Mississippi River, the Cannon River has been designated by the State of Minnesota as a part of the Minnesota Wild, Scenic, and Recreational Rivers System (Minnesota Administrative Rules, Chapter 6102.1550 to 6105.1700, 1997). With this designation comes the classification of the river as an Outstanding Resource Value Water (ORVW) with restricted stormwater discharge. Red Wing has updated ordinances and **building codes to address the Cannon River's** Scenic River classification and works with the MPCA to comply with rules associated with discharges to waters with prohibited or restricted discharges.

Zoning Code Ordinance Division 53: Cannon River Management Overlay District, is a comprehensive ordinance specifically aimed at conserving and protecting the natural scenic values and resources of the Cannon River and maintaining a high standard of environmental quality.

Red Wing's Zoning Code Ordinance Division 57: Storm Water Management, regulates land-disturbing or development activities that would have an adverse and potentially irreversible impact on water quality, stormwater runoff rates/volumes, and unique and fragile environmentally sensitive lands, waterways, and wildlife.

While both of the above ordinances address stormwater pollution prevention, Division 53 applies only to property located within the boundaries of the overlay district which parallels the Cannon River. The remainder of the storm-watershed is addressed by Zoning Code Division 57. These ordinances will be amended to incorporate requirements for discharges in the watersheds of ORVW and trout streams that are included in the current MS4 Permit and Construction Stormwater Permit. The City is also required to submit current mapping of the Cannon River watershed and stormwater infrastructure within it, for its MS4 SWPPP. The SWPPP must also include an assessment of measures within the SWPPP that eliminate new or expanded discharges to waters with prohibited or restricted discharges such as the Cannon River.

Since 1988, there have been six new developments in the Cannon River watershed that required assessment. All four residential developments meet expanded discharge limitations. Ponds are used as BMPs to mitigate runoff pollution in these areas. The Red Wing Business Park was started in 1985 with initial runoff directed to existing natural ravines. The Burnside Elementary School, built in 1993, also drained some stormwater to one of the same natural ravines.

6.3.3 Cannon River Watershed Partnership

The Cannon River Watershed Partnership (CRWP) was formed in 1990 as a result of interest in the watershed by the Minnesota Chapter of the Nature Conservancy, several divisions of the Minnesota Department of Natural Resources (MDNR), the Board of Water and Soil Resources, the MPCA, and

many local citizens. It was incorporated as a 501 c (3) non-profit organization to be led by a volunteer board of directors and paid staff. The Board is comprised of representatives of the Board of Commissioners and Soil and Water Conservation Districts from the six counties through which the Cannon River flows, as well as 13 individuals representing the diverse citizenry of the watershed. In 2012 there were five paid staff.

The CRWP received a grant from the MPCA in 2003 to develop the Lower Cannon River Turbidity TMDL. CRWP worked to compile existing data, collect additional samples, and coordinate a technical committee and public meetings. MPCA staff completed the TMDL document and initiated a public review of the work. The TMDL was approved by the U.S. Environmental Protection Agency in July 2007. A TMDL Implementation Plan was completed in 2009.

The TMDL study sets some significant load reductions for sediment in the Lower Cannon River watershed. Load reductions established in the TMDL are not applicable to the City of Red Wing. The water quality goal is total suspended solids (TSS) values of 44 mg/L or less. In the Lower Cannon River watershed, the City of Red Wing is currently the only MS4 community that discharges stormwater runoff into the Cannon River (via the Cannon River bottoms wetlands).

The following actions are specified in the Lower Cannon River Turbidity TMDL Implementation Plan (CRWP 2009) for the City of Red Wing:

Plan Action F-1: Provide long-term maintenance for detention basins in urban, suburban, and highway settings to reduce sedimentation in local streams and water bodies.

Plan Action F-2: Provide general stormwater education to residents, especially in urban areas.

Plan Action F-3: Provide education, design, and installation assistance and cost-share funding for stormwater reduction practices.

Plan Action F-4: Adopt local erosion control ordinances to control soil erosion from construction sites.

Plan Action F-5: Identify and repair erosion-prone land areas owned by the cities of Cannon Falls and Red Wing.

Plan Action F-6: Provide training to city and county staff to help reduce stormwater pollution caused by park maintenance, fleet and building maintenance, new construction and land disturbances, outfall inspections, and storm sewer system maintenance.

Plan Action F-7: Develop and implement street sweeping practices to reduce sediment loading.

These action items have been addressed by the City of Red Wing to the extent feasible and are currently ongoing.

6.4 STORMWATER RATE AND VOLUME ISSUES

6.4.1 General Issues

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 changes begin during construction, when clearing and grading of the site results in less infiltration, higher rates and volumes of stormwater runoff, and increased erosion. As construction continues, ground surfaces become covered with impervious materials (e.g., asphalt and concrete) that prevent infiltration of water into the soil. As a result, the rate and volume of stormwater runoff from the site further increases, which 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 base flows in creeks and streams and, potentially, a loss to the long-term sustainability of groundwater drinking supplies.

If the land drains to a landlocked basin, the additional volume of runoff can increase the water level and flood level of the basin. If the land drains to a stream, the additional runoff volume can cause the stream to flow full for longer durations, which increases the erosion potential. The increase in runoff rates from sites can also increase flooding risks and erosion.

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 is 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
- ◆ 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
- ◆ More strain on budgets and personnel for repairing flood-damaged facilities and controlling public use of facilities during flooding events
- ◆ Alterations to mix and diversity of wildlife species as a result of inundation of habitats

Of special concern is flooding on landlocked water bodies, which prolongs the damages and impacts. Since there is no surface outlet, runoff which collects in these depressions is removed only by

Damages caused by flooding include:

- Damage to homes, businesses, and other buildings
- Damage to infrastructure (e.g., roads, bridges)
- Flooding of individual septic systems, rendering them unusable
- Damage or destruction of recreational trails and bridges

seepage and evaporation. As water tables rise during periods of above-average precipitation, seepage out of landlocked basins can also decrease. As a result, landlocked basins are subject to wide variations in water levels and their 100-year floodplains typically cover large areas.

Landlocked basins can also provide benefits. The long-lasting seepage from landlocked basins provides important groundwater recharge benefits. Also, landlocked basins do not discharge surface waters to downstream basins, which could otherwise be negatively impacted by the additional stormwater volume.

The City is not currently aware of any landlocked basins. If issues related to landlocked basins are identified in the future, the City may be requested to provide outlets from landlocked basins to prevent damages that occur during periods of sustained high-water levels, but it is not always feasible or reasonable for the City to do so. For example, it may not be feasible to provide outlets because of the long distances to the nearest outlet, the depth of the pipe, and the capacity of the nearest outlet. It may not be reasonable to provide outlets because of the downstream impacts on flood levels and/or water quality. It can also be difficult for the City to provide even temporary relief during flooding situations for the same reasons that it is difficult to provide permanent outlets.

Floodplain management is the management of development and other activities in or near the floodplain to prevent flood damages. **The MDNR defines floodplain management as “the full range of public policy and action for ensuring wise use of the floodplains. It includes everything from collection and dissemination of flood control information to actual acquisition of floodplain lands, construction of flood control measures, and enactment and administration of codes, ordinances, and statutes regarding floodplain land use.”**

Minnesota law defines the floodplain as the land adjoining lakes, water basins, rivers, and **watercourses that has been or may be covered by the “100-year” or “regional” flood.** Floodplains of larger basins and streams are mapped by the Federal Emergency Management Agency (FEMA) on Flood Insurance Rate Maps (FIRMs), which are included in community Flood Insurance Studies (FIS). The City manages activities in designated floodplain areas through the Red Wing Floodplain Overlay Zoning Ordinance.

The City of Red Wing Surface Water Implementation Program **Table 7-8-2 (Section 7)** lists flooding-related projects that aim to solve flooding problems identified through experience and historical information presented by City Staff, and via the surface water modeling performed as part of the development of this Plan.

6.5 EROSION AND SEDIMENT CONTROL ISSUES

Sediment is as 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 carried in moving water. Abundant amounts of suspended sediment are carried by stormwater runoff when erosion occurs.

Although erosion and sedimentation are natural processes, they are often accelerated by human activities, especially construction. Prior to construction, the existing vegetation on the 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 Urban Small Sites BMP Manual* 2001). 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, storm sewers, etc., 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.

As 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, will be an increasingly important task for the City. Continued urbanization in the City will result in increased erosion and sedimentation, unless effective erosion prevention and sediment-control measures are implemented before, during, and after construction.

In recognition of these issues, the City's ordinances and approval processes address erosion and sediment control at construction sites. The current ordinance requires implementation of temporary and permanent erosion and sediment-control measures for developments and other projects.

In addition to meeting City requirements, owners and operators of construction sites disturbing 1 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 1 acre that are a part of a larger common plan of development or sale that is 1 acre or more must also obtain permit coverage.

The MPCA developed the NPDES General Stormwater Permit for Construction Activity (NPDES Construction Permit). A key permit requirement is the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) with appropriate 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.

6.6 ADEQUACY OF EXISTING PROGRAMS

6.6.1 City Ordinances and Official Controls

The City of Red Wing actively and progressively manages stormwater to protect life, property, water bodies within the City, and receiving waters outside the City. Toward this end, the City of Red Wing creates and implements regulatory programs that accomplish these aims. The City intends to continue implementing the following regulations and programs.

Table 6-6-1 Summary of City of Red Wing Land Use Controls

City regulations and land use controls include the following water resource-related plans and ordinances:
◆ The Red Wing Comprehensive Plan (2007)
◆ City of Red Wing Storm Water Pollution Prevention Program (Updated 2014)
◆ Stormwater Management Ordinance (Red Wing City Code Chapter 11: Division 57)
◆ Grading and Erosion Control (Red Wing City Code Chapter 11: Division 57)
◆ Shoreland Zoning Ordinance (Red Wing City Code, Chapter 11: Division 50)
◆ Cannon River District Requirements (Red Wing City Code, Chapter 11: Division 53)
◆ Floodplain Zoning Requirements (Red Wing City Code, Chapter 11: Division 52)
◆ Lawn Fertilizer Regulations (Red Wing City Code Chapter 11: Division 57)
◆ Stormwater Utility (Red Wing City Code, Chapter 3: Ord. 452)
◆ Open Space Preservation (Red Wing City Code Chapter 11: Division 43)
◆ Tree Preservation Ordinance (Red Wing City Code Chapter 11: Division 57 and 62)

The City requires permits and/or approvals for land-disturbing projects (including developments), depending on the type of project. The following is a listing of the water resource or stormwater-related City permits and/or approvals:

- Concept plan review
- Preliminary plat approval
- Final plat approval
- Rezoning approval
- Comprehensive plan amendment
- Planned Unit Development (PUD) Permit
- Conditional Use Permit
- Building Permit
- Land Alteration (Excavation and Fill) Permit

Applications for preliminary plat approvals, major site plan approval, and Planned Unit Development Permits must include a grading and drainage plan, and an erosion control plan.

The City of Red Wing is required to meet the conditions of its NPDES MS4 Permit and to implement the Red Wing Storm Water Pollution Prevention Program. The City continues to actively engage the MPCA and others to keep its permit and implementation up to date with regard to technology and regulations.

The City also actively works with the Goodhue County Soil and Water Conservation District (SWCD) and Goodhue County toward accomplishing common goals and adhering to the policies of these organizations.

The City of Red Wing works cooperatively with the Cannon River Watershed Partnership (CRWP), and the Lake Pepin Legacy Alliance. The City will review and update its existing plans and ordinances to bring them in conformance with the policies and goals of this Plan and the NPDES MS4 Permit requirements.

6.6.2 Education and Public Involvement Program

The City of Red Wing maintains various education and communication programs aimed at water resources issues. The City develops and distributes articles and information regarding the City's Storm Water Pollution Prevention Plan including information on:

- ◆ Stormwater issues.
- ◆ Non-point source pollution.
- ◆ NPDES regulation and guidance.
- ◆ Annual public meetings.
- ◆ Illicit discharges.
- ◆ Erosion control.

- ◆ Shoreline management.
- ◆ Local agency contacts.
- ◆ Stormwater website links.
- ◆ Composting and pollution prevention.

This information is distributed through public presentations, website postings, utility bill inserts, media articles, and broadcast of informational videos. Using City cable access Channel 6, the City broadcasts programming that explains stormwater pollution issues.

The City website and TV Community Calendar are used to inform citizens of public meetings and events. **The City’s Building Inspection Department will continue to distribute “Erosion Control Requirements” as a part of the building permit process.**

Public participation events such as storm drain marking are used to inform the public and give a sense of participation and ownership.

The City also works collaboratively with the Goodhue County Soil and Water Conservation District and Goodhue County in distributing educational materials and promoting/supporting outreach programs.

The City’s website provides pages and links devoted to water resource related issues. Topics may include the Red Wing Surface Water Management Plan, SWPPP information, BMPs, illicit discharge prevention and detection information, information on non-point source pollution, and local contact information for residents to request further information on specific stormwater topics or to report a stormwater-related infraction. **The City’s website is located at <http://www.red-wing.org/>.**

The City hosts an annual public meeting to distribute educational materials and present an overview of the MS4 **Program and the City’s SWPPP**. Oral and written statements are received and considered for inclusion in the SWPPP by City staff.

At this time, this recently updated communication program is deemed to meet the needs of the community. The City will continue to periodically review its educational programs to keep this communication up-to-date and useful.

6.6.3 Groundwater Protection

The City of Red Wing relies on groundwater for its municipal water supply; the City’s municipal well system consists of five wells within the Mt. Simon aquifer. The municipal water supply system is maintained and operated by the City of Red Wing Public Works Department. The City does not currently have a groundwater management plan or ordinance aimed specifically at groundwater resources. Protection of groundwater resources at the local level is accomplished indirectly through **the City’s Stormwater Management Ordinance and other portions of the city code**. Groundwater resources are further regulated by Goodhue County (via the SWCD) and the Minnesota Department of Health (MDH).

In 1998, the MDH enacted Rule 4720, which requires all public water suppliers that obtain their water from wells to prepare, enact, and enforce Wellhead Protection Plans. A Wellhead Protection Plan (WHPP) is intended to protect drinking water from being polluted by managing potential sources of contamination. The City of Red Wing has completed Phase I of its Wellhead Protection Plan (WHPP) and anticipates completion of Phase II in 2014 and 2015. Phase I of the WHPP determined the water supply wells and aquifer to be non-vulnerable to contamination from surface activities. The WHPP will include recommendations and/or regulations for protection of source water within the City of Red Wing.

Another way the City protects its groundwater supply is by following current standards for well construction. All of the **City's groundwater wells meet current standards**; this means the wells do not present pathways for contamination to readily enter the groundwater supply.

6.6.4 Subsurface Septic Treatment Systems (SSTS)

Red Wing City Code, Chapter 3.31, Subdivision 3.D, mandates attachment to sanitary sewer lines when a lot or parcel is within 500 feet of an existing sanitary sewer line. Because of this, over 98% of City residents are connected to sanitary sewers. The remaining residents will continue to rely on Goodhue County for septic system inspection and compliance. Goodhue County employs an environmental health technician who is tasked with administering MPCA Rule Chapter 7080, which includes standards for septic system operation. The goal of Goodhue County is to prevent the overflow of septic systems. **In the event of an overflow, the County's Citation Ordinance requires** discharge cessation through programmed pumping with a 10-month window to repair or replace the faulty septic system. Preventing and/or correcting improper operation of septic systems can protect water resources. Red Wing Zoning Ordinance Chapter 11 Division 90-100 defers septic responsibility to the Goodhue County Ordinance. The City of Red Wing allows septage haulers to dispose of tank pumpings into the City's sanitary sewage system at specific locations by permit.

6.6.5 Maintenance of the Stormwater System

The City of Red Wing is responsible for maintaining its stormwater system including storm sewer pipes, ponds, pond inlets and outlets, and channels.

The City will attempt to address flooding issues (identified in Section 4 of this Plan) that are due to the age and inadequacies in the storm sewer system as funding and staffing are available. Problems will be prioritized based on the level of impact of particular sites.

The City also uses video to examine old sewer lines for items in need of repair or replacement. Identified issues are included in the implementation **Table 7-8-2**.

For ponds, the amount of sediment which settles onto the bottom must be monitored to determine when sediment removal is needed. Sediments settle and displace the water storage volume of the pond. The depth of accumulated sediment can be measured by establishing a benchmark system. Elevations for the normal water level in the ponds can be recorded and periodically checked against **the depth to determine when a maximum allowable amount of the pond's storage is filled by**

sediment. Sediment removal is then necessary because the removal efficiency of a pond decreases as the storage volume decreases.

The City of Red Wing regularly assesses the need for stormwater pond maintenance. The Public Works Department conducts a visual inspection of ponds and determines the level of maintenance needed and recommends action when needed.

The City of Red Wing will continue to use aggressive street sweeping to keep refuse and sediments out of storm sewers. The City has a full-time street sweeper that cleans all city streets at least three times each year with a seasonal emphasis on sand removal in the spring and leaf removal in the autumn. Road sand from sweeping cannot be recycled due to rounding (loss of abrasion) and is stockpiled in a materials yard as on-site fill. Leaf pick-up is composted. Street sweeping personnel report clogs in sewer lines; catch basins and storm sewer lines are then cleaned.

The City of Red Wing's MS4 Permit SWPPP identified maintenance issues and outlined implementation tasks to address those issues. The identified tasks include:

- ◆ Develop and implement an annual inspection, maintenance, and tracking system for structural pollution control devices like sump catch basins and sump manholes.
- ◆ Inspect and record information on at least 20% of the **City's** outfalls, sediment basins, and ponds each year on a rotating basis.
- ◆ Develop and maintain an inventory of City facilities that may contribute pollutants to stormwater discharges.
- ◆ Make necessary repairs and replacements of sump catch basins, sump manholes, outfalls, sediment basins, and ponds as soon as possible—and at least in the same year as inspection reveals a problem.
- ◆ Locate, inspect, and report, on a quarterly basis, all exposed stockpiles and storage/material handling areas located on City-owned properties. All existing onsite BMPs will be inspected for conformance to NPDES Phase II Permit requirements. Any identified erosion-control issues will be corrected and documented per NPDES Phase II standards.
- ◆ Determine whether system repair, replacement, or maintenance measures are necessary by evaluating inspection reports and other pertinent information.
- ◆ Maintain records of inspection dates, findings, and subsequent responses; completion dates for repairs and any additional protection measures will be noted.
- ◆ Provide training materials and workshops to City staff to help reduce stormwater pollution caused from park maintenance, fleet and building maintenance, new construction and land disturbances, outfall inspections, and storm sewer system maintenance.
- ◆ Retain records of inspection results and any maintenance performed or recommended. After 2 years of inspections, if patterns of maintenance become apparent, the frequency of inspections may be adjusted.

- ◆ Review all discharges from **the City's stormwater** system to impaired waters.

6.6.6 Adequacy of Existing Capital Improvement and Implementation Programs to Correct Problems

This Plan, along with its capital improvement and implementation programs and combined with the Stormwater Utility Fund, give the City adequate tools to correct current and future problems.

The City will continue to use the Stormwater Utility Fee program established in 2008 to fund stormwater-related activities. The City's Stormwater Utility revenue is generated by fees according to impervious surface coverage. The Stormwater Utility Fee is the primary funding source for all stormwater improvements related to the City Surface Water Management Plan and NPDES Phase II requirements. This program is periodically reviewed to determine its adequacy for funding the projects and programs needed.

Table 6-6-2 Summary of Stormwater Issues for the City of Red Wing

<i>Category</i>	<i>Issue</i>
NPDES Stormwater Pollution Prevention Plan (SWPPP)	◆ Public education, outreach, and participation
	◆ Illicit discharge detection and elimination
	◆ Construction and post-construction site runoff control
	◆ Pollution prevention/housekeeping
	◆ Inventory and tracking BMP implementation
	◆ Stormwater system inspection and maintenance
	◆ Develop enforcement response procedures
	◆ Cannon River and special waters restricted discharge requirements
	◆ Existing and future TMDL waste load reductions
Impaired Waters	◆ Lake Pepin: future waste load allocation.
	◆ Mississippi River: South Metro Mississippi turbidity TMDL (25% sediment reduction)
	◆ Cannon River: turbidity TMDL sediment load reduction measures
	◆ Vermillion River: specific sediment reduction projects (Table 7-8-6)
	◆ Spring Creek: future waste load allocation or measures
◆ Hay Creek: future waste load allocation or measures	
Goodhue County	◆ Groundwater protection
	◆ Erosion control
	◆ FEMA floodplain
	◆ Stormwater runoff water quality
	◆ Water resources education
Cannon River Partnership	◆ Sediment load reductions
	◆ Erosion control and site stabilization
	◆ Pond maintenance
	◆ Water quality education
City Issues	◆ Stormwater Utility funding levels
	◆ Trout stream protection
	◆ Treatment and infiltration standard implementation
	◆ Protect natural areas and open space
	◆ Address local flooding and storm sewer issues
	◆ Ravine erosion repairs and stabilization
	◆ Aging infrastructure, including stormwater tunnels

6.7 OPPORTUNITIES

The City of Red Wing has several distinct opportunities which might assist in implementing this Plan. The City will actively pursue these opportunities.

Partnerships

The Cannon River Watershed Partnership, the Goodhue County SWCD, and the VRJPO provide technical support and funding for solving various water resource problems and completing water resource projects. These organizations have a record of working successfully with the individual cities toward meeting shared goals. The City will continue to collaborate and contribute to these organizations and take advantage of the available benefits.

The Lake Pepin Legacy Alliance (LPLA) was established in 2009 by a citizen-led committee determined to preserve and restore Lake Pepin as an integral part of the Upper Mississippi River system. The LPLA is dedicated to slowing and reversing the current trend of sediment and nutrient flow to Lake Pepin. They provide opportunities for public involvement in present and future watershed restoration activities that promote the importance of best practice implementation. The City will continue to look for opportunities to partner with the LPLA.

Grant Applications

The City will continue its efforts to actively seek opportunities and apply for grants and other funding as it becomes available. These funds can provide an important resource for funding water resource projects.

Redevelopment

The City will continue to be proactive in using the controls at its disposal to insure that opportunities presented by re-development to improve the stormwater systems and implement the policies of this Plan are not lost.

Agricultural Land Conversion

Residential development of agricultural land typically results in reduced loading of sediment to receiving waters. Red Wing has areas of agricultural land expected to be developed into residential neighborhoods. Along with the opportunity to apply stormwater BMPs with the development, these projects will reduce the acreage of agricultural land acting as a source of sediment in stormwater runoff.

Section 7

Implementation Program

7.0 Implementation Program

This section describes the significant components of the City’s Surface Water Management Plan (SWMP) implementation program, including **implementation of the City’s** NPDES Phase II MS4 Permit, operation and maintenance of **the City’s** stormwater system, education and public involvement, funding, ordinance implementation and official controls, and implementation priorities. The implementation program is presented at the end of this section in a series of tables. **Tables 7-8-1 - 7-8-6** present summary details of the implementation program including a project description, location, cost estimate, and priority. The tables are arranged as follows:

IMPLEMENTATION TABLES	
NPDES – SWPPP Programs and Tasks	Table 7-8-1
Infrastructure Improvements to Address Flooding Problems	Table 7-8-2
Infrastructure Improvements to Address Water Quality Problems	Table 7-8-3
Cannon River Turbidity Impairment Implementation Tasks	Table 7-8-4
South Metro Mississippi River Turbidity Impairment Implementation Task	Table 7-8-5
Vermillion River Turbidity Impairment Implementation Tasks	Table 7-8-6

7.1 NPDES PHASE II MS4 PERMIT

The City of Red Wing is included in a group of communities with populations greater than 10,000 that are federally required to obtain a Municipal Separate Storm Sewer System (MS4) Permit for managing non-point source stormwater. The Phase II NPDES permitting process requires cities such as Red Wing to file a Phase II NPDES Permit with the Minnesota Pollution Control Agency (MPCA), which 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 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 will be a combination of education, maintenance, control techniques, system design and engineering methods, and other such provisions that are appropriate to meet the requirements of the NPDES Phase II Permit.

BMPs have been planned and implemented to address each of the six minimum control measures as outlined in the permit:

1. Public education and outreach on stormwater impacts
2. Public participation/involvement
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post-construction stormwater management in new development and redevelopment
6. Pollution prevention/good housekeeping for municipal operations

For each of these six minimum control measures, the City identified appropriate BMPs, along with measurable goals, an implementation schedule, and the parties responsible to complete each measure.

The City must also complete mapping and assessments for special restricted discharge waters such as local trout streams and the Cannon River. These are included as separate BMPs within the SWPPP. As part of the mapping and assessments the SWPPP must include mapping of the MDNR minor subwatersheds in Red Wing that discharge in whole or in part to waters with prohibited or restricted discharges. Also required is an estimate of the percent impervious surface based on current land use, the percent expected future impervious surface based on zoning or comprehensive plans, and other information that may significantly affect runoff to the listed waters. The SWPPP must also assess how it can be reasonably modified to eliminate new or expanded discharges to waters with prohibited or restricted discharges. The assessment must be developed for new or expanded discharges created from 1988 until the year 2020.

As future BMPs may be needed or required based on future hydrologic modeling, the **City's** NPDES Permit, and/or TMDL studies, the City will identify appropriate locations and add them to the implementation program.

Prior to June 30 of each year of the five-year permit cycle, the City must hold an annual public meeting. At this meeting, the City distributes educational materials and presents an overview of the **MS4 Program and the City's SWPPP**. The City also receives oral and written statements and considers them for inclusion in 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 **Tables 7-8-1 – 7-8-6**.

7.2 OPERATION AND MAINTENANCE OF STORMWATER SYSTEMS

7.2.1 Maintenance of Stormwater Facilities

The stormwater system includes not only pipes and constructed ponds, but also lakes, wetlands, ditches, swales, and other drainage ways. 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 of Red Wing recognizes that maintenance of all of the City’s **stormwater facilities is an important part of** stormwater management. Proper maintenance will ensure that the stormwater system provides the necessary flood control and water quality treatment. **Table 7-2-1** summarizes surface water maintenance activities for the City of Red Wing.

7.2.1.1 Private Stormwater Facilities

Owners of private stormwater facilities are responsible for maintaining the 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, and other devices, including settled solids. . Owners of private stormwater facilities must provide the City with a maintenance plan that defines who will conduct the maintenance, the type of maintenance, and the maintenance intervals.

7.2.1.2 Publicly Owned Stormwater Facilities

The City of Red Wing is responsible for performing the maintenance of the stormwater facilities under City ownership. The Minnesota Department of Transportation is responsible for maintaining road ditches and culverts along U.S. Highway 61/63, State Highway 292, State Highway 58, and State Highway 19. Goodhue County is responsible for maintaining road ditches and culverts along CSAH 1, CSAH 18, CSAH 21, CR 45, CR 46, CR 53, and CSAH 66. The City will also notify the owners of other publicly owned stormwater facilities if scheduled maintenance is needed according to periodic site inspections or maintenance plans on file.

The City will develop an inventory and maintain a database for all private and public stormwater facilities within the City of Red Wing to assist in determining maintenance requirements. The

City is responsible for notifying owners of public and private stormwater facilities of the need to conduct maintenance.

In addition to constructing the drainage and water quality improvements called for in this Plan, 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.

7.2.1.3 Maintenance of Storm Sewer and Culvert Inlets

For safety reasons and to prevent pipe plugging, trash racks are typically installed on storm sewer and culvert inlets. These trash racks prevent people from entering the pipes and keep large debris from becoming lodged in the pipes. If not inspected and maintained, the trash racks will become plugged with debris such as branches, leaves, corn stalks, and other materials carried by storm flows. Even if partially plugged, additional flooding can occur. The City recognizes the importance of, and performs, periodic removal of collected debris from system trash racks and inlets.

7.2.1.4 Maintenance of Ponding Facilities

Steep slopes in the City of Red Wing increase the likelihood of high sediment loads in the City's stormwater runoff. Stormwater ponding and water quality treatment facilities perform a desirable function by settling sediment out of the stormwater. However, if accumulated sediments are not periodically removed, such basins can experience a significant loss in necessary stormwater detention capacity and sediment storage volume. Also, if left unattended, these facilities can become overgrown with unwanted vegetation that could reduce their effectiveness and hinder access for periodic maintenance.

The City of Red Wing periodically inspects stormwater storage basins and water quality treatment facilities to look for excessive sediment build-up, collected debris, and unwanted vegetation. If problems are noted, maintenance is then warranted. For sedimentation basins, if 25% of the sediment storage volume is filled with sediment, the basin should be dredged to provide its originally designed sediment storage volume. For planning purposes, it is often assumed that such dredging may occur every 5 years. However, basins that treat runoff from agricultural watersheds may need to be cleaned more frequently due to the increased quantity of sediment loads.

Overflow swales can turn into steep eroding channels if an ongoing erosion problem is not stabilized and the area restored. 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 basin and should not be mowed. This practice will allow ponding facilities to act like natural wetland areas by providing nearby upland wildlife habitat.

7.2.1.5 Riprap and Filter Areas

Riprap and filter areas along banks, in overflow swales, or around storm sewer or culvert outlets, need periodic maintenance. 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 annually inspect riprap areas and perform the necessary maintenance.

7.2.2 Street Sweeping

The Red Wing maintenance guide (**Table 7-2-1**) calls for the City to sweep streets and parking lots twice a year—once after snowmelt and again after leaf fall. The City will place a higher priority on sweeping streets directly tributary to sensitive resources. Currently, the City sweeps the downtown business district weekly, except in winter.

7.2.3 Adequacy of the Maintenance Program

The City's current program based on the Red Wing SWPPP is deemed as adequate to meet the conditions of its NPDES Permit and to maintain an effective stormwater management system.

The City of Red Wing is responsible for maintaining its stormwater system including storm sewer pipes, ponds, pond inlets and outlets, and channels. The City will continue and expand upon its operation and maintenance activities to ensure its system functions as designed. **The City's operation and maintenance program is closely tied with the City's implementation of its NPDES Phase II MS4 Permit (see Section 6.1.2). The City's operation and maintenance program is incorporated into the implementation program.**

Table 7-2-1. Surface Water Maintenance Guide for the City of Red Wing

Practice	Frequency	Comments
Wetland and Stormwater Pond Inspections	Once a year	Brief, on-site inspection and survey to record sediment buildup; skimmer and inlet/outlet structure conditions; erosion at inlet, outlet, and on slopes; debris; vegetation; and visual water quality.
Ditch Inspections	Once a year (same time as wetland and pond inspections)	Brief, on-site inspection to record sediment buildup, channel and side-slope erosion, debris, and vegetation.
Street and Parking Lot Sweeping	Twice a year (Downtown weekly)	Sweep streets once following snowmelt and again after leaf fall. Sweep areas directly tributary to sensitive water resources first. Sweep more frequently if need arises.
Storm Sewer Inlet/Catch Basin Repair and Cleaning	As needed, following major storm events	Repair deteriorated catch basins; clean storm sewer inlets and catch basins to prevent encroachment of sediment and debris above flow line of pipe.
Storm Sewer Discharge Point Inspections	Once a year and following major storm events	Inspect direct discharge points into stormwater ponds and wetlands to determine if discharge point is free of sediment and to observe the condition of any upstream treatment facility (if applicable).
Sediment Removal	As needed	Based on results of stormwater pond, wetland, and ditch inspections/surveys remove sediment from: (1) areas where it impedes stormwater flow, (2) areas not designated for sediment accumulation, and (3) areas where storage capacity is decreased 10% by sediment and/or the water quality treatment zone is decreased 25%.
Outlet Structure and Skimmer Maintenance	As needed	Determine maintenance needs based on results of stormwater pond, wetland, and ditch inspections.
Debris and Litter Control	Variable	Collect debris and litter as part of regular inspection program; control litter through public education efforts.
Herbicide Use in Waters and Along Roadsides	Discourage its use	Use only if absolutely necessary.
Alternative Road Deicing Chemicals	Encourage their use	Encourage use of alternative and experimental deicing chemicals that have less impact on water quality.
Televising, Jetting, and Repair of Storm Sewers and Culverts	As needed	Televising, jetting, and repair of storm sewers and culverts based on results of annual inspections of pipes with a known history of sedimentation problems.

7.3 EDUCATION AND PUBLIC INVOLVEMENT PROGRAM

The City believes public education is an important and effective method to control non-point source pollution. A public education program can raise citizen awareness regarding pollutant sources in everyday life and from all types of property. The City will continue to educate its residents, businesses, industries, and staff, on topics related to pollutant reduction, BMPs, the link between **daily housekeeping activities and the condition of Red Wing's water resources, and** general awareness of natural resources. The City will also seek to inform its residents, businesses, industries, and staff of initiatives and projects completed by the community that address its education goals. Public participation events, such as storm drain marker application, are used to inform the public and give a sense of participation and ownership.

Information is distributed through public presentations, website postings, media articles and broadcast of informational videos. The City produces and distributes informative articles about pollution prevention in utility bills. The community access TV Channel 6 Community Calendar is used to inform citizens of public meetings and events. The City also uses cable access Channel 6 to broadcast programming that explains stormwater pollution issues.

The City's website provides pages and links devoted to water-resource-related issues. Topics may include the Red Wing Surface Water Management Plan, SWPPP information, BMPs, illicit discharge prevention and detection information, information on non-point source pollution, and local contact information to request further information on specific stormwater topics or to report a stormwater-related infraction. **The City's website is located at:** <http://www.red-wing.org/>.

The City will continue to host an annual public meeting to distribute educational materials and present an overview of the **MS4 Program and the City's SWPPP**. Oral and written statements are received and considered for inclusion in the SWPPP by City staff.

The City's Building Inspection Department will continue to maintain and distribute erosion-control and other building-related stormwater standards and information as a part of the building permit process.

The City also works collaboratively with the Goodhue County Soil and Water Conservation District and Goodhue County in distributing educational materials and promoting/supporting outreach programs.

Education and housekeeping practices are especially important within the City limits since there is limited land available to provide water quality treatment facilities. The City of Red Wing will continue to develop and distribute educational materials to the general public and targeted groups regarding:

- Natural resources within and adjacent to the City.
- General stormwater issues.
- Non-point source pollution.
- NPDES regulation and guidance.
- Annual public meetings.
- Illicit discharges.
- Erosion control.
- Local agency contacts.
- Stormwater website links.
- City ordinances, policies, and programs pertaining to water resources.
- Reducing fertilizer/herbicide use.
- Lawn care practices that prevent organic debris from reaching storm sewer systems.
- Household and automobile hazardous waste disposal.
- Problems with pet waste and proper disposal.
- Litter control.
- Recycling and trash disposal.
- Composting, leaf collection, and grass clippings.
- Residential stormwater drainage.
- Native vegetation.
- Public area maintenance.
- Alternative landscaping methods.
- Plantings in buffer zones along wetlands, lakes, rivers, and streams.
- Car washing.

At this time, this recently updated communication program is deemed to meet the needs of the community. The City will continue to periodically review its educational programs to keep this communication up to date and useful.

7.4 FUNDING OF IMPLEMENTATION PROGRAM

Minnesota statutes (MS) provide authority to cities to raise funds for surface water management efforts using several methods including: assessments (MS 429), tax districts and utility fees (MS 444), and planning and fees (MS 462). The following paragraphs describe many of the funding methods available by statute to cities.

7.4.1 Ad Valorem Taxes

A common revenue source used to finance municipal services, including minor maintenance for drainage and water quality facilities, is general taxation. Using property taxes has the effect of spreading the cost over the entire tax base of the community. In the past, the State legislature has made this avenue difficult with periodic levy limit requirements for municipalities. As a result, funding projects that exceed general tax limits requires a bond referendum to be passed. This process can be very time consuming and expensive.

7.4.2 Special Assessment (MS 429)

Special assessments are used to finance special services in municipalities ranging from water quality treatment pond maintenance to construction of capital improvements. The assessments are levied against properties benefitting from the special services. The philosophy of this method is that the specially benefitted properties pay in relation to benefits received. In many cases the benefit is the increase in the market value of the properties.

The disadvantages of using this method include: (1) the difficulty in determining and proving benefit, (2) inability to assess runoff contributions, (3) the rigid procedural requirements, and (4) the hardship experienced by residents and other landowners paying large special assessments. The City prefers to use other methods to pay for projects, but may use special assessments in conjunction with the Storm Water Utility for some projects.

7.4.3 Building Permits, Land Development Fees, Land Exaction Fees, and Connection Charges (MS 462.358)

As land is developed or built upon, stormwater runoff and pollution loading increase. Administrative and capital costs can be recovered at the time the building permit is issued or when land development is approved. Cities can charge a system-connection fee, a land-development fee, and/or require dedication of land for ponding or drainage purposes. Where land is dedicated, the land must be part of the parcel being developed. These fees usually address problems in new developments and not in existing developments, so they will not be effective in already-developed portions of the City.

7.4.4 Stormwater Utility (MS 444.075)

A stormwater utility is set up in a similar manner to that used for sanitary sewer and water utilities. Under a utility system, a stormwater utility fee (typically billed quarterly) is charged

against all parcels within the City. The fees are usually proportionate to the amount of runoff each parcel of land contributes to a drainage system. These charges apply to both urbanized areas with storm sewers and rural areas where ditches and other infrastructure require capital investment and maintenance.

The fees can be used to finance drainage system projects, surface water quality improvements, infrastructure replacement, studies, operations, and maintenance. The fees can be accumulated to pay for such activities, or can be established as the revenue stream to pay for bonds sold to initially pay for such activities. The utility can be an important tool for attracting grants and other funding that often require match dollars from the applicant.

The utility provides municipalities with a tool for financing surface water management at far less cost than many of the other methods available. It is typically far easier for residents and businesses to pay small monthly fees rather than pay large special assessments. Many cities in Minnesota (including Red Wing) and around the country currently use this funding mechanism.

7.4.5 State Funding Sources

Other than stormwater utility fees, taxes, and assessments, the City of Red Wing could receive funding for surface-water-related projects from various state sources, such as grant and loan programs. The City could use loans for projects instead of county-issued bonds. The following paragraphs list various state-funded sources, grouped according to the state agency that administers the program.

The Minnesota Board of Water and Soil Resources (BWSR) administers several grant programs which may be applicable to Red Wing, provided that the City apply through Goodhue County or the SWCD. Those programs include: the Projects and Practices Grant Program (formerly the Clean Water Assistance Grant Program), the Accelerated Implementation and Shared Service Grant Program, the Clean Water Community Conservation Partner Grant Program, and the Conservation Drainage Grant Program.

The MPCA administers the Clean Water Partnership (CWP) Resource Investigation and Diagnostic Studies Grant and Loan Program, Clean Water Partnership Implementation Grants, Clean Water State Revolving Funds, and Surface Water Assessment Grants.

The Minnesota Department of Natural Resources (MDNR) administers many grant programs which could be applicable to the City of Red Wing including: the Flood Hazard Mitigation Grant Assistance Program, Shore Land and Aquatic Habitat Block Grants, Dam Safety Grants, Trails Grants, and the Conservation Partners Legacy Grant Program. Funding for many of these programs changes after each legislative session. The MDNR prepares individual fact sheets for many of these grant programs.

Other state funding sources include the Legislative Citizens Commission on Minnesota Resources (LCCMR) funds for non-urgent demonstration and research projects, the Minnesota **Department of Trade and Economic Development's Contaminant Cleanup Development Grant**

Program, the Minnesota Department of Agriculture’s Agriculture Best Management Practices Loan Program, and Minnesota Department of Transportation State Aid Funds.

7.4.6 Federal Funding Sources

The City of Red Wing could also receive surface water project funding from various federal sources, a few of which are discussed in the following paragraphs.

The U.S. Environmental Protection Agency (EPA) has discretionary funds available through each division and program area and administers the Clean Lakes Program (CLP) established by Section 314 of the Clean Water Act. **The CLP is similar to the MPCA’s CWP program.** The EPA also administers the 604b Grant Program, targeting water quality improvements in urban areas; the 319 Grant Program, for implementing non-point source pollution projects; and the Environmental Education Grant, for financing local environmental education initiatives.

The U.S. Army Corps of Engineers administers the Planning Assistance to States (Section 22) Program, the Project Cooperation Agreement Program for construction of flood control projects (also known as the Local Cooperation Agreement Program), the Section 14 Bank Protection Program, the Flood Plain Management Services Program, the Aquatic Plant Control Program, and provides many GIS products through its GIS Center.

The U.S. Fish and Wildlife Service administers the North American Wetlands Conservation Fund, as part of the North American Wetlands Conservation Act.

The Federal Emergency Management Agency (FEMA) has funds available to restore areas (including water resources) damaged or destroyed by a disaster.

7.4.8 Current City Funding Mechanisms

The City of Red Wing currently uses its stormwater utility, ad valorem (general) taxes, and special assessments to finance its surface water management efforts, along with land dedication and easement acquisition during the platting process.

7.4.9 Adequacy of Existing Funding Programs

This Plan, including its capital-improvement and implementation programs, and combined with the existing Storm Water Utility Fund, gives the City effective tools to correct current and future problems. The City will continue to use the Storm Water Utility Fee Program set up in 2008 to fund stormwater-related activities. The Storm Water Utility Fee is the primary funding source for all stormwater improvements related to the City Surface Water Management Plan and NPDES Phase II requirements.

In 2013, the MPCA reissued the NPDES MS4 General Permit for cities in Minnesota. The revisions create a higher level of protection for surface waters and also significantly increase the cost of

operating the Red Wing stormwater system. The City is also experiencing increased costs for system maintenance and operations as the system ages and as general costs rise.

To continue to meet the demands of new permit requirements and keep the Red Wing stormwater system operating effectively and efficiently, the City will review the adequacy of current Storm Water Utility rates and assess the need for increased rates.

7.5 DESIGN STANDARDS

Section 5 presents the City's stormwater-management-related regulations and design standards.

7.6 ORDINANCE IMPLEMENTATION AND OFFICIAL CONTROLS

The City's current ordinances and official controls are described in **Section 5**, and needs and issues are addressed in **Section 6**.

The MPCA's recent revision of the NPDES MS4 General Permit for cities in Minnesota will **require some adjustment in Red Wing's** ordinances to meet new requirements for special waters, trout streams, and other protective measures. After the MPCA reissued the permit, the City performed a review of its regulatory program to identify adjustments needed to existing controls and if new ordinances are required to meet the new NPDES MS4 General Permit **and the City's** resulting SWPPP.

The current NPDES MS4 General Permit and Construction Stormwater Permit include specific regulations regarding discharges to trout streams and other outstanding resource value waters. These regulations are applicable to the Cannon River and trout streams within the City (Hay Creek, Spring Creek, and Bullard Creek). The Red Wing Zoning Code Division 57 will need to be amended to conform to these requirements.

7.7 SURFACE WATER PLAN REVISIONS AND AMENDMENTS

It is anticipated that the Red Wing City Council will adopt this Plan in 2014 as an amendment to the **City's Comprehensive Plan**.

The Red Wing Surface Water Management Plan is based on information that is current at the time of Plan preparation and is, therefore, subject to change. Changes in land use, zoning, watersheds, and drainage patterns, and revisions to governmental regulations and rules could affect all or part of this Plan. As a result, the City may need to revise the Plan to keep it consistent with changing regulations and conditions. The City expects that most revisions to the Plan will be minor (i.e., changes to the implementation program). Revisions to the Plan will follow the processes detailed in **Section 1.7**.

7.8 CAPITAL IMPROVEMENT PROGRAM AND PRIORITIES

Tables 7-8-1 to 7-8-6 contain a comprehensive list of the projects, studies, programs, and official controls that comprise the **City of Red Wing's implementation program**. The program was developed **considering the City's goals** and policies (**Section 2**), existing regulatory controls (**Section 5**), and issues and opportunities (**Section 6**). The City will incorporate these program elements into its Capital Improvements Program (CIP) as funding is available.

Many of the implementation items listed in **Tables 7-8-1 – 7-8-6** are taken from the City's SWPPP for its MS4 NPDES Permit, or are expected to be a part of the upcoming revised NPDES MS4 Permit SWPPP requirements. Implementation tasks will be addressed **here and in the City's** SWPPP with available funding based on priority.

The implementation components listed in the **Tables 7-8-1 – 7-8-6** were prioritized to make the best use of available local funding, address existing water management problems, and prevent future water 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 that are specific to the City of Red Wing.

For this Plan, high-priority items include projects that address urgent existing flooding issues, projects that address imminent flooding problems, and official controls the City needs to adopt as soon as possible following Plan adoption. Medium-priority items include those program elements that require more lead time, address future water management issues, or are located within a trout stream watershed. Low-priority items include implementation components that address less pressing water management needs, such as pond construction for future development. The timing of other infrastructure improvements could change the priorities listed. For example, storm sewer upgrades would likely be completed at the same time as street reconstruction projects.

The City may also use general taxes in conjunction with, or in place of, Storm Water Utility funds for the public education and information programs and other administrative programs. The City will continue to explore all available, appropriate, and cost-effective funding options to finance implementation of this Plan. Examples include state agency grants and other grant and loan programs.

**Table 7-8-1. City of Red Wing Surface Water Implementation Program
NPDES – SWPPP Programs and Tasks**

ID #	Planned Activity	Location	Estimated Cost ¹	Priority	Comments	New Task
REQUIRED NPDES PERMIT ACTIVITIES						
1	NPDES public education and outreach	Citywide	\$5,000	High		NO
2	NPDES public participation/involvement	Citywide	\$5,000	High		NO
3	NPDES Illicit discharge detection and elimination	Citywide	\$5,000	High		NO
4	NPDES construction site stormwater runoff control	Citywide	\$2,000	High		NO
5	NPDES post-construction stormwater management	Citywide	\$2,000	High		NO
6	NPDES pollution prevention and housekeeping for operations	Citywide	\$10,000	High		NO
7	NPDES annual inspection of structural facilities	Citywide	\$20,000	High		NO
8	Inventory City facilities with runoff pollutants	Citywide	\$20,000	High	Facilities such as gas stations, vehicle repair locations, salt storage	YES
9	Design stormwater treatment for the above facilities in need	Citywide	\$50,000	High	Facilities such as gas stations, vehicle repair locations, salt storage	YES
10	Inventory stormwater management facilities	Citywide	\$50,000	High	Facilities: stationary and permanent BMPs, no ditches or swales	YES
11	Inspect stormwater management facilities	Citywide	\$20,000	High	Facilities: stationary and permanent BMPs, no ditches or swales	YES
12	Maintain stormwater management facilities	Citywide	\$100,000	High	Facilities: stationary and permanent BMPs, no ditches or swales	NO
13	Develop snow storage guidelines and standards	Citywide	\$3,000	High		YES
14	Develop tailored, job-specific training program	Citywide	\$5,000	High		YES
15	Mapping impaired water discharges	Citywide	\$25,000	High		YES
16	Revise Zoning Code Division 53 to prohibit expanded discharge to the Cannon River ORVW and incorporate revised MS4 permit requirements	Cannon River watershed	\$5,000	High		YES
17	Revise Zoning Code Division 57 for consistency with revised MS4 and Construction Stormwater Permits	Citywide	\$10,000	High		YES
18	Update SWPPP: Report impaired waters waste load allocations for Red Wing; develop actions to be taken and timeline to meet WLAs	Citywide	\$50,000	High		YES
19	Prepare annual NPDES reports	Citywide	\$15,000	High		NO
NPDES/SWPPP TOTAL			\$402,000			

¹ Cost estimates are estimated in 2012 dollars, and are updated from the 1999 Red Wing Watershed Plan, where applicable. All cost estimates are for planning purposes only since many of the estimates may not be based on engineering feasibility reports.

Table 7-8-2. City of Red Wing Surface Water Implementation Program

Improvements to Address Flooding Problems (From 2006 Plan – Note that project cost and design aspects such as detention basin volume shall be estimated and/or refined as part of feasibility studies for individual projects)

ID #	Planned Activity	Location	Cost Estimate ¹	Priority	Comments	New Task
20	Construct 10.8 acre-foot stormwater basin	41-PLS Cherry St	\$439,000	High- (planned 2016)	Basin area = 1 ac	NO
21	Construct 31.9 acre-foot stormwater basin	BA-16	TBD ²	Medium	Basin area = 10 ac	NO
22	Construct 8.4 acre-foot extended detention basin	HC4 Hay Creek Detention Basins	TBD ²	Medium	Basin area = 2 ac	NO
23	Construct 5.6 acre-foot extended detention basin	HC5 Hay Creek Detention Basins	TBD ²	Medium	Basin area = 1 ac	NO
24	Construct 32.3 acre-foot extended detention basin	HC9 Hay Creek Detention Basins	TBD ²	Medium	Basin area = 6 ac	NO
25	Construct 14.6 acre-foot extended detention basin	HC10	TBD ²	Medium	Basin area = 3 ac	NO
26	Construct 27.8 acre-foot extended detention basin	HC11	TBD ²	Medium	Basin area = 4 ac	NO
27	Construct 8.3 acre-foot extended detention basin	HCVR2,3 and 4	TBD ²	Medium	Basin area = 4 ac	NO
28	Construct 1.9 acre-foot extended detention basin	FSR and HCVR1	TBD ²	Medium	Basin area = 4 ac	NO
29	Construct 4.4 acre-foot extended detention basin	HCVR5 and 6	TBD ²	Medium	Basin area = 4 ac	NO
30	Construct 12.6 acre-foot extended detention basin	SC7	TBD ²	Medium	Basin area = 4 ac	NO
31	Construct 59.1 acre-foot extended detention basin	SC1	TBD ²	Medium	Basin area = 12 ac	NO
32	Construct 19.6 acre-foot extended detention basin	SC4	TBD ²	Medium	Basin area = 5 ac	NO
33	Construct 56.4 acre-foot extended detention basin	SC3	TBD ²	Medium	Basin area = 12 ac	NO
34	Construct 39.1 acre-foot extended detention basin	SC11	TBD ²	Medium	Basin area = 9 ac	NO
35	Construct 14.3 acre-foot extended detention basin	SC9	TBD ²	Medium	Basin area = 4 ac	NO
36	Construct 80.6 acre-foot extended detention basin	SC6	TBD ²	Medium	Basin area = 22 ac	NO
37	Construct 68.1 acre-foot extended detention basin	SC8	TBD ²	Medium	Basin area = 13 ac	NO
38	Construct 3.5 acre-foot extended detention basin	SC2-1	TBD ²	Medium	Basin area = 1 ac	NO
39	Construct 31.0 acre-foot stormwater basin	SC5	TBD ²	Medium	Basin area = 6 ac	NO
40	Construct 36.1 acre-foot stormwater basin	CR1	TBD ²	Low	Basin area = 6 ac	NO
41	Construct 29.3 acre-foot extended detention basin	1-PR	TBD ²	Medium	Basin area = 3 ac	NO
42	Construct 18.7 acre-foot stormwater basin	CR2	TBD ²	Low	Basin area = 4 ac	NO
43	Construct 50.4 acre-foot stormwater basin	CR3	TBD ²	Low	Basin area = 10 ac	NO
44	Storm sewer upgrade	Brick Ave (Hay Creek Watershed)	TBD ²	High	To be completed in whole or part in conjunction with other projects	NO
45	Storm sewer upgrade	Bush St (Mississippi River Watershed)	TBD ²	Medium	To be completed in whole or part in conjunction with other projects	NO
46	Storm sewer upgrade	East Ave. (Mississippi River watershed)	TBD ²	Medium	To be completed in whole or part in conjunction with other projects	NO
47	Storm sewer upgrade	Fairview Lane (Mississippi River watershed)	TBD ²	Medium	To be completed in whole or part in conjunction with other projects	NO

Table 7-8-2. City of Red Wing Surface Water Implementation Program

Improvements to Address Flooding Problems (From 2006 Plan – Note that project cost and design aspects such as detention basin volume shall be estimated and/or refined as part of feasibility studies for individual projects)

ID #	Planned Activity	Location	Cost Estimate ¹	Priority	Comments	New Task
48	Storm sewer upgrade	Haycreek Valley Rd. (Hay Creek watershed)	TBD ²	Medium	To be completed in whole or part in conjunction with other projects	NO
49	Storm sewer upgrade	Jackson St. (Mississippi River watershed)	TBD ²	Medium	To be completed in whole or part in conjunction with other projects	NO
50	Storm sewer upgrade	Pioneer Rd. (Hay Creek watershed)	TBD ²	Medium	To be completed in whole or part in conjunction with other projects	NO
51	Storm sewer upgrade	Plum St. (Mississippi River watershed)	TBD ²	Medium	To be completed in whole or part in conjunction with other projects	NO
52	Area upstream of Pioneer Road (Cty 66)	Pioneer Rd. (Hay Creek watershed)	TBD ²	Nuisance	From City staff	YES
53	North and South Service Drive	North and South Service Dr. (Spring Creek watershed)	TBD ²	Nuisance	From City staff	YES
54	Maple Street and Watson Street Area	Maple St. (Hay Creek watershed)	TBD ²	Medium	From City Staff	YES
55	Cleveland Street	Cleveland St. (Hay Creek watershed)	TBD ²	Medium	From City staff, might be completed	YES
56	Tunnel Rehabilitation	Citywide	\$300,000	High	First phase of annual tunnel rehabilitation planned for 6 th Street and East Avenue	YES
57	Revise Zoning Ordinance Division 52	Citywide	\$10,000	High	Revise to update minimum building elevations	YES
58	Update Hydrologic / Hydraulic Modeling	Citywide	\$50,000	Medium	Model updates to include recently-updated precipitation, soil, and land-use data	YES
59	Develop and implement runoff water quality monitoring program	Citywide, at targeted locations	\$20,000/yr per monitor station	High	Implement only if required to do so by NPDES or other regulations.	NO
60	Promote stormwater retention through infiltration practices and demonstration projects	Citywide	\$5,000 - \$50,000	Medium	Promotion of stormwater retention could be achieved by providing incentives to developers.	NO
61	Administer Red Wing Storm Water Utility	Citywide	\$10,000/yr	High		NO
Flooding TOTAL			TBD²			

¹ Cost estimates are estimated in 2012 dollars, and are updated from the 1999 Red Wing Watershed Plan, where applicable. All cost estimates are for planning purposes only since many of the estimates may not be based on engineering feasibility reports. Costs reflect total estimated project costs, including costs borne by developers as site development occurs.

² Project costs will be estimated on a case-by-case basis as priorities dictate. Total cost of flooding implementation program will vary according to the costs of the implemented projects.

Table 7-8-3. City of Red Wing Surface Water Implementation Program

Infrastructure Improvements to Address Water Quality Problems (From 2006 Plan)

ID #	Planned Activity	Location	Estimated Cost¹	Priority	Comments	New Activity?
62	Pond maintenance—sediment removal 6 ponds	Citywide	\$94,500 per pond; \$567,000 for six	High	Accumulated sediment will be dredged from ponds approximately every 5 years; with 30 ponds, six ponds per year will be dredged.	NO
63	Replace street sweeper/vacuum at 10 years old	Citywide	\$135,000 - street sweeper \$182,000 - street vacuum	High	Coordinate with City's Capital Equipment Program	NO
64	Partner with county, adjacent townships, and upstream landowners outside City's jurisdiction to reduce pollutant/sediment loadings and volume	Citywide	\$5,000 - \$50,000	High	This task includes projects, meetings, and/or agreements.	NO
65	Tyler Road North outlet trash collectors	Spring Creek watershed	TBD ²	High	From City staff	YES
66	Ponding at Featherstone and Hay Creek	Hay Creek watershed	TBD ²	High	From City staff	YES
67	Pond at Pioneer Road (near County facility)	Hay Creek watershed	TBD ²	High	From City staff	YES
68	Levee Street—multiple outflows	Mississippi watershed	TBD ²	High	From City staff	YES
69	Siewert Street ravine repair	Hay Creek watershed	TBD ²	High	From City staff	YES
Water Quality TOTAL			\$707,000 - \$799,000²			

¹ Cost estimates are estimated in 2012 dollars, and are updated from the 1999 Red Wing Watershed Plan, where applicable. All cost estimates are for planning purposes only since many of the estimates may not be based on engineering feasibility reports.

² Project costs will be estimated on a case-by-case basis as priorities dictate. Total cost will vary according to project costs to be determined.

**Table 7-8-4. City of Red Wing Surface Water Implementation Program
Cannon River Turbidity Impairment Implementation Tasks**

ID #	Planned Activity	Location	Estimated Cost ¹	Priority	Comments	New Activity?
70	Provide long-term maintenance for detention basins to reduce sedimentation in local streams	Cannon River watershed	TBD ²	Done	Cannon River Turbidity Impairment Implementation Task F-1	NO
71	Provide general stormwater education to residents, especially in urban areas	Cannon River watershed	TBD ²	Done	Cannon River Turbidity Impairment Implementation F-2	NO
72	Provide education, design, installation assistance, and cost-share funding for stormwater practices	Cannon River watershed	\$5,000	Medium	Cannon River Turbidity Impairment Implementation F-3	YES
73	Prepare and adopt local erosion-control standards and ordinances for construction sites	Cannon River watershed	TBD ²	Done	Cannon River Turbidity Impairment Implementation F-4	NO
74	Identify and repair erosion-prone land areas owned by the City of Red Wing	Cannon River watershed	TBD ²	Done	Cannon River Turbidity Impairment Implementation F-5	NO
75	Train city staff regarding pollution caused by park and fleet/building maintenance and construction, and outfall inspection and system maintenance	Cannon River watershed	TBD ²	Done	Cannon River Turbidity Impairment Implementation F-6	NO
76	Develop and implement street sweeping practices to reduce sediment especially in areas close to waters	Cannon River watershed	TBD ²	Done	Cannon River Turbidity Impairment Implementation F-7	NO

¹ Cost estimates are estimated in 2012 dollars, and are updated from the 1999 Red Wing Watershed Plan, where applicable. All cost estimates are for planning purposes only since many of the estimates may not be based on engineering feasibility reports.

² Project costs will be estimated on a case-by-case basis as priorities dictate.

**Table 7-8-5. City of Red Wing Surface Water Implementation Program
South Metro Mississippi River Turbidity Impairment Implementation Task**

ID #	Planned Activity	Location	Estimated Cost ¹	Priority	Comments	New Activity?
77	Develop BMPs to achieve an estimated 25% reduction in sediment load in existing urban areas and apply these BMPs to developing areas; in conjunction with the construction stormwater permit and minimum control measures, this will bring Red Wing into compliance with the TMDL.	Citywide	\$2,000	High		YES

¹ Cost estimates are estimated in 2012 dollars, and are updated from the 1999 Red Wing Watershed Plan, where applicable. All cost estimates are for planning purposes only since many of the estimates may not be based on engineering feasibility reports.

Table 7-8-6. City of Red Wing Surface Water Implementation Program

Mississippi and Vermillion River Turbidity Impairment Implementation Tasks

ID #	Planned Activity	Location	Estimated Cost¹	Priority	Comments	New Activity?
78	Erosion control along Cherry St. from Oakwood Cemetery	Mississippi River watershed	TBD ²	Medium		YES
79	Erosion control from Cannonview Dr. to the Cannon River bottoms	Cannon River watershed	TBD ²	Medium		YES
80	Relocate city sand/salt storage from Upper Harbor and cover and maintain	Mississippi River watershed	TBD ²	Medium		YES
81	Upper Harbor Stormwater Demonstration Project	Mississippi River watershed	TBD ²	Medium		YES
82	Addition of stormwater management projects as Upper Harbor re-develops	Mississippi River watershed	TBD ²	Medium		YES

¹ Cost estimates are estimated in 2012 dollars, and are updated from the 1999 Red Wing Watershed Plan, where applicable. All cost estimates are for planning purposes only since many of the estimates may not be based on engineering feasibility reports.

² Project costs will be estimated on a case-by-case basis as priorities dictate.

Section 8

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Figures

Figure 3.1.1
EXISTING LAND USE
City of Red Wing
Water Resources Management Plan



- | | |
|-------------------------|----------------------------|
| Municipal Boundary | Institutional |
| Streams | High Density Residential |
| Lakes | Medium Density Residential |
| Parcel Boundary | Low Density Residential |
| Existing Landuse | |
| Unknown | Open Space |
| Industry | Agriculture |
| Downtown | Park (active) |
| Commercial | Prairie Island Community |
| Utility | Vacant |

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.

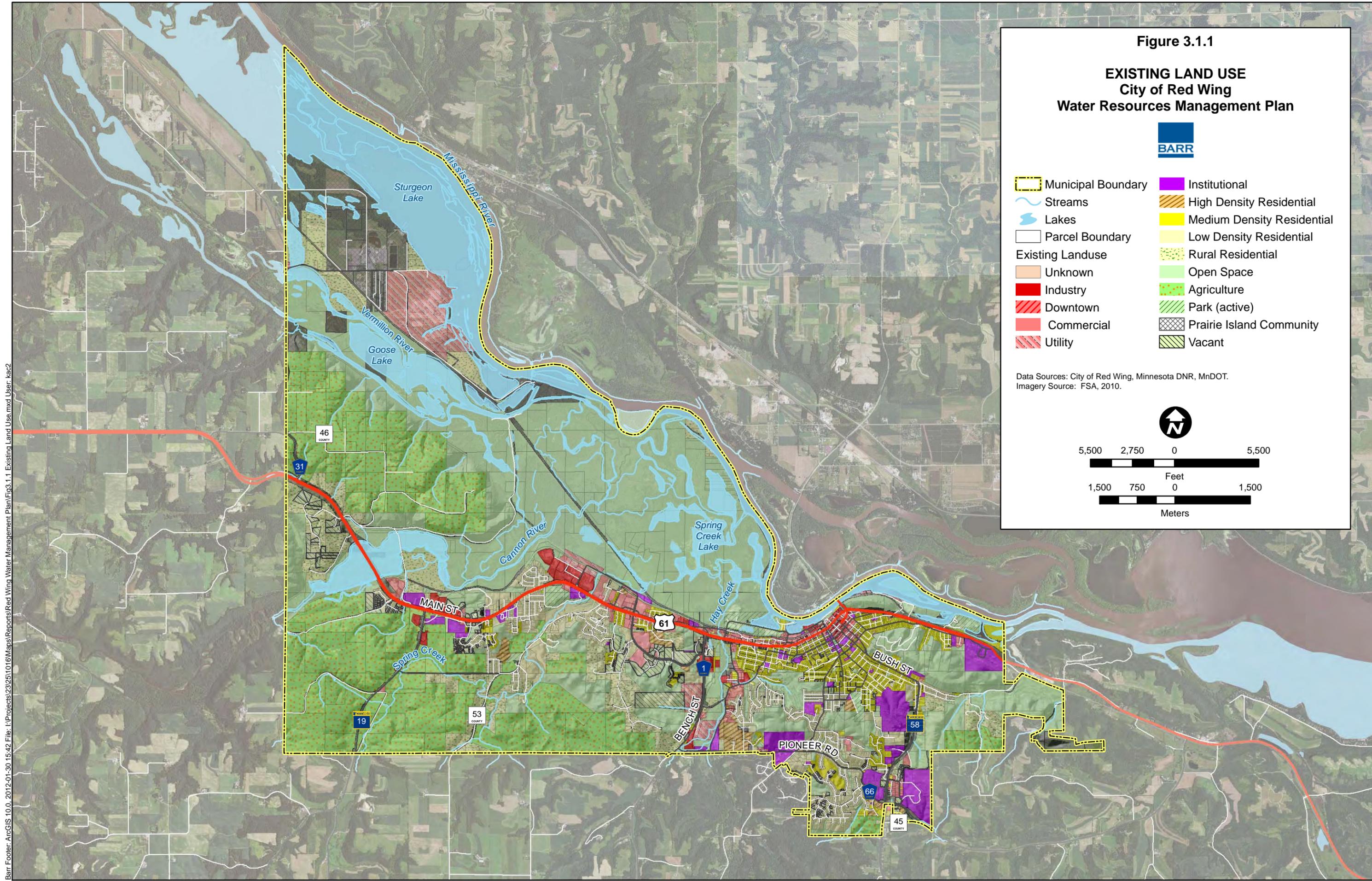
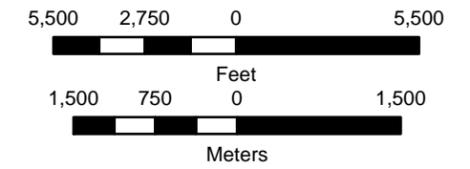


Figure 3.1.2
FUTURE LAND USE
City of Red Wing
Water Resources Management Plan



- Municipal Boundary
- Streams
- Lakes
- Future Landuse**
- Agricultural/Residential
- Commercial
- Industrial
- Open Space, Parkland, or Undevelopable Land
- Prairie Island Reservation
- Public/Semi-Public
- Residential

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.

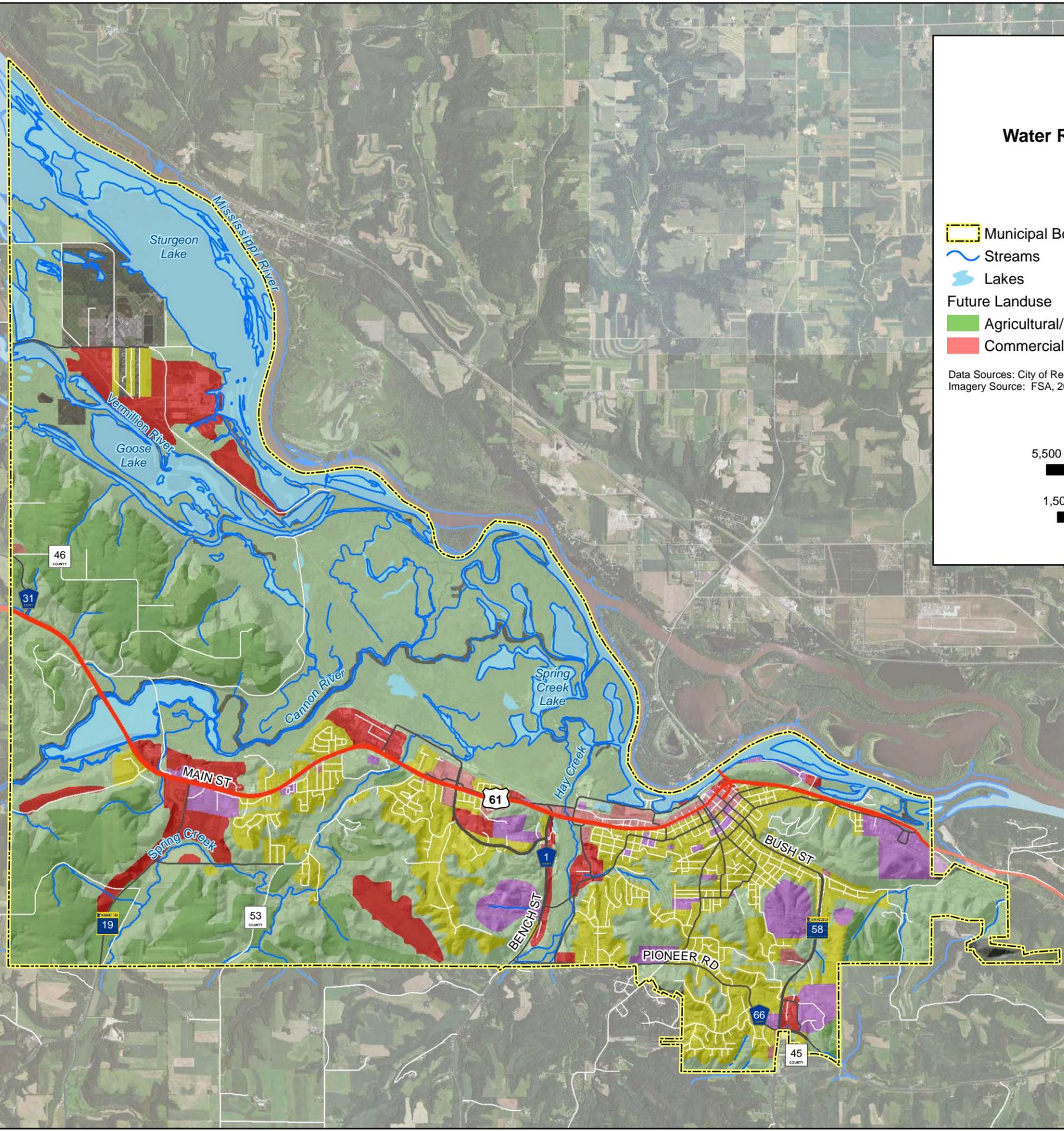
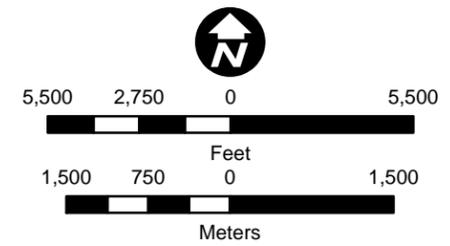
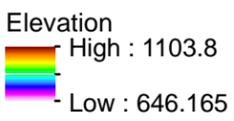


Figure 3.3.1
TOPOGRAPHY
City of Red Wing
Water Resources Management Plan



 Municipal Boundary  Streams  Lakes

Elevation
High : 1103.8
Low : 646.165



Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.



5,500 2,750 0 5,500
1,500 750 0 1,500
Feet
Meters

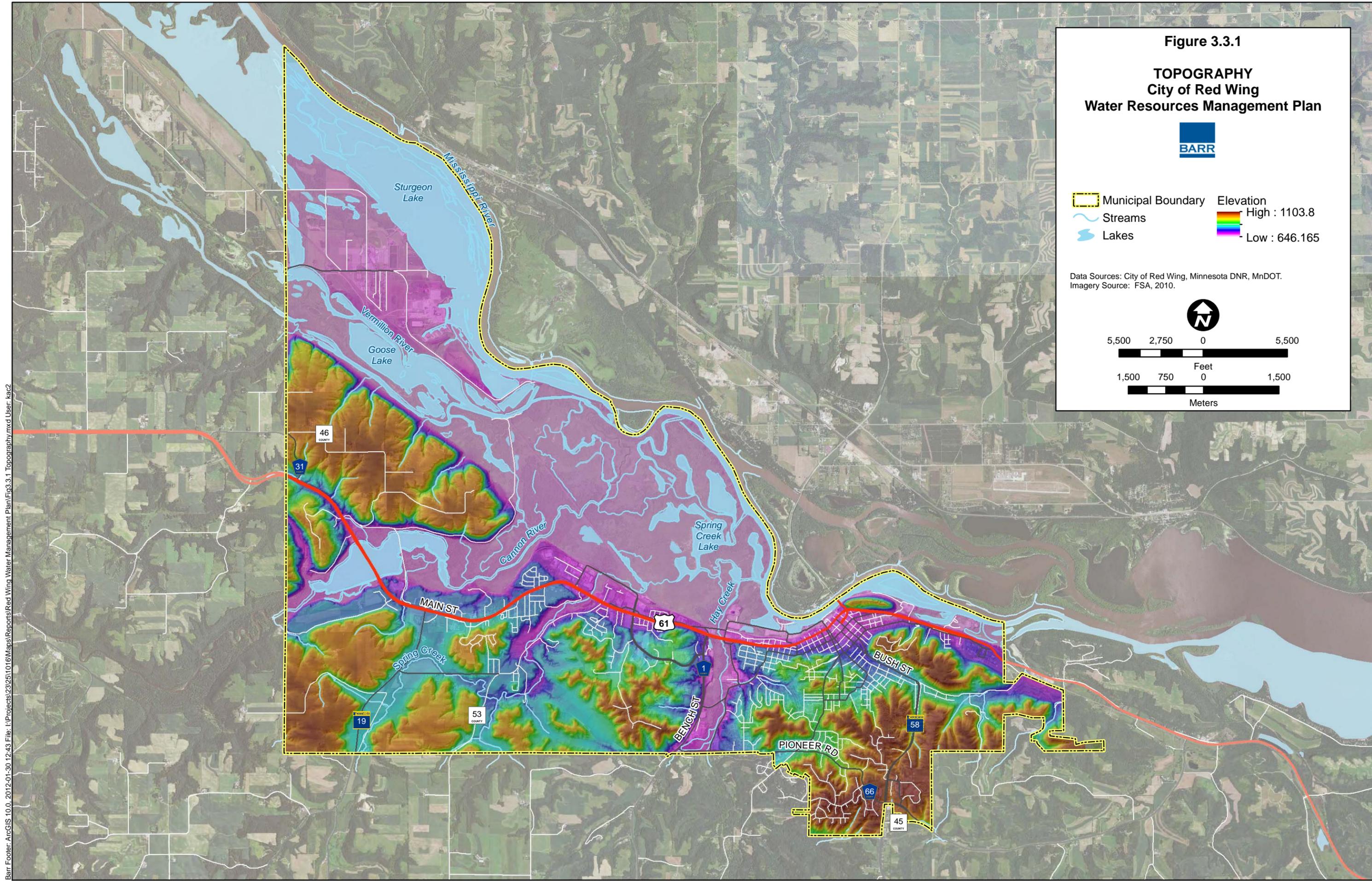


Figure 3.5.1
SOIL TYPES
City of Red Wing
Water Resources Management Plan

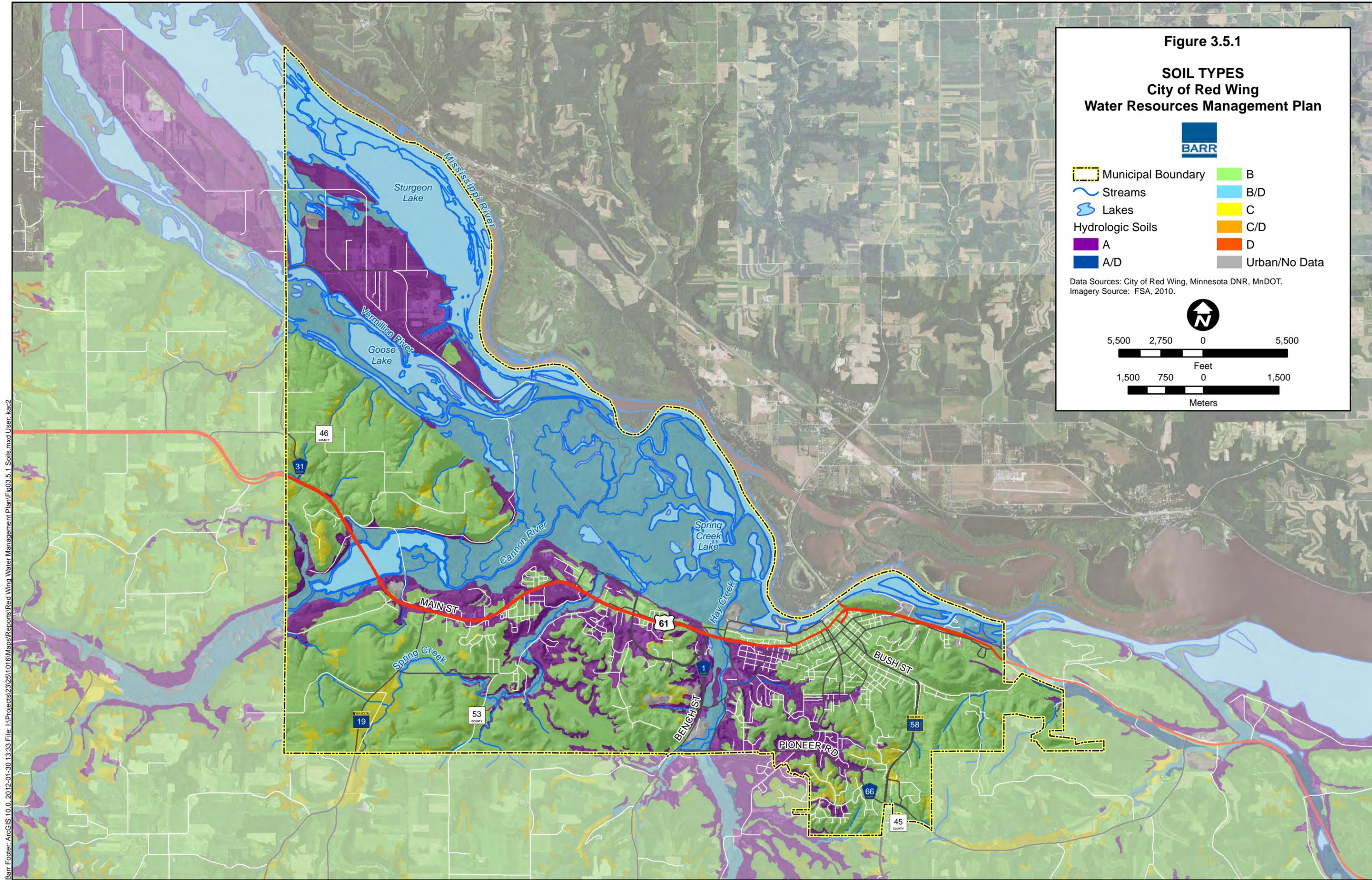


 Municipal Boundary
 Streams
 Lakes
Hydrologic Soils
 A
 A/D
 B
 B/D
 C
 C/D
 D
 Urban/No Data

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.



5,500 2,750 0 5,500
1,500 750 0 1,500
Feet
Meters



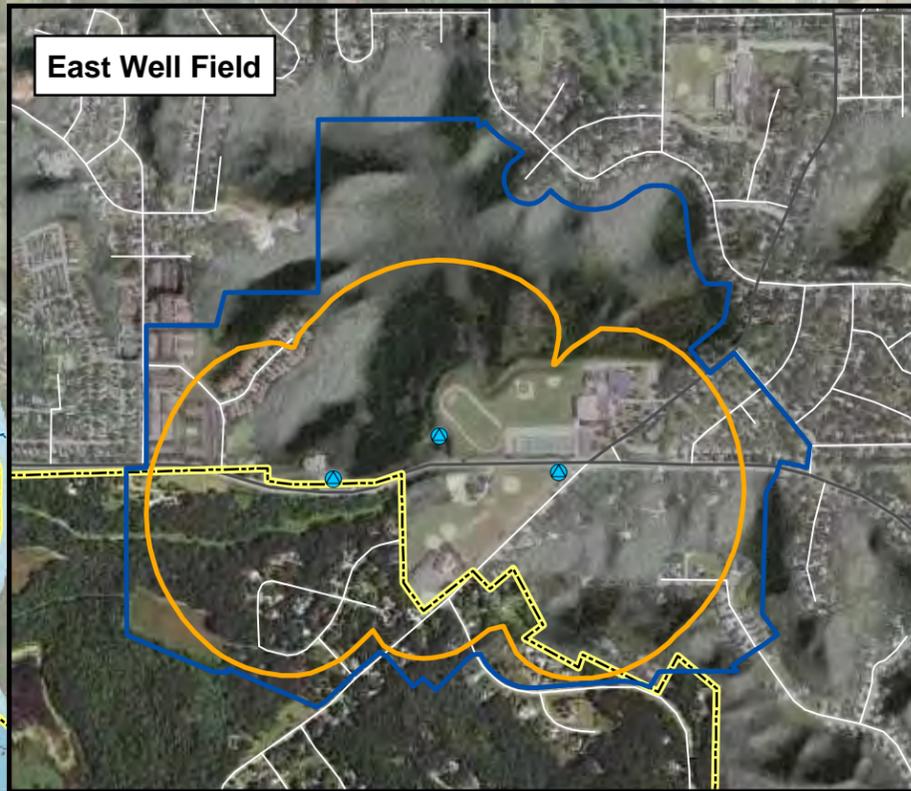
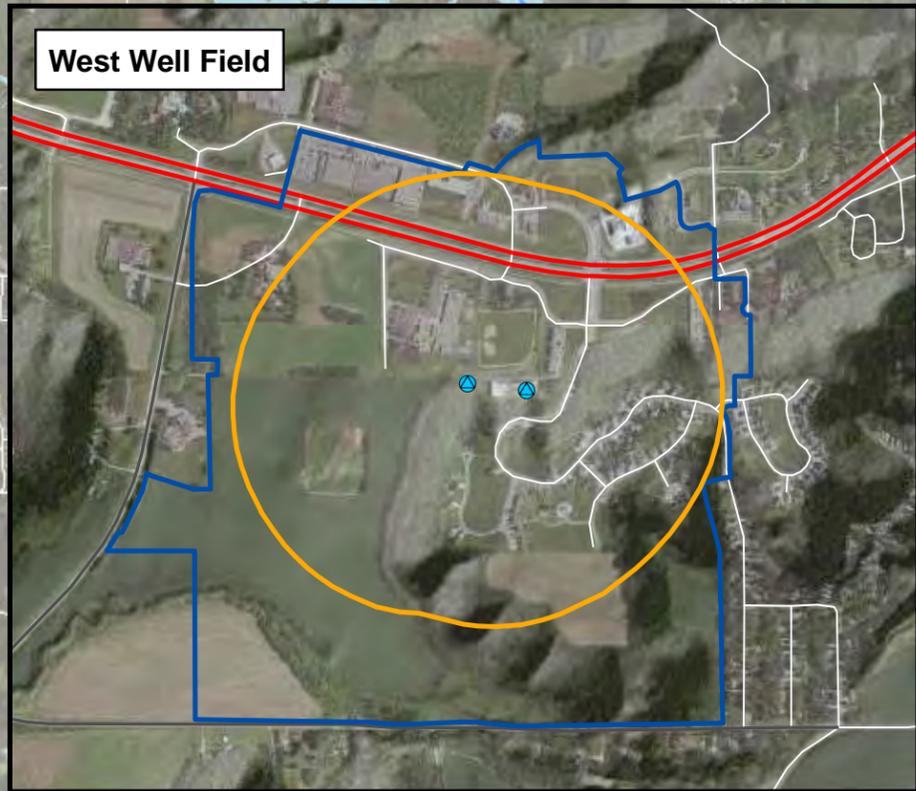


Figure 3.6.1
MUNICIPAL GROUNDWATER WELLS
City of Red Wing
Water Resources Management Plan



-  Red Wing Municipal Well
-  Drinking Water Supply Mgmt Area (DWSMA)
-  Wellhead Protection Area (WHPA)
-  Municipal Boundary
-  Streams
-  Lakes

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.

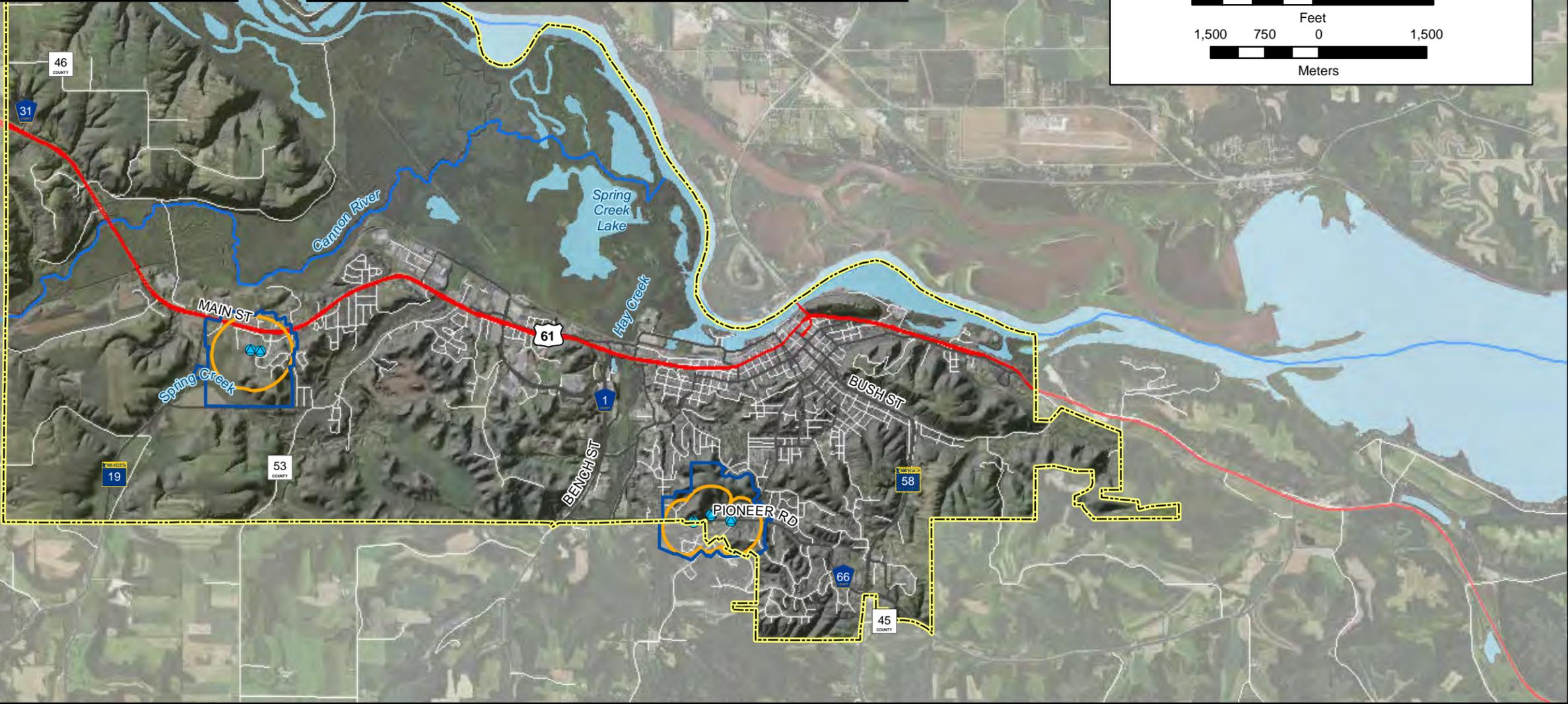
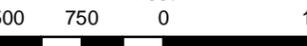


Figure 3.8.1
WETLANDS
City of Red Wing
Water Resources Management Plan



- Municipal Boundary
- Wetlands (National Wetlands Inventory)**
 - Freshwater Emergent Wetland
 - Freshwater Forested/Shrub Wetland
 - Freshwater Pond
 - Lake
 - Riverine

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.

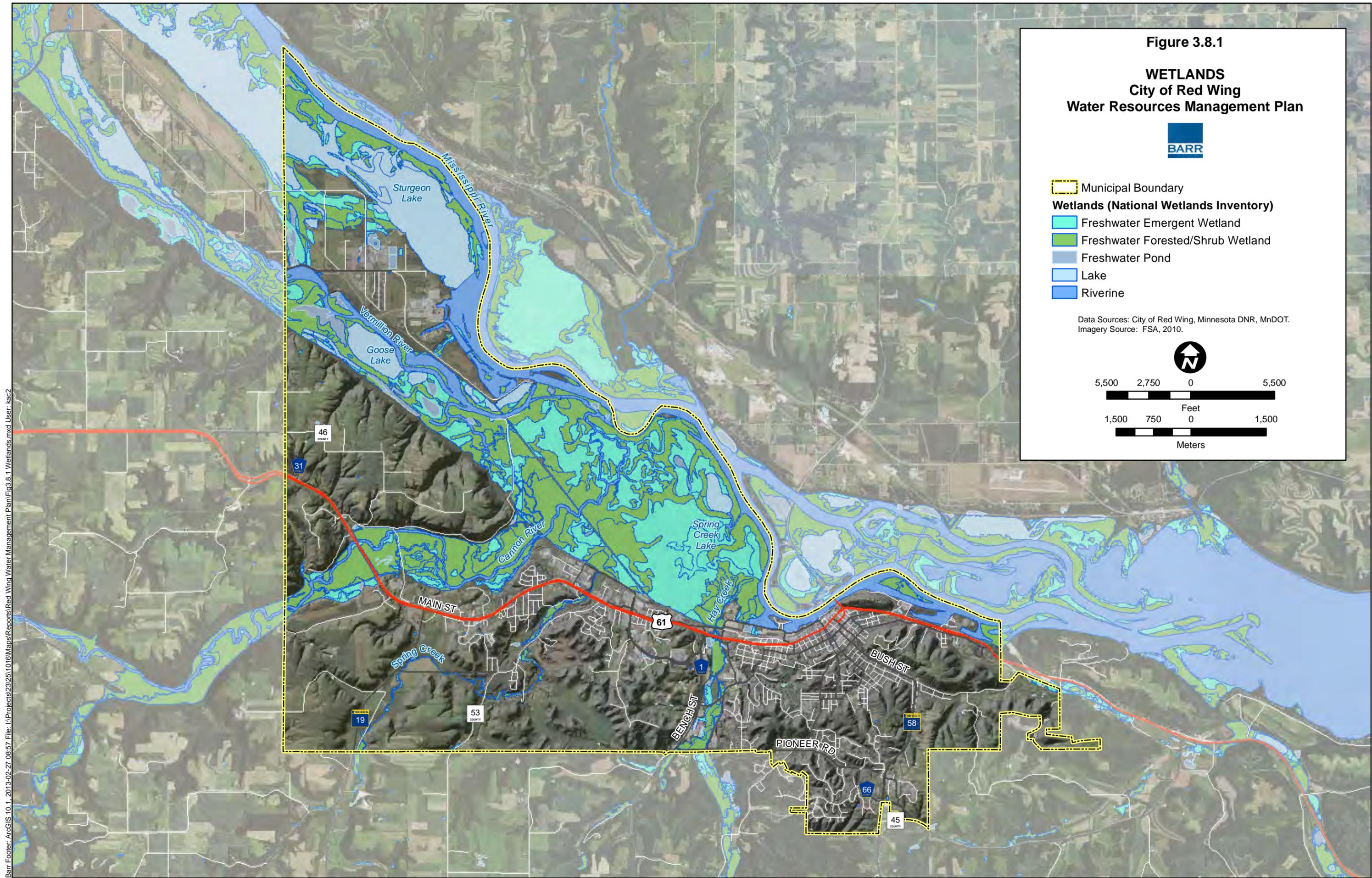
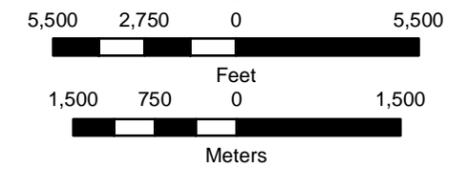


Figure 3.8.2
PUBLIC WATERS & TROUT
STREAM DESIGNATIONS
City of Red Wing
Water Resources Management Plan



-  Municipal Boundary
-  Minnesota Designated Trout Streams
-  Public Waters
-  Public Water Watercourses

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.



Feet
0 750 1,500 2,750 5,500

Meters
0 750 1,500

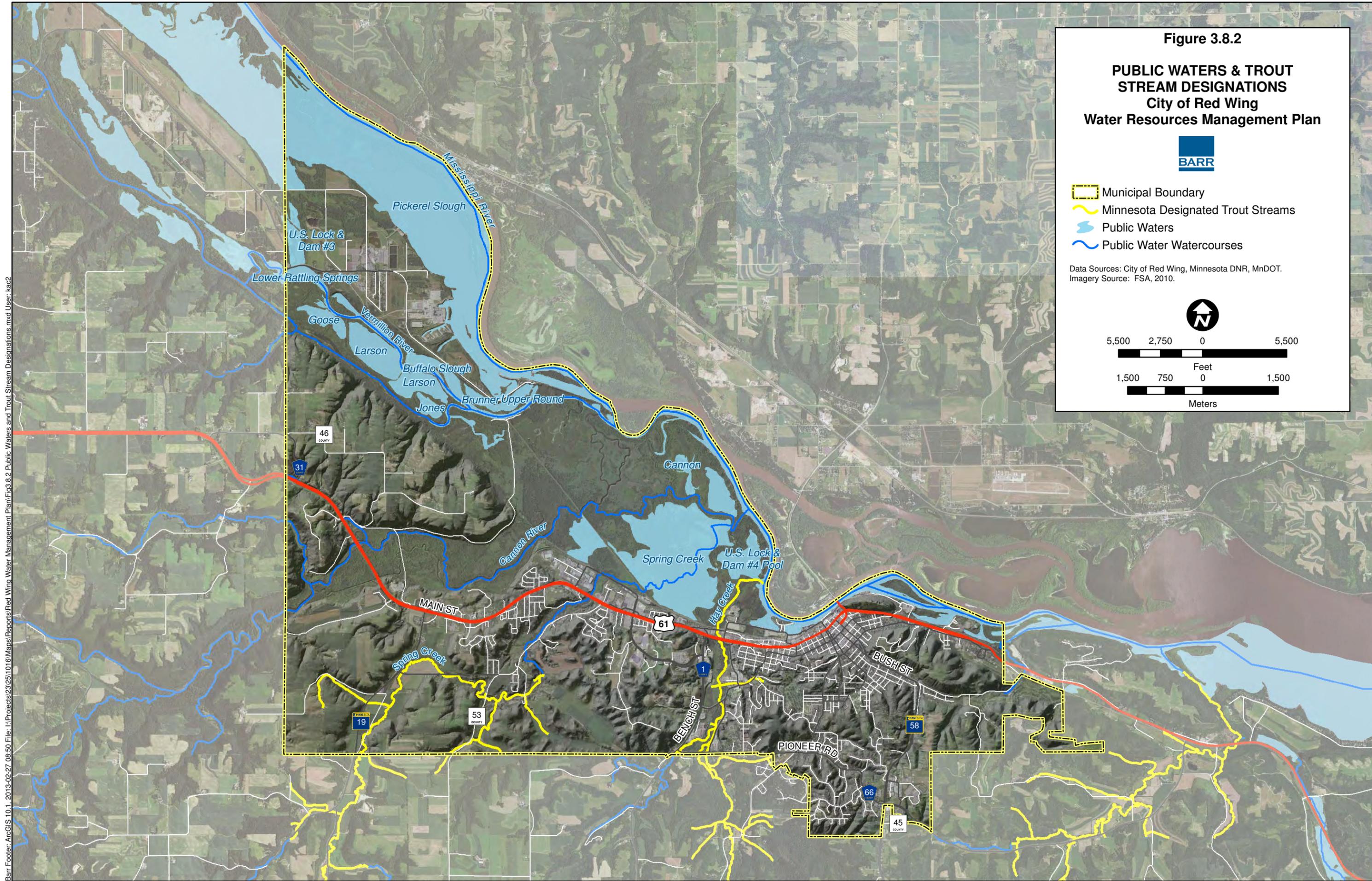
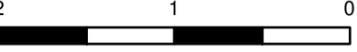


Figure 3.9.1
STORM WATERSHEDS
City of Red Wing
Water Resources Management Plan

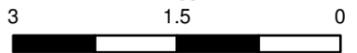


-  Municipal Boundary
-  Watershed Boundaries
-  Minnesota Designated Trout Streams
-  Streams

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.



Miles



Kilometers

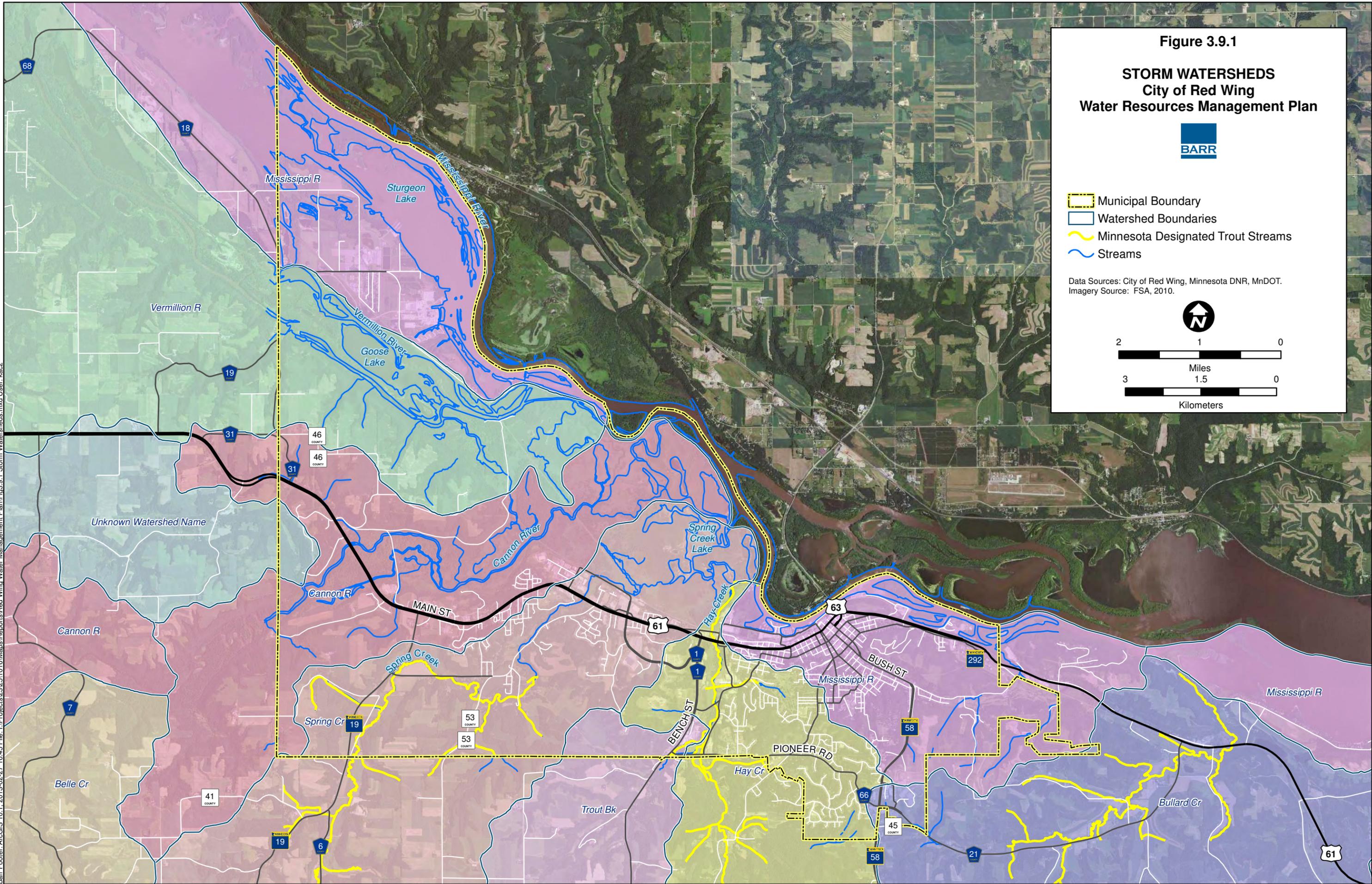


Figure 3.10.1
IMPAIRED WATERS
City of Red Wing
Water Resources Management Plan



-  Municipal Boundary
-  Impaired Waters (Draft 2014)
-  Streams
-  Lakes

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.

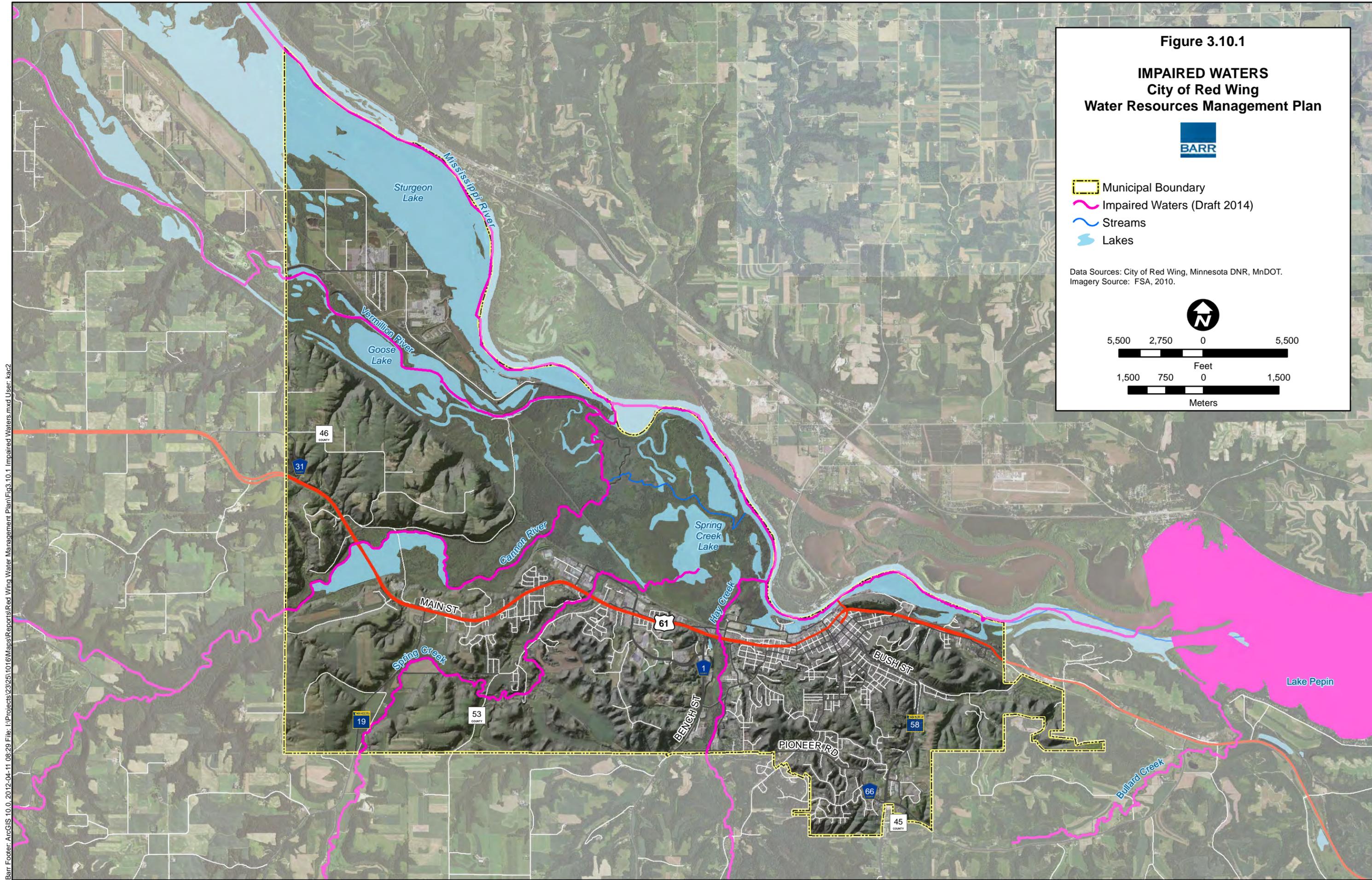
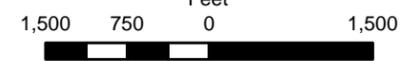
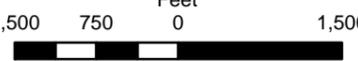


Figure 3.11.1
FLOODPLAIN AREAS IN RED WING
City of Red Wing
Water Resources Management Plan



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

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.



Feet
Meters

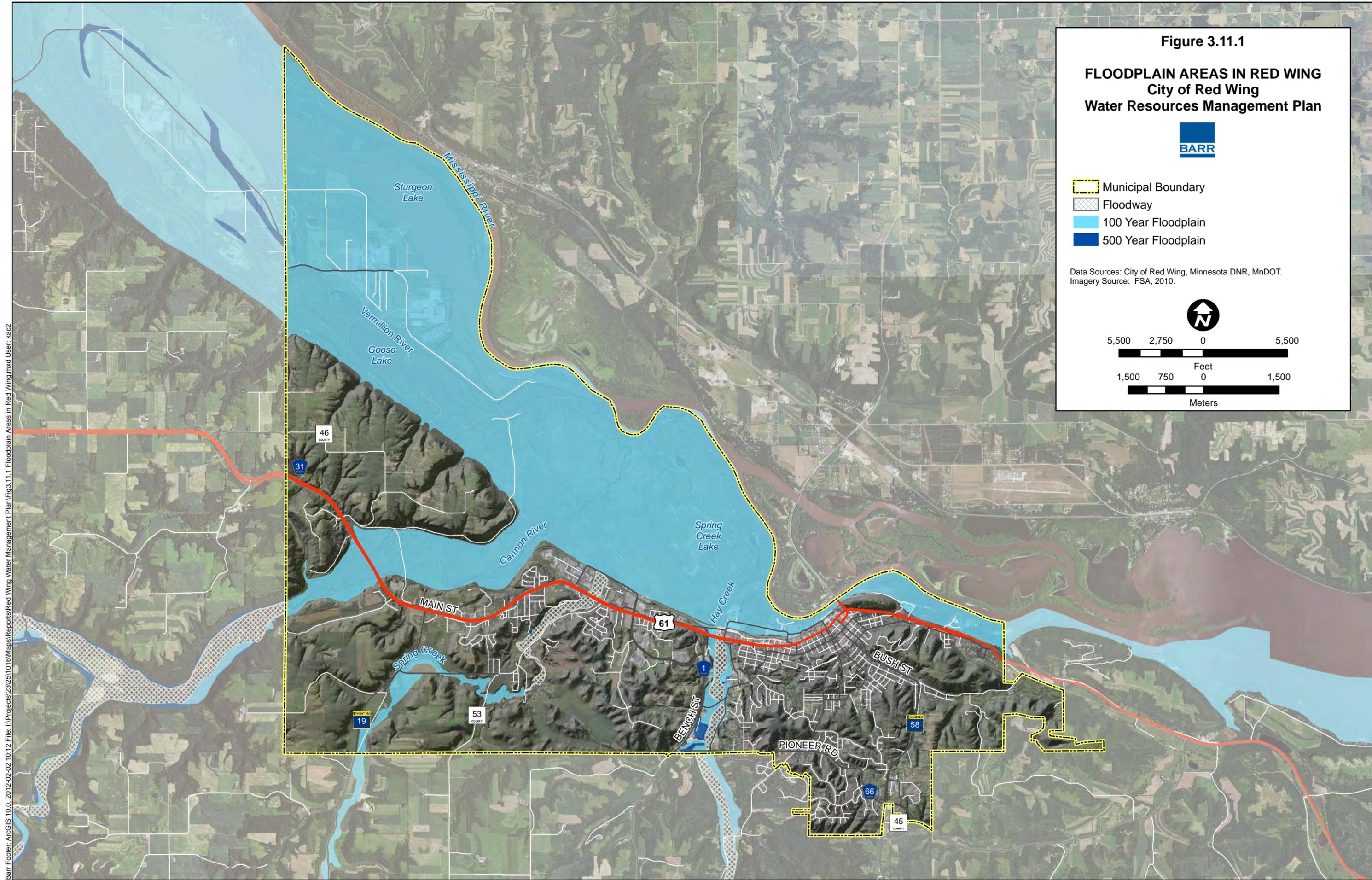


Figure 3.14.1
COUNTY BIOLOGICAL SURVEY
City of Red Wing
Water Resources Management Plan



- | | |
|----------------------------------|---------------------|
| Municipal Boundary | Forested Wetlands |
| Upland Forest | Shrub Wetlands |
| Deciduous Woodlands/
Savannas | Open Wetlands |
| Prairies | Bedrock Communities |
| | Streams |
| | Lakes |

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.

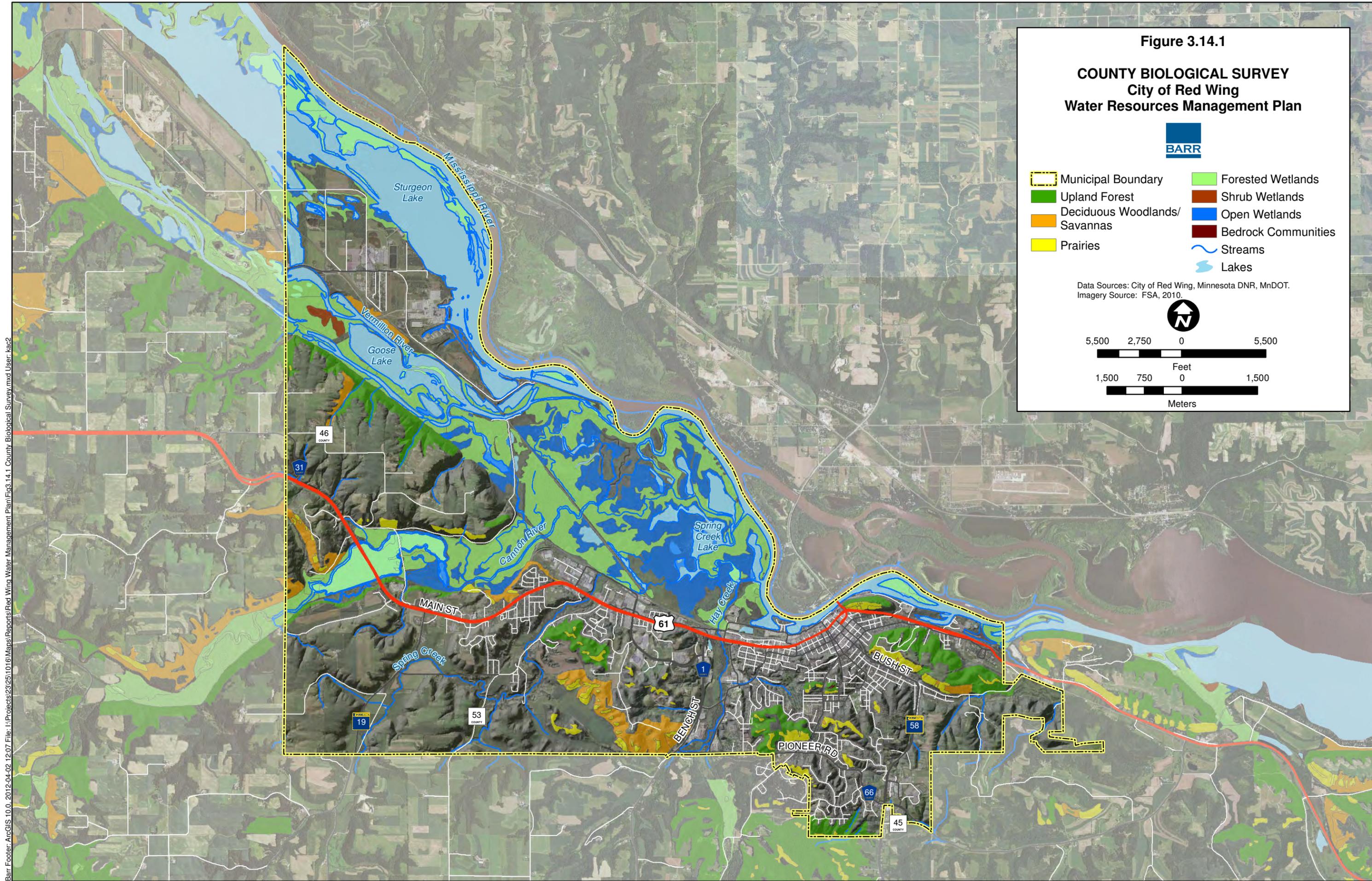
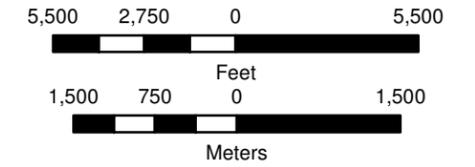


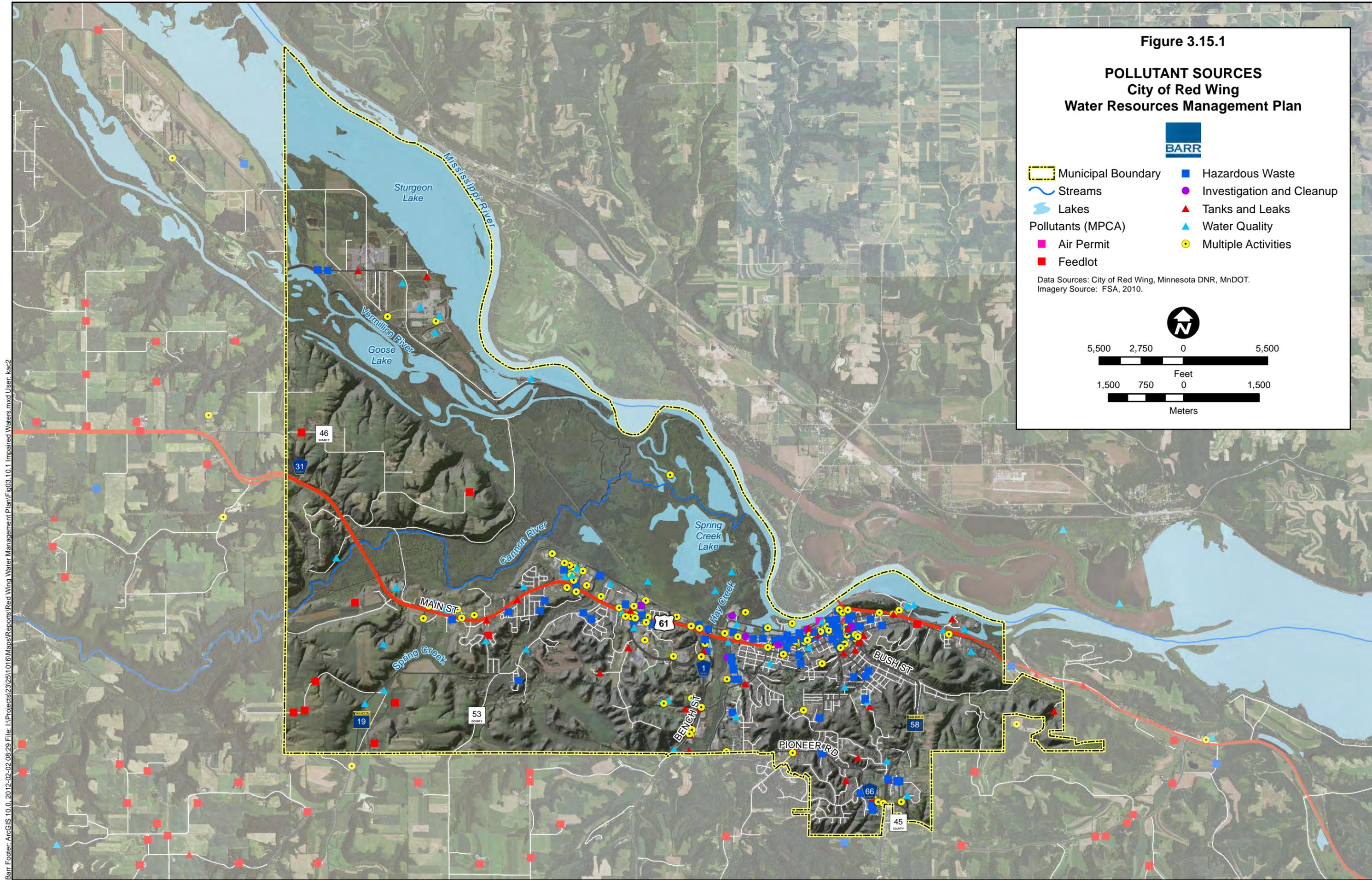
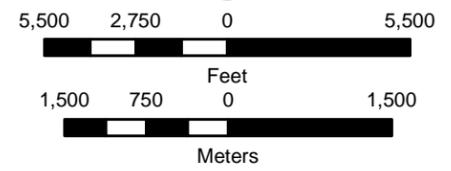
Figure 3.15.1

POLLUTANT SOURCES
City of Red Wing
Water Resources Management Plan

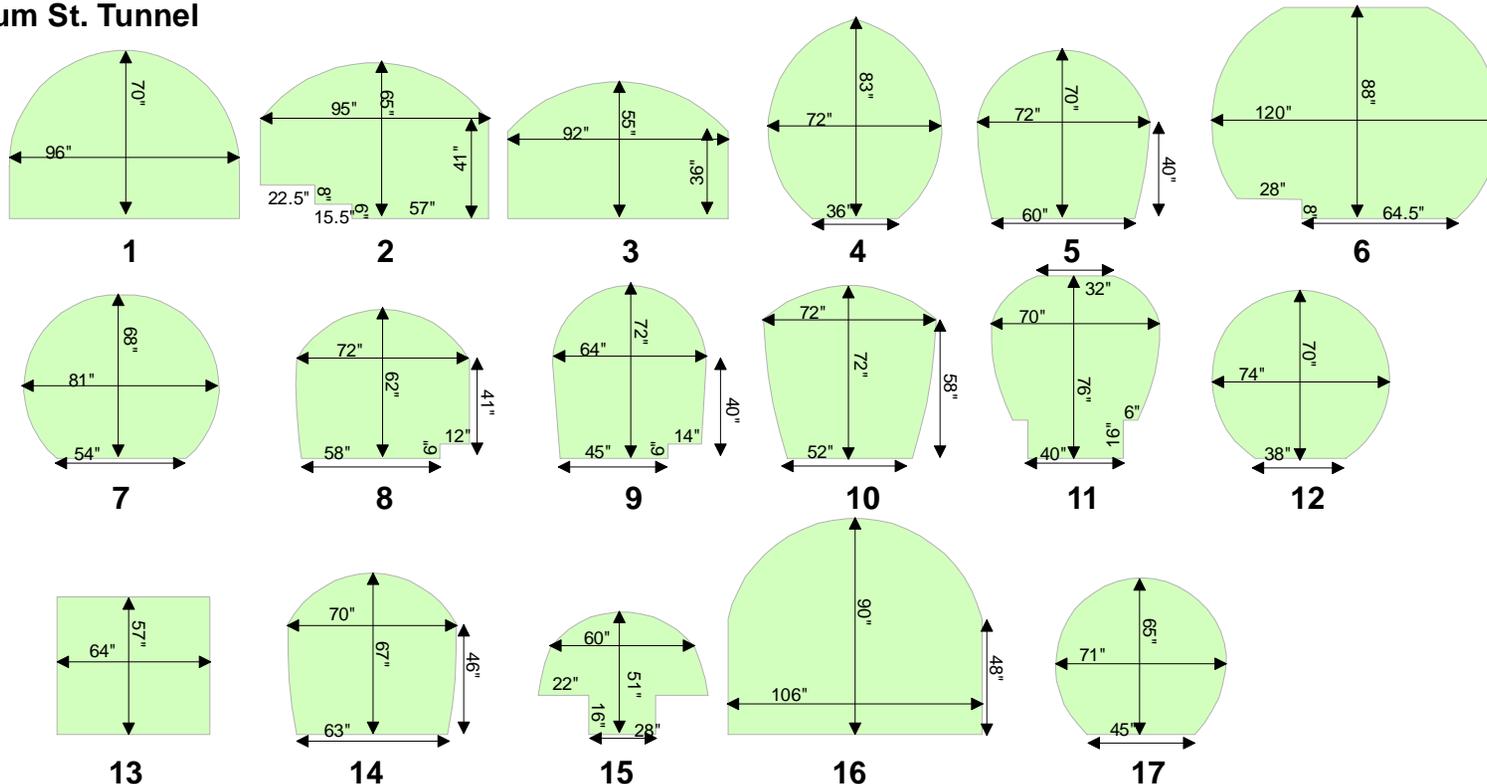


- Municipal Boundary
- Streams
- Lakes
- Air Permit
- Feedlot
- Hazardous Waste
- Investigation and Cleanup
- Tanks and Leaks
- Water Quality
- Multiple Activities

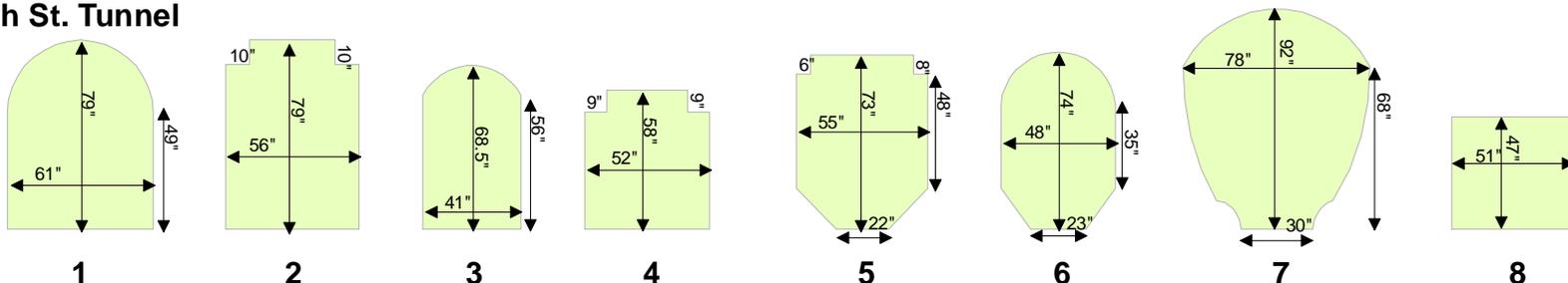
Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.



Plum St. Tunnel



Bush St. Tunnel



Bush St. Tunnel at 13th St.

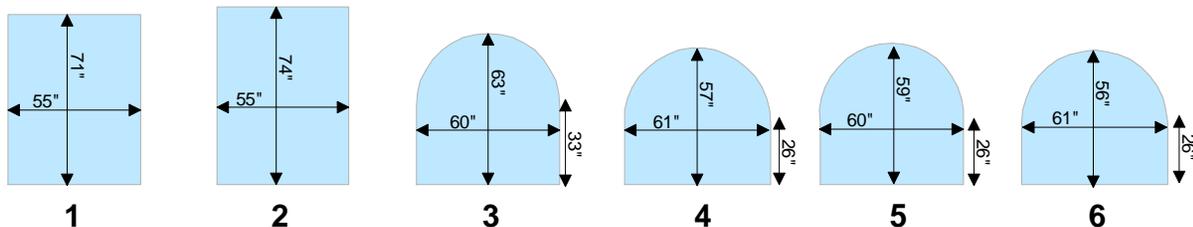


Figure 4.1.1
STORM WATER TUNNEL
CROSS SECTIONS
City of Red Wing
Water Resources Management Plan

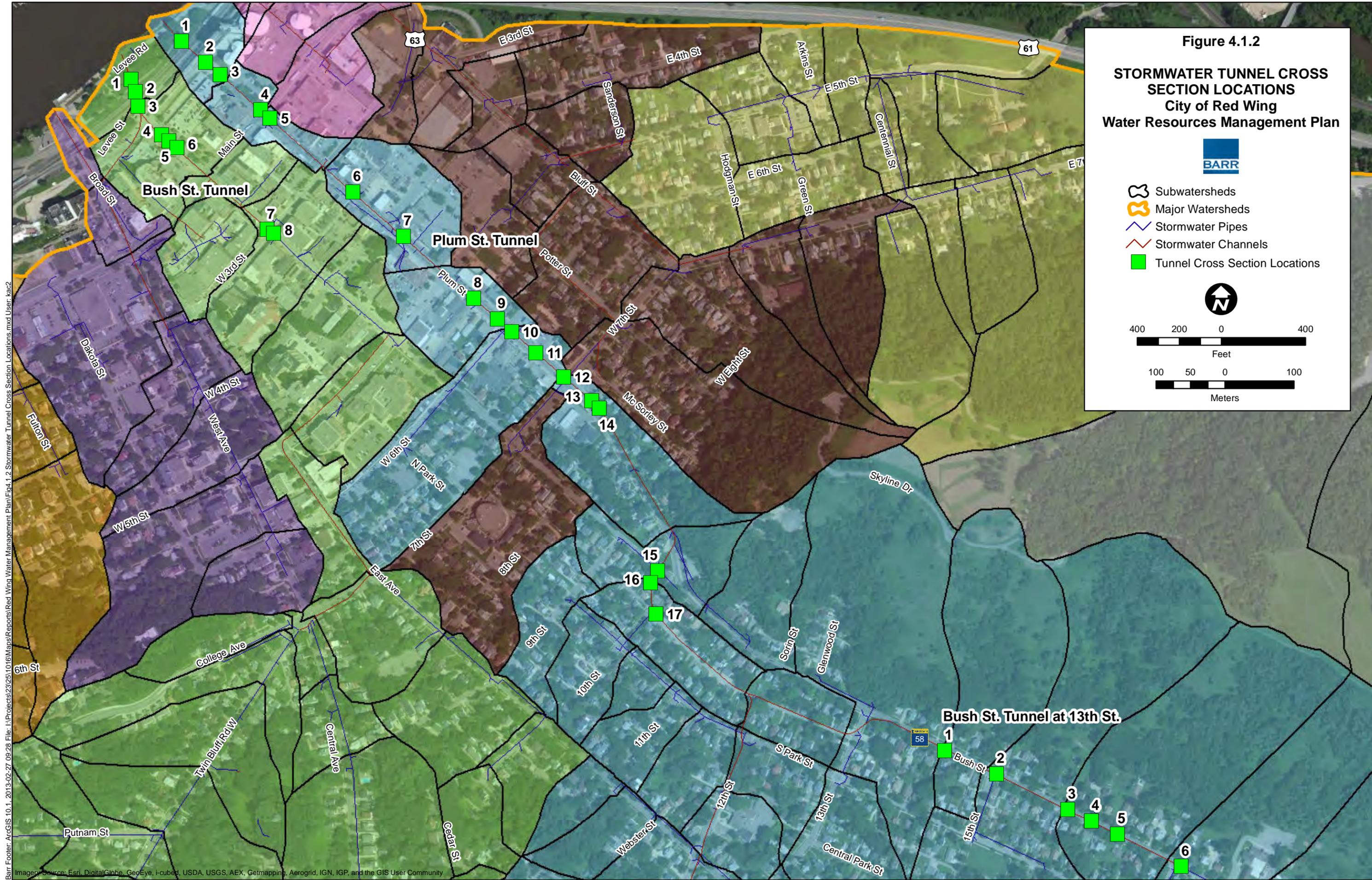


Figure 4.1.2

STORMWATER TUNNEL CROSS SECTION LOCATIONS
City of Red Wing
Water Resources Management Plan



- Subwatersheds
- Major Watersheds
- Stormwater Pipes
- Stormwater Channels
- Tunnel Cross Section Locations

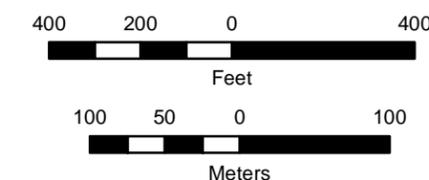
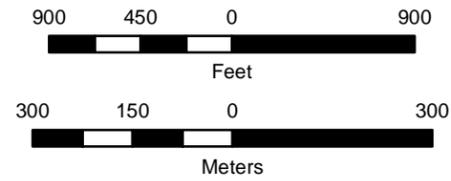




Figure 4.2.2
**MISSISSIPPI RIVER
SUBWATERSHEDS - WEST**
City of Red Wing
Water Resources Management Plan



-  Subwatersheds
-  Major Watersheds
-  Stormwater Pipes
-  Stormwater Channels
-  Impaired Streams (2014)
-  Storm Detention



MISSISSIPPI RIVER WATERSHED

MISSISSIPPI RIVER WATERSHED

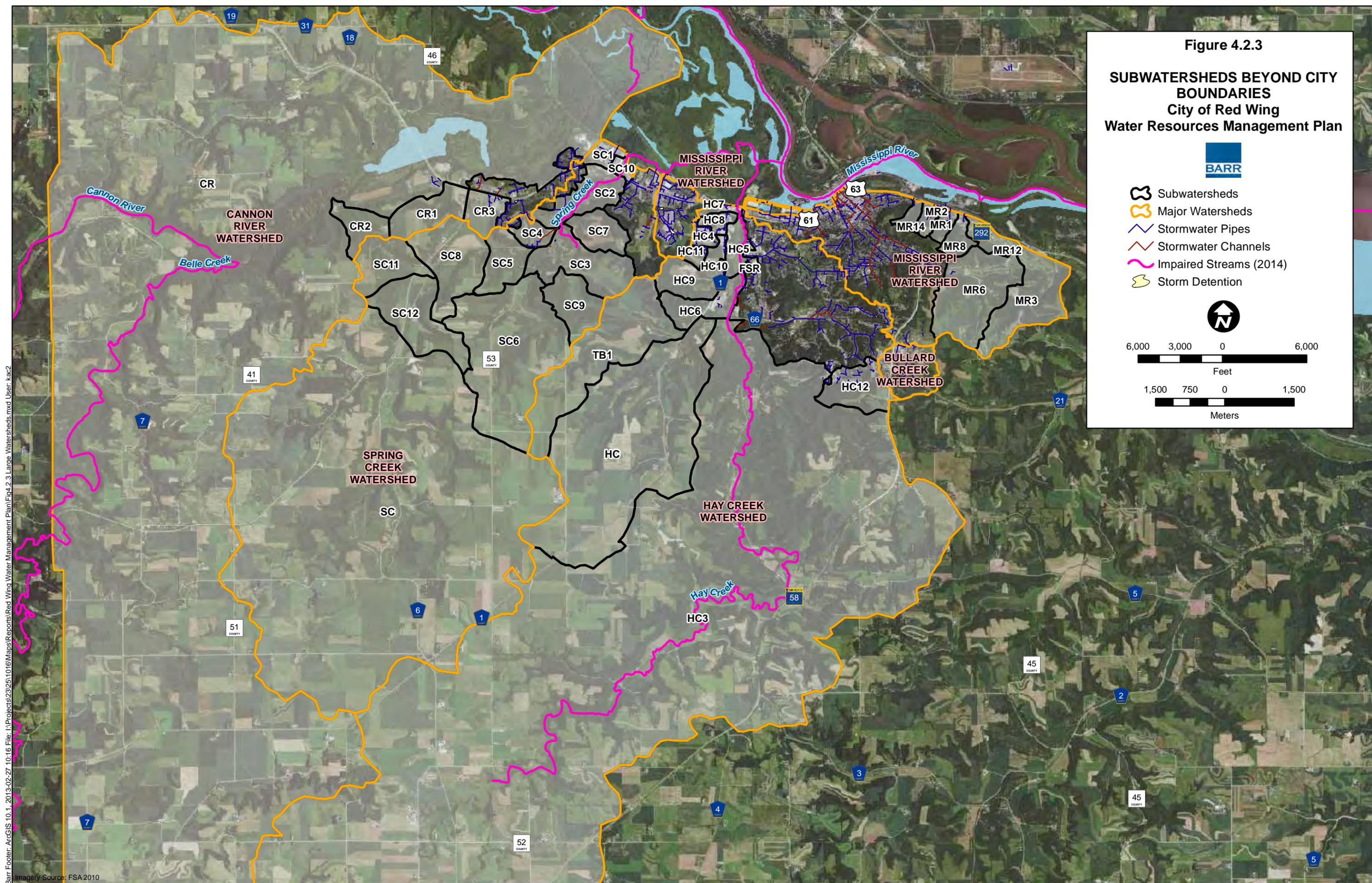
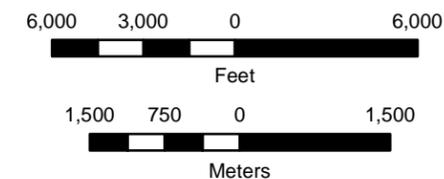
1PS
2PS
3PS
4BS
5BS
6BS
7BS
8BS
9BS
10BS
11BS
12BS
13BS
14BS
15BS
16BS
17BS
18BS
20BS
21BS
24BPLS
24CPLS
27APLS

Figure 4.2.3

SUBWATERSHEDS BEYOND CITY BOUNDARIES
City of Red Wing
Water Resources Management Plan



- Subwatersheds
- Major Watersheds
- Stormwater Pipes
- Stormwater Channels
- Impaired Streams (2014)
- Storm Detention



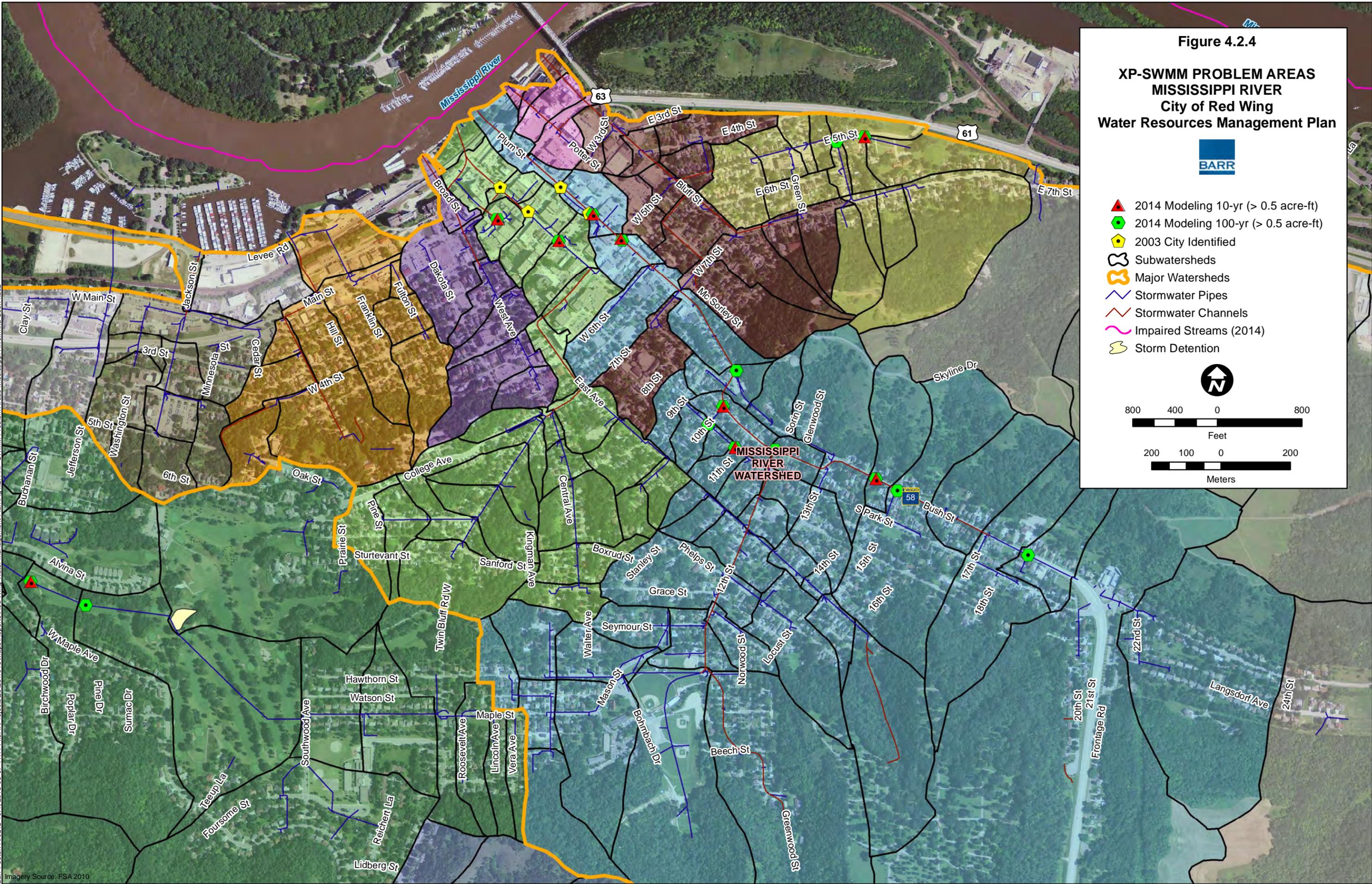


Figure 4.2.4

**XP-SWMM PROBLEM AREAS
MISSISSIPPI RIVER
City of Red Wing
Water Resources Management Plan**



- 2014 Modeling 10-yr (> 0.5 acre-ft)
- 2014 Modeling 100-yr (> 0.5 acre-ft)
- 2003 City Identified
- Subwatersheds
- Major Watersheds
- Stormwater Pipes
- Stormwater Channels
- Impaired Streams (2014)
- Storm Detention

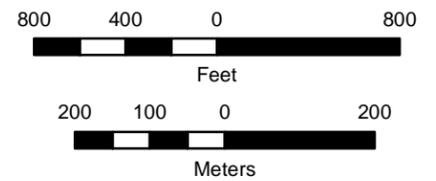


Figure 4.2.5

**XP-SWMM PROBLEM AREAS
MISSISSIPPI RIVER
CANNON RIVER AND SPRING CREEK
City of Red Wing
Water Resources Management Plan**



Problem Areas

- 2014 Modeling 10-yr (> 0.5 acre-ft)
- 2014 Modeling 100-yr (> 0.5 acre-ft)
- 2003 City Identified
- Subwatersheds
- Major Watersheds
- Stormwater Pipes
- Stormwater Channels
- Impaired Streams (2014)
- Storm Detention

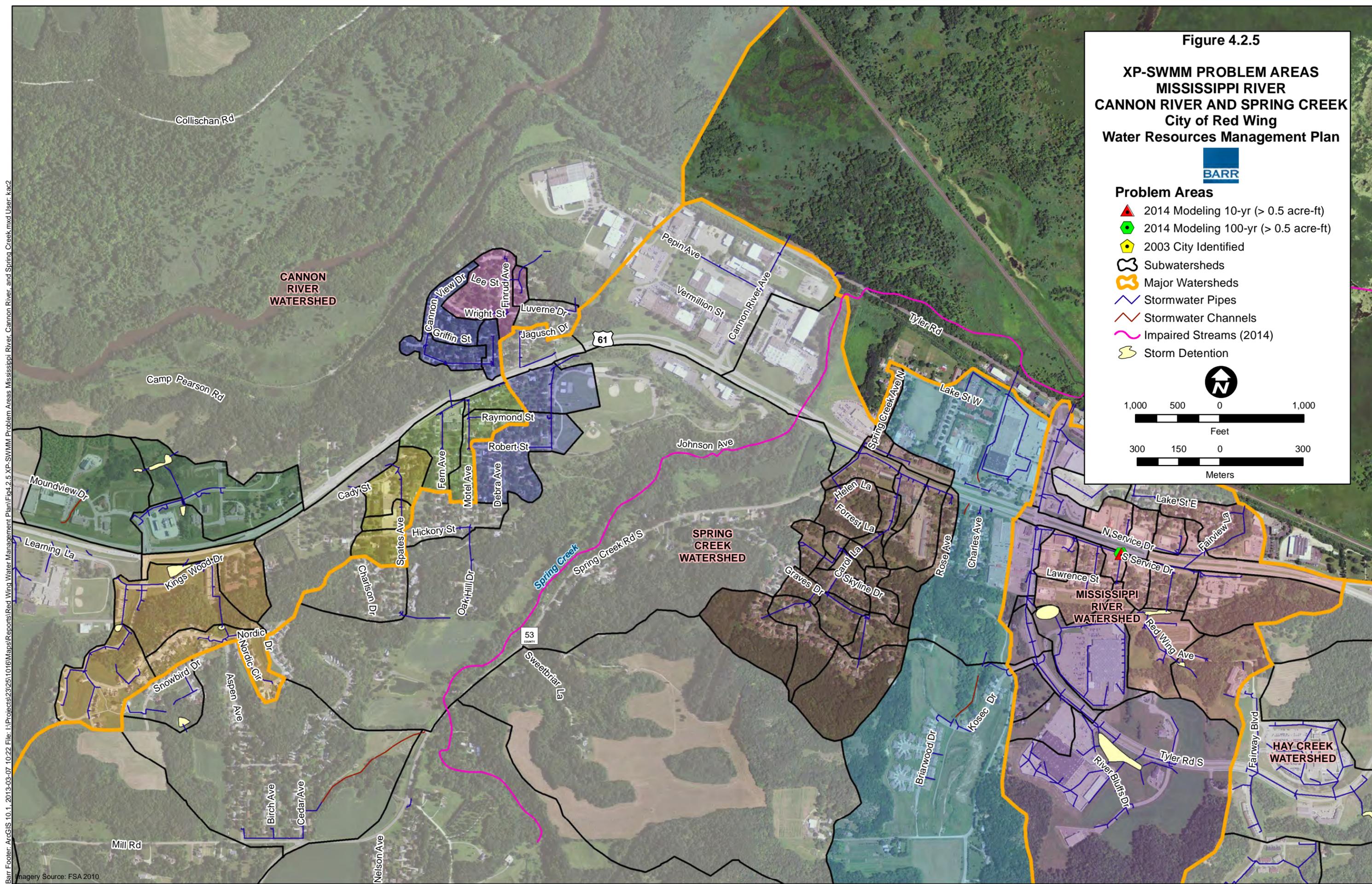
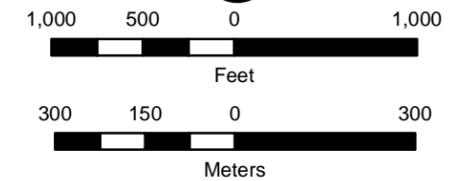


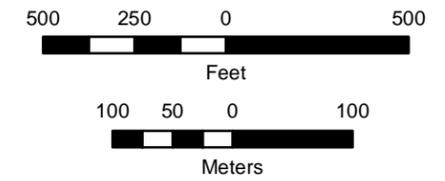


Figure 4.3.1

BULLARD CREEK SUBWATERSHEDS
City of Red Wing
Water Resources Management Plan



- Subwatersheds
- Major Watersheds
- Stormwater Pipes



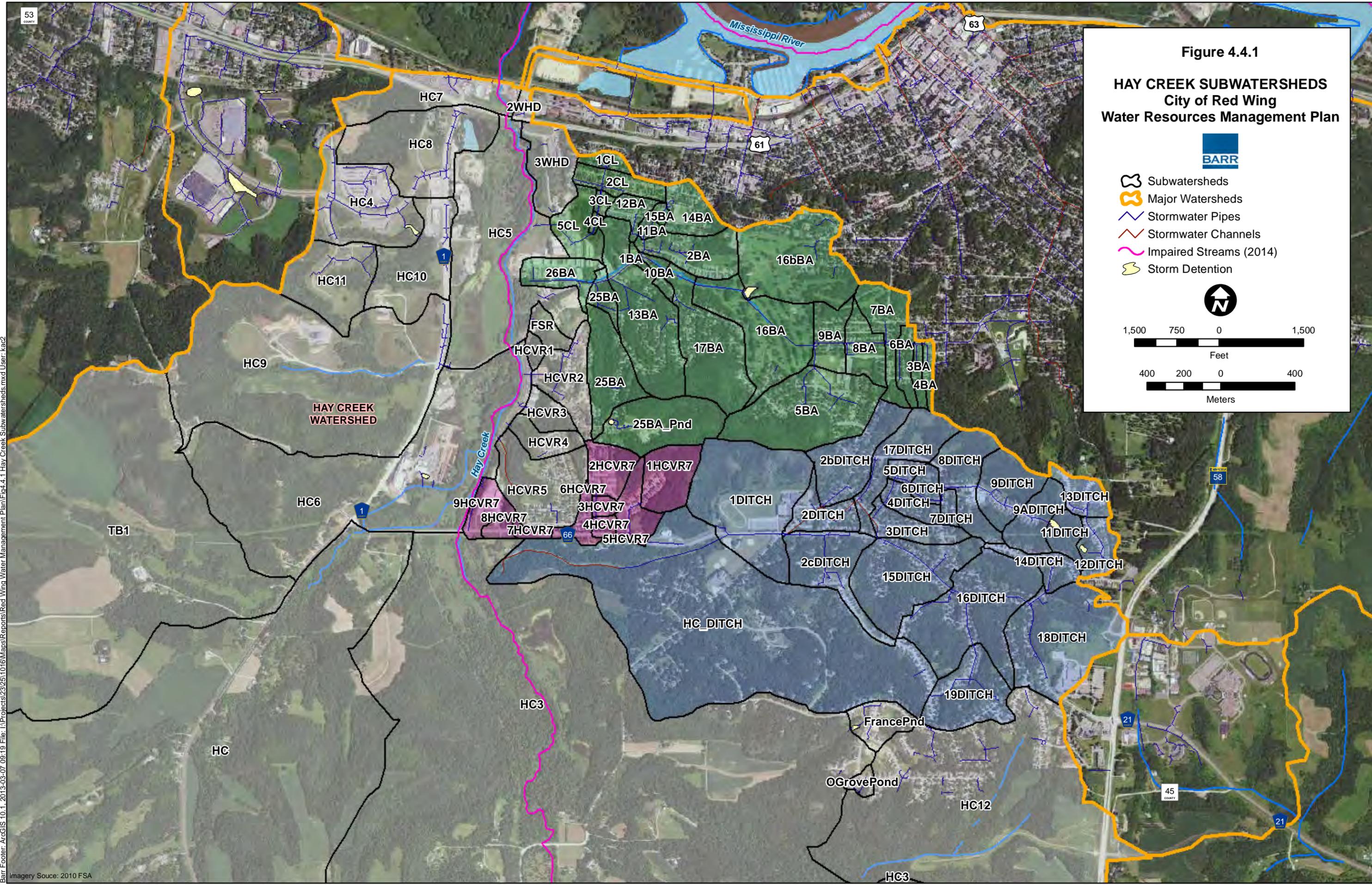
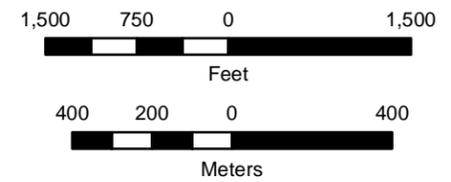


Figure 4.4.1

HAY CREEK SUBWATERSHEDS
City of Red Wing
Water Resources Management Plan



- Subwatersheds
- Major Watersheds
- Stormwater Pipes
- Stormwater Channels
- Impaired Streams (2014)
- Storm Detention



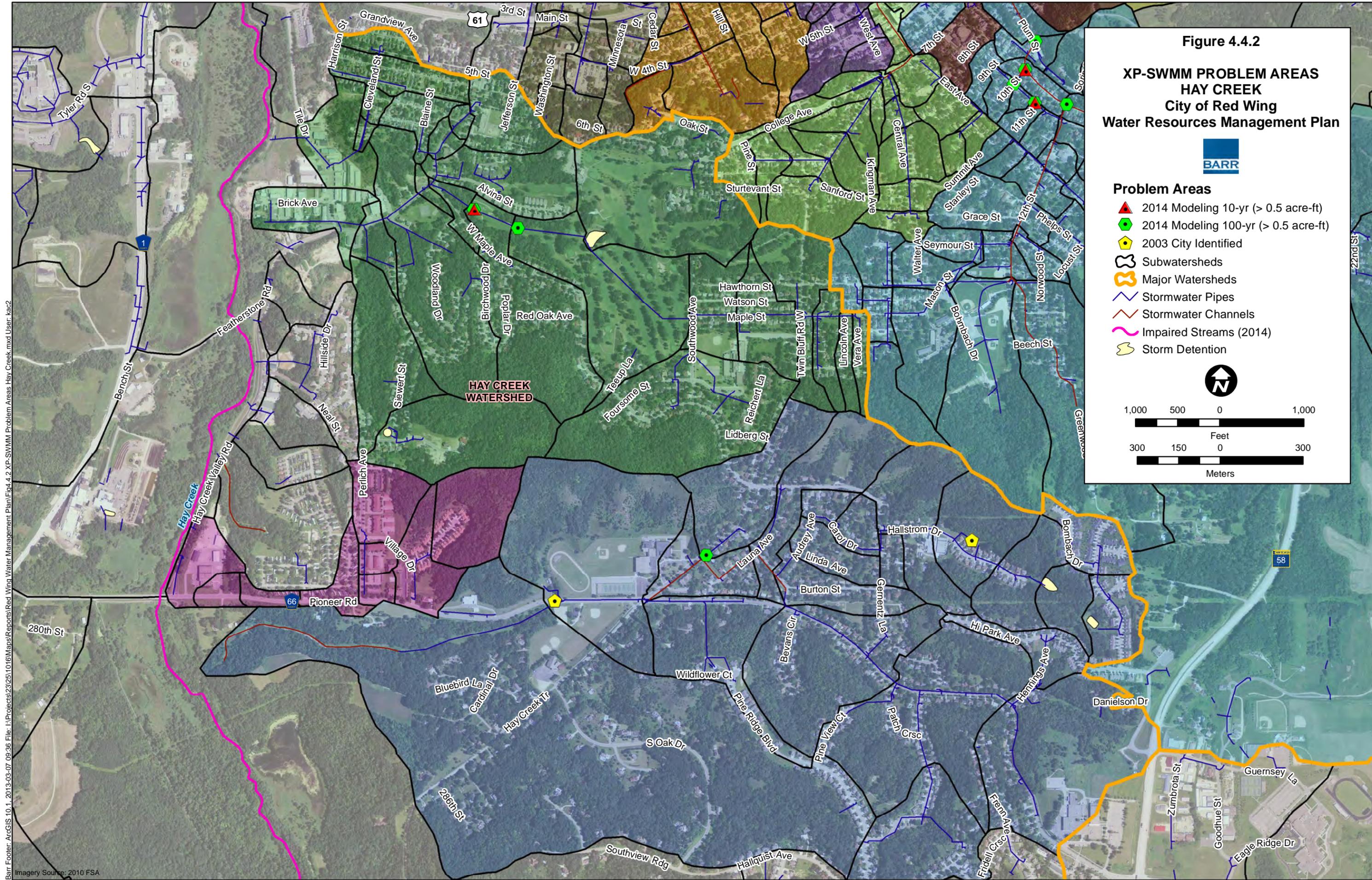


Figure 4.4.2
XP-SWMM PROBLEM AREAS
HAY CREEK
City of Red Wing
Water Resources Management Plan



Problem Areas

-  2014 Modeling 10-yr (> 0.5 acre-ft)
-  2014 Modeling 100-yr (> 0.5 acre-ft)
-  2003 City Identified
-  Subwatersheds
-  Major Watersheds
-  Stormwater Pipes
-  Stormwater Channels
-  Impaired Streams (2014)
-  Storm Detention



1,000 500 0 1,000
 Feet
 300 150 0 300
 Meters

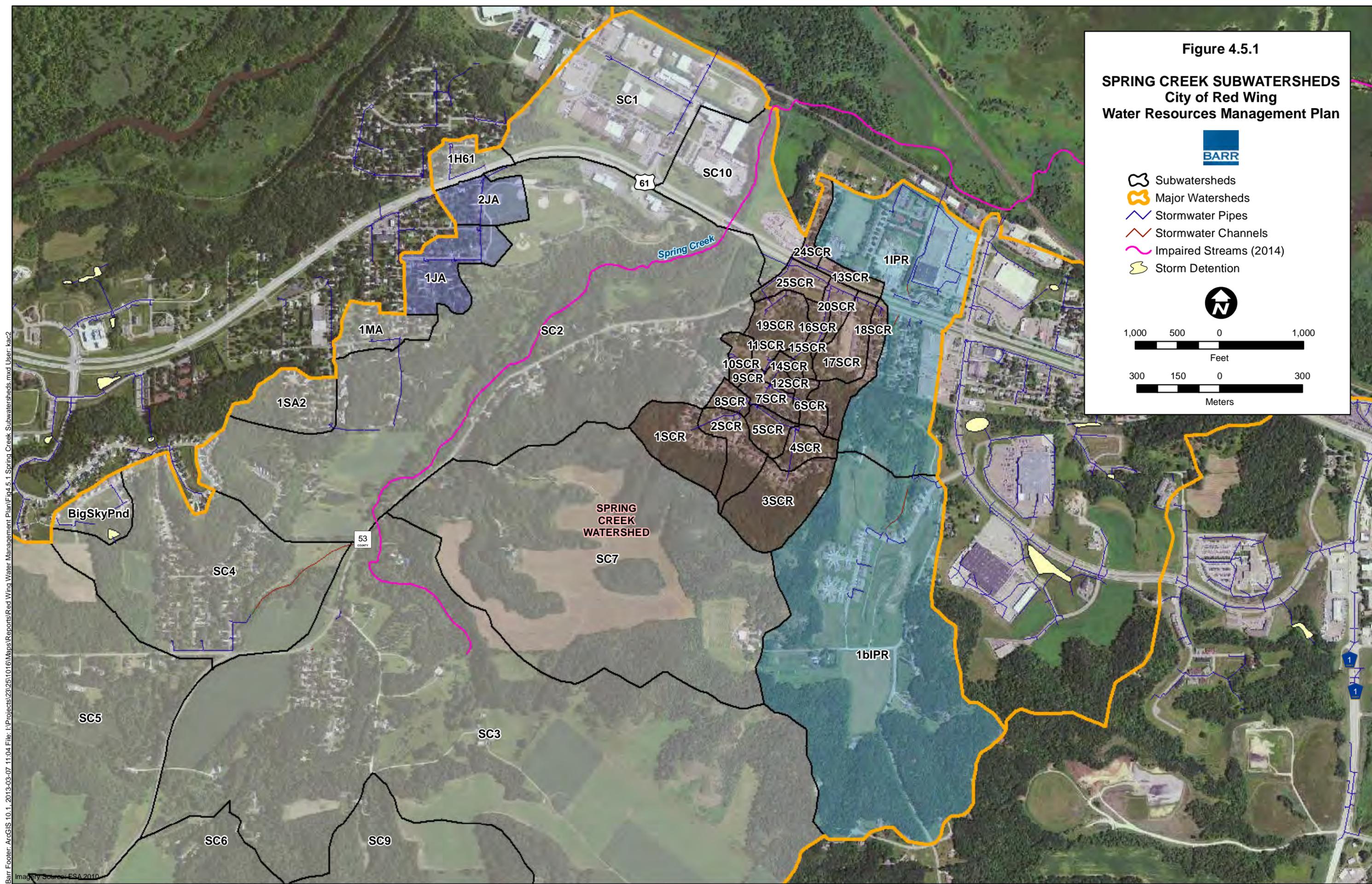


Figure 4.5.1

SPRING CREEK SUBWATERSHEDS
City of Red Wing
Water Resources Management Plan



- Subwatersheds
- Major Watersheds
- Stormwater Pipes
- Stormwater Channels
- Impaired Streams (2014)
- Storm Detention



1,000 500 0 1,000
 Feet

300 150 0 300
 Meters

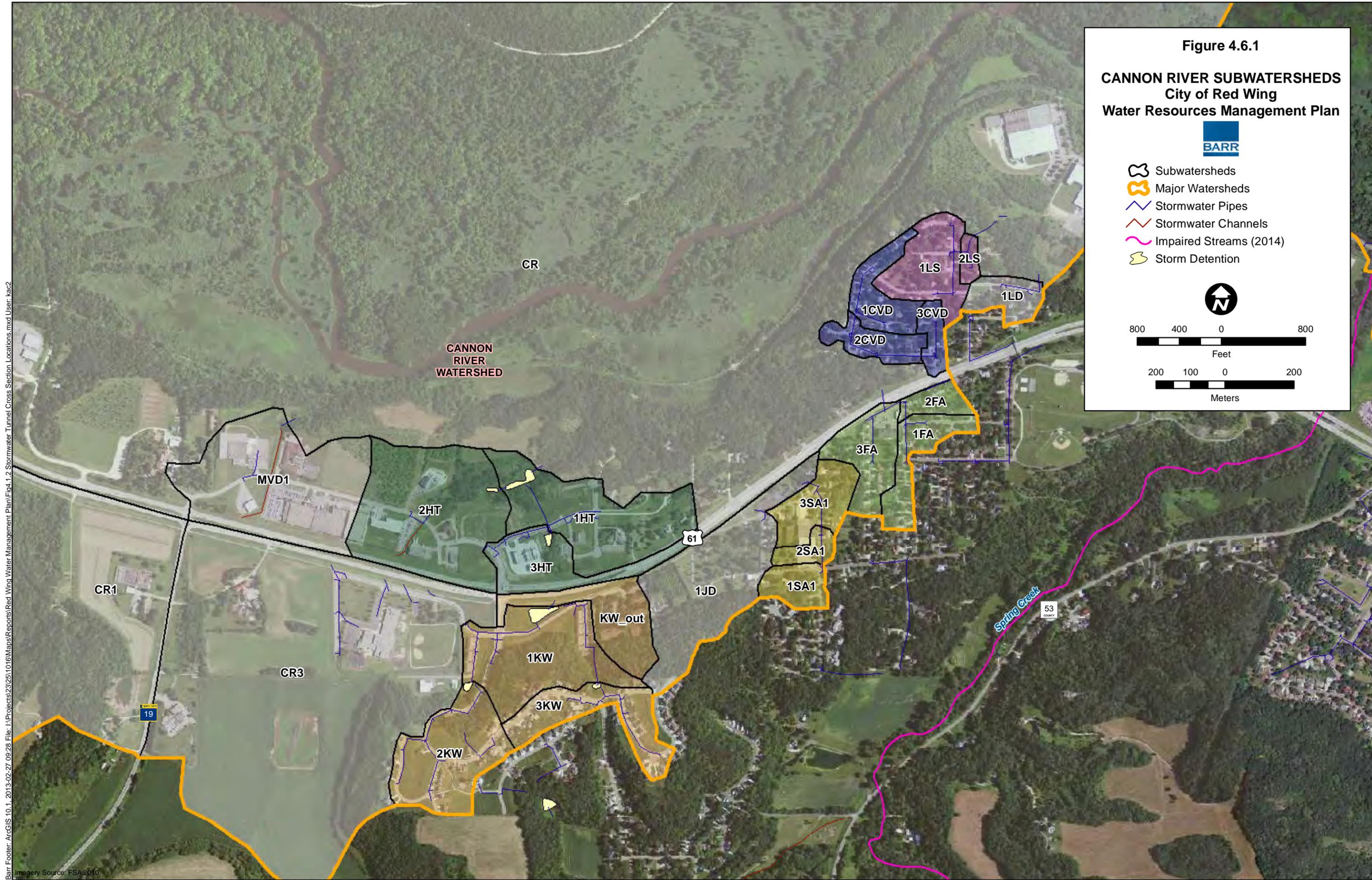


Figure 4.6.1

CANNON RIVER SUBWATERSHEDS
City of Red Wing
Water Resources Management Plan



-  Subwatersheds
-  Major Watersheds
-  Stormwater Pipes
-  Stormwater Channels
-  Impaired Streams (2014)
-  Storm Detention

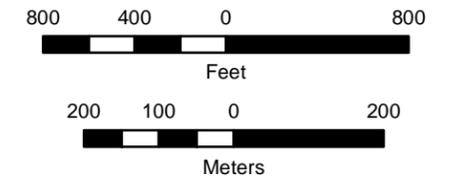


Figure 4.8.1

**EXISTING CONDITIONS
TOTAL SUSPENDED SOLIDS
City of Red Wing
Water Resources Management Plan**



- Municipal Boundary
- Minnesota Designated Trout Streams
- Major Watersheds
- Total Suspended Solids [lbs/acre/year]
 - 0 - 100
 - 100 - 200
 - 200 - 300
 - 300 - 400
 - 400 - 500
- Existing Ponds - TSS Removal Efficiency [%]
 - 0 - 20
 - 20 - 40
 - 40 - 60
 - 60 - 80

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.

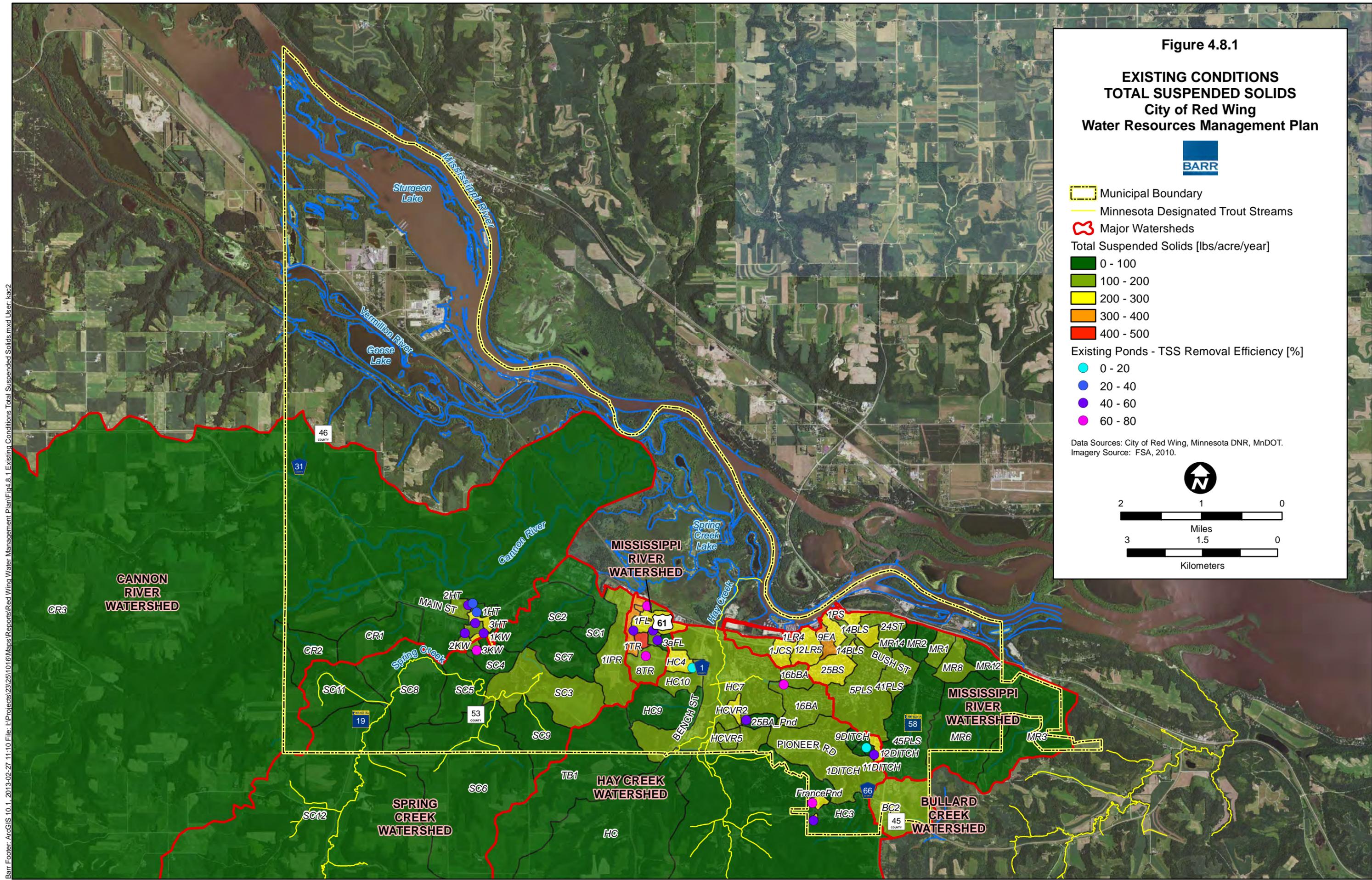


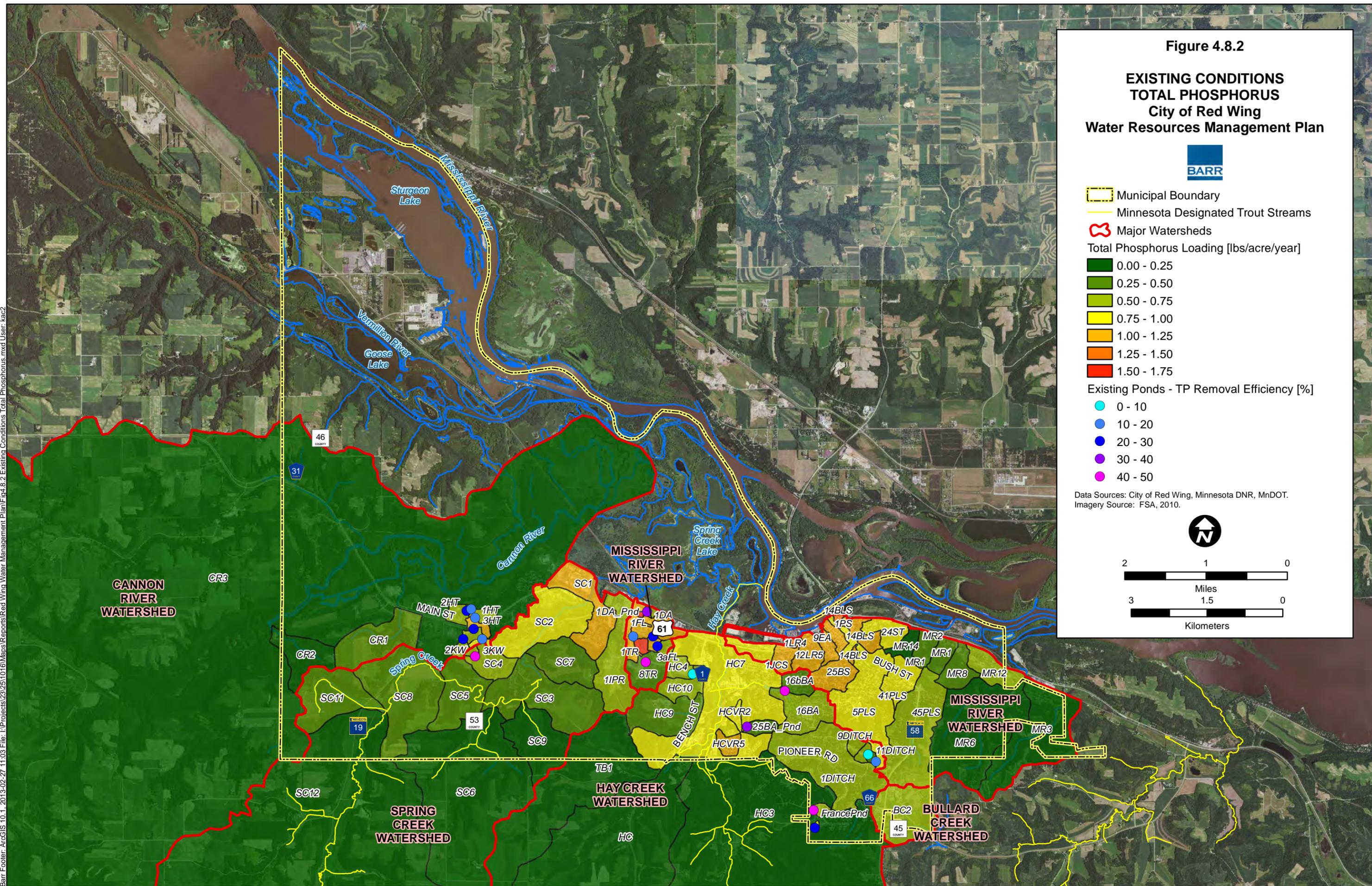
Figure 4.8.2

**EXISTING CONDITIONS
TOTAL PHOSPHORUS
City of Red Wing
Water Resources Management Plan**



- Municipal Boundary
- Minnesota Designated Trout Streams
- Major Watersheds
- Total Phosphorus Loading [lbs/acre/year]
 - 0.00 - 0.25
 - 0.25 - 0.50
 - 0.50 - 0.75
 - 0.75 - 1.00
 - 1.00 - 1.25
 - 1.25 - 1.50
 - 1.50 - 1.75
- Existing Ponds - TP Removal Efficiency [%]
 - 0 - 10
 - 10 - 20
 - 20 - 30
 - 30 - 40
 - 40 - 50

Data Sources: City of Red Wing, Minnesota DNR, MnDOT.
Imagery Source: FSA, 2010.



Appendices

Appendix A
City of Red Wing Ordinances Relevant to
Surface Water Management

DIVISION 50: LAKE AND SHORELAND MANAGEMENT OVERLAY DISTRICT

50-010 **Purpose.** These shoreland standards are adopted for the purpose of:

- A) Regulating suitable uses of land surrounding protected waters.
- B) Regulating the size of parcels, length of water frontage and alteration of shorelands of protected waters.
- C) Regulating the location of sanitary facilities adjacent to protected waters.
- D) Preservation of the natural vegetation, natural topography, and other natural resources to insure a high standard of environmental quality.

50-020 **Statutory Authorization, Policy, and Jurisdiction.**

- A) **Statutory Authorization.** This shoreland ordinance is adopted pursuant to the authorization and policies contained in Minnesota Statutes, Chapter 103F, Minnesota Regulations, Parts 6120.2500 - 6120.3900, and the planning and zoning enabling legislation in Minnesota Statutes Chapter 462 for municipalities.
- B) **Policy.** The uncontrolled use of shorelands of the City of Red Wing, Minnesota, affects the public health, safety and general welfare not only by contributing to pollution of public waters, but also by impairing the local tax base. Therefore, it is in the best interests of the public health, safety, and welfare to provide for the wise subdivision, use, and development of shorelands of public waters. The Legislature of Minnesota has delegated responsibility to local governments of the state to regulate the subdivision, use and development of the shorelands of public waters and thus preserve and enhance the quality of surface water, conserve the economic and natural environmental values of shorelands, and provide for the wise use of waters and related land resources. This responsibility is hereby recognized by the City of Red Wing.
- C) **Jurisdiction.** The provisions of this ordinance shall apply to the shorelands of the public water bodies as classified in Subd. 5 of this ordinance. Pursuant to Minnesota Regulations, Parts 6120.2500-6120.3900, no lake, pond, or flowage less than 10 acres in size in municipalities or 25 acres in size in unincorporated areas need be regulated in a local government's shoreland regulations. A body of water created by a private user where there was no previous shoreland may, at the discretion of the governing body, be exempt from this ordinance.

50-030 **General Provisions and Definitions.**

- A) **Compliance.** The use of any shoreland of public waters; the size and shape of lots; the use, size, type and location of structures on lots; the installation and maintenance of water supply and waste treatment systems, the grading and

filling of any shoreland area; the cutting of shoreland vegetation; and the subdivision of land shall be in full compliance with the terms of this ordinance and other applicable regulations.

- B) **Enforcement.** The Building/Zoning Administrator is responsible for the administration and enforcement of this ordinance. Any violation of the provisions of this ordinance or failure to comply with any of its requirements (including violations of conditions and safeguards established in connection with grants of variances or conditional uses) shall constitute a misdemeanor and shall be punishable as defined by law. Violations of this ordinance can occur regardless of whether or not a permit is required for a regulated activity Pursuant to Section 50-040 A) of this ordinance. In addition, the City may enforce these regulations by injunction or other civil proceeding. Civil enforcement shall not waive the right of the City to seek or enforce criminal penalties.
- C) **Interpretation.** In their interpretation and application, the provisions of this ordinance shall be held to be minimum requirements and shall be liberally construed in favor of the governing body and shall not be deemed a limitation or repeal of any other powers granted by State Statutes.
- D) **Serverability.** If any section, clause, provision, or portion of this ordinance is adjudged unconstitutional or invalid by a court of competent. Jurisdiction, the remainder of this ordinance shall not be affected thereby.
- E) **Abrogation and Greater Restrictions.** It is not intended by this ordinance to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance imposes greater restrictions, the provisions of this ordinance shall prevail. All other ordinances inconsistent with this ordinance are hereby repealed to the extent of the inconsistency only.
- F) **Definitions.** Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the same meaning as they have in common usage and so as to give this ordinance its most reasonable application. For the purpose of this ordinance, the words “must” and “shall” are mandatory and not permissive. All distances, unless otherwise specified, shall be measured horizontally.
- 1) **Accessory Structure or Facility** – Any building or structure on the same lot, or part of the main building subordinate to the principle building and its primary/permitted use.
 - 2) **Bluff** – A topographic feature such as a hill, cliff, or embankment with an average slope of twenty-five (25) percent or greater with a vertical rise of twenty-five (25) feet or greater, excluding road embankments.

- 3) **Boathouse** – A structure designed and used solely for the storage of boats or boating equipment.
- 4) **Building Line** – A line parallel to a lot line or the ordinary high water level at the required setback beyond which a structure may not extend.
- 5) **Clear Cutting** – Complete removal of trees and/or shrubs in a contiguous patch, strip, rows, or block.
- 6) **Commercial Use** – The principal use of land or buildings for the sale, lease, rental, or trade of products, goods, and services.
- 7) **Commissioner** – The commissioner of the Department of Natural Resources.
- 8) **Conditional Use** – A specific type of land use or development as defined by ordinance that would not be appropriate generally but may be allowed with appropriate restrictions as provided by official controls upon a finding that certain conditions detailed in the zoning ordinance exist, the use or development conforms to the comprehensive land use plan of the community, and the use is, compatible with the existing neighborhood.
- 9) **Deck** – A horizontal, unenclosed platform with or without attached railings, seats, trellises, or other features, attached or functionally related to a principal use or site and at any point extending more than three feet above ground.
- 10) **Duplex, Triplex, and Quad** – A dwelling structure on a single lot, having two, three, and four units, respectively, being attached by common walls and each unit equipped with separate sleeping, cooking, eating, living, and sanitation facilities.
- 11) **Dwelling Site** – A designated location for residential use by one or more persons using temporary or movable shelter, including camping and recreational vehicle sites.
- 12) **Dwelling Unit** – Any structure or portion of a structure, or other shelter designed as short or long term living quarters for one or more persons, including rental or time share accommodations such as motel, hotel, and resort rooms and cabins.
- 13) **Extractive Use** – The use of land for surface or subsurface removal of sand, gravel, rock, industrial minerals, other nonmetallic minerals, and peat not regulated under Minnesota Statutes, sections 93.44 to 93.51 as amended.
- 14) **Forest Land Conversion** – The clear cutting of forested lands to prepare for a new land use other than reestablishment of a subsequent forest stand.

- 15) **Hardship** – The same as that term is defined in Minnesota Statutes Chapter 462 as amended.
- 16) **Height of Building** – The vertical distance between the highest adjoining ground level at the building or ten feet above the lowest ground level, whichever is lower, and the highest point of a flat roof or average height of the highest gable of a pitched or hipped roof.
- 17) **Industrial Use** – The use of land or buildings for the production, manufacture, warehousing, storage, or transfer of goods, products, commodities, or other wholesale items.
- 18) **Intensive Vegetation Clearing** – The removal of greater than 30% of the trees or shrubs in a contiguous patch, strip, row, or block.
- 19) **Lot** – A parcel of land legally subdivided by plat, metes and bounds registered land survey, auditors plot, or other accepted means and separated from other parcels or portions by said description for the purpose of sale, leased or separation.
- 20) **Lot Width** – The shortest distance between lot lines measured at the midpoint of the building line.
- 21) **Nonconformity** – Any legal use, structure or parcel of land already in existence, recorded, or authorized before the adoption of official controls or amendments thereto that would not have been permitted to become established under the terms of the official controls as now written, if the official controls have been in effect prior to the date it was established, recorded or authorized.
- 22) **Ordinary High Water Level** – The boundary of public waters and wetlands, and shall be an elevation delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. For watercourses, the ordinary high water level is the elevation of the top of the bank of the channel. For reservoirs and flowages, the ordinary high water level is the operating elevation of the normal summer pool.
- 23) **Planned Unit Development (PUD)** – A type of development which may have one or more main uses or structures on a single parcel or contiguous parcel of land, controlled by a single landowner or development group, upon which the developer may be granted relief or design flexibility from special City Code provisions relating to land use, subdivision, and other similar regulations. This relief or design flexibility may be granted by the City in return for assurances of an overall innovation and/or quality of development

which will be of exceptional benefit to the community as a whole. While construction of the entire project may occur in planned stages, the entire project must create an environment compatible with adjacent uses and structures.

- 24) **Public Waters** – Any waters as defined in Minnesota Statutes, section 103 G.005, and subdivisions 14 and 15.
- 25) **Semipublic Use** – The use of land by a private, nonprofit organization to provide a public service that is ordinarily open to some persons outside the regular constituency of the organization.
- 26) **Sensitive Resource Management** – The preservation and management of areas unsuitable for development in their natural state due to constraints such as shallow soils over groundwater or bedrock, highly erosive or expansive soils, steep slopes, susceptibility to flooding, or occurrence of flora or fauna in need of special protection.
- 27) **Setback** – The minimum horizontal distance between a structure, sewage treatment system, or other facility and an ordinary high water level, sewage treatment system, top of a bluff, road, highway, property line, or other facility.
- 28) **Sewage Treatment System** – A septic tank and soil absorption system or other individual or cluster type sewage treatment system as described and regulated in Section 50-060 (J) of this ordinance.
- 29) **Sewer System** – Pipelines or conduits, pumping stations, and force main, and all other construction, devices, appliances, or appurtenances used for conducting sewage or industrial waste or other wastes to a point of ultimate disposal.
- 30) **Shore Impact Zone** – Land located between the ordinary high water level of a public water and a line parallel to it at a setback of fifty (50) percent of the structure setback.
- 31) **Shoreland** – Land located within the following distances from public waters: 1000 feet from the ordinary high water level of a lake, pond, or flowage; and 300 feet from a river or stream, or the landward extent of a floodplain designated by ordinance on a river or stream, whichever is greater. The limits of shorelands may be reduced whenever the waters involved are bounded by topographic divides which extend landward from the waters for lesser distances and when approved by the commissioner.
- 32) **Shoreland Bluff** – That part of a bluff which faces a river or lake designated as in the shoreland zone having:

- a) Part or all of the feature is located in a shoreland area.
 - b) The slope must drain toward the waterbody.
- 33) **Shoreland Bluff Impact Zone** – A shoreland bluff and land located within thirty (30) feet from the top of the bluff.
- 34) **Significant Historic Site** – Any archaeological site, standing structure, or other property that meets the criteria for eligibility to the National Register of Historic Places or is listed in the State Register of Historic Sites, or is determined to be an unplatted cemetery that falls under the provisions of Minnesota Statutes section 307.08 as amended. A historic site meets these criteria if it is presently listed on either register or if it is determined to meet the qualifications for listing after review by the Minnesota state archaeologist or the director of the Minnesota Historical Society. All unplatted cemeteries are automatically considered to be significant historic sites.
- 35) **Steep Slope** – Land where agricultural activity or development is not recommended or poorly suited based on slope steepness or soil site characteristics as found mapped and described in available county soil surveys or other technical reports, unless appropriate design and construction techniques and farming practices are used in accordance with the provisions of this ordinance. Where specific information is not available, steep slopes are lands having average slopes over 12 percent, as measured over horizontal distances of 50 feet or more, that are not bluffs.
- 36) **Structure** – Any building or appurtenance, including decks, except aerial or underground utility lines, such as sewer, electric, telephone, telegraph, gas lines, towers, poles, and other supporting facilities.
- 37) **Subdivision** – Land that is legally divided for the purpose of sale, rent, or lease, including planned unit developments.
- 38) **Surface Water-Oriented Commercial Use** – The use of land for commercial purposes, where access to and use of a surface water feature is an integral part of the normal conductance of business. Marinas, resorts, and restaurants with transient docking facilities are examples of such use.
- 39) **Toe of Bluff** – The point on a bluff where there is, as visually observed, a clearly identifiable break in the slope, from gentler to steeper slope above. If no break in the slope is apparent or if there is disagreement in the breaking point, the toe of the bluff shall be the lowest end of the lowest 50-foot segment, as measured on the ground, indicating an average slope exceeding twenty-five (25) percent.

- 40) **Top of Bluff** – The point on a bluff where there is, as visually observed, a clearly identifiable break in the slope, from steeper to gentler slope above. If no break in the slope is apparent or if there is disagreement in the breaking point, the top of the bluff shall be the highest end of the highest 50-foot segment, as measured on the ground, indicating an average slope exceeding twenty-five (25) percent.
- 41) **Variance** – The same as that term is defined or described in Minnesota Statutes Chapter 462 as amended.
- 42) **Water-Oriented Accessory Structure or Facility** – A small, above ground building or other improvement, except stairways, fences, docks, and retaining walls, which, because of the relationship of its use to a surface water feature, reasonably needs to be located closer to public waters than the normal structure setback. Examples of such structures and facilities include boathouses, gazebos, screen houses, fish houses, pump houses, and detached decks.
- 43) **Wetland** – A surface water feature classified as a wetland in the United States Fish and Wildlife Service Circular No. 39 (1971 edition).

50-040 Administration.

A) Permits Required.

- 1) A permit is required for the construction of buildings or building additions (and including such related activities as construction of decks and signs), the installation and/or alteration of sewage treatment systems, and those grading and filling activities not exempted by Section 50-050 F) of this ordinance. Application for a permit shall be made to the Building/Zoning Administrator on the forms provided. The application shall include the necessary information so that the Building/Zoning Administrator can determine the site's suitability for the intended use and that a compliant sewage treatment system will be provided.
- 2) A permit authorizing an addition to an existing structure shall stipulate that an identified nonconforming sewer treatment system, as defined by 50-060 K) of this ordinance shall be reconstructed or replaced in accordance with the provisions of this ordinance.

B) Certificate of Compliance.

- 1) The Building/Zoning Administrator shall issue a certificate of zoning compliance for each activity requiring a permit as specified in 50-040 A) of this ordinance. This certificate will specify that the use of land conforms to the requirements of this ordinance. Any use, arrangement, or construction at variance with that authorized by permit shall be deemed a violation of this

ordinance and shall be punishable as provided in 50-030 B) of this ordinance.

C) Variances.

- 1) Variances may only be granted in accordance with Section 90-110 of the Ordinance as applicable. A variance may not circumvent the general purposes and intent of this ordinance. No variance may be granted that would allow any use that is prohibited in the zoning district in which the subject property is located. Conditions may be imposed in the granting of a variance to ensure compliance and to protect adjacent properties and the public interest. In considering a variance request, the board of adjustment must also consider whether the property owner has reasonable use of the land without the variance, whether the property is used seasonally or year-round, whether the variance is being requested solely on the basis of economic considerations, and the characteristics of development on adjacent properties.
- 2) The planning commission shall hear and decide requests for variances in accordance with the rules that it has adopted for the conduct of business. When a variance is approved after the Department of Natural Resources has formally recommended denial in the hearing record, the notification of the approved variance required in 50-040 D) 1) of this ordinance. Below shall also include the planning commission's of the public record/testimony and the findings of facts and conclusions which supported the issuance of the variance.
- 3) For existing developments, application for variance must clearly demonstrate whether a conforming sewage treatment system is present for the intended use of the property. The variance, if issued, must require reconstruction of a nonconforming sewer treatment system.

D) Notifications to the Department of Natural Resources.

- 1) Copies of all notices of any public hearings to consider variances, amendments, or conditional uses under local shoreland management controls must be sent to the commissioner or the commissioner's designated representative and postmarked at least ten days before the hearings. Notices of hearings to consider proposed subdivisions/plats must include copies of the subdivision/plat.

50-050 Shoreland Classification System, and Land Use Districts

- A) **Shoreland Classification System.** The public waters of the City of Red Wing have been classified below with the criteria found in Minnesota Regulations, Part 6120.3300, and the Protected Waters Inventory Map for Goodhue County, Minnesota.

1) The shoreland area for the water bodies listed in 50-050 A) 2) and 3) of this ordinance and shall be defined in 50-030 F) 31 of this ordinance. And as shown on the Official Zoning Map.

2) Lakes

<i>Natural Environment Lakes</i>	<i>Protected Waters Inventory I.D</i>
Goose Lake	25-0005
Brunner Lake	25-0006
Birch Lake	25-0009
Spring Creek Lake	25-0011
Cannon Lake	25-0012
Devil's Lake	25-0013
Larson Lake	25-0016
Sturgeon Lake	25-0017 01

<i>General Development Lake</i>	<i>Protected Waters Inventory I.D.</i>
U.S. Lock & Dam No. 3 Pool	25-0017 00
U.S. Lock & Dam No. 4 Pool	79-0005 00

3) Rivers.

<i>Transition Rivers</i>	<i>From</i>	<i>To</i>
Vermilion	Red Wing City Limits	Confluence with Mississippi River in Sec. 11, T113N, R15W

<i>Tributary Rivers</i>
All other non-classified watercourses as shown on county protected waters inventory and map.

B) Land Use District Descriptions.

1) **Criteria For Designation.** The land use districts in 50-050 B) 2) of this ordinance, and the delineation of a land use district's boundaries on the Official Zoning Map, must be consistent with the goals, policies, and objectives of the comprehensive land use plan (when available) and the following criteria, considerations, and objectives.

a) General Considerations and Criteria for All Land Uses:

- i) Preservation of natural areas;
- ii) Present ownership and development of shoreland areas;

- iii) Shoreland soil types and their engineering capabilities; topographic characteristics;
 - iv) Vegetative cover;
 - v) In-water physical characteristics, values, and constraints;
 - vi) Recreational use of the surface water;
 - vii) Road and service center accessibility
 - viii) Socioeconomic development needs and plans as they involve water and related land resources;
 - ix) The land requirements of industry which, by its nature, requires location in shoreland areas; and
 - x) The necessity to preserve and restore certain areas having significant historical or ecological value.
- b) Factors and Criteria for Planned Unit Developments:
- i) Existing recreational -use of the surface water and likely increases in use associated with planned unit developments;
 - ii) Physical and aesthetic impacts of increased density;
 - iii) Suitability of lands for the planned unit development approach;
 - iv) Level of current development in the area; and
- 2) **Land Use Districts Descriptions.** The land use districts and the allowable land uses therein for the given classifications of waterbodies, shall be properly delineated on the Official Zoning Map and City Codes Chapter 11 for the shorelands of this community. These land use districts are in conformance with the criteria specified in Minnesota Regulation, Part 6120.3200, Subd. 3.
- 3) **Use and Upgrading of Inconsistent Land Use Districts.**
- a) When a revision is proposed to an inconsistent land use district provision, the following additional criteria and procedures shall apply:
 - i) For Lakes. When a revision to a land use district designation on a lake is considered, the Land use district boundaries and use provisions therein for all the shoreland areas within the jurisdiction of this ordinance on said lake must be revised to make them

substantially compatible' with the framework in 50-050 B) 1) and 2) of this ordinance.

- ii) For Rivers and Streams. When a revision to a land use district designation on a river or stream is proposed, the land use district boundaries and the use provisions therein for all shoreland on both sides of the river or stream within the same classification within the jurisdiction of this ordinance must be revised to make them substantially compatible with the framework in Subd. 50-050 B) 1) and 2) of this ordinance. If the same river classification is contiguous for more than a five-mile segment, only the shoreland for a distance of 2.5 miles upstream and downstream, or to the class boundary if closer, need be evaluated and revised.
- b) When an interpretation question arises about whether a specific land use fits within a given "use" category, the interpretation shall be made by the Board of Adjustment. When a question arises as to whether a land use districts boundaries are properly delineated on the Official Zoning Map, this decision shall be made by the city of Red Wing.
- c) When a revision is proposed to an inconsistent land use district provision by an individual party or landowner, this individual party or landowner will only be responsible to provide the supporting and/or substantiating information for the specific parcel in question. The City of Red Wing will direct the Building/Zoning Administrator to provide such additional information for this waterbody as is necessary to satisfy Items (a) and (b).
- d) The City of Red Wing must make a detailed finding of fact and conclusion when taking final action that this revision, and the upgrading of any inconsistent land use district designations on said waterbody, are consistent with the enumerated criteria and use provisions of 50-050 B) of this ordinance.

50-060 Zoning and Water Supply/Sanitary Provisions

- A) **Lot Area Standards.** The lot area (in square feet) for single, duplex, triplex, and quad residential lots created after the date of the enactment of this ordinance for the lake and river/stream classification will comply with all existing lot area requirements in Chapter 12 of the City Code.
- B) **Lot Width Standards.** The lot width standards (in feet) for single, duplex, triplex, and quad residential lots created after the date of enactment of this ordinance for the lake and river/stream classifications are the following:
 - 1) **Unsewered Lakes.**

a) Natural Environment:

	<i>Riparian Lots Width</i>	<i>Non-Riparian Lots Width</i>
Single	200	200
Duplex	300	400
Triplex	400	600
Quad	500	800

b) General Development:

	<i>Riparian Lots Width</i>	<i>Non-Riparian Lots Width</i>
Single	100	150
Duplex	180	265
Triplex	260	375
Quad	340	490

2) Sewered Lakes.

a) Natural Environment:

	<i>Riparian Lots Width</i>	<i>Non-Riparian Lots Width</i>
Single	125	125
Duplex	225	220
Triplex	325	315
Quad	425	410

b) General Development:

	<i>Riparian Lots Width</i>	<i>Non-Riparian Lots Width</i>
Single	75	75
Duplex	135	135
Triplex	195	190
Quad	255	245

C) **River/Stream Lot Width Standards.** There is no minimum lot size requirements for rivers and streams. The lot width standards for single, duplex, triplex and quad residential developments for the six-river/stream classifications are:

	<i>Transition</i>	<i>Tributary No Sewer</i>	<i>Sewer</i>
Single	250	700	75
Duplex	375	150	115
Triplex	500	200	150
Quad	625	250	190

D) Additional Special Provisions.

- 1) Residential subdivisions with dwelling unit densities exceeding those in the tables in 50-060 B) 1) and 2) of this ordinance can only be allowed if designed and approved as residential planned unit developments under 50-090 of this ordinance. Only land above the ordinary high water level of public waters can be used to meet lot area standards, and lot width standards must be met at both the ordinary high water level and at the building line. The sewer lot area dimensions in 50-060 B) 1) of this ordinance can only be used if publicly owned sewer system service is available to the property.
- 2) Subdivisions of duplexes, triplexes, and quads on Natural Environment Lakes must also meet the following standards:
 - a) Each building must be set back at least 200 feet from the ordinary high water level;
 - b) Each building must have common sewage treatment and water systems in one location and serve all dwelling units in the building;
 - c) Watercraft docking facilities for each lot must be centralized in one location and serve all dwelling units in the building; and
 - d) No more than 25 percent of a lake's shoreline can be in duplex, triplex, or quad developments.
- 3) Lots intended as controlled accesses to public waters or as recreation areas for use by owners of non-riparian lots within subdivisions are permissible and must meet or exceed the following standards:
 - a) They must meet the width and size requirements for residential lots, and be suitable for the intended uses of controlled access lots.
 - b) If docking, mooring, or over-water storage of more than six (6) watercraft is to be allowed at a controlled access lot, then the width of the lot (keeping the same lot depth) must be increased by the percent of the requirements for riparian residential lots for each watercraft beyond six, consistent with the following table:

Controlled Access Lot Frontage Requirements

<i>Ratio of lake size to shore length (acres/miles)</i>	<i>Required increase in frontage (percent)</i>
Less than 100	25
100-200	20
201-300	15
301-400	10

- c) They must be jointly owned by all purchasers of lots in the subdivision or by all purchasers of non-riparian lots in the subdivision who are provided riparian access rights on the access lot; and
- d) Covenants or other equally effective legal instruments must be developed that specify which lot owners have authority to use the access lot and what activities are allowed. The activities may include watercraft launching, loading, storage, beaching, mooring, or docking. They must also include other outdoors-recreational activities that do not significantly conflict with general public use of the public water or the enjoyment of normal property rights by adjacent property owners. Examples of the non-significant conflict activities include swimming, sunbathing, or picnicking. The covenants must limit the total number of vehicles allowed to be parked and the total number of watercraft allowed to be continuously moored, docked, or stored over water, and must require centralization of all common facilities and activities in the most suitable locations on the lot to minimize topographic and vegetation alterations. They must also require all parking areas, storage buildings, and other facilities to be screened by vegetation or topography as much as practical from view from the public water, assuming summer, leaf-on conditions.

E) Placement, Design, and Height of Structures.

1) **Placement of Structures on Lots.** When more than one setback applies to a site, structures and facilities must be located to meet all setbacks. Where structures exist on the adjoining lots on both sides of a proposed building site, structure setbacks may be altered without a variance to conform to the adjoining setbacks from the ordinary high water level, provided the proposed building site is not located in a shore impact zone or in a Shoreland Bluff Impact Zone Structure shall be located as follows.

- a) Structure and On-site Sewage System Setbacks (in feet) from Ordinary High Water Level.

Setbacks*

<i>Class of Public Waters</i>	<i>Structures</i>		<i>Sewage Treatment</i>
	<i>Unsewered</i>	<i>Sewered</i>	
<i>Lakes</i>			
Natural Environment	150	150	150
General Development	75	50	50

<u>Rivers</u>			
Remote	200	200	150
Forested and Transition	150	150	100
Tributary	100	50	75

* One water-oriented accessory structure designed in accordance with 50-050 E) 2) b) of this ordinance may be set back a minimum distance of ten (10) feet from the ordinary high water level.

- b) Additional Structure Setbacks. The following additional structure setbacks apply, regardless of the classification of the water body:

<i>Setback From:</i>	<i>Setback (in feet)</i>
Top of bluff	30
Unplatted cemetery	50
Right-of-way line of federal, state, or county highway	50
Right-of-way line of town road, public street, or other public roads or streets not classified	20

- c) Shoreland Bluff Impact Zone. Structures and accessory facilities, except stairways and landings, must not be placed within Shoreland Bluff Impact Zones.

2) Design Criteria for Structures.

- a) High Water Elevations. Structures must be placed in accordance with any floodplain regulations applicable to the site. Where these controls do not exist, the elevation to which the lowest floor, including basement, is placed or flood-proofed must be determined as follows:
- i) For lakes, by placing the lowest floor at a level at least three feet above the highest known water level, or three feet above the ordinary high water level, whichever is higher;
 - ii) For rivers and streams, by placing the lowest floor at least three feet above the flood of record, if data are available. If data are not available, by placing the lowest floor at least three feet above the ordinary high water level, or by conducting a technical evaluation to determine effects of proposed construction upon flood stages and flood flows and to establish a flood protection elevation. Under all three approaches, technical evaluations must be done by a qualified

engineer or hydrologist consistent with parts 6120.5000 to 6120.6200 governing the management of flood plain areas. If more than one approach is used, the highest flood protection elevation determined must be used for placing, structures and other facilities; and

- b) Water-oriented Accessory Structures. Each lot may have one water-oriented accessory structure not meeting the normal structure setback in Subd. 6BI of this ordinance if this water-oriented accessory structure complies with the following provisions:
 - i) The structure or facility must not exceed ten feet in height, exclusive of safety rails, and cannot occupy an area greater than 250 square feet. Detached decks must not exceed eight feet above grade at any point;
 - ii) The setback of the structure or facility from the ordinary high water level must be at least ten feet;
 - iii) The structure facility must be designed or used for human habitation and must not contain water supply or sewage treatment facilities; and
 - iv) The roof may be used as a deck with safety rails, but must not be enclosed or used as a storage area;
 - v) The structure or facility must not be designed or used for human habitation and must not contain water supply or sewage treatment facilities; and
 - vi) As an alternative for general development and recreational development water-bodies, water-oriented accessory structures used solely for watercraft storage, and including storage of related boating and water-oriented sporting equipment, may occupy an area up to 400 square feet provided the maximum width of the structure is 20 feet as measured parallel to the configuration of the shoreline.
- c) Stairways, Lifts, and Landings. Stairways and lifts are the preferred alternative to major topographic alterations for achieving access up and down shoreland bluffs and steep slopes to shore areas. Stairways and lifts must meet the following design requirements:
 - i) Stairways and lifts must not exceed four feet in width on residential lots. Wider stairways may be used for commercial properties, public open-space recreational properties, and planned unit developments;
 - ii) Landings for stairways and lifts on residential lots must not exceed 32 square feet in area. Landings larger than 32 square feet may be

used for commercial properties, public open-space recreational properties, and planned unit developments;

iii) Canopies or roofs are not allowed on stairways, lifts, or landings;

iv) Stairways, lifts and landings may be either constructed above the ground on posts or pilings, or placed into the ground, provided they are designed and built in a manner that ensures control of soil erosion;

v) Stairways, lifts, and landings, must be located in the most visually inconspicuous portions of lots, as viewed from the surface of the public water assuming summer, leaf-on conditions, whenever practical; and

vi) Facilities such as ramps, lifts, or mobility paths for physically handicapped persons are also allowed for achieving access to shore area, provided that the dimensional and performance standards of sub items (1) to (5) are complied with in addition to the requirements of Minnesota Regulations, Chapter 1340.

d) **Steep Slopes.** The Building/Zoning Administrator must evaluate possible soil erosion impacts and development visibility from public waters before issuing a permit for construction of sewage treatment systems, roads, driveways, structures, or other improvements on steep slopes. When determined necessary, conditions must be attached to issued permits to prevent erosion and to preserve existing vegetation screening of structures, vehicles, and other facilities as viewed from the surface of public waters, assuming summer, leaf on vegetation.

3) **Height of Structures.** All structures in the designated shoreland districts must not exceed the maximum height allowed by Chapter 11 of the City Codes except RM-2 districts in shoreland areas shall not exceed thirty-five (35) feet in height.

F) **Shoreland Alterations.** Alterations of vegetation and topography will be regulated to prevent erosion into public waters, fix nutrients, preserve shoreland aesthetics, preserve historic values, prevent bank slumping, and protect fish and wildlife habitat.

1) **Vegetation Alterations.**

a) Vegetation alteration necessary for the construction of structures and sewage treatment systems and the construction of roads and parking areas regulated by 50-050 G) of this ordinance are exempt from the vegetation alteration standards that follow.

- b) Removal or alteration of vegetation except for agricultural and forest management uses as regulated in 50-060 I) 2) and 3) of this ordinance, respectfully, is allowed subject to the following standards:
 - i) Intensive vegetation clearing within the shore and bluff impact zones and on steep slopes is not allowed. Intensive vegetation clearing from forest land conservation to another use outside of shoreland areas is allowable only as a conditional use if an erosion control and sedimentation plan is developed and approved by the soil and water conservation district in which the property is located.
 - ii) In shore and shoreland bluff impact zones and on steep slopes, limited clearing of trees, shrubs and cutting, pruning, and trimming of trees is allowed to provide a view to the water from the principal dwelling site and to accommodate the placement of stairways and landings, picnic areas, Access paths, livestock watering areas, beach watercraft access areas, and permitted water-oriented, accessory structures or facilities, provided that,
 - a. the screening of structures, vehicles, or other facilities as viewed from the water, assuming summer, leaf-on conditions, is not substantially reduced;
 - b. along rivers, existing shading of water surfaces is preserved; and
 - c. the above provisions are not applicable to the removal of trees, limbs, or branches that are dead, diseased, or pose safety hazards.

2) **Topographic Alterations/Grading and Filling.**

- a) Grading and filling and excavations necessary for the construction of structures, sewage treatment systems, and driveways under validly issued construction permits for these facilities do not require the issuance of a separate grading and filling permit. However, the grading and filling standards in this Section must be incorporated into the issuance of permit for construction of structures, sewage treatment systems, and driveways.
- b) Public roads and parking areas are regulated by 50-060 G) of this ordinance.
- c) Notwithstanding items (a) and (b) above, a grading and filling permit will be required for,
 - i) The movement of more than ten (10) cubic yards of material on steep slopes or within shore or Shoreland Bluff Impact zones; and

- ii) The movement of more than 50 cubic yards of material outside of steep slopes and shore and shoreland bluff impact zones.
- d) The following considerations and conditions must be adhered to during the issuance of construction permits, grading and filling permits, conditional use permits, variances and subdivision approvals:
 - i) Grading or filling in any type 2, 3, 4, 5, 6, 7, or 8 wetland must be evaluated to determine how extensively the proposed activity would affect the following functional qualities of the wetland*:
 - a. sediment and pollutant trapping and retention;
 - b. storage of surface runoff to prevent or reduce flood damage;
 - c. fish and wildlife habitat;
 - d. recreational use;
 - e. shoreline or bank stabilization; and
 - f. noteworthiness, including special qualities such as historic significance, critical habitat for endangered plants and animals, or others.

*This evaluation must also include a determination of whether the wetland alteration being proposed requires permits, reviews, or approvals by other local, state, or federal agencies, such as a watershed district, the Minnesota Department of Natural Resources, or the United States Army Corps of Engineers. The applicant will be so advised.

- ii) Alterations must be designed and conducted in a manner that ensures only the smallest amount of bare ground is exposed for the shortest time possible;
- iii) Mulches or similar materials must be used, where necessary, for temporary bare soil coverage, and a permanent vegetation cover must be established as soon as possible;
- iv) Methods to minimize soil erosion and to trap sediments before they reach any surface water feature must be used;
- v) Altered areas must be stabilized to acceptable erosion control standards consistent with the field office technical guides of the local

soil and water conservation districts and the United States Soil Conservation Service;

- vi) Fill or excavated material must not be placed in a manner that creates an unstable slope;
 - vii) Plans to place fill or excavated material on steep slopes must be reviewed by qualified professionals for continued slope stability and must not create finished slopes of 30 percent or greater;
 - viii) Fill or evacuated material must not be placed in shoreland bluff impact zones.
 - ix) Any alterations below the ordinary high water level of public waters must first be authorized by the commissioner under Minnesota Statutes, section 103G.245;
 - x) Alterations of topography must only be allowed if they are accessory to permitted or conditional uses and do not adversely affect adjacent or nearby properties; and
 - xi) Placement of natural rock rip-rap, including associated grading of the shoreline and placement of a filter blanket, is permitted if the finished slope does not exceed three feet horizontal to one foot vertical, the land-ward extent of the rip-rap is within ten feet of the ordinary high water level, and the height of the rip-rap above the ordinary high water level does not exceed three feet.
- e) Connections to public waters. Excavations where the intended purpose is connection to a public water, such as boat slips, canals, lagoons, and harbors, must be controlled by local shore-land controls. Permission for excavations may be given only after the commissioner has approved the proposed connection to public waters.

G) Placement and Design of New Roads, Driveways, and Parking Areas.

- 1) Public and private roads and parking areas must be designed to take advantage of natural vegetation and topography to achieve maximum screening from view from public waters. Documentation must be provided by a qualified individual that all roads and parking areas are designed and constructed to minimize and control erosion to public waters consistent with the field office technical guides of the local soil and water conservation district, or other applicable technical materials.
- 2) Roads, driveways, and parking areas must meet structure setbacks and must not be placed within bluff and shore impact zones, when other reasonable and feasible placement alternatives exist. If no alternatives exist, they may

be placed within these areas, and must be designed to minimize adverse impacts.

- 3) Public and private watercraft access ramps, approach roads, and access-related parking areas may be placed within shore impact zones provided the vegetative screening and erosion control conditions of this subpart are met. For private facilities, the grading and filling provision of 50-060 F) 2) of this ordinance must be met.

H) **Stormwater Management.** The following general and specific standards shall apply:

1) **General Standards:**

- a) When possible, existing natural drainage-ways, wetlands, and vegetated soil surfaces must be used to convey, store, filter, and retain storm-water runoff before discharge to public waters.
- b) Development must be planned and conducted in a manner that will minimize the extent of disturbed areas, runoff velocities, erosion potential, and reduce and delay runoff volumes. Disturbed areas must be stabilized and protected as soon as possible and facilities or methods used to retain sediment on the site.
- c) When development density, topographic features, and soil and vegetation conditions are not sufficient to adequately handle storm-water runoff using natural features and vegetation, various types of constructed facilities such as diversions, settling basins, skimming devices, dikes, waterways, and ponds may be used. Preference must be given to designs using surface drainage, vegetation, and infiltration rather than buried pipes and man-made materials and facilities.

2) **Specific Standards:**

- a) Impervious surface coverage of the lot area must not exceed the following:

<i>Zone</i>	<i>Percent of Lot Area</i>
A, AR, AC	10%
R-1, R-2	25%
R-3, RM-1, RM-2, B-1	60%
B-2, B-2A, B-3, I-1	70%
I-2	50%

- b) When constructed facilities are used for storm-water management, documentation must be provided by a qualified individual that they are

designed and installed consistent with the field office technical guide of the local soil and water conservation districts.

- c) New constructed storm-water outfalls to public waters must provide for filtering or settling of suspended solids and skimming of surface debris before discharge.
- d) Developments with greater than one acre of impervious surface shall be conducted pursuant to Minnesota Statutes 103B.3365.

I) Special Provisions for Commercial, Industrial, Public/Semipublic, Agricultural, Forestry and Extractive Uses and Mining of Metallic Minerals and Peat.

1) Standards for Commercial, Industrial, Public, and Semipublic Uses.

- a) Surface water-oriented commercial uses and industrial, public or semipublic uses with similar needs to have access to and use of public waters may be located on parcels or lots with frontage on public waters. Those uses with water-oriented needs must meet the following standards:
 - i) In addition to meeting impervious coverage limits, setbacks, and other zoning standards in this ordinance, the uses must be designed to incorporate topographic and vegetative screening of parking areas and structures;
 - ii) Uses that require short-term watercraft mooring for patrons must centralize these facilities and design them to avoid obstructions of navigation and to be the minimum size necessary to meet the need; and
 - iii) Uses that depend on patrons arriving by watercraft may use signs and lighting to convey needed information to the public, subject to the following general standards:
 - a. no advertising signs or supporting facilities for signs may be placed in or upon public waters. Signs conveying information or safety messages may be placed in or on public waters by a public authority or under a permit issued by the county sheriff;
 - b. signs may be placed, when necessary, within the shore impact zone if they are designed and sized to be the minimum necessary to convey needed information. they must only convey the location and name of the establishment and the general types of goods or services available. The signs must not contain other detailed information such as product brands and prices, must not

be located higher than ten feet above the ground, and must not exceed 32 square feet in size. If illuminated by artificial lights, the lights must be shielded or directed to prevent illumination out across public waters; and

- c. other outside lighting may be located within the shore impact zone or over public waters if it is used primarily to illuminate potential safety hazards and is shielded or otherwise directed to prevent direct illumination out across public waters. This does not preclude use of navigational lights.

2) Agriculture Use Standards.

- a) General cultivation farming, grazing, nurseries, horticulture, truck farming, sod farming, and wild crop harvesting are permitted uses if steep slopes and shore and bluff impact zones are maintained in permanent vegetation or operated under an approved conservation plan (Resource Management Systems) consistent with the field office technical guides of the local soil and water conservation district or the United States Soil Conservation Service, as provided by a qualified individual or agency. The shore impact zone for parcel with permitted agricultural land uses is equal to a line parallel to and 50 feet from the ordinary high water level.
- b) Animal feedlots must meet the following standards:
 - i) New feedlots must not be located in the shoreland of watercourses or in shoreland bluff impact zones and must meet a minimum setback of 300 feet from the ordinary high water level of all public waters basins; and
 - ii) Modifications or expansions to existing feedlots that are located within 300 feet from the ordinary high water level or within a bluff impact zone are allowed if they do not further encroach into the existing ordinary high water level setback or encroach on shoreland bluff impact zones.

3) Forest Management Standards.

- a) The harvesting of timber and associated reforestation must be conducted consistent with the provisions of the Minnesota Non point Source Pollution Assessment-Forestry and the provisions of the Water Quality in Forest Management “Best Management Practices in Minnesota”.

J) Water Supply and Sewage Treatment.

- 1) **Water Supply.** Any public or private supply of water for domestic purposes must meet or exceed standards for water quality of the Minnesota Department of Health and the Minnesota Pollution Control Agency.
- 2) **Sewage Treatment .** Any premises used for human occupancy must be provided with an adequate method of sewage treatment, as follows:
 - a) Publicly owned sewer systems must be used where available.
 - b) All private sewage treatment systems must meet or exceed the Minnesota Pollution Control Agency's standards for individual sewage treatment systems contained in the document titled, "Individual Sewage Treatment Systems Standards, Chapter 7080", a copy of which is hereby adopted by reference and declared to be a part of this ordinance.
 - c) On-site sewage treatment systems must be set back from the ordinary high water level in accordance with the setbacks continued in Subd. 50-060 E) 1) of this ordinance.
 - d) All proposed sites for individual sewage treatment systems shall be evaluated in accordance with the criteria in sub items (1)-(4). If the determination of a site's suitability cannot be made with publicly available, existing information, it shall then be the responsibility of the applicant to provide sufficient soil borings and percolation tests from on-site field investigations.
 - i) Evaluation criteria:
 - a. depth to the highest know or calculated ground water table or bedrock;
 - b. soil conditions, properties, and permeability;
 - c. slope;
 - d. the existence of lowlands, local surface depressions, and rock outcrops;
 - e) Nonconforming sewage treatment systems shall be regulated and upgraded in accordance with Subd. 50-070 A) 2) of this ordinance.

K) Trail Placement and Design.

- 1) Trails intended for use by pedestrians, bikers, in-line skaters, and other specialty uses shall be exempted from the other provisions of this ordinance provided the following provisions are met in the design and maintenance of the trails.

- a) Trails shall be setback at least 25 feet from the ordinary high water level when possible. In those areas where this setback cannot be met and no other feasible alternative exists, the trail may be allowed closer provided that as little vegetation is removed as possible and minimal siltation occurs during and after construction. In areas where the trail directly abuts a body of water, extensive measures must be taken to ensure bank stability.
- b) Intensive vegetation clearing may only occur in the direct pathway of the trail. Vegetation along side the trail shall not be intensively cleared.
- c) Limited clearing of trees and shrubs shall be allowed along the trail provided that the screening of structures and the trail as viewed from the water, assuming summer, leaf-on conditions, is not substantially reduced and existing shading of water surfaces is preserved. These provisions are not applicable to the removal of trees, limbs, or branches that are dead, diseased, or pose safety hazards.
- d) Trails shall be of minimum width necessary to accommodate the users of the trail to minimize the amount of impervious surface.
- e) Grading, filling, and excavations necessary for the construction of trails under validly issued construction permits for any trails do not require the issuance of a separate grading and filling permit.
- f) Grading or filling in any type of wetland must be evaluated to determine how extensively the trail would affect the following functional qualities of the wetland*:
 - i) Sediment and pollutant trapping and retention;
 - ii) Storage of surface runoff to prevent or reduce flood damage;
 - iii) Fish and wildlife habitat
 - iv) Shoreline or bank stabilization; and
 - v) Noteworthiness, including special qualities such as historic significance, critical habitat for endangered plants and animals, or others.

*This evaluation must also include a determination of whether the wetland alteration being proposed requires permits, reviews, or approvals by other local, state, or federal agencies such as a county government, the Minnesota Department of Natural Resources, or the

United States Army Corps of Engineers. The applicant will be so advised.

- g) Construction and maintenance of the trail must be designed and conducted in a manner that ensures only the smallest amount of bare ground is exposed for the shortest time possible;
 - h) Mulches or similar materials must be used for temporary bare soil coverage, and a permanent vegetation cover must be established as soon as possible;
 - i) Methods to minimize soil erosion and to trap sediments before they reach any surface water feature must be used;
 - j) Altered areas must be stabilized to acceptable erosion control standards consistent with the field office technical guides of the local soil and water conservation districts and the United States Soil Conservation Service;
 - k) Fill or excavated material must not be placed in a manner that creates an unstable slope;
 - l) Plans to place fill or excavated material on steep slopes must be reviewed by qualified professionals for continued slope stability and must not create finished slopes of 25 percent or greater;
 - m) Fill or excavated Material must not be placed in shore-land bluff impact zones;
 - n) Any alterations below the ordinary high water level of public waters must first be authorized by the commissioner under Minnesota Statutes, section 103G.245;
 - o) Alterations of topography must only be allowed if they are necessary and do not adversely affect adjacent or nearby properties; and
 - p) Placement of natural rock rip-rap, including associated grading of the shoreline and placement of a filter blanket, is permitted if the finished slope does not exceed three feet horizontal to one foot vertical, the landward extent of the rip-rap is within ten feet of the ordinary high water level, and the height of the rip-rap above the ordinary high water level does not exceed three feet.
- L) **Conditions Attached to Conditional Use Permits.** The City Council upon consideration of the criteria listed above and the purposes of this ordinance, shall attach such conditions to the issuance of the conditional use permits as it

deems necessary to fulfill the purposes of this ordinance. Such conditions may include, but are not limited to, the following,

- 1) Increased setbacks from the ordinary high water level;
- 2) Limitations on the natural vegetation to be removed or the requirement that additional vegetation be planted; and
- 3) Special provisions for the location, design, and use of structures, sewage treatment systems, watercraft launching and docking areas, and vehicle parking areas.

50-070 Nonconformities

A) Construction on Nonconforming Lots of Record.

- 1) Lots of record in the office of the county recorder on the date of enactment of local shoreland controls that do not meet the requirements of 50-060 A) of this ordinance may be allowed as building sites without variances from lot size requirements provided the use is permitted in the zoning district, the lot has been in separate ownership from abutting lands at all times since it became substandard, was created compliant with official controls in effect at the time, and sewage treatment and setback requirements of this ordinance are met.
- 2) A variance from setback requirements must be obtained before any use, sewage treatment system, or building permit is issued for a lot. In evaluating the variance, the board of adjustment shall consider sewage treatment and water supply capabilities or constraints of the lot and shall deny the variance if adequate facilities cannot be provided.
- 3) If, in a group of two or more contiguous lots under the same ownership, any individual lot does not meet the requirements of 50-060 A) of this ordinance the lot must not be considered as a separate parcel of land for the purposes of sale or development. The lot must be combined with the one or more contiguous lots so they equal one or more parcels of land, each meeting the requirements of 50-060 A) of this ordinance as much as possible.

B) Additions/Expansions to Nonconforming Structures.

- 1) All additions or expansions to the outside dimensions of an existing nonconforming structure must meet the setback, height, and other requirements of 50-060 A) of this ordinance. Any deviation from these requirements must be authorized by a variance pursuant to 50-040 C) of this ordinance.

- 2) Deck additions may be allowed without a variance to a structure not meeting the required setback from the ordinary high water level if all of the following criteria and standards are met:
 - a) The structure existed on the date the structure setbacks were established;
 - b) A thorough evaluation of the property and structure reveals no reasonable location for a deck meeting or exceeding the existing ordinary high water level setback of the structure;
 - c) The deck encroachment toward the ordinary high water level does not exceed 15 percent of the existing setback of the structure from the ordinary high water level or does not encroach closer than 30 feet, whichever is more restrictive; and
 - d) The deck is constructed primarily of wood, and is not roofed or screened.

C) Nonconforming Sewage Treatment Systems.

- 1) A sewage treatment system not meeting the requirements of 50-060 K) of this ordinance must be upgraded, at a minimum, at any time a permit or variance of any type is required for any improvement on, or use of, the property. For the purposes of this provision, a sewage treatment system shall not be considered nonconforming if the only deficiency is the sewage treatment system's improper setback from the ordinary high water level.
- 2) The governing body of the City of Red Wing has by formal resolution notified the commissioner of its program to identify nonconforming sewage treatment systems. The City of Red Wing will require upgrading or replacement of any nonconforming system identified by this program within a reasonable period of time which will not exceed two years. Sewage systems installed according to all applicable local shore-land management standards adopted under Minnesota Statutes, Section 105.485, in effect at the time of installation may be considered as conforming unless they are determined to be failing, except that systems using cesspools, leaching pits, seepage pits, or other deep disposal methods, or systems with less soil treatment area separation above groundwater than required by the Minnesota Pollution Control Agency's Chapter 7080 for design of on-site sewage treatment systems, shall be considered nonconforming.

50-080 Subdivision/Platting Provisions

- A) **Land Suitability.** Each lot created through subdivision, including Planned Unit Developments authorized under 50-090 of this Ordinance, must be suitable in its natural state for the proposed use with minimal alteration. Suitability analysis by the local unit of government shall consider susceptibility to flooding,

existence of wetlands, soil and rock formations with severe limitations for development, severe erosion potential, steep topography, inadequate water supply or sewage treatment capabilities, near-shore aquatic conditions unsuitable for water-based recreation, important fish and wildlife habitat, presence of significant historical sites, or any feature of the natural land likely to be harmful to the health, safety, or welfare of future residents of the proposed subdivision or of the community.

- B) Subdivision/platting of lands under the control of this ordinance shall be subdivided in accordance with Chapter 12 of the City Code.
- C) **Additional Information Requirements.** In addition to the information requested on preliminary plats, the following information shall also be provided for subdivisions that may fall under the controls of this ordinance:
 - 1) The surface water features required in Minnesota Statutes, Section 505.02, Subdivision 1, to be shown on plats, obtained from United States Geological Survey quadrangle topographic maps or more accurate sources;
 - 2) A line or contour representing the ordinary high water level, the “toe” and the “top” of bluffs, and the minimum building setback distances from the top of the bluff and the lake or stream.
- D) **Controlled Access or Recreational Lots.** Lots intended as controlled accesses to public waters or for recreational use areas for use by non-riparian lots within a subdivision must meet or exceed the sizing criteria in 50-060 C) of this Ordinance.

50-090 **Planned Unit Developments (PUD’s)**

- A) **Types of PUD’s Permissible.** Planned Unit Developments (PUD’s) are allowed as described in Division 47 of this Ordinance.
- B) **Processing of PUD’s.** Planned unit developments must be processed as described in Division 47 of this Ordinance.
- C) **Application for a PUD.** The applicant for a PUD must contact the Planning Coordinator for proper application as described Division 47 of this Ordinance.
- D) **Site “Suitable Area” Evaluation.** Proposed new or expansions to existing planned unit developments must be evaluated using the following procedures and standards to determine the suitable area for the dwelling/unit site density evaluation in 50-090 E) of this ordinance.
 - 1) The project parcel must be divided into tiers by locating one or more lines approximately parallel to a line that identifies the ordinary high water level at the following intervals, proceeding landward:

<i>Shoreland Tier Dimensions</i>	<i>Unsewered (ft.)</i>	<i>Sewered (ft.)</i>
General Development Lakes		
– First Tier	200	200
– Second and Additional Tiers	267	200
Recreational Development Lakes	267	267
Natural Environment Lakes	400	320
All River Classes	300	300

- 2) The suitable area within each tier is next calculated by excluding from the tier area all wetlands, bluffs, or land below the ordinary high water level of public waters. This suitable area and the proposed project are then subjected to either the residential or commercial planned unit development density evaluation steps to arrive at an allowable number of dwelling units or sites.

E) **Residential and Commercial PUD Density Evaluation.** The procedures for determining the “base” density of PUD and density increase multipliers are as follows. Allowable densities may be transferred from any tier to any other tier further from the waterbody, but must not be transferred to any other tier closer.

1) **Residential PUD “Base” Density Evaluation:**

- a) The suitable area within each tier is divided by the single residential lot size standard for lakes or, for rivers, the single residential lot width standard times the tier depth, unless the local unit of government has specified an alternative minimum lot size for rivers which shall then used to yield a base density of dwelling units or sites for each tier. Proposed locations and numbers of dwelling units or sites for the residential planned unit developments are then compared with the tier, density, and suitability analyses herein and the design criteria in 50-090 F) of this ordinance.

2) **Commercial PUD “Base” Density Evaluation:**

- a) Determine the average inside living area size of dwelling units or sites within each tier, including both existing and proposed units and sites. Computation of inside living area sizes need not include decks, patios, stoops, steps, garages, or porches and basements, unless they are habitable space.
- b) Select the appropriate floor area ratio from the following table:

***Commercial Planned Unit Development
Floor Area Ratios*
Public Waters Classes***

Average Unit Floor Area (sq. ft.)	Sewered general development lakes; first tier on unsewered general development lakes; urban, agricultural, tributary river segments	Second and additional tiers on unsewered general development lakes; recreational development lakes; transition and forested river segments	Natural environment lakes and remote river segments
200	.040	.020	.010
300	.048	.024	.012
400	.056	.028	.014
500	.065	.032	.016
600	.072	.038	.019
700	.082	.042	.021
800	.091	.046	.023
900	.099	.050	.025
1,000	.108	.054	.027
1,100	.116	.058	.029
1,200	.125	.064	.032
1,300	.133	.068	.034
1,400	.142	.072	.036
1,500	.150	.075	.038

* For average unit floor areas less than shown, use the floor area ratios listed for 200 square feet. For areas greater than shown, use the ratios listed for 1,500 square feet. For recreational camping areas, use the ratios listed at 400 square feet. Manufactured home sites in recreational camping areas shall use a ratio equal to the size of the manufactured home, or if unknown, the ratio listed for 1,000 square feet.

- c) Multiply the suitable area within each tier by the floor area ratio to yield total floor area for each tier allowed to be used for dwelling units or sites.
- d) Divide the total floor area by tier computed in Item (c) above by the average inside living area size determined in Item (a) above. This yields a base number of dwelling units and sites for each tier.
- e) Proposed locations and numbers of dwelling units or sites for the commercial planned unit development are then compared with the tier, density and suitability analysis herein and the design criteria in 50-090 F) of this ordinance.

3) Density Increase Multipliers:

- a) Increases to the dwelling unit or dwelling site base densities previously determined are allowable if the dimensional standards in 50-060 of this ordinance are met or exceeded and the design criteria in 50-090 F) of

this ordinance are satisfied. The allowable density increases in Item (b) below will only be allowed if structure setbacks from the ordinary high water level are increased to at least 50 percent greater than the minimum setback, or the impact on the water-body is reduced an equivalent amount through vegetative management, topography, or additional means acceptable to the local unit of government and the setback is at least 25 percent greater than the minimum setback.

- b) Allowable Dwelling Unit or Dwelling Site Density Increases for Planned Unit Developments:

<i>Density Evaluation Tiers</i>	<i>Maximum Density Increase within Each Tier</i>
First	50%
Second	100%
Third	200%
Fourth	200%
Fifth	200%

F) Other Requirements.

- 1) **Open Space Requirements.** The shore impact zone, based on normal structure setbacks, must be included as open space. For residential PUD’s, at least 50 percent of the shore impact zone area of existing developments or at least 70 percent of the sore impact zone area of new developments must be preserved in its natural or existing state. For commercial PUD’s, at least 50 percent of the shore impact zone must be preserved in its natural state.
- 2) **Erosion Control and Storm water Management.** Erosion control and storm water management plans must be developed and the PUD must:
 - a) Be designed, and the construction managed, to minimize the likelihood of serious erosion occurring either during or after construction. This must be accomplished by limiting the amount and length of time of bare ground exposure. Temporary ground covers, sediment entrapment facilities, vegetated buffer strips, or other appropriate techniques must be used to minimize erosion impacts on surface water features. Erosion control plans approved by a soil and water conservation district may be required if project size and site physical characteristics warrant; and
 - b) Be designed and constructed to effectively manage reasonably expected quantities and qualities of storm water runoff. Impervious surface coverage within any tier must not exceed 25 percent of the tier area, except that for commercial PUD’s 35 percent impervious surface coverage may be allowed in the first tier of federal development lakes with an approved stormwater management plan and consistency with 50-060 F) of this ordinance.

- 3) **Centralization and Design of Facilities.** Centralization and design of facilities and structures must be done according to the following standards:
- a) Planned unit developments must be connected to publicly owned water supply and sewer systems, if available. On-site water supply and sewage treatment systems must be centralized and designed and installed to meet or exceed applicable standards or rules of the Minnesota Department of Health and 50-060 E) and K) of this ordinance. On-site sewage treatment systems must be located on the most suitable areas of the development, and sufficient lawn area free of limiting factors must be provided for a replacement soil treatment system for each sewage system;
 - b) Dwelling units or sites must be clustered into one or more groups and located on suitable areas of the development. They must be designed and located to meet or exceed the following dimensional standards for the relevant shore land classification, setback from the ordinary high water level, elevation above the surface water features, and maximum height. Setbacks from the ordinary high water level must be increased in accordance with 50-090 E) 3) of this ordinance for developments with density increases;
 - c) Shore recreation facilities, including but not limited to swimming areas, docks, and watercraft mooring areas and launching ramps, must be centralized and located in areas suitable for them. Evaluation of suitability must include consideration of land slope, water depth, vegetation, soils, and depth to groundwater and bedrock, or other relevant factors. The number of spaces provided for continuous beaching, mooring, or docking of watercraft must not exceed one for each allowable dwelling unit or site in the first tier (notwithstanding existing mooring sites in an existing commercially used harbor). Launching ramp facilities, including a small dock for loading and unloading equipment, may be provided for use by occupants of dwelling units or sites located in other tiers;
 - d) Structures, parking areas, and other facilities must be treated to reduce visibility as viewed from public waters and adjacent shore lands by vegetation, topography, increased setbacks, color, or other means acceptable to the local unit of government, assuming summer, leaf-on conditions. Vegetative and topographic screening must be preserved, if existing, or may be required to be provided.
 - e) Water-oriented accessory structures and facilities may be allowed if they meet or exceed design standards contained in 60-060 E) of this ordinance and are centralized.

- G) **Conversions.** Local governments may allow existing resorts or other land uses and facilities to be converted to residential planned unit developments if all of the following standards are met:
- 1) Proposed conversions must be initially evaluated using the same procedures for residential planned unit developments involving all new construction. Inconsistencies between existing features of the development and these standards must be identified.
 - 2) Deficiencies involving water supply and sewage treatment, structure color, impervious coverage, open space, and shore recreation facilities must be corrected as part of the conversion or as specified in the conditional use permit.
 - 3) Shore and bluff impact zone deficiencies must be evaluated and reasonable improvements made as part of the conversion. These improvements must include, where applicable, the following:
 - a) Removal of extraneous buildings, docks, or other facilities that no longer need to be located in shore or bluff impact zones:
 - b) Remedial measures to correct erosion sites and improve vegetative cover and screening of buildings and other facilities as viewed from the water; and
 - c) If existing dwelling units are located in shore or bluff impact zones, conditions are attached to approvals of conversions that preclude exterior expansions in any dimension or substantial alterations. The conditions must also provide for future relocation of dwelling units, where feasible, to other locations, meeting all setback and elevation requirements when they are rebuilt or replaced.
 - 4) Existing dwelling unit or dwelling site densities that exceed standards in 50-090 E) of this ordinance may be allowed to continue but must not be allowed to be increased, either at the time of conversion or in the future. Efforts must be made during the conversion to limit impacts of high densities by recruiting seasonal use, improving vegetative screening, centralizing shore recreation facilities, installing new sewage treatment systems, or other means.

DIVISION 52: FLOODPLAIN OVERLAY DISTRICT

SECTION 1.0 STATUTORY AUTHORIZATION, FINDINGS OF FACT AND PURPOSE

- 1.1. Statutory Authorization: The legislature of the State of Minnesota has, in Minnesota Statutes Chapters 103F and 462 delegated the responsibility to local government units to adopt regulations designed to minimize flood losses. Therefore, the City Council of Red Wing, Minnesota, does ordain as follows:
- 1.2 Findings of Fact:
 - 1.21 The flood hazard areas of the City of Red Wing, Minnesota, are subject to periodic inundation which results in potential loss of life, loss of property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.
 - 1.22 Methods Used to Analyze Flood Hazards. This Ordinance is based upon a reasonable method of analyzing flood hazards which is consistent with the standards established by the Minnesota Department of Natural Resources.
 - 1.23 National Flood Insurance Program Compliance. This Ordinance is adopted to comply with the rules and regulations of the National Flood Insurance Program codified as 44 Code of Federal Regulations Parts 59–78, as amended, so as to maintain the community’s eligibility in the National Flood Insurance Program.
- 1.3 Statement of Purpose: It is the purpose of this Ordinance to promote the public health, safety, and general welfare and to minimize those losses described in Section 1.21 by provisions contained herein.

SECTION 2.0 GENERAL PROVISIONS

- 2.1 Lands to Which Ordinance Applies: This Ordinance shall apply to all lands within the jurisdiction of the City of Red Wing shown on the Official Zoning Map and/or the attachments thereto as being located within the boundaries of the Floodway, Flood Fringe, or General Flood Plain Districts.
- 2.2 Establishment of Official Zoning Map: The Official Zoning Map, together with all materials attached thereto, is hereby adopted by reference and declared to be a part of this Ordinance. The attached material shall include the Flood Insurance Study for Goodhue County, Minnesota, and Incorporated Areas and Flood Insurance Rate Map Panels therein numbered 27049C0045E, 27049C0065E, 27049C160E, 27049C0167E, 27049C0170E, 27049C0178E, 27049C0179E, 27049C0180E, 27049C0185E, 27049C0186E, 27049C0190E, 27049C0195E, 27049C0205E, and 27049C0215E, all dated September 25, 2009, and prepared by the Federal Emergency Management Agency. The Official Zoning

Map shall be on file in the offices of the City of Red Wing City Clerk and the Red Wing Zoning Administrator.

- 2.3 Regulatory Flood Protection Elevation: The regulatory flood protection elevation shall be an elevation no lower than one foot above the elevation of the regional flood plus any increases in flood elevation caused by encroachments on the flood plain that result from designation of a floodway. Within the AO Zone shown on Flood Insurance Rate Map Panel number 27049C0190E, as adopted in Section 2.2, the regulatory flood protection elevation shall be an elevation no lower than 2 feet above the highest adjacent grade of an existing structure, a proposed structure or a proposed structural addition.
- 2.4 Interpretation:
- 2.41 In their interpretation and application, the provisions of this Ordinance shall be held to be minimum requirements and shall be liberally construed in favor of the Governing Body and shall not be deemed a limitation or repeal of any other powers granted by state statutes.
- 2.42 The boundaries of the zoning districts shall be determined by scaling distances on the Official Zoning Map. Where interpretation is needed as to the exact location of the boundaries of the district as shown on the Official Zoning Map, as for example where there appears to be a conflict between a mapped boundary and actual field conditions and there is a formal appeal of the decision of the Zoning Administrator, the Board of Adjustment shall make the necessary interpretation. All decisions will be based on elevations on the regional (100-year) flood profile, the ground elevations that existed on the site at the time the Community adopted its initial floodplain ordinance or on the date of the first National Flood Insurance Program map showing the area within the 100-year floodplain if earlier, and other available technical data. Persons contesting the location of the district boundaries shall be given a reasonable opportunity to present their case to the Board of Adjustment and to submit technical evidence.
- 2.5 Abrogation and Greater Restrictions: It is not intended by this Ordinance to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this Ordinance imposes greater restrictions, the provisions of this Ordinance shall prevail. All other ordinances inconsistent with this Ordinance are hereby repealed to the extent of the inconsistency only.
- 2.6 Warning and Disclaimer of Liability: This Ordinance does not imply that areas outside the floodplain districts or land uses permitted within such districts will be free from flooding or flood damages. This Ordinance shall not create liability on the part of the City of Red Wing or any officer or employee thereof for any flood damages that result from reliance on this Ordinance or any administrative decision lawfully made thereunder.
- 2.7 Severability: See Division 05-100 of the Red Wing Zoning Ordinance.

- 2.8 Definitions: Unless specifically defined below, words or phrases used in this Ordinance shall be interpreted so as to give them the same meaning as they have in common usage and so as to give this Ordinance its most reasonable application.
- 2.811 Accessory Use or Structure – a use or structure on the same lot with, and of a nature customarily incidental and subordinate to, the principal use or structure.
- 2.812 Basement – means any area of a structure, including crawl spaces, having its floor or base subgrade (below ground level) on all four sides, regardless of the depth of excavation below ground level.
- 2.813 Conditional Use – means a specific type of structure or land use listed in the official control that may be allowed but only after an in-depth review procedure and with appropriate conditions or restrictions as provided in the official zoning controls or building codes and upon a finding that:
- (a) Certain conditions as detailed in the zoning ordinance exist.
 - (b) The structure and/or land use conform to the comprehensive land use plan, if one exists, and are compatible with the existing neighborhood.
- 2.814 Equal Degree of Encroachment – a method of determining the location of floodway boundaries so that floodplain lands on both sides of a stream are capable of conveying a proportionate share of flood flows.
- 2.815 Flood – a temporary increase in the flow or stage of a stream or in the stage of a wetland or lake that results in the inundation of normally dry areas.
- 2.816 Flood Frequency – the frequency for which it is expected that a specific flood stage or discharge may be equaled or exceeded.
- 2.817 Flood Fringe – that portion of the floodplain outside of the floodway. Flood fringe is synonymous with the term “floodway fringe” used in the Flood Insurance Study for Goodhue County, Minnesota, and Incorporated Areas.
- 2.818 Flood Plain – the beds proper and the areas adjoining a wetland, lake or watercourse which have been or hereafter may be covered by the regional flood.
- 2.819 Flood Proofing – a combination of structural provisions, changes, or adjustments to properties and structures subject to flooding, primarily for the reduction or elimination of flood damages.
- 2.820 Floodway – the bed of a wetland or lake and the channel of a watercourse and those portions of the adjoining floodplain which are reasonably required to carry or store the regional flood discharge.
- 2.821 Lowest Floor – the lowest floor of the lowest enclosed area (including basement). An unfinished or flood-resistant enclosure, used solely for parking of vehicles,

building access, or storage in an area other than a basement area, is not considered a building's lowest floor.

- 2.822 Manufactured Home – a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term “manufactured home” does not include the term “recreational vehicle.”
- 2.823 Obstruction – any dam, wall, wharf, embankment, levee, dike, pile, abutment, projection, excavation, channel modification, culvert, building, wire, fence, stockpile, refuse, fill, structure, or matter in, along, across, or projecting into any channel, watercourse, or regulatory floodplain which may impede, retard, or change the direction of the flow of water, either in itself or by catching or collecting debris carried by such water.
- 2.824 Principal Use or Structure – means all uses or structures that are not accessory uses or structures.
- 2.825 Reach – a hydraulic engineering term to describe a longitudinal segment of a stream or river influenced by a natural or man-made obstruction. In an urban area, the segment of a stream or river between two consecutive bridge crossings would most typically constitute a reach.
- 2.826 Recreational Vehicle – a vehicle that is built on a single chassis, is 400 square feet or less when measured at the largest horizontal projection, is designed to be self-propelled or permanently towable by a light duty truck, and is designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use. For the purposes of this Ordinance, the term recreational vehicle shall be synonymous with the term travel trailer/travel vehicle.
- 2.827 Regional Flood – a flood which is representative of large floods known to have occurred generally in Minnesota and reasonably characteristic of what can be expected to occur on an average frequency in the magnitude of the 100-year recurrence interval. Regional flood is synonymous with the term “base flood” used in the flood insurance study.
- 2.828 Regulatory Flood Protection Elevation – The regulatory flood protection elevation shall be an elevation no lower than one foot above the elevation of the regional flood plus any increases in flood elevation caused by encroachments on the floodplain that result from designation of a floodway. Within the AO Zone shown on Flood Insurance Rate Map Panel number 27049C0190E, as adopted in Section 2.2, the regulatory flood protection elevation shall be an elevation no lower than 2 feet above the highest adjacent grade of an existing structure, or a proposed structure, or a proposed structural addition.
- 2.829 Structure – anything constructed or erected on the ground or attached to the ground or on-site utilities, including, but not limited to, buildings, factories, sheds,

detached garages, cabins, manufactured homes, recreational vehicles not meeting the exemption criteria specified in Section 9.31 of this Ordinance and other similar items.

- 2.830 Substantial Damage – means damage of any origin sustained by a structure where the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the estimated market value, as indicated in the records of the County Assessor, of the structure before the damage occurred.
- 2.831 Substantial Improvement – within any consecutive 365-day period, any reconstruction, rehabilitation (including normal maintenance and repair), repair after damage, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the estimated market value, as indicated in the records of the County Assessor, of the structure before the “start of construction” of the improvement. This term includes structures that have incurred “substantial damage,” regardless of the actual repair work performed. The term does not, however, include either:
- (a) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions.
 - (b) Any alteration of an “historic structure,” provided that the alteration will not preclude the structure’s continued designation as an “historic structure.” For the purpose of this Ordinance, “historic structure” shall be as defined in 44 Code of Federal Regulations, Part 59.1.
- 2.832 Variance – means a modification of a specific permitted development standard required in an official control including this Ordinance to allow an alternative development standard not stated as acceptable in the official control, but only as applied to a particular property for the purpose of alleviating a hardship, practical difficulty or unique circumstance as defined and elaborated upon in a community's respective planning and zoning enabling legislation.
- 2.9 Annexations: The Flood Insurance Rate Map panels adopted by reference into Section 2.2 above may include floodplain areas that lie outside of the corporate boundaries of the City of Red Wing at the time of adoption of this Ordinance. If any of these floodplain land areas are annexed into the City of Red Wing after the date of adoption of this Ordinance, the newly annexed floodplain lands shall be subject to the provisions of this Ordinance immediately upon the date of annexation into the City of Red Wing.

SECTION 3.0 ESTABLISHMENT OF ZONING DISTRICTS

3.1 Districts:

- 3.11 Floodway District. The Floodway District shall include those areas designated as floodway on the Flood Insurance Rate Map Panels adopted in Section 2.2 and the AO Zone shown on Flood Insurance Rate Map Panel number 27049C0190E as adopted in Section 2.2.
 - 3.12 Flood-Fringe District. The Flood-Fringe District shall include those areas designated as floodway fringe. The Flood-Fringe District shall include those areas shown on the Flood Insurance Rate Map as adopted in Section 2.2 as being within Zone AE but being located outside of the floodway.
 - 3.13 General Floodplain District. The General Floodplain District shall include those areas designated as Zone A and Zone AE without a floodway on the Flood Insurance Rate Map adopted in Section 2.2.
- 3.2 Compliance: No new structure or land shall hereafter be used and no structure shall be constructed, located, extended, converted, or structurally altered without full compliance with the terms of this Ordinance and other applicable regulations which apply to uses within the jurisdiction of this Ordinance. Within the Floodway, Flood-Fringe and General Floodplain Districts, all uses not listed as permitted uses or conditional uses in Sections 4.0, 5.0 and 6.0 that follow, respectively, shall be prohibited. In addition, a caution is provided here that:
- 3.21 New manufactured homes, replacement manufactured homes and certain recreational vehicles are subject to the general provisions of this Ordinance and specifically Section 9.0.
 - 3.22 Modifications, additions, structural alterations, normal maintenance and repair, or repair after damage to existing nonconforming structures and nonconforming uses of structures or land are regulated by the general provisions of this Ordinance and specifically Section 11.0.
 - 3.23 As-built elevations for elevated or flood-proofed structures must be certified by ground surveys and flood-proofing techniques must be designed and certified by a registered professional engineer or architect as specified in the general provisions of this Ordinance and specifically as stated in Section 10.0 of this Ordinance.

SECTION 4.0 FLOODWAY DISTRICT (FW)

4.1 Permitted Uses:

- 4.11 General farming, pasture, grazing, outdoor plant nurseries, horticulture, truck farming, forestry, sod farming, and wild crop harvesting.
- 4.12 Industrial-commercial loading areas, parking areas, and airport landing strips.
- 4.13 Private and public golf courses, tennis courts, driving ranges, archery ranges, picnic grounds, boat launching ramps, swimming areas, parks, wildlife and nature

preserves, game farms, fish hatcheries, shooting preserves, target ranges, trap and skeet ranges, hunting and fishing areas, and single- or multiple-purpose recreational trails.

4.14 Residential lawns, gardens, parking areas, and play areas.

4.2 Standards for Floodway Permitted Uses:

4.21 The use shall have a low flood damage potential.

4.22 The use shall be permissible in the underlying zoning district if one exists.

4.23 The use shall not obstruct flood flows or increase flood elevations and shall not involve structures, fill, obstructions, excavations or storage of materials or equipment.

4.3 Conditional Uses:

4.31 Structures accessory to the uses listed in 4.1 above and the uses listed in 4.32-4.38 below.

4.32 Extraction and storage of sand, gravel, and other materials.

4.33 Marinas, boat rentals, docks, piers, wharves, and water control structures.

4.34 Railroads, streets, bridges, utility transmission lines, and pipelines.

4.35 Storage yards for equipment, machinery, or materials.

4.36 Placement of fill or construction of fences.

4.37 Recreational vehicles either on individual lots of record or in existing or new subdivisions or commercial- or condominium-type campgrounds, subject to the exemptions and provisions of Section 9.3 of this Ordinance.

4.38 Structural works for flood control such as levees, dikes and floodwalls constructed to any height where the intent is to protect individual structures and levees or dikes where the intent is to protect agricultural crops for a frequency flood event equal to or less than the 10-year frequency flood event.

4.4 Standards for Floodway Conditional Uses:

4.41 All Uses. No structure (temporary or permanent), fill (including fill for roads and levees), deposit, obstruction, storage of materials or equipment, or other uses may be allowed as a conditional use that will cause any increase in the stage of the 100-year or regional flood or cause an increase in flood damages in the reach or reaches affected.

- 4.42 All floodway conditional uses shall be subject to the procedures and standards contained in Section 10.4 of this Ordinance.
- 4.43 The conditional use shall be permissible in the underlying zoning district if one exists.
- 4.44 Fill:
- (a) Fill, dredge spoil and all other similar materials deposited or stored in the floodplain shall be protected from erosion by vegetative cover, mulching, riprap or other acceptable method.
 - (b) Dredge spoil sites and sand and gravel operations shall not be allowed in the floodway unless a long-term site development plan is submitted which includes an erosion/sedimentation prevention element to the plan.
 - (c) As an alternative, and consistent with Subsection (b) immediately above, dredge spoil disposal and sand and gravel operations may allow temporary, on-site storage of fill or other materials which would have caused an increase to the stage of the 100-year or regional flood but only after the Governing Body has received an appropriate plan which assures the removal of the materials from the floodway based upon the flood warning time available. The conditional use permit must be title registered with the property in the Office of the County Recorder.
- 4.45 Accessory Structures:
- (a) Accessory structures shall not be designed for human habitation.
 - (b) Accessory structures, if permitted, shall be constructed and placed on the building site so as to offer the minimum obstruction to the flow of floodwaters:
 - (1) Whenever possible, structures shall be constructed with the longitudinal axis parallel to the direction of flood flow; and
 - (2) So far as practicable, structures shall be placed approximately on the same flood flow lines as those of adjoining structures.
 - (c) Accessory structures shall be elevated on fill or structurally dry flood proofed in accordance with the FP-1 or FP-2 flood-proofing classifications in the State Building Code. As an alternative, an accessory structure may be flood proofed to the FP-3 or FP-4 flood-proofing classification in the State Building Code provided the accessory structure constitutes a minimal investment, does not exceed 500 square feet in size at its largest projection, and for a detached garage, the detached garage must be used solely for parking of vehicles and limited storage. All flood-proofed accessory structures must meet the following additional standards:

- (1) The structure must be adequately anchored to prevent flotation, collapse or lateral movement of the structure and shall be designed to equalize hydrostatic flood forces on exterior walls;
 - (2) Any mechanical and utility equipment in a structure must be elevated to or above the regulatory flood protection elevation or properly flood proofed; and
 - (3) To allow for the equalization of hydrostatic pressure, there must be a minimum of two “automatic” openings in the outside walls of the structure having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding. There must be openings on at least two sides of the structure and the bottom of all openings must be no higher than one foot above the lowest adjacent grade to the structure. Using human intervention to open a garage door prior to flooding will not satisfy this requirement for automatic openings.
- (d) Within an AO Zone, require that adequate drainage paths are placed on slopes around the proposed accessory structure to guide floodwaters around and away from the proposed accessory structure.

4.46 Storage of Materials and Equipment:

- (a) The storage or processing of materials that are, in time of flooding, flammable, explosive, or potentially injurious to human, animal, or plant life is prohibited.
- (b) Storage of other materials or equipment may be allowed if readily removable from the area within the time available after a flood warning and in accordance with a plan approved by the Governing Body.

4.47 Structural works for flood control that will change the course, current or cross section of protected wetlands or public waters shall be subject to the provisions of Minnesota Statute, Chapter 103G. Community-wide structural works for flood control intended to remove areas from the regulatory floodplain shall not be allowed in the floodway.

4.48 A levee, dike or flood wall constructed in the floodway shall not cause an increase to the 100-year or regional flood and the technical analysis must assume equal conveyance or storage loss on both sides of a stream.

SECTION 5.0 FLOOD-FRINGE DISTRICT (FF)

5.1 Permitted Uses: Permitted uses shall be those uses of land or structures listed as permitted uses in the underlying zoning use district(s). If no preexisting, underlying zoning use districts exist, then any residential or nonresidential structure or use of a structure or land shall be a permitted use in the Flood Fringe District provided such use does not constitute a

public nuisance. All permitted uses shall comply with the standards for Flood Fringe District “Permitted Uses” listed in Section 5.2 and the “Standards for all Flood Fringe Uses” listed in Section 5.5.

5.2 Standards for Flood-Fringe Permitted Uses:

- 5.21 All structures, including accessory structures, must be elevated on fill so that the lowest floor including basement floor is at or above the regulatory flood protection elevation. The finished fill elevation for structures shall be no lower than one (1) foot below the regulatory flood protection elevation and the fill shall extend at such elevation at least fifteen (15) feet beyond the outside limits of the structure erected thereon.
- 5.22 As an alternative to elevation on fill, accessory structures that constitute a minimal investment and that do not exceed 500 square feet at its largest projection may be internally flood proofed in accordance with Section 4.45(c).
- 5.23 The cumulative placement of fill where at any one time in excess of one-thousand (1,000) cubic yards of fill is located on the parcel shall be allowable only as a conditional use, unless said fill is specifically intended to elevate a structure in accordance with Section 5.21 of this Ordinance.
- 5.24 The storage of any materials or equipment shall be elevated on fill to the regulatory flood protection elevation.
- 5.25 The provisions of Section 5.5 of this Ordinance shall apply.

5.3 Conditional Uses: Any structure that is not elevated on fill or flood proofed in accordance with Section 5.21–5.22 or any use of land that does not comply with the standards in Section 5.23–5.24 shall only be allowable as a conditional use. An application for a conditional use shall be subject to the standards and criteria and evaluation procedures specified in Sections 5.4–5.5 and 10.4 of this Ordinance..

5.4 Standards for Flood-Fringe Conditional Uses:

- 5.41 Alternative elevation methods other than the use of fill may be utilized to elevate a structure's lowest floor above the regulatory flood protection elevation. These alternative methods may include the use of stilts, pilings, parallel walls, etc., or above-grade, enclosed areas such as crawl spaces or tuck-under garages. The base or floor of an enclosed area shall be considered above-grade and not a structure's basement or lowest floor if:
 - (1) the enclosed area is above-grade on at least one side of the structure;
 - (2) it is designed to internally flood and is constructed with flood-resistant materials; and

- (3) it is used solely for parking of vehicles, building access or storage. The above-noted alternative elevation methods are subject to the following additional standards:
 - (a) Design and Certification - The structure's design and as-built condition must be certified by a registered professional engineer or architect as being in compliance with the general design standards of the State Building Code and, specifically, that all electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities must be at or above the regulatory flood protection elevation or be designed to prevent floodwater from entering or accumulating within these components during times of flooding.
 - (b) Specific Standards for Above-grade, Enclosed Areas - Above-grade, fully enclosed areas such as crawl spaces or tuck-under garages must be designed to internally flood and the design plans must stipulate:
 - (i) A minimum area of openings in the walls where internal flooding is to be used as a flood-proofing technique. There shall be a minimum of two openings on at least two sides of the structure and the bottom of all openings shall be no higher than one foot above grade. The automatic openings shall have a minimum net area of not less than one square inch for every square foot of enclosed area subject to flooding unless a registered professional engineer or architect certifies that a smaller net area would suffice. The automatic openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters without any form of human intervention; and
 - (ii) That the enclosed area will be designed of flood resistant materials in accordance with the FP-3 or FP-4 classifications in the State Building Code and shall be used solely for building access, parking of vehicles or storage.

5.42 Basements, as defined by Section 2.812 of this Ordinance, shall be subject to the following:

- (a) Residential basement construction shall not be allowed below the regulatory flood protection elevation.
- b) Nonresidential basements may be allowed below the regulatory flood protection elevation provided the basement is structurally dry flood-proofed in accordance with Section 5.43 of this Ordinance.

5.43 All areas of nonresidential structures including basements to be placed below the regulatory flood protection elevation shall be flood proofed in accordance with the structurally dry flood-proofing classifications in the State Building Code. Structurally dry flood-proofing must meet the FP-1 or FP-2 flood-proofing

classification in the State Building Code and this shall require making the structure watertight with the walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy. Structures flood-proofed to the FP-3 or FP-4 classification shall not be permitted.

5.44 When at any one time more than 1,000 cubic yards of fill or other similar material is located on a parcel for such activities as on-site storage, landscaping, sand and gravel operations, landfills, roads, dredge spoil disposal or construction of flood control works, an erosion/sedimentation control plan must be submitted unless the community is enforcing a state-approved shoreland management ordinance. In the absence of a state-approved shoreland ordinance, the plan must clearly specify methods to be used to stabilize the fill on-site for a flood event at a minimum of the 100-year or regional flood event. The plan must be prepared and certified by a registered professional engineer or other qualified individual acceptable to the Governing Body. The plan may incorporate alternative procedures for removal of the material from the floodplain if adequate flood-warning time exists.

5.45 Storage of Materials and Equipment:

(a) The storage or processing of materials that are, in time of flooding, flammable, explosive, or potentially injurious to human, animal, or plant life is prohibited.

(b) Storage of other materials or equipment may be allowed if readily removable from the area within the time available after a flood warning and in accordance with a plan approved by the Governing Body.

5.46 The provisions of Section 5.5 of this Ordinance shall also apply.

5.5 Standards for All Flood-Fringe Uses:

5.51 All new principal structures must have vehicular access at or above an elevation not more than two (2) feet below the regulatory flood protection elevation. If a variance to this requirement is granted, the Board of Adjustment must specify limitations on the period of use or occupancy of the structure for times of flooding and only after determining that adequate flood-warning time and local flood emergency response procedures exist.

5.52 Commercial Uses – accessory land uses, such as yards, railroad tracks, and parking lots may be at elevations lower than the regulatory flood protection elevation. However, a permit for such facilities to be used by the employees or the general public shall not be granted in the absence of a flood-warning system that provides adequate time for evacuation if the area would be inundated to a depth and velocity such that when multiplying the depth (in feet) times velocity (in feet per second) the product number exceeds four (4) upon occurrence of the regional flood.

- 5.53 Manufacturing and Industrial Uses - measures shall be taken to minimize interference with normal plant operations especially along streams having protracted flood durations. Certain accessory land uses such as yards and parking lots may be at lower elevations subject to requirements set out in Section 5.52 above. In considering permit applications, due consideration shall be given to the needs of an industry whose business requires that it be located in floodplain areas.
- 5.54 Fill shall be properly compacted and the slopes shall be properly protected by the use of riprap, vegetative cover or other acceptable method. The Federal Emergency Management Agency (FEMA) has established criteria for removing the special flood hazard area designation for certain structures properly elevated on fill above the 100-year flood elevation - FEMA's requirements incorporate specific fill compaction and side slope protection standards for multi-structure or multi-lot developments. These standards should be investigated prior to the initiation of site preparation if a change of special flood hazard area designation will be requested.
- 5.55 Floodplain developments shall not adversely affect the hydraulic capacity of the channel and adjoining floodplain of any tributary watercourse or drainage system where a floodway or other encroachment limit has not been specified on the Official Zoning Map.
- 5.56 Standards for recreational vehicles are contained in Section 9.3.
- 5.57 All manufactured homes shall be securely anchored to an adequately anchored foundation system that resists flotation, collapse and lateral movement. Methods of anchoring may include, but are not to be limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable state or local anchoring requirements for resisting wind forces.

SECTION 6.0 GENERAL FLOODPLAIN DISTRICT

6.1 Permissible Uses:

- 6.11 The uses listed in Section 4.1 of this Ordinance shall be permitted uses.
- 6.12 All other uses shall be subject to the floodway/flood-fringe evaluation criteria pursuant to Section 6.2 below. Section 4.0 shall apply if the proposed use is in the Floodway District and Section 5.0 shall apply if the proposed use is in the Flood-Fringe District.

6.2 Procedures for Floodway and Flood-Fringe Determinations within the General Flood Plain District.

- 6.21 Upon receipt of an application for a permit or other approval within the General Flood Plain District, the applicant shall be required to furnish such of the following information as is deemed necessary by the Zoning Administrator for the

determination of the regulatory flood protection elevation and whether the proposed use is within the Floodway or Flood-Fringe District.

- (a) A typical valley cross section(s) showing the channel of the stream, elevation of land areas adjoining each side of the channel, cross-sectional areas to be occupied by the proposed development, and high-water information.
- (b) Plan (surface view) showing elevations or contours of the ground, pertinent structure, fill, or storage elevations, the size, location, and spatial arrangement of all proposed and existing structures on the site, and the location and elevations of streets.
- (c) Photographs showing existing land uses, vegetation upstream and downstream, and soil types.
- (d) Profile showing the slope of the bottom of the channel or flow line of the stream for at least 500 feet in either direction from the proposed development.

6.22 The applicant shall be responsible to submit one copy of the above information to a designated engineer or other expert person or agency for technical assistance in determining whether the proposed use is in the Floodway or Flood-Fringe District and to determine the regulatory flood protection elevation. Procedures consistent with Minnesota Regulations 1983, Parts 6120.5000-6120.6200 and 44 Code of Federal Regulations Part 65 shall be followed in this expert evaluation. The designated engineer or expert is strongly encouraged to discuss the proposed technical evaluation methodology with the respective Department of Natural Resources' Area Hydrologist prior to commencing the analysis. The designated engineer or expert shall:

- (a) Estimate the peak discharge of the regional flood.
- (b) Calculate the water surface profile of the regional flood based upon a hydraulic analysis of the stream channel and overbank areas.
- (c) Compute the floodway necessary to convey or store the regional flood without increasing flood stages more than 0.5 foot. A lesser stage increase than .5' shall be required if, as a result of the additional stage increase, increased flood damages would result. An equal degree of encroachment on both sides of the stream within the reach shall be assumed in computing floodway boundaries.

6.23 The Zoning Administrator shall present the technical evaluation and findings of the designated engineer or expert to the Governing Body. The Governing Body must formally accept the technical evaluation and the recommended Floodway and/or Flood-Fringe District boundary or deny the permit application. The Governing Body, prior to official action, may submit the application and all supporting data and analyses to the Federal Emergency Management Agency, the Department of Natural Resources or the Planning Commission for review and comment. Once the Floodway and Flood-Fringe District Boundaries have been determined, the

Governing Body shall refer the matter back to the Zoning Administrator who shall process the permit application consistent with the applicable provisions of Section 4.0 and 5.0 of this Ordinance.

SECTION 7.0 SUBDIVISIONS

- 7.1 **Review Criteria:** No land shall be subdivided which is unsuitable for the reason of flooding, inadequate drainage, water supply or sewage treatment facilities. All lots within the floodplain districts shall be able to contain a building site outside of the Floodway District at or above the regulatory flood protection elevation. All subdivisions shall have water and sewage treatment facilities that comply with the provisions of this Ordinance and have road access both to the subdivision and to the individual building sites no lower than two feet below the regulatory flood protection elevation. For all subdivisions in the floodplain, the Floodway and Flood-Fringe District boundaries, the regulatory flood protection elevation and the required elevation of all access roads shall be clearly labeled on all required subdivision drawings and platting documents.
- 7.2 **Floodway/Flood-Fringe Determinations in the General Floodplain District:** In the General Floodplain District, applicants shall provide the information required in Section 6.2 of this Ordinance to determine the 100-year flood elevation, the Floodway and Flood-Fringe District boundaries and the regulatory flood protection elevation for the subdivision site.
- 7.3 **Removal of Special Flood Hazard Area Designation:** The Federal Emergency Management Agency (FEMA) has established criteria for removing the special flood hazard area designation for certain structures properly elevated on fill above the 100-year flood elevation. FEMA's requirements incorporate specific fill compaction and side slope protection standards for multi-structure or multi-lot developments. These standards should be investigated prior to the initiation of site preparation if a change of special flood hazard area designation will be requested.

SECTION 8.0 PUBLIC UTILITIES, RAILROADS, ROADS, AND BRIDGES

- 8.1 **Public Utilities.** All public utilities and facilities such as gas, electrical, sewer, and water supply systems to be located in the floodplain shall be flood-proofed in accordance with the State Building Code or elevated to above the regulatory flood protection elevation.
- 8.2 **Public Transportation Facilities.** Railroad tracks, roads, and bridges to be located within the floodplain shall comply with Sections 4.0 and 5.0 of this Ordinance. Elevation to the regulatory flood protection elevation shall be provided where failure or interruption of these transportation facilities would result in danger to the public health or safety or where such facilities are essential to the orderly functioning of the area. Minor or auxiliary roads

or railroads may be constructed at a lower elevation where failure or interruption of transportation services would not endanger the public health or safety.

8.3 On-site Sewage Treatment and Water Supply Systems: Where public utilities are not provided:

- (1) On-site water supply systems must be designed to minimize or eliminate infiltration of floodwaters into the systems; and
- (2) New or replacement on-site sewage treatment systems must be designed to minimize or eliminate infiltration of floodwaters into the systems and discharges from the systems into floodwaters and they shall not be subject to impairment or contamination during times of flooding. Any sewage treatment system designed in accordance with the State's current statewide standards for on-site sewage treatment systems shall be determined to be in compliance with this Section.

SECTION 9.0 MANUFACTURED HOME AND MANUFACTURED HOME PARKS AND PLACEMENT OF RECREATIONAL VEHICLES.

9.1 New manufactured homes parks and expansions to existing manufactured home parks shall be subject to the provisions placed on subdivisions by Section 7.0 of this Ordinance.

9.2 The placement of new or replacement manufactured homes in existing manufactured home parks or on individual lots of record that are located in floodplain districts will be treated as a new structure and may be placed only if elevated in compliance with Section 5.0 of this Ordinance. If vehicular road access for pre-existing manufactured home parks is not provided in accordance with Section 5.51, then replacement manufactured homes will not be allowed until the property owner(s) develops a flood-warning emergency plan acceptable to the Governing Body.

9.21 All manufactured homes must be securely anchored to an adequately anchored foundation system that resists flotation, collapse and lateral movement. Methods of anchoring may include, but are not to be limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable state or local anchoring requirements for resisting wind forces.

9.3 Recreational vehicles that do not meet the exemption criteria specified in Section 9.31 below shall be subject to the provisions of this Ordinance and as specifically spelled out in Sections 9.33–9.34 below.

9.31 Exemption. Recreational vehicles are exempt from the provisions of this Ordinance if they are placed in any of the areas listed in Section 9.32 below and further they meet the following criteria:

- (a) Have current licenses required for highway use.

- (b) Are highway ready, meaning on wheels or the internal jacking system, are attached to the site only by quick disconnect type utilities commonly used in campgrounds and recreational vehicle parks, and the recreational vehicle has no permanent structural type additions attached to it.
- (c) The recreational vehicle and associated use must be permissible in any pre-existing, underlying zoning use district.

9.32 Areas Exempted for Placement of Recreational Vehicles:

- (a) Individual lots or parcels of record.
- (b) Existing commercial recreational vehicle parks or campgrounds.
- (c) Existing condominium type associations.

9.33 Recreational vehicles exempted in Section 9.31 lose this exemption when development occurs on the parcel exceeding \$500 for a structural addition to the recreational vehicle or exceeding \$500 for an accessory structure such as a garage or storage building. The recreational vehicle and all additions and accessory structures will then be treated as a new structure and shall be subject to the elevation/flood-proofing requirements and the use of land restrictions specified in Sections 4.0 and 5.0 of this Ordinance. There shall be no development or improvement on the parcel or attachment to the recreational vehicle that hinders the removal of the recreational vehicle to a flood-free location should flooding occur.

9.34 New commercial recreational vehicle parks or campgrounds and new residential type subdivisions and condominium associations and the expansion of any existing similar use exceeding five (5) units or dwelling sites shall be subject to the following:

- (a) Any new or replacement recreational vehicle will be allowed in the Floodway or Flood-Fringe Districts provided said recreational vehicle and its contents are placed on fill above the regulatory flood protection elevation and proper elevated road access to the site exists in accordance with Section 5.51 of this Ordinance. No fill placed in the floodway to meet the requirements of this Section shall increase flood stages of the 100-year or regional flood.
- (b) All new or replacement recreational vehicles not meeting the criteria of (a) above may, as an alternative, be allowed as a conditional use if in accordance with the following provisions and the provisions of 10.4 of the Ordinance. The applicant must submit an emergency plan for the safe evacuation of all vehicles and people during the 100-year flood. Said plan shall be prepared by a registered engineer or other qualified individual, shall demonstrate that adequate time and personnel exist to carry out the evacuation, and shall demonstrate the provisions of Section 9.31(a) and (b) of this Ordinance will be met. All attendant sewage and water facilities for new or replacement recreational vehicles must be protected or constructed so as to not be impaired

or contaminated during times of flooding in accordance with Section 8.3 of this Ordinance.

SECTION 10.0 ADMINISTRATION

- 10.1 Zoning Administrator: A Zoning Administrator or other official designated by the Governing Body shall administer and enforce this Ordinance. If the Zoning Administrator finds a violation of the provisions of this Ordinance, the Zoning Administrator shall notify the person responsible for such violation in accordance with the procedures stated in Division 95 of the Zoning Ordinance.
- 10.2 Permit Requirements:
- 10.21 Permit Required. A Permit issued by the Zoning Administrator in conformity with the provisions of this Ordinance shall be secured prior to the erection, addition, modification, rehabilitation (including normal maintenance and repair), or alteration of any building, structure, or portion thereof; prior to the use or change of use of a building, structure, or land; prior to the construction of a dam, fence, or on-site septic system; prior to the change or extension of a nonconforming use; prior to the repair of a structure that has been damaged by flood, fire, tornado, or any other source; and prior to the placement of fill, excavation of materials, or the storage of materials or equipment within the floodplain.
- 10.22 Application for Permit. Application for a permit shall be made in duplicate to the Zoning Administrator on forms furnished by the Zoning Administrator and shall include the following where applicable: plans in duplicate drawn to scale, showing the nature, location, dimensions, and elevations of the lot; existing or proposed structures, fill, or storage of materials; and the location of the foregoing in relation to the stream channel. Application procedures shall follow the requirements listed in Division 85 of the City Zoning Ordinance.
- 10.23 State and Federal Permits. Prior to granting a permit or processing an application for a conditional use permit or variance, the Zoning Administrator shall determine that the applicant has obtained all necessary state and federal permits.
- 10.24 Certificate of Compliance for a New, Altered, or Nonconforming Use. It shall be unlawful to use, occupy, or permit the use or occupancy of any building or premises or part thereof hereafter created, erected, changed, converted, altered, or enlarged in its use or structure until a certificate of compliance shall have been issued by the Zoning Administrator stating that the use of the building or land conforms to the requirements of this Ordinance.
- 10.25 Construction and Use to be as Provided on Applications, Plans, Permits, Variances and Certificates of Compliance. Permits, conditional use permits, or certificates of compliance issued on the basis of approved plans and applications authorize only the use, arrangement, and construction set forth in such approved plans and applications, and no other use, arrangement, or construction. Any use,

arrangement, or construction at variance with that authorized shall be deemed a violation of this Ordinance, and punishable as provided by Division 95 of this Zoning Ordinance.

- 10.26 Certification. The applicant shall be required to submit certification by a registered professional engineer, registered architect, or registered land surveyor that the finished fill and building elevations were accomplished in compliance with the provisions of this Ordinance. Flood-proofing measures shall be certified by a registered professional engineer or registered architect.
- 10.27 Record of First Floor Elevation. The Zoning Administrator shall maintain a record of the elevation of the lowest floor (including basement) of all new structures and alterations or additions to existing structures in the floodplain. The Zoning Administrator shall also maintain a record of the elevation to which structures or alterations and additions to structures are flood proofed.
- 10.28 Notifications for Watercourse Alterations. The Zoning Administrator shall notify, in riverine situations, adjacent communities and the Commissioner of the Department of Natural Resources prior to the community authorizing any alteration or relocation of a watercourse. If the applicant has applied for a permit to work in the beds of public waters pursuant to Minnesota Statute, Chapter 103G, this shall suffice as adequate notice to the Commissioner of Natural Resources. A copy of said notification shall also be submitted to the Chicago Regional Office of the Federal Emergency Management Agency (FEMA).
- 10.29 Notification to FEMA When Physical Changes Increase or Decrease the 100-year Flood Elevation. As soon as is practicable, but not later than six (6) months after the date such supporting information becomes available, the Zoning Administrator shall notify the Chicago Regional Office of FEMA of the changes by submitting a copy of said technical or scientific data.

10.3 Board of Adjustment:

- 10.31 Rules. The Board of Adjustment shall adopt rules for the conduct of business and may exercise all of the powers conferred on such Boards by State law. The Board of Adjustments is established in Division 80-040 of this Zoning Ordinance.
- 10.32 Administrative Review. The Board of Adjustment shall hear and decide appeals where it is alleged there is error in any order, requirement, decision, or determination made by an administrative official in the enforcement or administration of this Ordinance.
- 10.33 Variances. The Board of Adjustment may authorize upon appeal in specific cases such relief or variance from the terms of this Ordinance as will not be contrary to the public interest and only for those circumstances such as hardship, practical difficulties or circumstances unique to the property under consideration, as provided for in the respective enabling legislation for planning and zoning for cities

or counties as appropriate. In the granting of such variance, the Board of Adjustment shall clearly identify in writing the specific conditions that existed consistent with the criteria specified in this Ordinance, any other zoning regulations in the community, and in the respective enabling legislation that justified the granting of the variance. No variance shall have the effect of allowing in any district uses prohibited in that district, permit a lower degree of flood protection than the regulatory flood protection elevation for the particular area, or permit standards lower than those required by state law. The general procedures and requirements for variances are listed in Division 90-110 of this Zoning Ordinance. The following additional variance criteria of the Federal Emergency Management Agency must also be satisfied:

- (a) Variances shall not be issued by a community within any designated regulatory floodway if any increase in flood levels during the base flood discharge would result.
- (b) Variances shall only be issued by a community upon (i) a showing of good and sufficient cause, (ii) a determination that failure to grant the variance would result in an undue hardship to the applicant, and (iii) a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.
- (c) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.

10.34 Hearings. The process for processing an appeal from a decision of the Zoning Administrator, or an application for a variance, shall follow the same process as listed in Division 90-110 (Variance) or 90-120 (Zoning Appeal) as listed in the Zoning Ordinance. In addition, the Zoning Administrator shall submit by mail to the Commissioner of Natural Resources a copy of the application for proposed variances sufficiently in advance so that the Commissioner will receive at least ten-days' notice of the hearing.

10.35 Decisions. The Board of Adjustment shall arrive at a decision on such appeal or variance within time limits allowed by Minnesota State Statutes. In passing upon an appeal, the Board of Adjustment may, so long as such action is in conformity with the provisions of this Ordinance, reverse or affirm, wholly or in part, or modify the order, requirement, decision or determination of the Zoning Administrator or other public official. It shall make its decision in writing setting forth the findings of fact and the reasons for its decisions. In granting a variance, the Board of Adjustment may prescribe appropriate conditions and safeguards such as those specified in Section 10.46, which are in conformity with the purposes of this Ordinance. Violations of such conditions and safeguards, when made a part of the terms under which the variance is granted, shall be deemed a violation of this Ordinance punishable under Section 12.0. A copy of all decisions granting

variances shall be forwarded by mail to the Commissioner of Natural Resources within ten (10) days of such action.

10.36 Appeals. Appeals from any decision of the Board of Adjustment may be made, and as specified in this community's official controls and also by Minnesota Statutes.

10.37 Flood Insurance Notice and Record Keeping. The Zoning Administrator shall notify the applicant for a variance that:

- 1) The issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as \$25 for \$100 of insurance coverage, and
- 2) Such construction below the 100-year or regional flood level increases risks to life and property. Such notification shall be maintained with a record of all variance actions. A community shall maintain a record of all variance actions, including justification for their issuance, and report such variances issued in its annual or biennial report submitted to the Administrator of the National Flood Insurance Program.

10.4 Conditional Uses. The Red Wing City Council shall hear and decide applications for conditional uses permissible under this Ordinance. Applications shall be submitted to the Zoning Administrator and processed in accordance with Division 90-040 of this Zoning Ordinance.

10.41 Hearings. Upon filing with the Zoning Administrator an application for a conditional use permit, a hearing notice and notification shall be completed in accordance with Division 85 of this Zoning Ordinance. In addition to those requirements, the Zoning Administrator shall also submit by mail to the Commissioner of Natural Resources a copy of the application for proposed conditional use sufficiently in advance so that the Commissioner will receive at least ten-days' notice of the hearing.

10.42 Decisions. Decisions on Conditional User Permit applications shall follow the requirements listed in Division 90-040 of the Zoning Ordinance. In addition, the City Council shall prescribe appropriate conditions and safeguards, in addition to those specified in Section 10.46, which are in conformity with the purposes of this Ordinance. Violations of such conditions and safeguards, when made a part of the terms under which the conditional use permit is granted, shall be deemed a violation of this Ordinance punishable under Section 12.0. A copy of all decisions granting conditional use permits shall be forwarded by mail to the Commissioner of Natural Resources within ten (10) days of such action.

10.43 Procedures to be followed by the City Council in Passing on Conditional Use Permit Applications Within All Flood Plain Districts. In addition to the requirements listed in Division 90-040 of the Zoning Ordinance, the following additional requirements shall also be met:

- (a) Require the applicant to furnish such of the following information and additional information as deemed necessary by the City Council for determining the suitability of the particular site for the proposed use:
 - (1) Plans in triplicate drawn to scale showing the nature, location, dimensions, and elevation of the lot, existing or proposed structures, fill, storage of materials, flood-proofing measures, and the relationship of the above to the location of the stream channel; and
 - (2) Specifications for building construction and materials, flood proofing, filling, dredging, grading, channel improvement, storage of materials, water supply and sanitary facilities.
- (b) Transmit one copy of the information described in subsection (a) to a designated engineer or other expert person or agency for technical assistance, where necessary, in evaluating the proposed project in relation to flood heights and velocities, the seriousness of flood damage to the use, the adequacy of the plans for protection, and other technical matters.
- (c) Based upon the technical evaluation of the designated engineer or expert, the City Council shall determine the specific flood hazard at the site and evaluate the suitability of the proposed use in relation to the flood hazard.

10.44 Factors Upon Which the Decision of the City Council Shall Be Based. In passing upon conditional use applications, the City Council shall consider all relevant factors specified in other sections of this Ordinance, and:

- (a) The danger to life and property due to increased flood heights or velocities caused by encroachments.
- (b) The danger that materials may be swept onto other lands or downstream to the injury of others or that they may block bridges, culverts or other hydraulic structures.
- (c) The proposed water supply and sanitation systems and the ability of these systems to prevent disease, contamination, and unsanitary conditions.
- (d) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner.
- (e) The importance of the services provided by the proposed facility to the community.
- (f) The requirements of the facility for a waterfront location.
- (g) The availability of alternative locations not subject to flooding for the proposed use.

- (h) The compatibility of the proposed use with existing development and development anticipated in the foreseeable future.
- (i) The relationship of the proposed use to the comprehensive plan and floodplain management program for the area.
- (j) The safety of access to the property in times of flood for ordinary and emergency vehicles.
- (k) The expected heights, velocity, duration, rate of rise, and sediment transport of the floodwaters expected at the site.
- (l) Such other factors which are relevant to the purposes of this Ordinance.

10.45 Time for Acting on Application. The City Council shall act on an application in the manner described above and within a maximum time limit as prescribed by Minnesota State Statutes.

10.46 Conditions Attached to Conditional Use Permits. Upon consideration of the factors listed above and the purpose of this Ordinance, the City Council shall attach such conditions to the granting of conditional use permits as it deems necessary to fulfill the purposes of this Ordinance. Such conditions may include, but are not limited to, the following:

- (a) Modification of waste treatment and water supply facilities.
- (b) Limitations on period of use, occupancy, and operation.
- (c) Imposition of operational controls, sureties, and deed restrictions.
- (d) Requirements for construction of channel modifications, compensatory storage, dikes, levees, and other protective measures.
- (e) Flood-proofing measures, in accordance with the State Building Code and this Ordinance. The applicant shall submit a plan or document certified by a registered professional engineer or architect that the flood-proofing measures are consistent with the regulatory flood protection elevation and associated flood factors for the particular area.

SECTION 11.0 NONCONFORMING USES

11.1 A structure or the use of a structure or premises which was lawful before the passage or amendment of this Ordinance but which is not in conformity with the provisions of this Ordinance may be continued subject to the following conditions. Historic structures, as defined in Section 2.831(b) of this Ordinance, shall be subject to the provisions of Sections 11.11–11.15 of this Ordinance.

- 11.11 No such use shall be expanded, changed, enlarged, or altered in a way that increases its nonconformity.
- 11.12 Any structural alteration or addition to a nonconforming structure or nonconforming use which would result in increasing the flood damage potential of that structure or use shall be protected to the Regulatory Flood Protection Elevation in accordance with any of the elevation on fill or flood-proofing techniques (i.e., FP-1 through FP-4 flood-proofing classifications) allowable in the State Building Code, except as further restricted in 11.13 and 11.16 below.
- 11.13 The cost of all structural alterations or additions to any nonconforming structure over the life of the structure shall not exceed 50 percent of the estimated market value of the structure, as indicated in the records of the County Assessor, unless the conditions of this Section are satisfied. The cost of all structural alterations and additions must include all costs such as construction materials and a reasonable cost placed on all manpower or labor. If the cost of all previous and proposed alterations and additions exceeds 50 percent of the estimated market value of the structure, then the structure must meet the standards of Section 4.0 or 5.0 of this Ordinance for new structures depending upon whether the structure is in the Floodway or Flood-Fringe District, respectively.
- 11.14 If any nonconforming use is discontinued for 12 consecutive months, any future use of the building premises shall conform to this Ordinance. The Assessor shall notify the Zoning Administrator in writing of instances of nonconforming uses that have been discontinued for a period of 12 months.
- 11.15 If any nonconforming use or structure is substantially damaged, as defined in Section 2.830 of this Ordinance, it shall not be reconstructed except in conformity with the provisions of this Ordinance. The applicable provisions for establishing new uses or new structures in Sections 4.0, 5.0 or 6.0 will apply depending upon whether the use or structure is in the Floodway, Flood-Fringe or General Floodplain District, respectively.
- 11.16 If a substantial improvement occurs, as defined in Section 2.831 of this Ordinance, from any combination of a building addition to the outside dimensions of the existing building or a rehabilitation, reconstruction, alteration, or other improvement to the inside dimensions of an existing nonconforming building, then the building addition and the existing nonconforming building must meet the requirements of Section 4.0 or 5.0 of this Ordinance for new structures, depending upon whether the structure is in the Floodway or Flood-Fringe District, respectively.

SECTION 12.0 PENALTIES FOR VIOLATION

- 12.1 Violation of the provisions of this Ordinance or failure to comply with any of its requirements (including violations of conditions and safeguards established in connection

with grants of variances or conditional uses) shall constitute a misdemeanor and shall be punishable as defined by law.

12.2 Nothing herein contained shall prevent the City of Red Wing from taking such other lawful action as is necessary to prevent or remedy any violation. Such actions may include but are not limited to:

12.21 In responding to a suspected Ordinance violation, the Zoning Administrator and Local Government may utilize the full array of enforcement actions available to it including but not limited to prosecution and fines, injunctions, after-the-fact permits, orders for corrective measures or a request to the National Flood Insurance Program for denial of flood insurance availability to the guilty party. The Community must act in good faith to enforce these official controls and to correct Ordinance violations to the extent possible so as not to jeopardize its eligibility in the National Flood Insurance Program.

12.22 When an Ordinance violation is either discovered by or brought to the attention of the Zoning Administrator, the Zoning Administrator shall immediately investigate the situation and document the nature and extent of the violation of the official control. As soon as is reasonably possible, this information will be submitted to the appropriate Department of Natural Resources and Federal Emergency Management Agency Regional Office along with the community's plan of action to correct the violation to the degree possible.

12.23 The Zoning Administrator shall notify the suspected party of the requirements of this Ordinance and all other official controls and the nature and extent of the suspected violation of these controls. If the structure and/or use is under construction or development, the Zoning Administrator may order the construction or development immediately halted until a proper permit or approval is granted by the community. If the construction or development is already completed, then the Zoning Administrator may either:

- (1) issue an order identifying the corrective actions that must be made within a specified time period to bring the use or structure into compliance with the official controls; or
- (2) notify the responsible party to apply for an after-the-fact permit/development approval within a specified period of time not to exceed 30 days.

12.24 If the responsible party does not appropriately respond to the Zoning Administrator within the specified period of time, each additional day that lapses shall constitute an additional violation of this Ordinance and shall be prosecuted accordingly. The Zoning Administrator shall also upon the lapse of the specified response period notify the landowner to restore the land to the condition which existed prior to the violation of this Ordinance.

SECTION 13.0 AMENDMENTS

The floodplain designation on the Official Zoning Map shall not be removed from floodplain areas unless it can be shown that the designation is in error or that the area has been filled to or above the elevation of the regulatory flood protection elevation and is contiguous to lands outside the floodplain. Special exceptions to this rule may be permitted by the Commissioner of Natural Resources if he determines that, through other measures, lands are adequately protected for the intended use.

All amendments to this Ordinance, including amendments to the Official Zoning Map, must be submitted to and approved by the Commissioner of Natural Resources prior to adoption. Changes in the Official Zoning Map must meet the Federal Emergency Management Agency's (FEMA) Technical Conditions and Criteria and must receive prior FEMA approval before adoption. The Commissioner of Natural Resources must be given 10-days' written notice of all hearings to consider an amendment to this Ordinance and said notice shall include a draft of the Ordinance amendment or technical study under consideration.

DIVISION 53: CANNON RIVER MANAGEMENT OVERLAY DISTRICT

53-010 **Policy and Administration.** An Ordinance for the controlling of bluffland and riverland development in order to protect and preserve the outstanding scenic, recreational, natural, historical and scientific values of the Cannon River in the City, in a manner consistent with Minnesota Statutes, Sections 104.31-104.40, Minnesota Regulations NR 78-81, and the Management Plan for the Cannon River hereafter referred to as NR 2900 (6 MCAR 1.2900).

53-020 **Purpose.** This Ordinance is adopted to achieve the policy of Section 53-010 and to: (1) designate land use districts along the bluffland and shoreline of the Cannon River as required by NR 78-81 and 2900; (2) regulate the area of a lot, and the length of bluffland and water frontage suitable for building sites; (3) regulate the setback of structures and sanitary waste treatment facilities from blufflines and shorelines to protect the existing and/or natural scenic values, vegetation, soils, water quality, floodplain areas, and bedrock from disruption by man-made structures or facilities; (4) regulate alterations of the natural vegetation and topography; (5) maintain property values and prevent poorly-planned development; (6) conserve and protect the natural scenic values and resources of the Cannon River and to maintain a high standard of environmental quality; and, (7) to comply with Minnesota Regulations (NR 78-81) and NR 2900.

53-030 General Provisions

A) **Jurisdiction.** The jurisdiction of this Ordinance shall include all lands designated within the Cannon River land use districts within the jurisdiction of the City as defined in NR 2900.

B) **Compliance.** The use of any land within the Cannon River land use districts; the size and shape of lots; the use and location of structures on lots; the installation and maintenance of water supply and waste disposal facilities; the filling, grading, lagooning, or dredging of any river area; the cutting of vegetation or alteration of the natural topography within the district; and the subdivision of land shall be in full compliance with the terms of this Ordinance and other applicable regulations. Permits from the zoning authority are required by this Ordinance and other applicable City Code provisions, for the construction of buildings, public or private water supply and sewage treatment systems, the grading and filling of the natural topography and erection of signs within the Cannon River land use districts.

C) Rules

1) It is not intended by this Ordinance to repeal, abrogate or impair any existing easement, covenants, deed restrictions, or land use controls. Where this Ordinance imposes greater restrictions, the provisions of this Ordinance shall prevail.

- 2) In their interpretation and application, the provisions of this Ordinance shall be held to be minimum requirements, and shall not be deemed a limitation or repeal of any powers or rights granted by Minnesota Statutes.
- 3) The provisions of this Ordinance shall be severable, and the invalidity of any paragraph, subparagraph, or subdivision thereof shall not make void any other paragraph, subparagraph, subdivision or any other part. If any court of competent jurisdiction shall adjudge invalid any provision of this Ordinance or the application of this Ordinance to a particular property, building, or other structure, such judgment shall not affect any other provision of this Ordinance or any other property, building, or structure not specifically included in said judgment.

D) **Definitions.** The following terms, as used in this Ordinance, shall have the meanings stated:

- 1) **Agricultural Use** – The use of land for the production of food or fiber, their storage on the area, and/or the raising thereon of domestic pets and domestic farm animals.
- 2) **Bluffline** – A line along the top of a slope connecting the points at which the slope becomes less than 13%. This applies to those slopes within the land use district(s), which are beyond the setback provisions from the ordinary high water mark.
- 3) **Building Line** – That line measured across the width of the lot at the point where the main structure is placed in accordance with setback provisions.
- 4) **Campground** – An area accessible by vehicle and containing campsites or camping spurs for tents and trailer camping.
- 5) **Clear-cutting** – The removal of an entire stand of vegetation, not to include agricultural products.
- 6) **Commissioner** – The Commissioner of Natural Resources.
- 7) **Conditional Use** – A use of land which is permitted only when allowed by the Council after a public hearing, if certain conditions are met which eliminate or minimize the incompatibility with other permitted uses of the district.
- 8) **Essential Services** – Underground or overhead gas, electrical, steam or water distribution systems: collection, communication, supply, or disposal systems, including poles, wires, mains, drains, sewers, pipes, conduits, cables, fire alarm boxes, traffic signals, hydrants and other similar equipment and accessories in conjunction therewith; but not including buildings or transmission services.

- 9) **Forestry** – The use and management, including logging, of a forest, woodland or plantation and related research and educational activities, including the construction, alteration or maintenance of woodroads, skidways, landings and fences.
- 10) **Hardship** – As used in connection with a variance under this Ordinance, the property in question cannot be put to a reasonable use under the conditions allowed by this Ordinance. Economic consideration alone shall not constitute a hardship if any reasonable use for the property exists under the terms of this Ordinance.
- 11) **Lot** – A parcel of land designated by metes and bounds, registered land survey, auditors plot, or other accepted means and separated from other parcels or portions by said description for the purpose of sale, lease, or separation thereof. For the purpose of these regulations, a lot shall be considered to be an individual building site which shall be occupied by no more than one principal structure equipped with sanitary facilities.
- 12) **Mining Operation** – The removal of stone, sand and gravel, coal, salt, iron, copper, nickel, petroleum or other material from the land for commercial, industrial, or governmental purposes.
- 13) **Nonconforming Use** – Any use of land established before the effective date of this Ordinance, which does not conform to the use restrictions of a particular zoning district. This should not be confused with substandard dimensions of a conforming use.
- 14) **Open Space Recreation Uses** – Recreation use particularly oriented to and utilizing the outdoor character of an area; including hiking and riding trails, primitive campsites, campgrounds, waysides, parks and recreational areas.
- 15) **Ordinary High Water Mark** – A mark delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape. The ordinary high water mark is commonly that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. In areas where the ordinary high water mark is not evident, setbacks shall be measured from the stream bank of the following water bodies that have permanent flow or open water: the main channel, adjoining side channels, backwaters and sloughs.
- 16) **Planned Cluster Development** – A pattern of subdivision development which places dwelling units into compact groupings while providing a commonly owned or dedicated open space.
- 17) **Primitive Campsites** – An area that consists of individual remote campsites accessible only by foot or water.

- 18) **Screened** – When a structure is built or placed on a lot or vegetation is planted such that when the structure is built it is visually inconspicuous as viewed from the river during the summer months. Visually inconspicuous means difficult to see or not readily noticeable in summer months as viewed from the river.
- 19) **Selective Cutting** – The removal of single scattered trees, provided a continuous tree cover is maintained within the structure setback areas.
- 20) **Setback** – The minimum horizontal distance between a structure and the ordinary high water mark, bluffline, or highway.
- 21) **Sewage Treatment System** – Any system for the collection, treatment and dispersion of sewage including but not limited to septic tanks, soil absorption systems and drain fields.
- 22) **Structure** – Any building, sign, or appurtenance thereto, except aerial or underground utility lines, such as sewer, electric, telephone, telegraph, or gas lines, including towers, poles, and other supporting appurtenances, and fences used to control livestock or delineate boundaries.
- 23) **Subdivision** – Improved or unimproved land or lands which are divided for the purpose of ready sale or lease, or divided successively within a five year period for the purpose of sale or lease, into three or more lots or parcels of less than five acres each, contiguous in area and which are under common ownership or control.
- 24) **Substandard Use** – Any use within the land use district existing prior to the effective date of this Ordinance which is permitted within the applicable land use district but does not meet the minimum lot area, length of water frontage, structure setbacks or other dimensional standards of this Ordinance.
- 25) **Variance** – Any modification or variation of official controls where it is determined that by reason of exceptional circumstances, the strict enforcement of the official controls would cause unnecessary hardship.
- 26) **Watershed Management or Flood Control Structure** – A dam, floodwall, wingdam, dike, diversion channel, or an artificially deepened or widened stream channel following the same or approximately the same course as the natural channel, or any other structure for altering or regulating the natural flow condition of a river or stream. The term "watershed management or flood control structure" does not include pilings, retaining walls, gabion baskets, rock riprap, or other facilities intended primarily to prevent erosion and which must be authorized by permit from the Commissioner of Natural Resources.

27) **Wetland** – Land which is annually subject to periodic or continual inundation by water and commonly referred to as a bog, swamp or marsh.

53-040 Land Use District Provisions

A) Designation of Districts.

- 1) In order to preserve and protect the Cannon River and its adjacent lands which possess outstanding scenic, recreational, natural, historical, scientific and similar values, the Cannon River has been given the Scenic and/or Recreational River classification(s) and the uses and classification of this river and its adjacent lands are hereby designated by land use zoning districts, the boundaries of which are based on the Cannon River Management Plan, NR 2900.
- 2) The boundaries of the Cannon River Scenic and/or Recreational land use districts are shown on the map designated as the City of Red Wing Official Zoning Map, which is made a part of this Ordinance and is on file with the zoning authority. In case of conflict between the map and the property descriptions in NR 2900 the latter shall prevail.

B) Minimum District Dimensional Requirements.

- 1) The following chart sets forth the minimum area, setbacks, and other requirements of each district:

<i>Land Use District Classifications:</i>	<i>Scenic</i>	<i>Recreational</i>
Minimum lot size above ordinary high water mark	4 acres	2 acres
Lot width at building line	250'	200'
Lot width at ordinary high water mark	250'	200'
Building setback from ordinary high water mark	150'	100'
Building setback from bluffline	30'	20'
On site sewage treatment system setback from ordinary high water mark	100'	75'
Maximum structure height	35'	35'
Controlled vegetative cutting area	<i>See Section 53-070 (A)</i>	

Setback from ordinary high water mark	150'	100'
Setback from bluffline	30'	20'

Said requirements do not apply to agricultural buildings (non-residential structures)

- 2) It is unlawful for any person to place a structure on any slope greater than 13% (13 feet vertical rise in 100 feet horizontal distance) unless such structures can be screened, excluding agricultural fencing; sewage disposal system facilities can be installed so as to comply with the Sanitary Provisions of Section 53-060; any potential or actual erosion or sedimentation problems do not exist, and adequate preventive measures are taken; consideration to color and design is given subject to the Advisory Planning Commission conditions.
- 3) It is unlawful for any person to place a structure in any floodway, except agricultural fencing where required. Structures proposed within a floodplain shall be consistent with City and/or Statewide Standards and Criteria for Management of Floodplain Areas in Minnesota. (Minnesota Regulations NR 85-93).

C) Substandard Lots.

- 1) Lots of record in the office of the County Recorder on the effective date of this Ordinance which do not meet the dimensional requirements of this Ordinance shall be allowed as building sites, provided: such use is permitted in the land use districts; the lot was in separate ownership on the effective date of this Ordinance; and all sanitary and dimensional requirements are complied with, as practicable.
- 2) If in a group of contiguous lots under a single ownership, any individual lot does not meet the lot width minimum requirements of this Ordinance, such individual lot cannot be considered as a separate parcel of land for purposes of sale or development, but must be combined with adjacent lots under the same ownership so that the combination of lots will equal one or more parcels of land, each meeting the lot width requirements of this Ordinance or to the greatest extent practicable.

53-050 Uses Within the Land Use Districts

- A) **Purpose.** The purpose of establishing standards and criteria for uses in the Cannon River land use district shall be to protect and preserve existing natural, scenic, historical, scientific, and recreational values, to maintain proper relationships between various land use types, and to prohibit new residential, commercial, or industrial uses that are inconsistent with the Statewide Standards and Criteria for Scenic and Recreational Rivers, NR 78-81, and NR 2900.

B) Permitted and Conditional Uses.

1) In the following table of uses:

- P means Permitted Use
- C means Conditional Use
- N means Nonpermitted Use

2) Certain of the following uses are subject to the Zoning Dimension Provisions and Sanitary Provisions of Section 53-040 and Section 53-060. All of the following uses are subject to the Vegetative Cutting Provisions of Section 53-070.

<i>LAND USE DISTRICTS:</i>	<i>Scenic</i>	<i>Recreational</i>
Governmental campgrounds, subject to management plan specifications	P	P
Private campgrounds, subject to management plan specifications	C	C
Public accesses, road access type with boat launching facilities subject to management plan specifications	P	P
Public accesses, trail type, subject to management plan specifications	P	P
Temporary docks	C	P
Other governmental open space recreational uses, subject to management plan specifications	P	P
Other private open space recreational uses, subject to management plan specifications	C	C
Agricultural uses	P	P
Single family residential uses	P	P
Forestry uses	P	P
Essential services	P	P
Sewage disposal systems	P	P

Private roads and minor public streets	P	P
Signs approved by Federal, State, or local government which are necessary for public health and safety and signs indicating areas that are available or not available for public use	P	P
Signs not visible from the river that are not specified in Item 14	P	P
Governmental and private resource management for improving fish and wild-life habitat; wildlife management areas; nature areas; accessory roads	P	P
Underground mining that does not involve surface excavation in the land use district	C	C
Sand and gravel excavation, subject to the provisions of NR 2920 A.6.	C	C
Utility transmission power lines and pipelines, subject to the provisions of Section 53-070	P	P
Public roads, subject to the provisions of Section 53-070	C	C
Canoe rental establishments, subject to the provisions of NA 2920 A.7.	C	C
Inner tube rental establishments	N	N

- 3) All uses not listed as permitted or conditional uses shall not be allowed within the applicable land use districts.

53-060 Sanitary Provisions

A) Sewage Disposal and Water Supply.

- 1) Any premises intended for human occupancy must provide for an adequate method of sewage treatment. Public or municipal collection and treatment facilities must be used where available and feasible. Where public or municipal facilities are not available, all on-site individual sewer treatment systems shall conform to the minimum standards and administrative procedures set forth in other applicable City Code provisions, the minimum standards of the Minnesota Pollution Control Agency, the Minnesota Department of Health and Section 53-040 of this Ordinance.

- 2) It is unlawful for any person to install or extend any individual sewer disposal system or private well without first obtaining a permit for such action from the Zoning Authority for the specific installation or extension.
- 3) Any public or private supply of water for domestic purposes must conform to Minnesota Department of Health standards for water quality and the administrative procedures of other applicable City Code provisions.

53-070 Landscape Alterations.

A) Vegetative Cutting.

- 1) The vegetative cutting provisions shall apply to those areas as specified in Section 53-040 of this Ordinance.
- 2) General Provisions, Within Designated Areas:
 - a) Clear cutting, except for any authorized public services such as roads and utilities, shall not be permitted.
 - b) Selective cutting of trees in excess of four inches in diameter at breast height shall be permitted provided cutting is spaced in several cutting operations and a continuous tree cover is maintained.
 - c) The cutting provisions of this sub-paragraph shall not be deemed to prevent:
 - i) The removal of diseased or insect-infested trees, or of rotten or damaged trees that present safety hazards.
 - ii) Pruning understory vegetation, shrubs, plants, brushes, grasses or from harvesting crops, or cutting suppressed trees or trees less than four inches in diameter at breast height.
 - d) Trimmings and cuttings generated from removal of trees shall be disposed of as per good forestry methods.
- 3) Clear Cutting. Clear cutting anywhere in designated land use district(s) on the Cannon River is subject to the following standards and criteria:
 - a) Clear cutting shall not be used as a cutting method where soil, slope, or other watershed conditions are determined by the Zoning Authority to be fragile and subject to severe erosion and/or sedimentation.
 - b) Clear cutting shall be conducted only where clear-cut blocks, patches or strips are, in all cases, shaped and blended with the natural terrain.

- c) The size of clear cut blocks, patches or strips shall be kept at the minimum necessary.
- d) Where feasible all clear cuts shall be conducted between September 15 and May 15. If natural regeneration will not result in adequate vegetative cover, areas in which clear cutting is conducted shall be replanted to prevent erosion and to maintain the aesthetic quality of the area. Where feasible, replanting shall be performed in the same spring, or the following spring.
- e) Trimmings and cuttings generated from removal of trees shall not be allowed to remain in designated set-back or land-use districts.

B) Grading, Filling, Alterations of the Beds of Public Waters.

- 1) Any grading and filling work done within the designated land use district(s) of this Ordinance shall require a permit and shall comply with the following:
 - a) Grading and filling of the natural topography which is not accessory to a permitted or conditional use shall not be permitted in the land use district(s).
 - b) Grading and filling of the natural topography which is accessory to a permitted or conditional use shall not be conducted without a grading and filling permit from the Zoning Authority. A grading and filling permit may be issued only if the conditions of this Subparagraph are properly satisfied.
 - c) Grading and filling of the natural topography which is accessory to a permitted or conditional use shall be performed in a manner which minimizes earth- moving, erosion, tree clearing, and the destruction of natural amenities.
 - d) Grading and filling in of the natural topography shall also meet the following standards:
 - i) The smallest amount of bare ground is exposed for as short a time as feasible.
 - ii) Temporary ground cover such as mulch is used and permanent ground cover, such as sod, is planted.
 - iii) Methods to prevent erosion and to trap sediment are employed.
 - iv) Fill is stabilized to accepted engineering standards.
- 2) Excavation of material from, or filling in a Scenic or Recreational River, or construction of any permanent structures or navigational obstructions therein is

prohibited unless authorized by a permit from the Commissioner of DNR pursuant to Minnesota Statutes Section 105.42.

- 3) Drainage or filling in of wetlands is not allowed within the land use districts designated by this Chapter.
- C) **Utility Transmission Lines.** All utility transmission crossings of land within the Cannon River land use districts shall require a conditional use permit. The construction of such transmission services shall be subject to the standards and criteria of Minnesota Regulations NR 79 (i)(2). No conditional use permit shall be required for high voltage transmission lines under control of the Environmental Quality Council pursuant to Minnesota Statutes, Section 116C.61.
- D) **Public Roads.** In addition to such permits as may be required by Minnesota Statutes Section 105.42, a conditional use permit shall be required for any construction or reconstruction of new public roads within the Cannon River land use district(s). Such construction or reconstruction shall be subject to the standards and criteria of Minnesota Regulations NR 79 (j) (2). A conditional use permit is not required for minor public streets, which are streets intended to serve primarily as an access to abutting properties. Public roads include township, county, and municipal roads and highways which serve or are designed to serve flows of traffic between communities or other traffic generating areas.

53-080 Subdivisions.

A) **Land Suitability.**

- 1) No land shall be subdivided which is determined by the Council, to be unsuitable by reason of flooding, inadequate drainage, soil and rock formations with severe limitations for development, severe erosion potential, unfavorable topography, inadequate water supply or sewage treatment capabilities or any other feature likely to be harmful to the health, safety, or welfare of the future residents of the proposed subdivision or the City.
- 2) The provisions otherwise set forth in this Ordinance and in other applicable City Code provisions shall apply to all plats, except Planned Cluster Developments.

B) **Planned Cluster Developments.** A planned cluster development may be allowed only when the proposed clustering provides a better means of preserving agricultural land, open space, woods, scenic views, wetlands, and other features of the natural environment than traditional subdivision development. Except for minimum setbacks and height limits, altered dimensional standards may be allowed as exceptions to this Ordinance for planned cluster developments provided:

- 1) Preliminary plans are approved by the Commissioner to their enactment by the Council.

- 2) Central sewage facilities are installed which meet the standards, criteria, rules or regulations of the Minnesota Department of Health and the Pollution Control Agency.
- 3) Open space is preserved. This may be accomplished through the use of restrictive deed covenants, public dedications, granting of scenic easements, or other methods.
- 4) There is not more than one centralized boat launching facility for each cluster.

53-090 **Administration.**

A) Organization Provisions.

- 1) The provisions of this Ordinance shall be administered by the City Zoning Authority.
- 2) The Board of Adjustment shall act upon all questions as they arise in the administration of this Ordinance; to hear and decide appeals; and to review any order, requirements, decisions or determination made by the Zoning Authority, who is charged with enforcing this Ordinance as provided by Minnesota Statutes.

B) Nonconforming Uses, Substandard Uses.

- 1) **Nonconforming Uses.** Uses which are prohibited by this Ordinance but which are in existence prior to the effective date of this Ordinance shall be non-conforming uses. Such uses shall not be intensified, enlarged, or expanded beyond the permitted or delineated boundaries of the use or activity as stipulated in the most current permit issued prior to the adoption of this Ordinance.
- 2) **Nonconforming Sanitary Systems.** All sanitary facilities inconsistent with the performance standards of other applicable City Code provisions and the minimum standards of the Minnesota Pollution Control Agency and the Minnesota Department of Health shall be brought into conformity or discontinued within five (5) years of the effective date of this Ordinance, or other applicable City Code provisions.
- 3) **Substandard Uses.** All uses in existence prior to the effective date of this Ordinance which are permitted uses within the newly established land use district, but do not meet the minimum lot area, setbacks or other dimensional requirements of this Ordinance are substandard uses. All substandard uses, except for substandard signs, shall be allowed to continue subject to the following conditions and exceptions:

- a) Any structural alteration or addition to a substandard use which will increase the substandard dimensions shall not be allowed.
- b) Substandard signs shall be gradually eliminated over a period of time not to exceed five (5) years from the effective date of this Ordinance.
- c) Where a setback pattern from the ordinary high water mark has already been established on both sides of a proposed building site, the setback of the proposed structure may be allowed to conform to that pattern. (This provision shall apply to lots which do not meet the minimum lot width requirements of this Ordinance.)

C) Variances.

- 1) The granting of a variance requires the presence of the following conditions:
 - a) The strict enforcement of the land use controls will result in unnecessary hardship.
 - b) Granting of the variance is not contrary to the purpose and intent of the zoning provisions herein established by these standards and criteria, and is consistent with NR 2900.
 - c) There are exceptional circumstances unique to the subject property which were not created by the landowners.
 - d) Granting of the variance will not allow any use which is neither a permitted nor a conditional use in the land use district in which the subject property is located.
 - e) Granting of the variance will not alter the essential character of the locality as established by the management plan, NR 2900.
- 2) All variances to the requirements of this Chapter must be certified in accordance with 53-090 (G).

D) Plats.

- 1) Copies of all plats within the boundaries of the Cannon River Land Use District(s) shall be forwarded to the Commissioner within ten (10) days of approval by the City.
- 2) Inconsistent Plats. Approval of a plat which is inconsistent with this Ordinance is permissible only if the detrimental impact of the inconsistency is more than overcome by other protective characteristics of the proposal.

- 3) All inconsistent plats approved by the City must be certified in accordance with 53-090 (G).

E) Amendments.

- 1) This Ordinance may be amended whenever the public necessity and the general welfare require such amendments by the procedure specified in this Subdivision. Amendments to this Ordinance must be certified by the Commissioner as specified in 53-090 (G).
- 2) Requests for amendments of this Ordinance shall be initiated by a petition of the owner or owners of the actual property; or by action of the City.
- 3) An application for an amendment shall be filed with the Zoning Authority.
- 4) Upon receipt in proper form of the application and other requested materials, the Planning Commission shall conduct a public hearing in the manner prescribed by Minnesota Statutes.
- 5) Following the public hearing, the Planning Commission shall make a report of its recommendation on the proposed amendment and shall file a copy with the City within sixty (60) days after the hearing. Certification from the Commissioner must be obtained as specified in 53-090 (G) below before the proposed amendment becomes effective.
- 6) To defray the administrative costs of processing requests for an amendment to this Ordinance, a fee not exceeding administrative costs shall be paid by the petitioners. Such fee shall be determined by the Council.

- F) Conditional Use Permit Review.** A copy of all notices of any public hearing, or where a public hearing is not required, a copy of the application to consider issuance of a conditional use permit shall be sent so as to be received by the Commissioner at least fifteen (15) days prior to such hearings or meeting to consider issuance of a conditional use permit. A copy of the decision shall be forwarded to the Commissioner within ten (10) days of such action.

G) Certification.

- 1) Certain land use decisions, which directly affect the use of land within the designated land use districts and involve any of the following actions must be certified by the Commissioner:
 - a) Adopting or amending City Code provisions regulating the use of land including rezoning of particular tracts of land.

- b) Granting a variance from a provision of this Ordinance which relates to the zoning dimension provisions of Section 53-040 and any other zoning dimension provisions established in NR 2900.
- c) Approving a plat which is inconsistent with the zoning provisions of the City Code.

2) Certification Procedure.

- a) A copy of all notices of any public hearings, or where a public hearing is not required, a copy of the application to consider zoning amendments, variances, or inconsistent plats under City Code provisions shall be sent so as to be received by the Commissioner at least fifteen (15) days prior to such hearings or meetings to consider such actions. The notice of application shall include a copy of the proposed ordinances or amendment, or a description of the requested variance.
- b) The City shall notify the Commissioner of its final decision on the proposed action within ten (10) days of the decision.
- c) The action becomes effective when and only when either
 - i) The final decision taken by the City has previously received certification of approval by the Commissioner; or,
 - ii) The City receives certification of approval after its final decision; or,
 - iii) Thirty (30) days have elapsed from the day the Commissioner received notice of the final decision, and the City has received from the Commissioner either certification of approval or notice of non-approval; or,
 - iv) The Commissioner certifies his approval within thirty (30) days after conducting a public hearing.
- d) In case the Commissioner gives notice of non-approval of an ordinance, variance or inconsistent plat, either the applicant or the chief executive officer of the City may within thirty (30) days of said notice, file with the Commissioner a demand for hearing. If the demand for hearing is not made within thirty (30) days, the notice of non-approval becomes final.
 - i) The hearing will be held in an appropriate local community within sixty (60) days of the demand and after at least two (2) weeks published notice.
 - ii) The hearing will be conducted in accordance with Minnesota Statutes 105.44, Subdivisions 5 and 6 (1971) as amended.

iii) The Commissioner shall either certify his approval or disapproval of the proposed action within thirty (30) days of the hearing.

H) Permits.

1) The following table summarizes the permit and certification process within the land use districts designated by this Ordinance:

<i>Scenic, Recreational Land Use District Permits</i>	<i>Action Necessary</i>
Building Permits	LP
Sign Construction Permits	LP
Septic Permits	LP
Water Supply Permits	LP
Grading, Filling Permits	LP
Conditional Use Permits	PH – LP
Amendments to Ordinance	PH – CC
Amendments to District Boundary	PH – CC
Inconsistent Plats	PH – CC
Planned Cluster Developments	PH – WA
Variances	PH – CC
Plats (Notification not Required)	PH - FD

LP- Permit issued by the Council in accordance with this Ordinance and all other City Code provisions.

CC- Certification by the Commissioner of Natural Resources prior to final plat approval.

PH- Public hearing necessary by the Council giving fifteen (15) days notice of the hearing to the Commissioner of Natural Resources.

FD- Council forwards any decisions to the Commissioner of Natural Resources within ten (10) days after taking final action.

WA- The Commissioner of Natural Resources shall submit, after notice of public hearing and before the Council gives preliminary approval, a written review and approval of the project.

53-100 **Violation a Misdemeanor.** Every person violates a section, subdivision, paragraph or provision of this Ordinance when he performs an act thereby prohibited or declared unlawful, or fails to act when such failure is thereby prohibited or declared unlawful, and upon conviction thereof, shall be punished as for a misdemeanor except as otherwise stated in specific provisions hereof.

DIVISION 57: STORM WATER MANAGEMENT REGULATIONS

57-010 **Statutory Authorization.** This regulation is adopted pursuant to Minnesota Statutes Section 462351 (1990).

57-020 **Findings.** The City of Red Wing hereby finds that uncontrolled and inadequately planned use of wetlands, woodlands, natural habitat areas, areas subject to soil erosion and areas containing restrictive soils adversely affects the public health, safety and general welfare by impacting water quality and contributing to other environmental problems, creating nuisances, impairing other beneficial uses of environmental resources and hindering the ability of the City of Red Wing to provide adequate water, flood control, and other community services. In addition, extraordinary public expenditures may be required for the protection of persons and property in such areas and in areas, which may be affected by unplanned land usage.

57-030 **Purpose.** The purpose of this ordinance is to promote, preserve and enhance the natural resources within the City of Red Wing; to protect them from adverse effects occasioned by poorly sited development or incompatible activities; to regulate land-disturbing or development activities that would have an adverse and potentially irreversible impact on water quality, stormwater runoff rates/volumes, and unique and fragile environmentally-sensitive lands, waterways, and wildlife; to alleviate current flooding problems and prevent future flooding problems; to minimize conflicts and encourage compatibility between land-disturbing and development activities and water quality and environmentally sensitive lands, waterways, and wildlife; and to require detailed review standards and procedures for land-disturbing or development activities proposed for such areas, thereby achieving a balance between urban growth and development and protection of water quality, water quantity and natural resources.

57-040 **Special Definitions.**

A) For the purposes of these Storm Water Management Regulations, the following terms, phrases, words, and their derivatives shall have the meaning stated below. When not inconsistent with the context, words used in the present tense include the future tense, words in the plural number include the singular number, and words in the singular number include the plural number. The word “shall” is always mandatory and not merely directive.

- 1) **Applicant** – Any person who wishes to obtain a building, erosion control, or grading permit, or zoning or subdivision approval.
- 2) **Architect** – A person duly registered or authorized to practice architecture in the State of Minnesota.
- 3) **Bedrock** – In-place solid rock.

- 4) **Best Management Practices (BMP)** – A technique or series of techniques, which are proven to be effective in controlling runoff, erosion, and sedimentation.
- 5) **Bluff** – A topographic feature such as a hill, cliff, or embankment having the following characteristics. (Note: an area with an average slope of less than 18 percent over a distance of 50 feet or more shall not be considered part of the bluff):
 - a) Part or the entire feature is located in a shoreland area;
 - b) The slope rises at least twenty-five feet (25') above the ordinary high water level of the water body; and
 - c) The grade of the slope from the toe of the bluff to a point twenty-five feet (25') or more above the ordinary high water level averages eighteen percent (18%) or greater.
- 6) **Borrow** – Earth material acquired from an off-site location for use in grading on a site.
- 7) **Civil Engineer** – A professional engineer registered in the State of Minnesota to practice in the field of civil works.
- 8) **Clearing and Grubbing** – The cutting and removal of trees, shrubs, bushes, windfalls and other vegetation including removal of stumps, roots, and other remains in the designated areas.
- 9) **Control Measure** – A practice or combination of practices to control erosion and resulting pollution.
- 10) **Detention Facility** – A permanent natural or man-made structure, including wetlands, for the temporary detention of storm and snowmelt runoff water.
- 11) **Developer** – Any person, firm, corporation, sole proprietorship, partnership, state agency, or political subdivision thereof engaged in a land disturbance activity.
- 12) **Drainage Ordinance Map/Drainage Plan Map** – A map classifying areas of the city based on the drainage system's capacity to handle existing and future potential stormwater flow.
- 13) **Erosion** – The wearing away of the ground surface as a result of the movement of wind, water, ice, and/or land disturbance activities.

- 14) **Erosion and Sediment Control Plan** – A plan which includes a set of best management practices or equivalent measures designed to control surface runoff and erosion, and to retain sediment on a particular site during the period in which pre-construction and construction-related land disturbances, fills, and soil storage occur, and before final improvements are completed, all in accordance with the specific requirements set forth in Section 57-080. An erosion and sediment control plan is part of the stormwater management plan submittal.
- 15) **Excavation** – The mechanical removal of earth material.
- 16) **Fill** – A deposit of soil or other earth materials placed by artificial means.
- 17) **Flood Fringe** – The portion of the floodplain outside the floodway.
- 18) **Floodplain** – The areas adjoining a watercourse or water basin that have been or may be inundated by the critical 100-year flood (commonly defined as the regional flood).
- 19) **Floodway** – The channel of the watercourse, the bed of water basins, and those portions of the adjoining floodplains that are reasonably required to carry and discharge floodwater and provide water storage during the critical 100-year (regional) flood.
- 20) **General Storm Water Permit** – The Minnesota Pollution Control Agency's (MPCA) general National Pollutant Discharge Elimination System (NPDES) construction storm water permit covering anyone conducting a land-disturbing activity which disturbs more than a set amount of total land area as established by the Minnesota Pollution Control Agency and the Federal Storm Water Pollution Prevention Plan.
- 21) **Grade** – The vertical location of the ground surface.
- a) Existing grade is the grade prior to grading.
 - b) Rough grade is the stage at which the grade approximately conforms to the approved plan.
 - c) Finish grade is the final grade of the site, which conforms to the approved plan.
- 22) **Hydric Soils** – Soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

- 23) **Hydrophytic Vegetation** – Macrophytic plant life growing in water, soil or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content
- 24) **Intensive Vegetation Clearing** – The complete removal of vegetation (trees, shrubs, and/or grasses) in a contiguous patch, strip, row, or block.
- 25) **Land Disturbance Activity** – Any land change that may result in soil erosion from wind, water and/or ice and the movement of sediments into or upon waters, lands, or rights-of-way within the City of Red Wing, including but not limited to building demolition, clearing and grubbing, grading, excavating, transporting and filling of land. Land disturbance activity does not include the following:
- a) Minor land disturbance activities including, but not limited to, underground utility repairs, home gardens, minor repairs, and maintenance work which do not disturb more than five hundred (500) square feet of land.
 - b) Installation of fence, sign, telephone, and electric poles and other kinds of posts or poles.
 - c) Emergency work to protect life, limb, or property and emergency repairs. If the land-disturbing activity would have required an approved Erosion and Sediment Control Plan except for the emergency, then the land area disturbed shall be shaped and stabilized in accordance with the requirements of Section 8.
- 26) **Outfall** – The point of discharge to any watercourse from a public or private stormwater drainage system.
- 27) **Person** – Any individual, firm, corporation, partnership, franchisee, association or governmental entity.
- 28) **Public Waters** – Waters of the state as defined in Minnesota Statutes, section 103G.005, subdivision 15.
- 29) **Regional Flood** – A flood that is representative of large floods known to have occurred, or are predicted to occur, generally in the state and reasonably characteristic of what can be expected to occur on an average frequency in the magnitude of a 100-year recurrence interval.
- 30) **Retention Facility** – A permanent natural or artificial basin or structure that provides for the storage of storm and snowmelt runoff waters.
- 31) **Sediment** – Solid matter carried by water, sewage, or other liquids.

- 32) **Sanitary Sewer System** – The combination of public and private pipelines or conduits, pumping stations, and force main pipe, and all other construction, devices, appliances, or appurtenances used for conveying domestic sewage or industrial waste or other wastes to a point of ultimate disposal in a public sewage treatment facility.
- 33) **Storm Sewer System** – The combination of public and private pipelines or conduits, pumping stations and force main piping and all other construction, devices, appliances, or appurtenances used for conveying stormwater runoff and snowmelt runoff to various locations throughout the city.
- 34) **Stormwater Management Plans** – Drainage computations, grading plan, and erosion control plan, prepared to show the orderly management of storm and snowmelt runoff water.
- 35) **Structure** – Anything manufactured, constructed, excavated or erected which is normally attached to or positioned on land, including portable structures, earthen structures, earthen depressions, roads, parking lots, utilities, and paved storage areas.
- 36) **Trout Streams** – Waters of the state designated as trout waters by Minnesota Rules 6264.0050. Designated trout streams are capable of supporting trout and other cold water species. Designated trout streams in Red Wing are Hay Creek, Trout Brook and the upper portion of Spring Creek.
- 37) **Utility** – The owner/operator of any underground, at-grade, or overhead facility including an underground line, facility, system, and its appurtenances used to produce, store, convey, transmit, or distribute communications, data, electricity, power, heat, gas, oil, petroleum products, water (including stormwater), steam, sewage, and other similar substances.
- 38) **Wetlands** – Lands, transitional between terrestrial and aquatic systems where the water table is usually at or near the ground surface or the land is covered by shallow water. For purposes of this definition, wetlands must have the following three attributes (Minnesota Rules 8420 lists the exemptions for which certain lands are not considered wetlands with respect to the Minnesota Wetland Conservation Act):
- a) Have a predominance of hydric soils;
 - b) Are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions; and
 - c) Under normal circumstances support a prevalence of such vegetation.

57-050 **Scope and Effect.**

A) **Applicability.** The following three permits/reviews may be required from the city for a project/construction activity:

- 1) **Building Permit.** Required for construction of buildings or building modifications. This permit is obtained from the City's Building Official. This ordinance addresses only those building permit requirements pertaining to the grading plan review.
- 2) **Grading Permit.** A grading and erosion control permit shall be required for projects that will raise or lower the ground elevation, remove topsoil, alter the contours or land, or utilize, disturb, or remove more than 50 cubic yards or earthen material. However, a series of projects that will raise or lower the ground elevation, remove topsoil, alter the contours of land, or utilize, disturb, or remove more than 50 cubic yards of earthen material shall also require a grading and erosion control permit. Single Family residential construction shall be exempt from the requirement of obtaining a grading and erosion control permit, except that said development shall follow any requirements for grading and erosion control set forth in the approval process for the subdivision or conditional use permit or if the area to be graded with a Single Family residential construction is one (1) acre or more.
- 3) **Grading Plan Review.** Required when any land disturbance activity will disturb more than one acre of land. Applicants must submit grading plans to the City of Red Wing's Zoning Administrator. The City Engineer performs this review. The grading plan must address erosion and sediment control as follows:
 - a) If the area to be graded is less than one (1) acre, the project proposer will be required to install temporary erosion and sediment controls at locations as directed by the City Engineer or his/her representative.
 - b) If the area to be graded is one (1) or more acres, the project proposer must obtain an NPDES construction stormwater permit from the MPCA.
- 4) **Stormwater Management Plan Review.** Required when any land disturbance activity will disturb more than one acre of land. Applicants must submit stormwater management plans to the City of Red Wing's Zoning Administrator.
- 5) Every applicant for a building permit must submit a grading plan and stormwater management plan, when required, to the City of Red Wing's Zoning Administrator. No building permit shall be issued until approval of the grading plan and the stormwater management plan (if required).

B) **Trout Streams.** The City of Red Wing seeks to preserve and prevent the degradation of the trout streams located in and near the city. To this end, different

approval standards will be applied to projects located within watersheds that drain to designated trout streams.

- C) **Cannon River Watershed.** The Cannon River from the northern city limits of Faribault to its confluence with the Mississippi River is designated as an Outstanding Resource Value Waters in the State of Minnesota. Stricter standards apply for development within watersheds designated with ORVW status. These stricter standards are found in the National Pollutant Discharge Elimination System (NPDES) Permit issued by the Minnesota Pollution Control Agency (MPCA).
- D) **Public Nuisances.**
- 1) **Policy.** It is the policy of the City of Red Wing to prevent and remedy the degradation of the quality of surface and ground waters as well as public and private land resources in order to protect the health, safety and general welfare of the public. All acts or failures to act by persons which may result in the degradation of such water and land resources is considered to be a public nuisance in accordance with, but not limited to, Minnesota Statutes, Section 609.74, 561.19, and 144.37, and as hereinafter specifically defined.
 - 2) **Specific Public Nuisances.** The following items are public nuisances and shall be considered in violation of this ordinance:
 - a) Excavation and fill activities. The excavation of any material from or placement of any fill material into or adjacent to any watercourse, wetland, lake, or other water body without necessary local, state or federal authorizations is a public nuisance.
 - b) Sump pump discharge to property other than where the water originates.
- E) **Exemptions.** The provisions of this ordinance do not apply to:
- 1) A lot for which a currently valid building permit has been approved on or before the effective date of this ordinance;
 - 2) Installation of fence, sign, telephone, and electric poles and other kinds of posts or poles; or
 - 3) Emergency work to protect life, limb, or property.

57-060 Stormwater Management Plan – Submittal Requirements

- A) **Application.** A written application for stormwater management plan approval, along with the proposed stormwater management plan, shall be filed with the City of Red Wing's Zoning Administrator and shall include a statement indicating the grounds upon which the approval is requested, that the proposed use is permitted by right or as an exception in the underlying zoning district, and adequate evidence

showing that the proposed use will conform to the standards set forth in this ordinance. Prior to applying for approval of a stormwater management plan, an applicant may have the stormwater management plans reviewed by the appropriate departments of the city.

- 1) Two sets of clearly legible blue or black lined copies of drawings and other required information shall be submitted to the Zoning Administrator, and shall be accompanied by a receipt from the City evidencing the payment of all required fees for processing and approval as set forth in separate Council Resolution (Resolution Affixing Fees), and a bond when required by Section 57-070 (D) of this ordinance in the amount to be calculated in accordance with that section. All drawings shall be prepared to a scale appropriate to the site of the project and suitable for the review to be performed. At a minimum, the scale of the drawings shall be 1 inch equals 100 feet (1 inch equals 50 feet is preferred). At the discretion of the City Engineer, developers shall provide drawings as electronic files on AutoCAD with georeferences to State Plane Coordinates.

B) Stormwater Management Plan Submittal Materials. At a minimum, the stormwater management plan submittal materials shall contain the following information:

- 1) **Existing Site Map.** A map of existing site conditions showing the site and immediately adjacent areas, including:
 - a) The name and address of the applicant, the section, township and range, north point, date and scale of drawing and number of sheets;
 - b) Location of the tract by an insert map at a scale sufficient to clearly identify the location of the property and giving such information as the names and numbers of adjoining roads, railroads, utilities, subdivisions, towns and districts or other landmarks, and preferably georeferenced to the State Plane coordinate system.
 - c) Location of the tract on a copy of the city's Drainage Plan Map, which identifies the regions of the City where peak discharge and/or runoff volume requirements have been established. If a Drainage Plan Map has not been established, the peak 100-year discharge from each subwatershed in the tract in question after the proposed improvements are constructed shall be no greater than: a) the peak 100-year discharge from the tract in its present condition; or b) peak discharge from 10-year post development peak discharge, whichever is less;
 - d) Existing topography relative to mean sea level (MSL) with a contour interval appropriate to the topography of the land but in no case having a contour interval greater than 2 feet;
 - e) Location and dimensions of all slopes of 18% or more.

- f) A delineation performed by a certified wetland delineator (or a wetland delineator who has successfully completed a wetland delineation training course) of all streams, rivers, public waters and wetlands located on and immediately adjacent to the site, including depth of water, a description of all vegetation which may be found in the water or wetland, a statement of general water quality and any classification given to the water body or wetland by the Minnesota Department of Natural Resources, the Minnesota Pollution Control Agency, and/or the United States Army Corps of Engineers;
 - g) Location and dimensions of existing stormwater drainage systems and natural drainage patterns on and immediately adjacent to the site delineating in which direction and at what rate stormwater is conveyed from the site for the critical 100-year storm event, identifying the receiving stream, river, public water, or wetlands and setting forth those areas of the unaltered site where stormwater collects;
 - h) A description of the soils on the site, including a map indicating soil types of areas to be disturbed, as well as a soil report containing information on the suitability of the soils for the type of development proposed, for the type of sewage disposal proposed, and describing any remedial steps to be taken by the developer to render the soils suitable;
 - i) Vegetative cover, clearly delineating any vegetation proposed for removal;
 - j) 100-year floodplains, flood fringes and floodways; and
 - k) Portions of site located within trout stream watershed(s), name of trout stream watershed(s), and location of trout streams within 1000 feet of proposed project/development.
- 2) **Computations.** The applicant must provide both drainage and water quality computations as part of the submittal package.
- a) Drainage computations include providing the following information for each subwatershed:
 - i) The peak discharge rate and runoff volume for the 100-year rainfall and snowmelt events under existing and proposed conditions.
 - ii) The 10-year peak discharge rate under post-development conditions.
 - iii) The drainage computations must show that the discharge requirements for the site as referenced in the City's Drainage Plan Map or Section 57-080 (G) of this ordinance are met.

- b) Water quality computations must be submitted that show the project meets all the requirements of Section 57-080 G) of this ordinance.
 - c) Computations must be submitted that show the project meets the requirements of Section 57-080 (I) of this ordinance (*trout streams*).
- 3) **Site Construction Plan.** A site construction plan, including:
- a) Locations and dimensions of all proposed land disturbing activities and any phasing of those activities;
 - b) Locations and dimensions of all temporary soil or dirt stockpiles;
 - c) Erosion and sediment control plan showing locations and dimensions of all construction site erosion and sediment control measures and other permanent erosion and sediment control measures necessary to meet the requirements of this ordinance (See Section 57-080: D, E and F).
 - d) Schedule of anticipated starting and completion date of each land-disturbing activity including the installation of construction site erosion and sediment control measures needed to meet the requirements of this ordinance; and
 - e) Provisions and schedule for maintenance of the construction site erosion and sediment control measures during construction.
- 4) **Plan of Final Site Conditions.** A plan of final site conditions on the same scale as the existing site map showing the site changes, including:
- a) Finished grading plan showing contours at the same contour interval as provided for the “existing site map” or as required to clearly indicate the relationship of proposed changes to existing topography and remaining features, including any impacts to wetlands (Note: finished grade contours may be shown on the “existing site map” provided the existing and final grades are clearly distinguishable from each other);
 - b) A landscape plan, drawn to an appropriate scale, including dimensions and distances and the location, type, size and description of all proposed landscape materials which will be added to the site as part of the development;
 - c) A drainage plan of the developed site delineating in which direction and at what peak discharge rate stormwater will be conveyed from the site and setting forth the areas of the site where stormwater will be allowed to collect and be managed;

- d) An internal drainage plan showing the direction flows will be routed including overflow swales where water will flow if the storm sewer system has reached its capacity (see Section 57-080, L of this Ordinance).
- e) The proposed size, alignment and intended use of any structures to be erected on the site;
- f) A clear delineation and tabulation of all areas which shall be paved or surfaced, including a description of the surfacing material to be used; and
- g) All drainage easements dedicated to the city of Red Wing, including ponding, flowage and maintenance easements (see also Sections 57-080, M and P of this ordinance).
- h) Minimum building elevations (see Section 57-080, Q of this ordinance).
- i) Any other information pertinent to the particular project which in the opinion of the applicant is necessary for the review of the project.

57-070 Plan Review Procedure

A) **Process.** Storm Water management Plan review and approval shall be processed as follows:

- 1) **Project Requiring a Certificate of Compliance.** Stormwater management plans meeting the requirements of 57-060 for projects that disturb less than one (1) acre shall be submitted by the project proposer to the Zoning Administrator. The Zoning Administrator shall forward the application to the City Engineer for review and comments. Said Storm Water Management Plan shall be processed as a Certificate of Compliance as per Section 90-030 of this Zoning Code. Administrative Review shall be conducted in accordance with 57-080 of these regulations.
- 2) **Project Requiring a Conditional Use Permit.** Stormwater management plans meeting the requirements of 57-060 for projects that disturb one (1) acre or more shall be submitted to the Zoning Administrator. The Zoning Administrator shall forward the application to the City Engineer for review and comment. Stormwater management plans for one or more acres of disturbed property shall be processed as a Conditional Use Permit as per Section 90-040 of this Zoning Code. The Conditional Use Permit review shall be conducted in accordance with Section 57-080 and 57-090 of this ordinance.
- 3) **Projects that are Part of Another Zoning or Subdivision Process.** Stormwater Management Plans that are required as part of a permit review involving a Driveway Access Permit, Planned Unit Development, Zoning Amendment, or Subdivision shall be processed by following the permit process for that permit or

application as established in Chapter 11 of the Zoning Ordinance and Chapter 12 of the Subdivision Ordinance.

- B) **Duration.** Approval of a Stormwater Management Plan submitted under the provisions of this ordinance shall expire one year after the date of approval unless construction has commenced in accordance with the plan. However, if prior to the expiration of the approval, the applicant makes a written request to the Zoning Administrator for an extension of time to commence construction, setting forth the reasons for the requested extension, the Zoning Administrator may grant one extension of not greater than one single year. Receipt of any request for an extension shall be acknowledged by the Zoning Administrator within 15 days. The Zoning Administrator shall make a decision on the extension within 30 days of receipt of the request. Any plan may be revised in the same manner as originally approved.
- C) **Conditions.** A stormwater management plan may be approved subject to compliance with conditions reasonable and necessary to insure that the requirements contained in this ordinance are met. Such conditions may, among other matters, limit the size, kind or character of the proposed development, require the construction of structures, drainage facilities, storage basins and other facilities, require replacement of vegetation, require specific protective measures related to trout stream runoff, establish required monitoring procedures, stage the work over time, require alteration of the site design to insure buffering, and require the conveyance to the City of Red Wing or other public entity of certain lands or interests therein.
- D) **Performance Bond.** Prior to the approval of any stormwater management plan that requires a Conditional Use Permit, the applicant shall submit an agreement to construct such required physical improvements, to dedicate property or easements, or to comply with such conditions as may have been agreed to. Such agreement shall be accompanied by a bond, letter of credit, or cash deposit to cover the amount of the established cost of complying with the agreement. The agreement and bond shall guarantee completion and compliance with conditions within a specific time, which time may be extended in accordance with Section 57-070 (B) of this Ordinance. Projects that require a Certificate of Compliance shall not require a performance bond, letter of credit, or cash deposit, however, the City may withhold the issuance of a certificate of occupancy for projects that have not complied with the Certificate of Compliance permit and conditions of approval.
- 1) The adequacy, conditions and acceptability of any agreement and bond, letter of credit, or cash deposit shall be determined by the Red Wing City Council or any official of the City of Red Wing as may be designated by resolution of the Red Wing City Council.
- E) **Fees.** An application fee as determined in Section 85-030 of this Ordinance shall accompany all applications for a Stormwater Management Plan.

57-080 General Standards

- A) **Applicability.** The City shall approve no stormwater management plan, which fails to meet the standards contained in this section.
- B) **Site Dewatering.** Water pumped from the site shall be treated by temporary sedimentation basins, grit chambers, sand filters, upflow chambers, hydro-cyclones, swirl concentrators or other appropriate controls as appropriate. Water may not be discharged in a manner that causes erosion or flooding of off-site property, receiving channels or a wetland.
- C) **Waste and Material Disposal.** All waste and unused building materials (including garbage, debris, cleaning wastes, wastewater, toxic materials or hazardous materials) shall be properly disposed of off-site and not allowed to be carried by runoff or wind into a receiving channel, storm sewer system, neighboring property, or tracked onto off-site streets or property by construction vehicles. The site shall be policed daily by the contractor or the owner and all such materials shall be collected and stored or otherwise anchored until they are properly disposed of.
- D) **Tracking.** Each site shall have graveled roads, rocked access drives and parking areas of sufficient width and length to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by street cleaning (not flushing) before the end of each workday.
- E) **Drain Inlet Protection.** All storm drain inlets shall be protected during construction until control measures are in place with a silt fence, straw bale, or equivalent barrier meeting accepted design criteria, standards and specifications contained in the MPCA publication "Protecting Water Quality in Urban Areas."
- F) **Site Erosion Control.** The following criteria 1) through 4) apply only to construction activities that result in runoff leaving the site.
- 1) Channelized runoff from adjacent areas passing through the site shall be diverted around disturbed areas, if practical. Otherwise, the channel shall be protected as described below. Sheetflow runoff from adjacent areas greater than 10,000 square feet in area shall also be diverted around disturbed areas, unless shown to have resultant runoff rates of less than 0.5 ft.³/sec. across the disturbed area for the one year storm. Diverted runoff shall be conveyed in a manner that will not erode the conveyance and receiving channels.
 - 2) All activities on the site shall be conducted in a logical sequence to minimize the area of bare soil exposed at any one time. If at all possible, grading operations that disturb existing vegetation or ground cover shall be placed to minimize the area of bare soil exposed at any one time.

- 3) Runoff from the entire disturbed area on the site shall be controlled by meeting either subsections a) and b) or a) and c) below:
 - a) All disturbed ground left inactive for fourteen or more days shall be stabilized by seeding and mulching or sodding (only available prior to September 15) or by mulching or covering or other equivalent control measures.
 - b) For sites with more than one acre disturbed at one time, or if a channel originates in the disturbed area, one or more temporary or permanent sedimentation basins shall be constructed. Each sedimentation basin shall have a surface area of at least one- percent of the area draining to the basin and at least three feet of depth and constructed in accordance with accepted design specifications. The sedimentation basins shall be maintained regularly and sediment shall be periodically removed to maintain a depth of three feet. The basin discharge rate shall also be sufficiently low as to not cause erosion along the downstream discharge channel or the receiving water.
 - c) For sites with less than one acre disturbed at one time, sedimentation basins are still encouraged. However, at a minimum, silt fences, straw bales, or equivalent control measures shall be placed along all sideslope and downslope sides of the site. If a channel or area of concentrated runoff passes through the site, silt fences shall be placed along the channel edges to reduce sediment reaching the channel. Silt fences placed in concentrated flow channels perpendicular to the flow direction shall be backed by snow fence and support posts that are no more than four (4) feet apart. The use of silt fences, straw bales, or equivalent control measures must include a maintenance and inspection schedule.
- 4) Any soil or dirt storage piles containing more than ten cubic yards of material should not be located with the downslope toe of the pile less than 25 feet from a roadway or drainage channel. If remaining for more than seven days, dirt stockpiles shall be stabilized by mulching, vegetative cover, tarps or other means. Erosion from piles which will be in existence for less than seven days shall be controlled by placing straw bales or silt fence barriers around the pile. In-street utility repair or construction, soil or dirt storage piles located closer than 25 feet of a roadway or drainage channel must be covered with tarps or suitable alternative control, if exposed for more than seven days, and the storm drain inlets must be protected with straw bale or other appropriate filtering barriers.
- 5) Trout Streams. The following additional erosion and sediment control criteria apply to proposed projects located partially or wholly within trout stream watersheds:
 - a) A Performance Bond, Letter of Credit, or Cash Deposit shall be required for Stormwater Management Plans that require a Certificate of Compliance if the

proposed project is located partially or wholly within a trout stream watershed.

G) Stormwater Management Criteria for Permanent Stormwater Detention Facilities.

1) General Requirements

- a) Applicants will be required to provide permanent stormwater detention facilities if regional facilities have not been constructed in the watershed of the proposed project. When required to provide such facilities, the applicant shall install or construct all necessary stormwater management facilities to manage increased runoff so that the 100-year storm peak discharge rates existing before the proposed development or the 10-year post-development peak discharge rate, whichever is less, shall not be increased, and accelerated channel erosion will not occur as a result of the proposed land-disturbing or development activity. Upon construction of a regional stormwater detention facility in the watershed, the city may allow (but is not obligated to allow) some or all of these stormwater management facilities to be removed. The city may also require the applicant to make an in-kind or monetary contribution for the development and maintenance of regional stormwater management facilities designed to serve multiple land-disturbing and development activities undertaken by one or more persons, including the applicant.
- b) The applicant shall give consideration to reducing the need for on-site stormwater management facilities by incorporating the use of natural topography and land cover such as wetlands, ponds, natural swales and depressions as they exist before development to the degree that they can accommodate the additional flow of water without compromising the integrity or quality of the wetland or pond.
- c) The following stormwater management practices shall be investigated in developing a stormwater management plan, in descending order of preference:
 - i) Natural infiltration of precipitation and runoff on-site;
 - ii) Flow attenuation by use of open vegetated swales, and natural depressions;
 - iii) Stormwater retention facilities; and
 - iv) Stormwater detention facilities.

d) A combination of successive practices may be used to achieve the applicable minimum control requirements specified in subsection i) above. The applicant shall provide justification for the method selected.

2) **Design Standards.** Stormwater detention facilities required by the City of Red Wing to include water quality treatment features, shall be designed according to the most current technology as reflected in the MPCA publication “Protecting Water Quality in Urban Areas,” and shall contain, at a minimum, the following design factors (see also Section 57-080, I) of this ordinance) for special design factors that apply in trout stream watersheds:

- a) A permanent pond surface area for wet detention ponds, or wetted area for the extended detention in modified dry ponds, equal to two percent of the impervious area draining to the pond or one percent of the entire area draining to the pond, whichever amount is greater;
- b) An average permanent pool depth of four to ten feet for wet detention basins;
- c) Wet storage volume for wet detention ponds, or the extended detention volume for modified dry ponds, shall be equal to or greater than the runoff from the critical one-year event but in no case shall it be less than one-half inch of runoff from the entire drainage area tributary to the basin;
- d) A permanent pool length-to-width ratio of 3:1 or greater;
- e) For wet detention ponds, a minimum protective shelf shall be provided that extends ten feet into the permanent pool at a slope of 10:1, beyond which slopes should not exceed 4:1 (5:1 or flatter is preferred);
- f) A minimum 25-foot wide protective buffer strip of vegetation surrounding the permanent pool of a wet detention pond;
- g) All stormwater detention facilities shall have a device to keep oil, grease, and other floatable material from moving downstream as a result of normal operations;
- h) Stormwater detention facilities for new development must be sufficient to limit peak flows in each subwatershed to those that existed before the development for the 100-year storm event or the 10-year post-development discharge, whichever is less. All calculations and hydrologic models/information used in determining peak flows shall be submitted along with the stormwater management plan;
- i) All stormwater detention facilities must have a forebay to remove coarse-grained particles prior to discharge into the main part of the water quality treatment basin;

- j) All overflow swales designed to pass runoff flows from part or all of the 100-year event that have a channel slope of 2 percent or steeper, or other 100-year discharge velocities that will exceed 4 feet per second, shall be armored with permanent, non-photo-degrading erosion control materials; and

H) Wetlands.

- 1) Runoff shall not be discharged directly into wetlands without presettlement of the runoff.
 - 2) A protective buffer strip of natural vegetation at least 25 feet in width shall surround all wetlands.
 - 3) Wetlands must not be drained or filled, wholly or partially, unless replaced by restoring or creating wetland areas of at least equal public value in accordance with the Minnesota Wetland Conservation Act and Minnesota Rules 8420. Replacement must be guided by the following principles in descending order of priority:
 - a) Avoiding the direct or indirect impact of the activity that may destroy or diminish the wetland;
 - b) Minimizing the impact by limiting the degree or magnitude of the wetland activity and its implementation;
 - c) Rectifying the impact by repairing, rehabilitating, or restoring the affected wetland environment;
 - d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the activity; and
 - e) Compensating for the impact by replacing or providing substitute wetland resources or environments.
- I) Trout Streams.** In addition to the other requirements of this ordinance, the following best management practices (BMPs) apply to proposed projects located within trout stream watersheds.
- 1) Modified dry ponds or “extended detention basins.” Whenever stormwater detention is required in trout stream watersheds, extended detention basins must be installed instead of wet detention basins. To prevent temperature increases, no standing water will be allowed in new stormwater detention basins. The basin design will include:

- a) Multi-tiered outlet that includes a low flow outlet to detain runoff from the 1-year, 24 hour rainfall event for a period of 1½ to 2 days.
 - b) Bottom of the basin must be located above the groundwater table; if not, underdrains must be used to ensure that infiltration is not limited by high groundwater levels.
- 2) Bioretention types of stormwater best management practices (BMPs) that use plants and soils to remove pollutants from stormwater. These BMPs incorporate shallow, vegetated depressions along parking lots and roads to hold stormwater for short periods of time to allow it to infiltrate or drain slowly to natural water bodies. In most situations, curb and gutter cannot be used in conjunction with bioretention BMPs. Rainwater gardens are a type of bioretention area designed to be amenities for the neighborhood, possibly achieved through the combined use of stone retaining walls, wooden fences, flowering perennials, and flowering shrubs. If well-drained soils are not present, rainwater gardens and other infiltration practices will not be effective. If well-drained soils are present, infiltration basins or rainwater gardens designed to contain the runoff from the 1-year 24-hour event may be allowed as an alternative to an extended detention basin.
 - 3) “Stormceptors” and other water quality treatment devices that remove sediment from stormwater may be used in place of other BMPs.
 - 4) Porous pavement and/or reinforced sod must be used where feasible (i.e. for overflow parking lots).
 - 5) If the proposed project includes a trout stream tributary that currently experiences erosion and/or sedimentation problems, the project proposer must work with the city to include channel modifications in the project that will also address the existing erosion and/or sedimentation problem.
 - 6) Riparian tree canopy. The project proposer must preserve all trees and shrubs within 50 feet of the top of the stream bank to provide shade for the trout stream. All stormwater detention facilities shall include planting of new trees and/or preservation of existing trees to provide shade to help minimize water temperature increases in the detention facility.
 - 7) Project proposers must consider methods for reducing the amount of impervious surface on the site. The project proposer must provide reasons for why such methods cannot be incorporated into the project. Suggestions include:
 - a) Reduce road widths. One way to accomplish this is to allow parking on just one side of a residential street.
 - b) Eliminate paving in the center of cul-de-sacs.

- c) Reduce sidewalk widths.
 - d) Allow and provide for shared parking.
 - e) Build two story houses to create a smaller building “footprint.”
 - f) Install semipermeable/permeable paving (see (d) above).
- J) **Steep Slopes.** No land-disturbing or development activities shall be allowed on slopes of 18 percent or more.
- K) **Catch Basins.** All newly installed and rehabilitated catch basins shall be provided with a sump area for the collection of coarse-grained material.
- L) **Drain Leaders.** Wherever possible, all newly constructed and reconstructed buildings shall route drain leaders to pervious areas wherein the runoff can be allowed to infiltrate. The flow rate of water exiting the leaders shall be controlled so no erosion occurs in the pervious areas.
- M) **Inspection and Maintenance.** All stormwater management facilities shall be designed to minimize the need of maintenance, to provide access for maintenance purposes and to be structurally sound. All stormwater management facilities shall have a plan of operation and maintenance that assures continued effective removal of pollutants carried in stormwater runoff. The Red Wing city engineer, or designated representative, will inspect all stormwater management facilities during construction and during the first year of operation. The inspection records will be kept on file at the public works department. Any maintenance or repair needed during construction and the first year of operation shall be the responsibility of the applicant. It shall be the responsibility of the applicant to provide any necessary easements or other property interests to allow access to the stormwater management facilities for inspection and maintenance purposes.
- N) **Models/Methodologies/Computations.** Hydrologic models and design methodologies used for the determination of runoff and analysis of stormwater management structures shall be approved by the Red Wing city engineer. Plans, specification and computations for stormwater management facilities submitted for review shall be signed by a registered professional engineer. All computations shall be submitted with the proposed plans for review, unless otherwise approved by the Red Wing city engineer.
- O) **Watershed Management Plans/Groundwater Management Plans.** Stormwater management plans shall be consistent with the adopted Red Wing Watershed Management Plan and the Goodhue County Groundwater Management Plan.

- P) **Easements.** If a stormwater management plan involves direction of some or all runoff off of the site, it shall be the responsibility of the applicant to obtain from adjacent property owners any necessary easements or other property interests concerning flowage of water.
- Q) **Building Elevations.** All lowest floor elevations and other permanent fixtures, including heating and air conditioning ventilation systems, shall meet the following:
- 1) Minimum of two feet above the 100-year flood elevation for basins with pipe outlets or waterways.
 - 2) Minimum of two feet above the 100-year landlocked basin (no piped outlet) flood level computed as follows:
 - a) Step 1 – Assume the water surface elevation is two feet higher than the normal water surface elevation of the basin.
 - b) Step 2 – Above the assumed water surface elevation, store the volume of water equal to 7.2 inches of runoff over the entire drainage area to the landlocked basin.
 - c) Step 3 – The 100-year landlocked basin flood level is the elevation the water would rise to from the above Step 1 and Step 2 computation.
 - d) Note: The 100-year landlocked basin flood elevation may be lowered by excavating an overflow swale or constructing an outlet pipe at an overflow point.
 - 3) All lowest entry elevations (i.e. windows, window wells, walkout elevations) for buildings adjacent to overflow swales and/or conveyance channels shall be at least two feet above the 100-year flow elevation of the adjacent swale or channel at the point where the adjacent swale or channel is closest to the building.

57-090 **Lawn Maintenance and Vegetation Removal**

- A) **Use of Impervious Surfaces.** No person shall apply fertilizer to or deposit grass clippings, leaves, or other vegetative materials on impervious surfaces, or within a stormwater drainage system (including yard swales), natural drainage ways, or within wetland or detention basin buffer areas.
- B) **Unimproved Land Areas/Vegetative Cover Required.** Except for driveways, sidewalks, patios, areas occupied by structures or areas which have been improved by landscaping, all areas shall be covered by plants or vegetative growth.
- C) **Fertilizer Content.** Except for the first growing season for newly established turf areas, no person shall apply liquid fertilizer which contains more than one-half

percent by weight of phosphorus, or granular fertilizer which contains more than three percent by weight of phosphorus, unless the single application is less than or equal to one-tenth pound of phosphorus per one thousand square feet. Annual application amount shall not exceed one-half pound of phosphorus per one thousand square feet of lawn area.

D) **Buffer Zone.** Fertilizer applications shall not be made within 15 feet of any wetland or water resource.

57-100 **Violation and Penalties.** Any person, firm or corporation violating any provision of this Ordinance shall be subject to Section 95-040 of this Ordinance.

57-110 **Other Controls.** In the event of any conflict between the provisions of this section of the ordinance and the provisions of any other ordinance adopted by the City Council, the more restrictive standard prevails.

Appendix B
City of Red Wing MS4
Stormwater Pollution Prevention Program



Minnesota Pollution Control Agency

520 Lafayette Road North
St. Paul, MN 55155-4194

MS4 SWPPP Application for Reauthorization

for the NPDES/SDS General Small Municipal Separate Storm Sewer System (MS4) Permit MNR040000 reissued with an effective date of August 1, 2013
Stormwater Pollution Prevention Program (SWPPP) Document

Doc Type: Permit Application

Instructions: This application is for authorization to discharge stormwater associated with Municipal Separate Storm Sewer Systems (MS4s) under the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) Permit Program. **No fee** is required with the submittal of this application. Please refer to "Example" for detailed instructions found on the Minnesota Pollution Control Agency (MPCA) MS4 website at <http://www.pca.state.mn.us/ms4>.

Submittal: This MS4 SWPPP Application for Reauthorization form must be submitted electronically via e-mail to the MPCA at ms4permitprogram.pca@state.mn.us from the person that is duly authorized to certify this form. All questions with an asterisk (*) are required fields. All applications will be returned if required fields are not completed.

Questions: Contact Claudia Hochstein at 651-757-2881 or claudia.hochstein@state.mn.us, Dan Miller at 651-757-2246 or daniel.miller@state.mn.us, or call toll-free at 800-657-3864.

General Contact Information (*Required fields)

MS4 Owner (with ownership or operational responsibility, or control of the MS4)

*MS4 permittee name: City of Red Wing *County: Goodhue County
(city, county, municipality, government agency or other entity)
*Mailing address: 315 West Fourth Street
*City: Red Wing *State: MN *Zip code: 55066
*Phone (including area code): 651-385-3600 *E-mail: paul.drotos@ci.red-wing.mn.us

MS4 General contact (with Stormwater Pollution Prevention Program [SWPPP] implementation responsibility)

*Last name: Drotos *First name: Paul
(department head, MS4 coordinator, consultant, etc.)
*Title: Environmental Officer
*Mailing address: 315 West Fourth Street
*City: Red Wing *State: MN *Zip code: 55066
*Phone (including area code): (651) 380-3798 *E-mail: paul.drotos@ci.red-wing.mn.us

Preparer information (complete if SWPPP application is prepared by a party other than MS4 General contact)

Last name: _____ First name: _____
(department head, MS4 coordinator, consultant, etc.)
Title: _____
Mailing address: _____
City: _____ State: _____ Zip code: _____
Phone (including area code): _____ E-mail: _____

Verification

- I seek to continue discharging stormwater associated with a small MS4 after the effective date of this Permit, and shall submit this MS4 SWPPP Application for Reauthorization form, in accordance with the schedule in Appendix A, Table 1, with the SWPPP document completed in accordance with the Permit (Part II.D.). Yes
- I have read and understand the NPDES/SDS MS4 General Permit and certify that we intend to comply with all requirements of the Permit. Yes

Certification (All fields are required)

- Yes - I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted.

I certify that based on my inquiry of the person, or persons, who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

I am aware that there are significant penalties for submitting false information, including the possibility of civil and criminal penalties.

This certification is required by Minn. Stat. §§ 7001.0070 and 7001.0540. The authorized person with overall, MS4 legal responsibility must certify the application (principal executive officer or a ranking elected official).

By typing my name in the following box, I certify the above statements to be true and correct, to the best of my knowledge, and that this information can be used for the purpose of processing my application.

Name: Kay Kuhlmann
(This document has been electronically signed)

Title: City Council Administrator Date (mm/dd/yyyy): 12/02/2013

Mailing address: 315 West Fourth St.

City: Red Wing State: MN Zip code: 55066

Phone (including area code): (651) 385-3612 E-mail: kay.kuhlmann@ci.red-wing.mn.us

Note: The application will not be processed without certification.

Stormwater Pollution Prevention Program Document

I. Partnerships: (Part II.D.1)

- A. List the **regulated small MS4(s)** with which you have established a partnership in order to satisfy one or more requirements of this Permit. Indicate which Minimum Control Measure (MCM) requirements or other program components that each partnership helps to accomplish (List all that apply). Check the box below if you currently have no established partnerships with other regulated MS4s. If you have more than five partnerships, hit the tab key after the last line to generate a new row.

No partnerships with regulated small MS4s

Name and description of partnership	MCM/Other permit requirements involved

- B. If you have additional information that you would like to communicate about your partnerships with other regulated small MS4(s), provide it in the space below, or include an attachment to the SWPPP Document, with the following file naming convention: *MS4NameHere_Partnerships*.

While the City does not have partnerships with other regulated MS4s, its partnerships with the following organizations are an important part of how it manages stormwater:

Minnesota Cities Stormwater Coalition: Steering Committee reviews policy impacts of stormwater regulations on MS4 Cities.

Cannon River Watershed Partnership: NGO concerned with all clean water issues associated with the 6 county area of the Cannon River Watershed.

Goodhue County Soil and Water Conservation District: Water Planning Advisory Committee overseeing the County's five year Stormwater Management Plan.

Lake Pepin Legacy Alliance: Premiere advocacy group against the siltification of Lake Pepin.

Izaak Walton League of America: National organization working to protect natural resources.

II. Description of Regulatory Mechanisms: (Part II.D.2)

Illicit discharges

- A. Do you have a regulatory mechanism(s) that effectively prohibits non-stormwater discharges into your small MS4, except those non-stormwater discharges authorized under the Permit (Part III.D.3.b.)? Yes No

1. If **yes**:

- a. Check which *type* of regulatory mechanism(s) your organization has (check all that apply):

- Ordinance Contract language
 Policy/Standards Permits
 Rules
 Other, explain: _____

- b. Provide either a direct link to the mechanism selected above or attach it as an electronic document to this form; or if your regulatory mechanism is either an Ordinance or a Rule, you may provide a citation:

Citation:

SECTION 3.11 RULES AND REGULATIONS RELATING TO STORMWATER SERVICE

SECTION 3.13 VIOLATION A MISDEMEANOR AND/OR WILL RESULT IN A FINE AND/OR A BILL

Direct link:

<http://lf.ci.red-wing.mn.us/WebLink8/DocView.aspx?id=60050&dbid=0>

Check here if attaching an electronic copy of your regulatory mechanism, with the following file naming

convention: *MS4NameHere_IDDEreg*.

2. If **no**:

Describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, this permit requirement is met:

Construction site stormwater runoff control

A. Do you have a regulatory mechanism(s) that establishes requirements for erosion and sediment controls and waste controls? Yes No

1. If **yes**:

a. Check which *type* of regulatory mechanism(s) your organization has (check all that apply):

- Ordinance Contract language
 Policy/Standards Permits
 Rules
 Other, explain: _____

b. Provide either a direct link to the mechanism selected above or attach it as an electronic document to this form; or if your regulatory mechanism is either an Ordinance or a Rule, you may provide a citation:

Citation:

Direct link:

ZONING CODE DIVISION 53: CANNON RIVER MANAGEMENT OVERLAY DISRICT: A highly restrictive development ordinance to preserve the Cannon River Overlay District: ex.53-070: <http://lf.ci.red-wing.mn.us/WebLink8/DocView.aspx?id=11197&dbid=0>

ZONING CODE DIVISION 57: STORMWATER MANAGEMENT REGULATIONS: 57-050, 57-060, 57-070, 57-080, 57-090, 57-100, 57-110: <http://lf.ci.red-wing.mn.us/WebLink8/DocView.aspx?id=41494&dbid=0>

Check here if attaching an electronic copy of your regulatory mechanism, with the following file naming convention: *MS4NameHere_CSWreg*.

B. Is your regulatory mechanism at least as stringent as the MPCA general permit to Discharge Stormwater Associated with Construction Activity (as of the effective date of the MS4 Permit)? Yes No

If you answered **yes** to the above question, proceed to C.

If you answered **no** to either of the above permit requirements listed in A. or B., describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

The City Planner and the Planning Commission will review a comprehensive list of changes needed to Division 57 of the Red Wing Zoning Code in order for it to comply with the current MS4 permit, including stringency provisions concerning the Construction Permit. The SWPPP Responsible Party will provide a complete list of these required changes to the Planning Commission within 10 months of permit coverage extension in order for submission to City Council for adoption and recodification within 12 months of permit coverage extension.

C. Answer **yes** or **no** to indicate whether your regulatory mechanism(s) requires owners and operators of construction activity to develop site plans that incorporate the following erosion and sediment controls and waste controls as described in the Permit (Part III.D.4.a.(1)-(8)), and as listed below:

- | | |
|--|---|
| 1. Best Management Practices (BMPs) to minimize erosion. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 2. BMPs to minimize the discharge of sediment and other pollutants. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 3. BMPs for dewatering activities. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 4. Site inspections and records of rainfall events | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 5. BMP maintenance | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 6. Management of solid and hazardous wastes on each project site. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 7. Final stabilization upon the completion of construction activity, including the use of perennial vegetative cover on all exposed soils or other equivalent means. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 8. Criteria for the use of temporary sediment basins. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |

If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

Post-construction stormwater management

A. Do you have a regulatory mechanism(s) to address post-construction stormwater management activities?

Yes No

1. If **yes**:

a. Check which *type* of regulatory mechanism(s) your organization has (check all that apply):

- Ordinance Contract language
 Policy/Standards Permits
 Rules
 Other, explain: _____

b. Provide either a direct link to the mechanism selected above or attach it as an electronic document to this form; or if your regulatory mechanism is either an Ordinance or a Rule, you may provide a citation:

Citation:

Direct link:

ZONING CODE DIVISION 57: STORMWATER MANAGEMENT REGULATIONS: 57-050, 57-060, 57-070, 57-080, 57-090, 57-100, 57-110: <http://f.ci.red-wing.mn.us/WebLink8/DocView.aspx?id=41494&dbid=0>

Check here if attaching an electronic copy of your regulatory mechanism, with the following file naming convention: *MS4NameHere_PostCSWreg*.

B. Answer **yes** or **no** below to indicate whether you have a regulatory mechanism(s) in place that meets the following requirements as described in the Permit (Part III.D.5.a.):

1. **Site plan review:** Requirements that owners and/or operators of construction activity submit site plans with post-construction stormwater management BMPs to the permittee for review and approval, prior to start of construction activity. Yes No

2. **Conditions for post construction stormwater management:** Requires the use of any combination of BMPs, with highest preference given to Green Infrastructure techniques and practices (e.g., infiltration, evapotranspiration, reuse/harvesting, conservation design, urban forestry, green roofs, etc.), necessary to meet the following conditions on the site of a construction activity to the Maximum Extent Practicable (MEP):

a. For new development projects – no net increase from pre-project conditions (on an annual average basis) of: Yes No

- 1) Stormwater discharge volume, unless precluded by the stormwater management limitations in the Permit (Part III.D.5.a(3)(a)).
- 2) Stormwater discharges of Total Suspended Solids (TSS).
- 3) Stormwater discharges of Total Phosphorus (TP).

b. For redevelopment projects – a net reduction from pre-project conditions (on an annual average basis) of: Yes No

- 1) Stormwater discharge volume, unless precluded by the stormwater management limitations in the Permit (Part III.D.5.a(3)(a)).
- 2) Stormwater discharges of TSS.
- 3) Stormwater discharges of TP.

3. **Stormwater management limitations and exceptions:**

a. Limitations

1) Prohibit the use of infiltration techniques to achieve the conditions for post-construction stormwater management in the Permit (Part III.D.5.a(2)) when the infiltration structural stormwater BMP will receive discharges from, or be constructed in areas: Yes No

- a) Where industrial facilities are not authorized to infiltrate industrial stormwater under an NPDES/SDS Industrial Stormwater Permit issued by the MPCA.
- b) Where vehicle fueling and maintenance occur.
- c) With less than three (3) feet of separation distance from the bottom of the infiltration system to the elevation of the seasonally saturated soils or the top of bedrock.
- d) Where high levels of contaminants in soil or groundwater will be mobilized by the infiltrating stormwater.

- 2) Restrict the use of infiltration techniques to achieve the conditions for post-construction stormwater management in the Permit (Part III.D.5.a(2)), without higher engineering review, sufficient to provide a functioning treatment system and prevent adverse impacts to groundwater, when the infiltration device will be constructed in areas:
- a) With predominately Hydrologic Soil Group D (clay) soils.
 - b) Within 1,000 feet up-gradient, or 100 feet down-gradient of active karst features.
 - c) Within a Drinking Water Supply Management Area (DWSMA) as defined in Minn. R. 4720.5100, subp. 13.
 - d) Where soil infiltration rates are more than 8.3 inches per hour.
- 3) For linear projects where the lack of right-of-way precludes the installation of volume control practices that meet the conditions for post-construction stormwater management in the Permit (Part III.D.5.a(2)), the permittee's regulatory mechanism(s) may allow exceptions as described in the Permit (Part III.D.5.a(3)(b)). The permittee's regulatory mechanism(s) shall ensure that a reasonable attempt be made to obtain right-of-way during the project planning process.
4. **Mitigation provisions:** The permittee's regulatory mechanism(s) shall ensure that any stormwater discharges of TSS and/or TP not addressed on the site of the original construction activity are addressed through mitigation and, at a minimum, shall ensure the following requirements are met:
- a. Mitigation project areas are selected in the following order of preference:
 - 1) Locations that yield benefits to the same receiving water that receives runoff from the original construction activity.
 - 2) Locations within the same Minnesota Department of Natural Resource (DNR) catchment area as the original construction activity.
 - 3) Locations in the next adjacent DNR catchment area up-stream
 - 4) Locations anywhere within the permittee's jurisdiction.
 - b. Mitigation projects must involve the creation of new structural stormwater BMPs or the retrofit of existing structural stormwater BMPs, or the use of a properly designed regional structural stormwater BMP.
 - c. Routine maintenance of structural stormwater BMPs already required by this permit cannot be used to meet mitigation requirements of this part.
 - d. Mitigation projects shall be completed within 24 months after the start of the original construction activity.
 - e. The permittee shall determine, and document, who will be responsible for long-term maintenance on all mitigation projects of this part.
 - f. If the permittee receives payment from the owner and/or operator of a construction activity for mitigation purposes in lieu of the owner or operator of that construction activity meeting the conditions for post-construction stormwater management in Part III.D.5.a(2), the permittee shall apply any such payment received to a public stormwater project, and all projects must be in compliance with Part III.D.5.a(4)(a)-(e).
5. **Long-term maintenance of structural stormwater BMPs:** The permittee's regulatory mechanism(s) shall provide for the establishment of legal mechanisms between the permittee and owners or operators responsible for the long-term maintenance of structural stormwater BMPs not owned or operated by the permittee, that have been implemented to meet the conditions for post-construction stormwater management in the Permit (Part III.D.5.a(2)). This only includes structural stormwater BMPs constructed after the effective date of this permit and that are directly connected to the permittee's MS4, and that are in the permittee's jurisdiction. The legal mechanism shall include provisions that, at a minimum:
- a. Allow the permittee to conduct inspections of structural stormwater BMPs not owned or operated by the permittee, perform necessary maintenance, and assess costs for those structural stormwater BMPs when the permittee determines that the owner and/or operator of that structural stormwater BMP has not conducted maintenance.
 - b. Include conditions that are designed to preserve the permittee's right to ensure maintenance responsibility, for structural stormwater BMPs not owned or operated by the permittee, when those responsibilities are legally transferred to another party.
 - c. Include conditions that are designed to protect/preserve structural stormwater BMPs and site features that are implemented to comply with the Permit (Part III.D.5.a(2)). If site configurations or structural stormwater BMPs change, causing decreased structural stormwater BMP effectiveness, new or improved structural stormwater BMPs must be implemented to ensure the conditions for post-construction stormwater management in the Permit (Part III.D.5.a(2)) continue to be met.

If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within twelve (12) months of the date permit coverage is extended, these permit requirements are met:

The SWPPP Responsible Party has been meeting with the City Planner, the Assistant City Planner, the Planning Advisory Commission, the City Engineer, and the City Building Inspector in order to discuss implementation of required post-construction stormwater management procedures within 12 months of SWPPP permit coverage extension. The City's post-construction regulatory mechanisms will be revised to address the new permit requirements. New regulations to address the 14 stipulations listed above in the "No" column will include a comprehensive update of Division 57 in the Zoning Code. These newly written procedures will include inspection and reporting protocols to be adopted and become operational within 12 months of when permit coverage is extended.

III. Enforcement Response Procedures (ERPs): (Part II.D.3)

A. Do you have existing ERPs that satisfy the requirements of the Permit (Part III.B.)? Yes No

1. If **yes**, attach them to this form as an electronic document, with the following file naming convention: *MS4NameHere_ERPs*.

2. If **no**, describe the tasks and corresponding schedules that will be taken to assure that, with twelve (12) months of the date permit coverage is extended, these permit requirements are met:

The City of Red Wing has procedures to enforce erosion control and IDDE violations. These procedures are not formalized in writing, but within 12 months of permit coverage extension, ERPs concerning IDDEs, construction site runoff, and post construction stormwater management will be developed, codified, and available in written format.

B. Describe your ERPs:

When the Building Inspector or the Environmental Officer discovers a SWPPP violation from either a report, an observation, or an inspection, a verbal warning is issued to a responsible party on the site. The verbal warning requires a specific action from the responsible party within a stated time period (usually 24 hours, but highly weather-dependent). At the deadline, another site visit determines if compliance is met or if the responsible party is making adequate progress. If not, a written warning along with a denial of any subsequent building permits, or a stop work order, may be issued.

In the case of any illicit discharge, which is a misdemeanor according to City Code, the violation must be addressed immediately. Section 3.11 of the City Code, "Rules and Regulations Relating to Stormwater Service," states: "It shall be illegal to pollute the waters of the state by throwing, discarding, or otherwise allowing materials or substances onto City streets, storm sewers, or into public drainage areas where they can be transported by runoff into stormwater conveyances that will degrade stormwater and thereby add to the impairment of the waters of the state." The City Environmental Officer, the City Engineer, and the Building Inspector are all badged law enforcement officers who can issue a misdemeanor citation for illicit discharge violations.

In the case of a reportable spill within the city limits of Red Wing, the current SWPPP provisions outline specific response procedures, including the chain of command throughout abatement.

IV. Storm Sewer System Map and Inventory: (Part II.D.4.)

A. Describe how you manage your storm sewer system map and inventory:

Red Wing uses an advanced SQL database program called CarteGraph, with an ESRI graphic interface, to inventory and manage stormwater infrastructure. The system was designed in 2007 to integrate SWPPP requirements with GASB and utility locating in order to insure accuracy through continuous updating. The City's Infrastructure Asset Coordinator is responsible for updates and works with the City's Environmental Officer to include inspection information and other relevant data into the CarteGraph program.

B. Answer **yes** or **no** to indicate whether your storm sewer system map addresses the following requirements from the Permit (Part III.C.1.a-d), as listed below:

1. The permittee's entire small MS4 as a goal, but at a minimum, all pipes 12 inches or greater in diameter, including stormwater flow direction in those pipes. Yes No

2. Outfalls, including a unique identification (ID) number assigned by the permittee, and an associated geographic coordinate. Yes No

3. Structural stormwater BMPs that are part of the permittee's small MS4. Yes No

4. All receiving waters. Yes No

If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

- C. Answer **yes** or **no** to indicate whether you have completed the requirements of 2009 Minnesota Session Law, Ch. 172, Sec. 28: with the following inventories, according to the specifications of the Permit (Part III.C.2.a.-b.), including:
1. All ponds within the permittee's jurisdiction that are constructed and operated for purposes of water quality treatment, stormwater detention, and flood control, and that are used for the collection of stormwater via constructed conveyances. Yes No
 2. All wetlands and lakes, within the permittee's jurisdiction, that collect stormwater via constructed conveyances. Yes No
- D. Answer **yes** or **no** to indicate whether you have completed the following information for each feature inventoried.
1. A unique identification (ID) number assigned by the permittee. Yes No
 2. A geographic coordinate. Yes No
 3. Type of feature (e.g., pond, wetland, or lake). This may be determined by using best professional judgment. Yes No

If you have answered **yes** to all above requirements, and you have already submitted the Pond Inventory Form to the MPCA, then you do not need to resubmit the inventory form below.

If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

The City of Red Wing has identified, determined the coordinates, and inventoried most of its stormwater ponds and will provide a complete listing of its stormwater ponds using the Pond Inventory Form within 12 months from when permit coverage is granted. All wetlands and lakes that collect stormwater via constructed conveyances will also be inventoried within 12 months of permit coverage extension.

- E. Answer **yes** or **no** to indicate if you are attaching your pond, wetland and lake inventory to the MPCA on the form provided on the MPCA website at: <http://www.pca.state.mn.us/ms4>, according to the specifications of Permit (Part III.C.2.b.(1)-(3)). Attach with the following file naming convention: *MS4NameHere_inventory*. Yes No

If you answered **no**, the inventory form must be submitted to the MPCA MS4 Permit Program within 12 months of the date permit coverage is extended.

V. Minimum Control Measures (MCMs) (Part II.D.5)

A. MCM1: Public education and outreach

1. The Permit requires that, within 12 months of the date permit coverage is extended, existing permittees revise their education and outreach program that focuses on illicit discharge recognition and reporting, as well as other specifically selected stormwater-related issue(s) of high priority to the permittee during this permit term. Describe your **current** educational program, including **any high-priority topics included**:

The City of Red Wing no longer has a community newsletter. Stormwater pollution information is addressed through leaflets distributed in water bills. Other articles are published in the twice-weekly local newspaper, The Republican Eagle, and its free advertising handout.

Every year around Earth Day, the City of Red Wing engages all 7th grade science students in a one period long classroom presentation about fresh water and stormwater issues. Stormwater Pollution Prevention will also be a topic for World Water Week for fifth graders. Third graders participate in stormwater education activities sponsored by the Izaak Walton League every May. Boy Scouts, Girl Scouts, and Environmental Learning Center students also participate in installing catch basin stampings and distributing neighborhood informational door hangings.

Red Wing's Public Access Channel 6 presents over 100 hours of stormwater informational videos to the public every year. The City's website includes a stormwater page with information about our Stormwater Utility and the SWPPP program, including the MS4 permit itself.

2. List the categories of BMPs that address your public education and outreach program, including the distribution of educational materials and a program implementation plan. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. Refer to the U.S. Environmental Protection Agency's (EPA) *Measurable Goals Guidance for Phase II Small MS4s*

(<http://www.epa.gov/npdes/pubs/measurablegoals.pdf>).

If you have more than five categories, hit the tab key after the last line to generate a new row.

Established BMP categories	Measurable goals and timeframes
Newsletters/ Flyers	2 billing inserts in water bills per year (5,400 per mailing).
Cable Access Channel (Charter, HBC)	At least 100 hours of stormwater video programming.
Catch Basin Stampings	Attach at least 25 "No Dumping" stampings per year.
Informational Door Hangers	Distribute at least 100 door hangers in neighborhoods receiving catch basin stampings
7 th Grade Science classes focused on SWPPP	Students are taught during 5 classroom periods.
Stormwater and watershed information	Informational articles are published in the local newspaper at least 4 times per year.
Support a strong recycling education program to keep recyclables off the street and out of storm sewers.	Public appearances by Red Wing's recycling mascot, Rubin the Blue Bin, encourages clean streets through recycling.
"Mutt Mitt" dispensers in public parks provide approximately 9,000 uses per year for proper pet waste disposal.	Continue to provide "Mutt Mitts" for park visitors, providing cleaner water through proper pet waste disposal.
BMP categories to be implemented	Measurable goals and timeframes
Website Improvement	Review and update website with current information 4 times a year. Continue to count web-site hits.
Local World Water Week Educational Event (actual dates depends on school curriculum)	Involve 5 th grade students in stormwater pollution education. Document program for continuous improvement and count number of participants.
Izaak Walton 3 rd Grade Environmental Day	Involve 3 rd graders in pollution prevention to make connections between clean water, and swimming and fishing. Document program and count number of participants.

- Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

Paul Drotos, City Environmental Officer

B. MCM2: Public participation and involvement

- The Permit (Part III.D.2.a.) requires that, within 12 months of the date permit coverage is extended, existing permittees shall revise their current program, as necessary, and continue to implement a public participation/involvement program to solicit public input on the SWPPP. Describe your current program:

While formal input on the SWPPP has been somewhat limited, public participation and involvement in SWPPP issues and outcomes has been actively expressed by citizens reporting stormwater pollution violations to city officials. These reports, which remain anonymous, are taken seriously and are actively responded to. Whether it is illegal dumping of leaves into streets, vehicles leaking fluids, discarded cigarette butts, or restaurants washing equipment outside, citizens prove their understanding and dedication to SWPPP principles by giving direct input on stormwater pollution problems. The city actively solicits public input by responding to these reports as soon as possible and if the outcome is not obvious then it contacts the reporting citizen with mitigation information.

The annual SWPPP meeting, which is held around Earth Day as part of a regular City Council Meeting, is an important part of our public stormwater participation and involvement outreach. By presenting current and relevant information about our SWPPP to the City Council, we inform our elected leaders about the details required in our annual report. Televised City Council meetings have a high viewership in Red Wing which guarantees information to the public about our SWPPP program. Each Annual Meeting presentation includes an invitation for citizens to get involved in stormwater issues and participate in projects like the annual river clean-ups on the Mississippi and Cannon Rivers and also the hazardous material collections held in Red Wing.

- List the categories of BMPs that address your public participation/involvement program, including solicitation and documentation of public input on the SWPPP. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. Refer to the EPA's *Measurable Goals Guidance for Phase II Small MS4s* (<http://www.epa.gov/npdes/pubs/measurablegoals.pdf>). If you have more than five categories, hit the tab key after the last line to generate a new row.

Established BMP categories	Measurable goals and timeframes
Annual Meeting during City Council Meeting.	Elected official involvement and high citizen viewership.
Input from concerned persons are reviewed and acknowledged.	Comments and suggestions by concerned citizens are reviewed and a written response is sent within 30 days.
Rain barrel workshops sponsored by the Cannon River Watershed Partnership (CRWP).	A one hour multi-media presentation and hands-on rain barrel construction class is a popular Community Education class. Participants are counted.
BMP categories to be implemented	Measurable goals and timeframes
Local World Water Week Educational Event	Annual 5-7 grade science field trip including stormwater education.
Izaak Walton 3 rd Grade Environmental Day	Involve 3 rd graders in pollution prevention to make connections between clean water, and swimming and fishing. Document program for continuous improvement and count number of participants.

3. Do you have a process for receiving and documenting citizen input? Yes No

If you answered **no** to the above permit requirement, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, this permit requirement is met:

4. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

Paul Drotos, City Environmental Officer

C. MCM 3: Illicit discharge detection and elimination

1. The Permit (Part III.D.3.) requires that, within 12 months of the date permit coverage is extended, existing permittees revise their current program as necessary, and continue to implement and enforce a program to detect and eliminate illicit discharges into the small MS4. Describe your current program:

A mandatory annual meeting for all outside workers is scheduled every spring to discuss employee's stormwater responsibilities about IDDE and other relevant SWPPP issues. The importance of reporting and mitigation are stressed. Professionally produced videos are shown and discussed and a test is administered. All part-time summer workers are also educated about their Stormwater Pollution Prevention obligations during their mandatory orientation meeting.

2. Does your Illicit Discharge Detection and Elimination Program meet the following requirements, as found in the Permit (Part III.D.3.c.-g.)?

- a. Incorporation of illicit discharge detection into all inspection and maintenance activities conducted under the Permit (Part III.D.6.e.-f.) Where feasible, illicit discharge inspections shall be conducted during dry-weather conditions (e.g., periods of 72 or more hours of no precipitation). Yes No
- b. Detecting and tracking the source of illicit discharges using visual inspections. The permittee may also include use of mobile cameras, collecting and analyzing water samples, and/or other detailed procedures that may be effective investigative tools. Yes No
- c. Training of all field staff, in accordance with the requirements of the Permit (Part III.D.6.g.(2)), in illicit discharge recognition (including conditions which could cause illicit discharges), and reporting illicit discharges for further investigation. Yes No
- d. Identification of priority areas likely to have illicit discharges, including at a minimum, evaluating land use associated with business/industrial activities, areas where illicit discharges have been identified in the past, and areas with storage of large quantities of significant materials that could result in an illicit discharge. Yes No
- e. Procedures for the timely response to known, suspected, and reported illicit discharges. Yes No
- f. Procedures for investigating, locating, and eliminating the source of illicit discharges. Yes No
- g. Procedures for responding to spills, including emergency response procedures to prevent spills from Yes No

entering the small MS4. The procedures shall also include the immediate notification of the Minnesota Department of Public Safety Duty Officer, if the source of the illicit discharge is a spill or leak as defined in Minn. Stat. § 115.061.

- h. When the source of the illicit discharge is found, the permittee shall use the ERPs required by the Permit (Part III.B.) to eliminate the illicit discharge and require any needed corrective action(s). Yes No

If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

3. List the categories of BMPs that address your illicit discharge, detection and elimination program. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. Refer to the EPA's *Measurable Goals Guidance for Phase II Small MS4s* (<http://www.epa.gov/npdes/pubs/measurablegoals.pdf>).

If you have more than five categories, hit the tab key after the last line to generate a new row.

Established BMP categories	Measurable goals and timeframes
Illicit Discharge Employee Training	All employees working outside receive I.D.D.E. training.
Illicit Discharge Part-time Training	All summer help employees receive I.D.D.E. training.
City telephone operators immediately forward I.D.D.E. information to responsible parties.	The City's answering system includes after hours numbers for reporting I.D.D.E. Staff is trained on who to call.
Illicit Discharge Detection	Employees consistently report illicit discharges from observations or inspections in ponds, outfalls or other BMPs.
Illicit Discharge Response	Reports of illicit discharge are responded to immediately.
Goodhue County Health Department manages septic systems.	The G.C.H.D. will continue to report annually on septic system installs and also overflow problems.
Identify non-stormwater flows.	Continue to monitor non-stormwater flow occurrences to make sure flows do not add pollution.
BMP categories to be implemented	Measurable goals and timeframes
Continue to work with City Deputy Directors to implement Industrial Stormwater Permits and sampling protocols.	Insure industrial permitted areas and significant materials are dealt with properly and industrial pollution threats are managed appropriately.

4. Do you have procedures for record-keeping within your Illicit Discharge Detection and Elimination (IDDE) program as specified within the Permit (Part III.D.3.h.)? Yes No

If you answered **no**, indicate how you will develop procedures for record-keeping of your Illicit Discharge, Detection and Elimination Program, within 12 months of the date permit coverage is extended:

The City of Red Wing will require the site responder to an illicit discharge (one that rises to the level of a water pollution threat) to provide a written report about all aspects of the illicit discharge, including discovery, reporting, inspection, and mitigation. Specifics will include location, time, date, and actions taken. Extenuating circumstances along with an assessment of volumes involved and the effectiveness of the mitigation procedures will also be included. All Minnesota Duty Officer information will also be included.

5. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

Paul Drotos, City Environmental Officer

D. MCM 4: Construction site stormwater runoff control

1. The Permit (Part III.D.4) requires that, within 12 months of the date permit coverage is extended, existing permittees shall revise their current program, as necessary, and continue to implement and enforce a construction site stormwater runoff control program. Describe your current program:

Division 57 of the City's Zoning Code addresses building permits, grading permits, and grading plan reviews, which

require a stormwater management plan for one acre or more of land disturbance. The current requirements include protocols for submittal, mapping, topography, hydrology, soils, vegetation, floodplains, wetlands, trout streams etc. Relevant code citations include: 57-050 Scope and Effect, 57-060 Stormwater Management Plan-Submittal Requirements, 57-070 Plan Review Procedure, 57-080 General Standards, 57-090 Lawn Maintenance and Vegetation Removal, 57-100 Violation and Penalties, 57-110 Other Controls.

2. Does your program address the following BMPs for construction stormwater erosion and sediment control as required in the Permit (Part III.D.4.b.):
- a. Have you established written procedures for site plan reviews that you conduct prior to the start of construction activity? Yes No
 - b. Does the site plan review procedure include notification to owners and operators proposing construction activity that they need to apply for and obtain coverage under the MPCA's general permit to *Discharge Stormwater Associated with Construction Activity No. MN R100001*? Yes No
 - c. Does your program include written procedures for receipt and consideration of reports of noncompliance or other stormwater related information on construction activity submitted by the public to the permittee? Yes No
 - d. Have you included written procedures for the following aspects of site inspections to determine compliance with your regulatory mechanism(s):
 - 1) Does your program include procedures for identifying priority sites for inspection? Yes No
 - 2) Does your program identify a frequency at which you will conduct construction site inspections? Yes No
 - 3) Does your program identify the names of individual(s) or position titles of those responsible for conducting construction site inspections? Yes No
 - 4) Does your program include a checklist or other written means to document construction site inspections when determining compliance? Yes No
 - e. Does your program document and retain construction project name, location, total acreage to be disturbed, and owner/operator information? Yes No
 - f. Does your program document stormwater-related comments and/or supporting information used to determine project approval or denial? Yes No
 - g. Does your program retain construction site inspection checklists or other written materials used to document site inspections? Yes No

If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met.

3. List the categories of BMPs that address your construction site stormwater runoff control program. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. Refer to the EPA's *Measurable Goals Guidance for Phase II Small MS4s* (<http://www.epa.gov/npdes/pubs/measurablegoals.pdf>). **If you have more than five categories**, hit the tab key after the last line to generate a new row.

Established BMP categories	Measurable goals and timeframes
Permit Application System	Process all applications within 30 days of receipt for building permits, grading permits, or stormwater management plans on construction sites disturbing one acre or more of land.
Required Erosion and Sediment Controls throughout construction process.	Silt fence, rock entrances, inlet protection, vegetation establishment, street sweeping, dewatering are some of the techniques used throughout a construction process.
BMP categories to be implemented	Measurable goals and timeframes
Permit Update	Update SWPPP permit and ordinances to meet MPCA General Permit to Discharge Stormwater Associated with Construction Activity (Construction Permit).
Factsheet	Develop factsheet to accompany permit application to assist contractors with understanding permit regulations.
Notification of Permit Changes	Explain permit changes to construction applicants when

	necessary.
Checklist for Site Plan Review	Update procedures for site plan review on an annual basis and incorporate into written procedures.

4. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

Jay Owens, City Engineer; Brian Peterson, City Planner; Frank Peterson, City Building Inspector; Paul Drotos, City Environmental Officer

E. MCM 5: Post-construction stormwater management

1. The Permit (Part III.D.5.) requires that, within 12 months of the date permit coverage is extended, existing permittees shall revise their current program, as necessary, and continue to implement and enforce a post-construction stormwater management program. Describe your current program:

The City requires continuous stormwater pollution prevention after all new construction is completed. Calculated peak discharge rates have been used to determine the extent of structural and non-structural BMPs. All land surface disturbances require re-vegetation. Current BMPs include: natural infiltration, flow attenuation, stormwater retention and detention. Regular inspections are coupled with prescribed maintenance response procedures.

2. Have you established written procedures for site plan reviews that you will conduct prior to the start of construction activity? Yes No
3. Answer **yes** or **no** to indicate whether you have the following listed procedures for documentation of post-construction stormwater management according to the specifications of Permit (Part III.D.5.c.):
- a. Any supporting documentation that you use to determine compliance with the Permit (Part III.D.5.a), including the project name, location, owner and operator of the construction activity, any checklists used for conducting site plan reviews, and any calculations used to determine compliance? Yes No
 - b. All supporting documentation associated with mitigation projects that you authorize? Yes No
 - c. Payments received and used in accordance with Permit (Part III.D.5.a.(4)(f))? Yes No
 - d. All legal mechanisms drafted in accordance with the Permit (Part III.D.5.a.(5)), including date(s) of the agreement(s) and names of all responsible parties involved? Yes No

If you answered **no** to any of the above permit requirements, describe the steps that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met.

4. List the categories of BMPs that address your post-construction stormwater management program. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. Refer to the EPA's *Measurable Goals Guidance for Phase II Small MS4s* (<http://www.epa.gov/npdes/pubs/measurablegoals.pdf>). **If you have more than five categories**, hit the tab key after the last line to generate a new row.

Established BMP categories	Measurable goals and timeframes
Required Structural and Non-structural BMPs	All building sites require immediate stormwater pollution prevention with suggested hierarchy of: 1.) Natural Infiltration, 2.) Flow attenuation, 3.) Stormwater retention, 4.) Stormwater detention.
Prescribed Retention Basins	Retention basins have been used for slowing stormwater leaving a new development to the predevelopment runoff rate.
Land Surface Disturbances	Sites must be mulched, seeded, sodded or otherwise protected to prevent erosion, siltation, sedimentation, and washing.
Long Term Operation and Maintenance	Regular inspections with maintenance feed-back to Public Works. Annual inspection records maintained.
BMP categories to be implemented	Measurable goals and timeframes
For New Development Projects	Within 12 months of permit coverage extension, codify regulations for building sites of one acre or more so that there

	is no net increase from pre-project conditions of: 1.) Stormwater discharge volume, 2.) Stormwater discharge of TSS, 3.) Stormwater discharge of TP.
For Redevelopment Projects	Within 12 months of permit coverage extension, codify regulations for building sites of one acre or more so that there is a net reduction from pre-project conditions of: 1.) Stormwater discharge volume, 2.) Stormwater discharge of TSS, 3.) Stormwater discharge of TP.
Codify: 3.) Stormwater Management Limitations and Exceptions, 4.) Mitigation Provisions, and 5.) Long Term Maintenance of Structural Stormwater BMPs as cited in this SWPPP Document.	Within 12 months of permit coverage, codify regulations for building sites of one acre or more to comply with this SWPPP Document (p.5) documenting changes required in Post-construction stormwater management.
For increased impervious surfaces totaling 1 or more acres in area.	Conform to the current General Permit Authorization to Discharge Stormwater Associated with Construction Activity Under the NPDES/ State Disposal System Program without being less restrictive.

5. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

Jay Owens, City Engineer; Brian Peterson, City Planner; Paul Drotos, City Environmental Officer

F. MCM 6: Pollution prevention/good housekeeping for municipal operations

1. The Permit (Part III.D.6.) requires that, within 12 months of the date permit coverage is extended, existing permittees shall revise their current program, as necessary, and continue to implement an operations and maintenance program that prevents or reduces the discharge of pollutants from the permittee owned/operated facilities and operations to the small MS4. Describe your current program:

The City of Red Wing provides annual training to all field employees about stormwater pollution prevention and illicit discharges (See MCM 3 above). This training includes 8 important pollution prevention practices: 1.) Vehicle and equipment washing, 2.) Vehicle and equipment maintenance, 3.) Good housekeeping, 4.) Spill reporting and response, 5.) Street maintenance, 6.) Outdoor storage of materials and wastes, 7.) Landscaping and lawn care, 8.) Illicit discharge detection and reporting. Street sweeping is a constant component of good housekeeping. The City does annual inspections of all sump manholes. 20% of all stormwater infrastructure including MS4 outfalls, sediment basins, and ponds are inspected on an annual rotating basis. The City owns and operates one site for material handling and it is inspected annually. Scheduled stormwater infrastructure inspections along with ad hoc Public Works inspections are the foundation of necessary repair and replacement of stormwater infrastructure. Inspection records are maintained, and system maintenance and improvement are reported to elected officials at the annual meeting.

2. Do you have a facilities inventory as outlined in the Permit (Part III.D.6.a.)? Yes No

3. If you answered **no** to the above permit requirement in question 2, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, this permit requirement is met:

Within 12 months of the date permit coverage is extended, the City of Red Wing will develop and maintain an inventory of City facilities that may contribute pollutants to stormwater discharges.

4. List the categories of BMPs that address your pollution prevention/good housekeeping for municipal operations program. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. For an explanation of measurable goals, refer to the EPA's *Measurable Goals Guidance for Phase II Small MS4s* (<http://www.epa.gov/npdes/pubs/measurablegoals.pdf>).

If you have more than five categories, hit the tab key after the last line to generate a new row.

Established BMP categories	Measurable goals and timeframes
Maintain rigorous municipal employee training program.	Provide mandatory SWPPP training for all City field workers.
Maintain rigorous street sweeping program.	Sweep city streets at least two times per year and enforce street sweeping requirements for contractors tracking from construction sites.
Inspect and/or clean sump manholes	Inspect and/or clean all sump manholes annually.

Inspect 20% of outfalls and ponds while responding to all reports of infrastructure inadequacy or failure.	Inspect and record the information on a minimum of 20% of outfalls and ponds every year and report information about required maintenance to the Public Works Department.
Inspect the City's material handling site for pollution or erosion problems.	Increase annual reporting regarding the City's material handling site to quarterly reporting.
BMP categories to be implemented	Measurable goals and timeframes
Standardize "Environmental Good Housekeeping Reminder Notice."	Create a citation style written warning for minor stormwater code violations within 12 months of permit coverage extension.
Maintain "Environmental Good Housekeeping Thank You Notice"	Create a positive reinforcement stormwater hand-out within 12 months of permit coverage extension.
Provide Controlled Dumping Area for Directional Boring Slurry (mostly bentonite).	Provide and maintain ongoing controlled dumping site for fine particulate slurry used in directional boring during the construction season.
Continue to use de-icing compounds such as Ice Melt 55 to restrict the use of salt and sand on City streets.	Continue to investigate new winter road maintenance procedures and practices to limit TSS and chloride pollution. Inventory and record road applications every year.

5. Does discharge from your MS4 affect a Source Water Protection Area (Permit Part III.D.6.c.)? Yes No
- a. If **no**, continue to 6.
- b. If **yes**, the Minnesota Department of Health (MDH) is in the process of mapping the following items. Maps are available at <http://www.health.state.mn.us/divs/eh/water/swp/maps/index.htm>. Is a map including the following items available for your MS4:
- 1) Wells and source waters for drinking water supply management areas identified as vulnerable under Minn. R. 4720.5205, 4720.5210, and 4720.5330? Yes No
- 2) Source water protection areas for surface intakes identified in the source water assessments conducted by or for the Minnesota Department of Health under the federal Safe Drinking Water Act, U.S.C. §§ 300j – 13? Yes No
- c. Have you developed and implemented BMPs to protect any of the above drinking water sources? Yes No
6. Have you developed procedures and a schedule for the purpose of determining the TSS and TP treatment effectiveness of all permittee owned/operated ponds constructed and used for the collection and treatment of stormwater, according to the Permit (Part III.D.6.d.)? Yes No
7. Do you have inspection procedures that meet the requirements of the Permit (Part III.D.6.e.(1)-(3)) for structural stormwater BMPs, ponds and outfalls, and stockpile, storage and material handling areas? Yes No
8. Have you developed and implemented a stormwater management training program commensurate with each employee's job duties that:
- a. Addresses the importance of protecting water quality? Yes No
- b. Covers the requirements of the permit relevant to the duties of the employee? Yes No
- c. Includes a schedule that establishes initial training for new and/or seasonal employees and recurring training intervals for existing employees to address changes in procedures, practices, techniques, or requirements? Yes No
9. Do you keep documentation of inspections, maintenance, and training as required by the Permit (Part III.D.6.h.(1)-(5))? Yes No

If you answered **no** to any of the above permit requirements listed in **Questions 5 – 9**, then describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

#7: Current inspection procedures for structural stormwater BMPs, ponds, and outfalls already meet new permit requirements, however, the current annual inspection of stockpile, storage, and material handling areas will be increased to quarterly inspections within 3 months of the date that permit coverage is extended.

10. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

Paul Drotos, City Environmental Officer; Bob Stark, Deputy Director Utilities

VI. Compliance Schedule for an Approved Total Maximum Daily Load (TMDL) with an Applicable Waste Load Allocation (WLA) (Part II.D.6.)

- A. Do you have an approved TMDL with a Waste Load Allocation (WLA) prior to the effective date of the Permit? Yes No

1. If **no**, continue to section VII.
2. If **yes**, fill out and attach the MS4 Permit TMDL Attachment Spreadsheet with the following naming convention: *MS4NameHere_TMDL*.

This form is found on the MPCA MS4 website: <http://www.pca.state.mn.us/ms4>.

VII. Alum or Ferric Chloride Phosphorus Treatment Systems (Part II.D.7.)

- A. Do you own and/or operate any Alum or Ferric Chloride Phosphorus Treatment Systems which are regulated by this Permit (Part III.F.)? Yes No

1. If **no**, this section requires no further information.
2. If **yes**, you own and/or operate an Alum or Ferric Chloride Phosphorus Treatment System within your small MS4, then you must submit the Alum or Ferric Chloride Phosphorus Treatment Systems Form supplement to this document, with the following naming convention: *MS4NameHere_TreatmentSystem*.

This form is found on the MPCA MS4 website: <http://www.pca.state.mn.us/ms4>.

VIII. Add any Additional Comments to Describe Your Program

The proximity of Red Wing to the Mississippi River has highlighted the importance of clean water to the Red Wing Community throughout its history. City leadership and management have continuously supported SWPPP initiatives by instituting a Stormwater Utility Fee, which is used for implementing SWPPP regulations and programs. Red Wing has also systematically developed a stormwater infrastructure information and assessment program using GIS technology and a sophisticated SQL database program. Recently, the City purchased a mobile camera vehicle for sewer inspections and also commissioned a comprehensive tunnel engineering survey. Red Wing has been an active participant in numerous clean water initiatives, including the recently completed Mississippi Makeover project. Red Wing continues to host and participate in various clean water initiatives with outstanding civic capacity for environmental issues. Red Wing built its first municipal combined sewers in 1885 for flood control. By 2004, they were all separated. Presently, it relies on its MCMs, BMPs, and especially its citizens to help prevent runoff pollution.