SURFACE WATER MANAGEMENT PLAN

Appendix C

City of St. Francis

June, 2009

(REVISED FOR URRWMO COMMENTS: JUNE 4, 2009)

Prepared By:

BOLTON & MENK
Engineers & Surveyors

The City of St. Francis
Surface Water Management Plan
(SWMP)
St. Francis, Minnesota
Project No. R13.100111

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

By: _____
Jared Voge, P.E.

License Number: 45063

Date: June 4, 2009

BOLTON & MENK, INC.
CONSULTING ENGINEERS & SURVEYORS
Mankato · Fairmont · Sleepy Eye · Burnsville · Willmar · Chaska · Ramsey, MN · Ames, IA

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

I. PURPOSE OF PLAN

The purpose of this Surface Water Management Plan (SWMP) is to promote, preserve and enhance the natural resources within the City of St. Francis. The City will protect water quality and unique and fragile environmentally sensitive land from adverse effects that can potentially be caused by poorly sited development or incompatible activities. The City proposes to accomplish this by regulating land disturbances and development activities.

Minnesota Rules Chapter 8410 (Metropolitan Area Local Water Management) requires specific elements to be addressed in local water management plans. The various sections of this plan are designed to address each element required under these rules. In addition, this plan follows the Metropolitan Council's 2030 Water Resources Management Policy Plan requirements.

The Minnesota Pollution Control Agency has not yet designated the City of St. Francis as a mandatory Municipally Separate Storm Sewer System (MS4) community needing to submit a National Pollutant Discharge Elimination System (NPDES) permit regulating its stormwater runoff. As such, the City has not submitted a Storm Water Prevention Plan (SWPPP) or a permit application. However, with the increasing levels of regulation, it is not unlikely that the City of St. Francis will be designated an MS4 community sometime in the future. This plan is one step in meeting those requirements, so it has been written to be flexible enough to be updated in that case. Accordingly, an additional purpose of this SWMP is to control or eliminate stormwater pollution.

The City's goal is to minimize conflicts and encourage compatibility between land disturbing activities, water quality and environmentally sensitive lands. This will be accomplished through detailed development ordinances, plan review standards, and recommended pollution control procedures in an effort to strike a balance between urban growth and the protection of water quality and natural areas. This SWMP, in conjunction with the policies set forth in the City ordinances, establishes standards and specifications for conservation practices and planning activities to minimize stormwater pollution, soil erosion and sedimentation.

This submittal is a culmination of research, mapping, land use analysis/planning, and hydraulic design. The end product is a design tool that can be used by the City of St. Francis in planning growth and infrastructure replacement. The current City ordinances have also been revisited as part of this process, as they are the best means to implement the recommendations made in this plan.

Following the approval of this SWMP and ordinances by the Upper Rum River Watershed Management Organization (URRWMO), the City will have administrative authority for the approved SWMP and ordinances. The City will also have the duty to enforce the SWMP and associated ordinances. The City places a high priority on improving impaired waters and intends to work with the URRWMO and other agencies to achieve water quality goals by reducing the impact created by activities within the City.

II. EXECUTIVE SUMMARY

A. Plan Purpose and Background

Stormwater regulations have changed significantly over the years. The following is a listing of those regulatory changes:

1. 1982

The *Metropolitan Surface Water Management Act* was passed. The Act was originally included in Chapter 509. The Act was recreated and modified in 1990 and became Minnesota Statue 103B.205 to 103B.255.

Originally, the former Water Resources Board oversaw implementation of the act. When that board was merged with two other boards to form the Minnesota Board of Water and Soil Resources in 1987, the Board of Water and Soil Resources assumed responsibility for the act. Forty-six watershed management organizations (36 joint powers Watershed Management Organizations and 10 Watershed Districts) were originally responsible for preparing plans to:

- protect, preserve, and use natural surface and groundwater storage and retention systems
- minimize public capital expenditures needed to correct flooding and water quality problems
- identify and plan for means to effectively protect and improve surface and groundwater quality
- establish more uniform local policies and official controls for surface and groundwater management
- prevent erosion of soil into surface water systems
- promote groundwater recharge
- protect and enhance fish and wildlife habitat and water recreational facilities
- secure the other benefits associated with the proper management of surface and groundwater. [1]

2. 1987

The Federal Clean Water Act was amended to address stormwater as a pollution source. This resulted in the EPA developing a NPDES Phase I permit that targeted Cities with populations in excess of 100,000. As a result, in 1991, Minneapolis and St. Paul were required to apply for permits. One permit requirement was the development of a city-wide Storm Water Pollution Prevention Plan (SWPPP) that included approximately 30 mandatory Best Management Practices (BMPs) addressing everything from education and good housekeeping for municipal operations to mandatory city ordinances.

[1] Excerpt taken from the Minnesota Board of Water & Soil Resources Website: http://www.bwsr.state.mn.us/watermgmt/metroareasurface.html

3. 1991

The Upper Rum River Water Management Organization (URRWMO) was formed to meet the requirements of the Metropolitan Surface Water Management Act. The URRWMO is a joint powers organization including the Cities of St. Francis and Oak Grove, Burns Township, and portions of the City of East Bethel. A small corner of the City of Ham Lake also falls within the URRWMO. The URRWMO Board is made up of representatives from each of these cities and townships.

4. 1991

The Minnesota Legislature passed the Wetlands Conservation Act (WCA). The WCA is administered according to Minnesota Rules Chapter 8420 to implement the purpose of the Act, which is to:

- Achieve no net loss in the quantity, quality, and biological diversity of Minnesota's existing wetlands;
- Increase the quantity, quality and biological diversity of Minnesota wetlands by restoring or enhancing diminished or drained wetlands;
- Avoid direct and indirect impacts from activities that destroy or diminish the quantity, quality, or biological diversity of wetlands;
- Replace wetland values where avoidance of activities is not feasible and prudent. [2]

5. 1992

The Board of Soil and Water Resources (BWSR) developed Minnesota Rules Chapter 8410. This set of rules consists of 18 parts that define the scope, general structure and content required for BWSR approval of a Local Surface Water Management Plan. The table of contents of this plan and the content within each chapter has been structured to meet MN Rule 8410.

6. 2003

NPDES Phase II, the second round of the 1987 Federal Clean Water Act amendment, targeted cities referred to as Small MS4's. These cities were required to apply for an MS4 general permit under several criteria. Cities with a population of at least 50,000 and a population density of at least 1000 per square mile were covered in this phase. Other cities with populations over 10,000 and a population density of at least 1000 per square mile were also covered. In addition, several smaller cities consisting of municipalities with population of at least 5000 that discharge or have the potential to discharge to an outstanding resource value water, trout lake, trout stream, or a water listed as impaired were included.

[2] Excerpt taken from the University of Minnesota Duluth website: http://www.d.umn.edu/fm/safety_envir/wetlands/pdf_pages/4.0%20Wetland%20Regulations.pdf

7. 2005

The Metropolitan Council has requirements for local water management plans.

This Surface Water Management Plan Update is designed to address current requirements governing local water management plans. The general boundary of the plan includes all property within the City limits of St. Francis. When accepted by all local, regional, state, and federal agencies having jurisdiction, the City of St. Francis will be the sole responsible party for administering this plan.

B. General Content of Required Local Plans

This SWMP follows the general report structure listed in Minnesota Rules Chapter 8410.0170, the general requirements in Minnesota Statute sections 103B.205 - 103B.255, and the Metropolitan Council's requirements for local water management plans as adopted May 2005 as part of the Metropolitan Council's *Water Resources Management Plan*.

C. Summary of the Goals, Problems, and Potential Solutions

The general findings of this Surface Water Management Plan are summarized as follows:

1. St. Francis is located in the Anoka Sand Plain. The area is well known for its highly permeable soil. As such, the runoff from significant rainfalls is generally reduced to the extent that the existing drainage network functions well. There is no significant flooding along the Rum River flood plain, but during large storm events there is some significant flooding along Seelye Brook and in wetlands.

   Because of the pervious nature of the Anoka Sand Plain, the City will need to review its development ordinances to mitigate the adverse effect that a significant increase in impervious surfacing and mass grading can have on runoff conditions. The addition of significant amounts of impervious surfaces and the reduced permeability associated with the soil compaction in mass grading without a reasonable attempt to restore or duplicate the current infiltration pattern could create very significant increases in runoff volumes and downstream flooding. This is especially true where improvements in uppermost watershed limits must flow a significant distance to the ultimate watershed outlet. The longer flow path associated with each of these watersheds allows greater opportunities for peak flows from conventional detention ponds to coincide.

   One solution to the problem of coincident peak flows is the use of low impact development techniques. The current low-density residential developments in the areas outside of the downtown corridor and areas surrounding the Rum River are a close approximation of what a low impact development can be like. This area has a noticeably lesser stormwater impact than that of either high-density residential developments or commercial/industrial developments.

   This plan recommends modifying the current development ordinances to encourage infiltration and soil ripping of mass grading to compensate for lost infiltration conditions as well as requiring oversized retention ponding to mitigate and compensate for increases in runoff. Innovative solutions to the stormwater runoff increases associated with the increase in impervious surface will be investigated and encouraged when deemed appropriate. Potential solutions include pervious pavements, infiltration basins, and low impact development among others.

2. The Minnesota Pollution Control Agency (MPCA) has not completed total maximum daily load (TMDL) studies for the impaired Rum River within the city boundaries of St. Francis, and is still completing the TMDL study of Lake Pepin (downstream from St. Francis). The Lake Pepin TMDL may have a major impact on all NPDES permittees in the metro area. The City of St. Francis is aware of the potential need to amend the local water management plan prior to 2015 based on the implications and requirements of the Lake Pepin TMDL and the TMDLs for the impaired Rum River within the city.

3. An integral part of this SWMP is the comprehensive stormwater runoff modeling of the existing conditions throughout the entire city. This modeling includes:

   a. Mapping major drainage outfalls from the City as well as more detailed mapping in higher density residential areas with storm sewer and pond systems.

   b. Estimating the runoff from the 100-year rainfall event.

   c. Routing the runoff through the existing system.

   The existing system may be a pipe network, pond, wetland or waterway. The modeling predicts the peak flows based on the 100-year rainfall event.

   This modeling will provide a baseline for comparison purposes as new developments change the drainage pattern. With this modeling information, City staff can readily review the cumulative impacts of large developments for effects on the baseline conditions across the entire watershed.

   StormNET software was used in the comprehensive modeling. This software is based on the industry standard EPASWMM process and the St. Vennant equations. The model can be used to input actual rainfall events from rain gauges and can model the transport of pollutants through the system. This will be very useful in evaluating the BMP measures to address future TMDLs.

4. Where the cumulative effect of regulated development is potential flooding, the recommended practice is the construction of infiltration basins, retention ponds or detention basins as a requirement of further development of the outlying growth areas. It is further recommended that the post construction peak outflows from new developments be limited to 90 percent of the existing peak flow for the 2, 10, and 100-year storms in areas where infiltration is possible. Where infiltration is not permitted/ possible, post construction flows shall not exceed existing discharge rates. This will better mitigate the cumulative effects of increased impervious surfacing and increased runoff volume from new developments.

   Because the majority of the area is served by large stream/wetland complexes, regional ponding is not possible for a significant part of the City. Where they are possible, the creation of regional ponds is preferred because of the limited maintenance (compared to a multitude of individual development ponds) and the opportunity to control larger drainage areas. By contrast, a multitude of scattered ponds associated with each individual site development may be designed to reduce the peak outflow for its smaller area, by storing the excess runoff and releasing it at a lesser rate for a longer duration. This longer pond outflow

duration may coincide with the reduced peak flows from other individual site ponds and create a larger combined peak flow than the original undeveloped condition. Hence, regional ponds are recommended where physically possible, because of the opportunity to control the runoff on a larger scale and ensure that the downstream system is not adversely impacted by uncoordinated development that meets a typical runoff ordinance. The greater control afforded by regional ponds may also reduce the flows to the downstream system and allow for decreased costs in downstream infrastructure improvements.

5. The proposed infiltration requirements and pond network is part of the goal of accommodating continued responsible growth. Revisions will be required as formal developer layouts are presented to the City. Although this plan forms a sound basis for future development, it is important to remain flexible in finding ways to manage runoff while still accommodating the continued development of the City.

6. The maps attached at the end of this plan are for general illustration purposes. As part of the plan development, large scale maps and GIS compatible files have also been prepared.

7. The City will pursue outside funding to help finance the recommended capital improvements described in this plan. Local financing will most likely come from a combination of stormwater trunk fees and stormwater utility funds.

   Any determined stormwater management charges or area charges to new developments should be reviewed on an annual basis to ensure that changes in land acquisition, construction cost, bonding cost, legal cost, etc. are included in the computed fee.

8. The use of native vegetation for buffers in undeveloped and previously developed areas is strongly recommended in accordance with regulatory requirements and accepted practices. This plan requires the protection of the City's wetlands through the use of wetland buffers. New developments will be required to provide native vegetated buffers around wetlands. The City will also encourage the landowners around existing wetlands in developed areas to add buffers to their wetlands. Wetlands are to be further protected by controlling discharges from developing areas. The proposed controls include pretreatment BMPs and runoff controls designed to maintain the current hydrology and maintain or improve the current functions and values of the wetland.

D. Amendments and Updates

This plan is intended for the coverage period to 2015. It should be considered as a working document that should be updated and amended in accordance with the procedures described in Section IX. Amendment will be needed as development progresses and actual new development data is integrated into the overall model.

III. REGULATORY REQUIREMENTS AFFECTING PLAN

The following is a brief summary of the primary Statutes and Rules governing stormwater management in the 7-County metropolitan area. These requirements establish and control the content of this plan and cite objectives regarding surface water management:

A. Minnesota Rules Chapter 8410.0170

These rules outline the structure of a SWMP. Each SWMP must have the following at a minimum:

1. A purpose statement outlining the purposes of the water management programs required by MN Statute sections 103B.205 - 103B.255.
2. A section of water resource related agreements
3. A land and water resource inventory (required by part 8410.0060)
4. A section on the establishment of policies and goals
5. A section on assessment of problems
6. A section on corrective actions
7. A section on financial considerations
8. An implementation program discussing which components of the implementation program the City will prioritize
9. A section on the City's amendment procedures

This document is intended to meet these rules and hence each requirement is included.

B. **Minnesota Statute 103B.235**

This state law predates Minnesota Rule 8410 and includes additional requirements as follows:

1. Subdivision 1 - ***Requirement*** states that the City of St. Francis is required to submit a watershed management plan because it is within the 7-County metropolitan area.
2. Subdivision 2 - ***Contents*** states that the SWMP shall:
    a. Describe existing and proposed physical environment and land use;
    b. Define drainage areas and the volumes, rates, and paths of stormwater runoff;
    c. Identify areas and elevations for stormwater storage adequate to meet performance standards established in the watershed plan;
    d. Define water quantity and water quality protection methods adequate to meet performance standards established in the watershed plan;
    e. Identify regulated areas; and
    f. Set forth an implementation program, including a description of official controls and, as appropriate, a capital improvement program.
3. Subdivision 3 - ***Review*** states that, after consideration but before adoption by the governing body, the City shall submit its SWMP to the area water management organization (WMO) for review for consistency with the watershed plan adopted pursuant to section 103B.231. The Upper Rum River Water Management Organization (URRWMO) has WMO jurisdiction in St. Francis. According to the statute, the URRWMO must approve or disapprove the plan or parts of the plan. The URRWMO has 60 days to complete its review; provided, however, that the URRWMO shall, as part of its review, take into account the comments submitted to it by the Metropolitan Council pursuant to subdivision 3a. If the

WMO fails to complete its review within the prescribed period, the SWMP shall be deemed approved unless the City agrees to an extension.

3a. Subdivision 3a - ***Review by Metropolitan Council*** states that the City shall submit its SWMP to the Metropolitan Council for review and comment. The council shall have 45 days to review and comment upon the SWMP or parts of the plan with respect to consistency with the Metropolitan Council's comprehensive development guide for the metropolitan area. The Metropolitan Council's 45-day review period shall run concurrently with the 60-day review period by the URRWMO. The Metropolitan Council shall submit its comments to the URRWMO and shall send a copy of its comments to the City. If the Metropolitan Council fails to complete its review and make comments to the URRWMO within the 45-day period, the URRWMO shall complete its review as provided in subdivision 3 of State Statute 103B.235.

4. Subdivision 4 - ***Adoption and Implementation*** requires the City to adopt and implement its plan within 120 days after approval of the SWMP by the URRWMO and to amend its official controls accordingly within 180 days.

5. Subdivision 5 - ***Amendments*** states that to the extent and in the manner required by the URRWMO, all major amendments to the SWMP shall be submitted to the URRWMO for review and approval in accordance with the provisions of State Statute 103B.235, subdivisions 3 and 3a for the review of plans. All minor amendments will be reviewed and approved by the City Council.

All of these required MS 103B.235 items are covered in this document.

C. **Local Ordinances**

The City of St. Francis will administer and enforce the water resource-related ordinances under the direction and control of, and subject to the powers expressly reserved to, the City Council. Following approval of this SWMP and ordinances, the City shall have administrative authority for the approved SWMP and ordinances. The Applicant, permittee or any other person or political subdivision with an interest in the determination of the City's interpretation or application of these ordinances may file a written appeal to the City Council within fifteen (15) business days of said determination. Said appeal shall state the specific grounds upon which the appeal is based. Within thirty (30) days of the date of receipt of the appeal, the City shall schedule the appeal for a regular or special meeting of the City Council. The City Council shall make its decision to affirm, reverse, or remand the determination by adopting a resolution stating findings of fact.

D. **Total Maximum Daily Loads and Impaired Waters**

The 1987 amendment to the Federal Clean Water Act required all impaired waters to be corrected. In making rules to meet the 1987 Amendment, the Environmental Protection Agency (EPA) first set criteria to determine a list of impaired waters depending on the potential use of the water. The Minnesota Pollution Control Agency (MPCA) worked to set guidelines to establish intended uses for the waters of the state and then set acceptable water quality criteria. After testing to determine the water quality, waters failing to meet the water quality criteria are placed on the 303d Impaired Waters list that is submitted to the EPA. Table 1 in Section IV, page 17 of this plan lists the Rum River as the only (2008) MPCA 303d Impaired Water in St. Francis. It should be noted that as of 2008 not

all waters of the State of Minnesota had been tested. Hence, the impaired waters list is likely to increase in the St. Francis area.

The process to remedy the impairment includes establishing a Total Maximum Daily Load (TMDL) allocation to each contributor to the problem. A TMDL is a calculation that determines the allowable pollutant load that can be discharged into the impaired water so that the limited load will ensure that the water improves to levels where it is no longer impaired. The typical process is initiated by the MPCA and includes a series of stakeholder meetings to formulate viable solutions and mutually work out a reasonable allocation of acceptable pollutant loading.

E. Specific Lakes and Streams with Water Quality Problems

Since a TMDL study has not been completed for the known impaired waters in St. Francis and downstream from St. Francis (such as Lake Pepin), the City will cooperate with the MPCA as they develop TMDL requirements for impaired waters. The Rum River watershed is too large for the City of St. Francis to take the lead on the TMDL Stakeholder process for this water. The City will volunteer to participate in the Stakeholder process for this water. Through this SWMP, the City of St. Francis has watershed modeling and will bring this information to the MPCA in an effort to formulate a TMDL for the impaired Rum River.

Once a TMDL study is completed for the impaired water, the City must include, in this SWMP, an implementation strategy including funding mechanisms that will allow the implementation of the TMDL requirements. As MPCA completes its TMDL process for the impaired water, the implementation of the measures to meet the TMDL will immediately become a priority for the City of St. Francis.

F. Upper Rum River Water Management Organization

The City of St. Francis entered into a *Joint Powers Agreement for the Establishment of the Upper Rum River Watershed Management Organization to Plan, Control and Provide for the Development of the Upper Rum River Watershed* on June 18, 1991. The URRWMO updated its plan in 2007. The Minnesota Board of Water and Soil Resources officially signed the Findings of Fact, Conclusions and Order accepting the Second Generation Watershed Management Plan on April 25, 2007. The URRWMO's plan update triggered the mandatory re-evaluation and need for an update of the City's SWMP prior to April 25, 2009.

G. NPDES Requirements

In 1987, the US Congress amended the Clean Water Act to include stormwater pollution and directed the Environmental Protection Agency (EPA) to initiate rulemaking. The first round of EPA rules were implemented in 1991 when NPDES Phase I permits were required for all cities exceeding 100,000 in population. Phase II was implemented in 2003 and targeted several other categories of cities. Cities with a population of at least 50,000 and a population density of at least 1000 per square mile were covered in this phase. Other cities with populations over 10,000 and a population density of at least 1000 per square mile were also covered. In addition, several smaller cities were also targeted. These cities consist of municipalities with population of at least 5000 that discharge or have the potential to discharge to an outstanding resource value water, trout lake, trout

stream, or a water listed as impaired. The Minnesota Pollution Control Agency (MPCA) assumed responsibility for implementing the rules and issuing all Phase II permits. The City of St. Francis has not been required to submit a permit for its Municipally Separate Storm Sewer System (MS4) yet, but with increasing regulations, it is likely this will happen in the future. The permit will require the City of St. Francis, when designated as an MS4 community, to meet six minimum stormwater control measures as follows:

1. Public education and outreach
2. Public participation and involvement
3. Detection and elimination of illegal discharges
4. Control of large construction sites runoff
5. Post construction stormwater management
6. Pollution prevention or housekeeping for municipal operations

At which time the MS4 requirements are applied to the City of St. Francis, the City will implement its Phase II permit. The City will be required to submit a Storm Water Prevention Program (SWPPP), which is essentially a list of promised steps the City proposes to make to meet these minimum control measures. The promises are in the form of Best Management Practices (BMPs) to be implemented at specified times over the life of the permit.

In general, the NPDES stormwater discharge permit program is designed to reduce adverse impacts to water quality. The primary targets of acceptable stormwater management plans are urban runoff and construction runoff. This is because urban runoff carries pollutants from cars, lawn fertilizers, pesticide spills, and other contaminants into lakes, wetlands, and streams without entering wastewater treatment systems. Construction runoff is often laden with sediment caused by large amounts of un-vegetated soil that is loosened by excavation and grading.

The MPCA mandates are intended to regulate these sources of continued environmental degradation. To comply with the NPDES permit requirements, the City will develop a SWPPP to establish measurable goals using the Best Management Practice (BMP) approach and to be able to track performance and progress.

Erosion and sediment control measures must be included in the City-wide SWPPP. The minimum standard is the General Permit Authorization to Discharge Storm Water Associated With Construction Activity Under the National Pollutant Discharge Elimination System/State Disposal System Permit Program Permit MN R100001 (NPDES/SDS Permit) issued by the Minnesota Pollution Control Agency on August 1, 2003, as amended. Some components of the NPDES/SDS Permit include:

1. Where ten (10) or more acres of disturbed soil drain to a common location, a temporary (or permanent) sediment basin must be provided prior to the runoff leaving the site or entering surface waters. The basins must be designed and constructed according to the standards in the NPDES General Construction Permit Part III.B.
2. The permittee or applicant must ensure final stabilization of the site in accordance with the NPDES General Construction Permit requirements. The site will be considered as having achieved final stabilization following submission of Certificate of Completion by the permittee or applicant, and inspection and approval by the City.

H. Non-Degradation Rulemaking

The MPCA is currently going through due process to update its non-degradation rulemaking effort and amend the state rules governing the non-degradation of waters (Minn. R. 7050.0180 and 7050.0185). Rules protecting Outstanding Resource Value Waters were adopted in 1984, while rules governing non-degradation of all waters were adopted in 1988. Since then, there have been many changes to the state and federal structure for water protection and to the understanding of water quality. The MPCA intends, with the assistance of a significant stakeholder effort, to thoroughly investigate the issues associated with non-degradation of waters, and to adopt rules that will address those concerns.

The MPCA has already taken the first steps in the rulemaking process by publishing two Requests for Comments regarding their intent to amend the current non-degradation rules. These Requests for Comments were published in the ***State Register*** on January 29, 2007 and May 29, 2007.[3] The MPCA is currently holding stakeholder meetings to gather input. The City of St. Francis will incorporate the non-degradation policies into this SWMP when they are formally adopted into the state rules.

IV. LAND AND WATER RESOURCES INVENTORY

Each plan must contain an inventory of water resource and physical factors affecting the water resources based on existing records and publications. If data publications and maps are available at a convenient central location, they may be included by reference. The plan must include a brief summary of the data and must identify where the publication can be obtained. The following subsections are required.

A. Precipitation

The state climatology office has records of all official rain gauges throughout Anoka County. The monthly precipitation totals and county-wide monthly averages for Anoka County are available online at:

http://climate.umn.edu/HIDENannual/

Information is readily available from 1971 to the present. Over this time period, the aggregate annual precipitation for Anoka County ranged as follows:

Lowest annual precipitation..... 14.7 inches in 1976

Highest Annual Precipitation..... 43.36 inches in 1991

Average Annual Precipitation ..... 31.40 inches per year

The following is the average annual precipitation for Anoka County per decade:

1970s..... 30.4 inches per year

1980s..... 29.7 inches per year

1990s..... 33.6 inches per year

2000s..... 32.0 inches per year

[3] Excerpt taken from MPCA website: http://www.pca.state.mn.us/water/nondegradation-rule.html

On the average, June is the wettest month, followed by August and July.

B. General Geology and Topographic Data

The Rum River flows through the City of St. Francis. The general terrain is relatively flat and is often referred to as the Anoka Sand Plain. The elevations range from approximate elevation 1100 feet above mean sea level in northwestern St. Francis to near 880 feet at the most downstream point of the Rum River before leaving the City. The straight-line distance between these points is approximately 35,000 feet, making the average slope less than 1 percent. In general, the land slope ranges from less than 1 percent to 2 percent.

Steep slopes exist along the Rum River, as well as in other locations scattered throughout the City. A map showing the areas with slopes between 12 and 18 percent and areas with slopes greater than 18 percent is attached as Figure 1.

Virtually all of the St. Francis city limits is within the Anoka Sand Plain, which consists of highly permeable soils. Figure 2 shows the general subsurface geology of aquifers in the vicinity of St. Francis. The Anoka Sand Plain is part of the undifferentiated drift (Layer 1). The Minnesota Department of Natural Resources and the Minnesota Geological Survey generated Figure 3 as part of the Regional Hydrogeologic Assessment for the Anoka Sand Plain.[4] Based on Figure 3, waterborne contaminants in the St. Francis area can reach upper aquifers within hours or months of release, necessitating additional care in regulating surface water contamination. The majority of St. Francis is rated with the highest geologic sensitivity to pollution in the uppermost aquifer with a portion in the west rated in the moderate to high sensitivity.

The Board of Water and Soil Resources website indicates that Anoka County, though not participating in the official metropolitan groundwater planning process, has prepared a "groundwater protection assessment." The county public health department coordinates the county groundwater planning and management activities.[5] However, there is no mention of the assessment on Anoka County Health and Environment Department website.

The City Wellhead Protection Plan was completed in 2005. See the Appendix for maps showing the 10-year capture zone (Well Head Protection Area, WHPA) as well as the Drinking Water Supply Management Area (DWSMA) for the three municipal drinking water wells in St Francis. Stormwater infiltration will not be allowed inside these zones.

C. Surface Water Resource Data

1. Public Waters

A map of the public waters, streams, lakes, and public ditch systems established under Minnesota Statutes chapter 103D or 103E is shown in Figure 4.

The Minnesota Department of Natural Resources (DNR) uses the U.S. Fish and Wildlife classification system (Circular 39) for wetlands and currently requires a permit for alteration of wetland types 3-5 which are 2.5 acres or larger. St. Francis City Code Chapter 13 includes provisions designed to further protect wetlands.

---

[4] Minnesota Dept. of Administration / Office of Geographic and Demographic Analysis / Land Management Information Center. Website: http://www.lmic.state.mn.us/chouse/metadata/asp.html

[5] http://www.bwsr.state.mn.us/watermgmt/metrogroundwaterplans.html

In addition to the protected waters list, the Rum River is designated as a Wild & Scenic Outstanding Resource Value Water (it is classified as Scenic and Recreational from the Highway 27 bridge in Onamia to Madison and Rice streets in Anoka) and is therefore a "special water" (see Figure 4 – Parks Map).

2. Shoreland

In order to control the development and utilization of shoreland along protected waters thereby preserving the water quality, natural characteristics, economic values and the general health, safety and welfare, the City of St. Francis implemented the Rum River Scenic District and Urban Stormwater Ordinances. These ordinances are intended to control the utilization of shoreland areas and to preserve the quality and natural character of these waters within the City.

3. Minnesota Wetlands Conservation Act

The National Wetlands Invertory (NWI) inventory map is attached as Figure 6.

According to City Code Chapter 13, pretreatment of all stormwater from new developments is required prior to discharge into any wetlands.

The Minnesota Wetland Conservation Act (WCA) requires the designated Local Governmental Unit (LGU) in charge of administering the WCA to generate a Notice of Wetland Conservation Act Decision for any impact to wetlands within the City of St. Francis. In all but minor decisions, the LGU will call for a Technical Evaluation Panel (TEP) review of the application or impact prior to issuing a decision. The LGU must give notice of proposed actions affecting wetlands to all of the following:

a. The Minnesota Board of Water and Soil Resources

b. The Soil and Water Conservation District

c. The Minnesota Department of Natural Resources

d. The Upper Rum River Watershed Management Organization

e. The U.S. Army Corps of Engineers

f. Interested citizens requesting notification of such actions

If a TEP meeting is required, all listed parties are invited to review the proposed action. However, it is not uncommon for a TEP meeting to consist of only a small contingent of this list, as some invitees may have no jurisdiction over the proposed action.

4. Watersheds

A general watershed map is attached as Figures 10A and 10B. The City of St. Francis was broken into 9 larger watersheds based on general drainage patterns, topography, and the waterway to which they drain. The major watersheds were further delineated into subwatersheds based on topography and the type of stormwater management systems. Watersheds that primarily use storm sewer and detention ponds for stormwater management were delineated. The map shows the major watersheds and subwatersheds as well as modeled open channel segments, stream junctions, and outfalls.

5. Flood Levels

Floodplains are covered by City of St. Francis Code Chapter 12. A comprehensive map showing all of the FEMA Flood Insurance Rate Map (FIRM) flood plains is attached as Figure 7. Flood studies have been performed (with elevations determined) for the following waterways:

a. Rum River

b. Seelye Brook

Flood zones have been mapped for County Ditch 18 and 19, but elevations have not been established. Copies of the flood studies and maps are available at City Hall or online at the FEMA Map Service Center.

6. Water Quality Information

Section 303d of the Clean Water Act requires that each state submit a list of Impaired Waters. The MPCA website lists the impaired waters as officially designated in 2008. Table 1 lists the impaired waters found in St. Francis:

Table 1

303d Impaired Waters List Excerpt from MPCA

Name	Affected Use	Pollutant or Stressor	Year Designated	Target Start	Target Completion
Rum River	Aquatic Consumption	Hg	2008	Yet to be determined	Yet to be determined

The Minnesota DNR maintains a database on all Minnesota lakes. Some of this data is very limited or not available, while other lakes have been studied in great detail. To find the most current data on the lakes around St. Francis, access the Lake Finder on the DNR Website.

The WMO document has a list of monitoring locations. The Anoka Conservation District (ACD) has water quality information. The ACD has also published a water atlas.

7. Water Appropriations

According to the 2007 URRWMO Watershed Management Plan, there are 4 water appropriations locations in St. Francis: two irrigation locations and two municipal waterworks locations. The City's Wellhead Protection Plan was completed in 2005 and includes three municipal water wells. The Wellhead Protection Plan is incorporated into this plan by reference. At present, the plan includes all of the current municipal ground water appropriations.

8. Soil Data

The Anoka County soil survey map of the St. Francis area is attached as Figure 8. In general, the City of St. Francis has soils in SCS Hydrologic Soil Type A and A/D. In the western portion of St. Francis, large areas of Type B soils exist, as well as some Type C. Table 2 lists the recommended infiltration rates based on SCS hydrologic soil types.

Table 2

Infiltration Rates Per Soil Type

Source: Urban Hydrology for Small Watersheds (SCS, 1986), as amended, revised or supplemented.

Hydrologic Soils Type	Infiltration Rate	Soil Texture
A	0.30 inches/hour	Sand, loamy sand, or sandy loam
B	0.15 inches/hour	Silt loam or loam
C	0.07 inches/hour	Sandy clay loam
D	Less than 0.02 inches/hour	Clay loam, silty clay loam, sandy clay, silty clay, or clay

9. Land Use and Public Utility Services

Necessary land use and public utility services information is limited to information that existed at the time the plan or plan amendment was developed, including a general map of the existing land cover in St. Francis (Figure 9)

Land use is one of the primary mechanisms that affect flooding and water quality. As prairie and forested areas are converted to agricultural and urban uses, the volume and rate of stormwater runoff increases. This increase in stormwater runoff can cause a change in the bank full flow of area streams and conveyances. This can cause stream bank erosion and deterioration of the stream. In addition, increased area runoff can cause erosion in steep areas. The conversion of natural land cover also increases the amount of pollutants in stormwater runoff such as the levels of pesticides and nutrients from agricultural land use, and trace metal concentrations from urban land use. Pollutant loading analysis has not been included within this plan. This plan estimates the future land use throughout the study area in order to evaluate the drainage system needs.

Although pollutant concentrations may not vary greatly between land uses, pollutant loadings are a function of both runoff volume and concentration. The volume of runoff is directly related to the amount of impervious surface from a particular land use. For example, if a fictitious ***Area A*** has twice the runoff due to higher impervious land cover as ***Area B*** with the same pollutant concentration, ***Area A*** will have twice the pollutant loading. This is the basis for the major difference in water quality between residential and commercial land uses and affects surface water planning strategies for the different land uses. The land cover types for the St. Francis area are shown in Figure 9.

10. Water-based Recreation Areas and Land Ownership

The attached Figure 4 – Parks Map shows the location of all Parks and the location of all DNR public water accesses within the City of St. Francis.

11. Fish and Wildlife Habitat

As identified in Figure II-12 of the URRWMO SWMP, one area of High Biodiversity exists within the community. This area is bound on the west by

CSAH 70, extends east to CSAH 71, is bound on the north by CSAH 28, and extends south to the southern City limits.

12. Unique Features and Scenic Areas

The Rum River Corridor within the City has unique and valuable local, state, regional, and national resources. The river is an essential element in the local, regional, and state economy; sewer and water and recreational systems and serves important biological and ecological functions. The prevention and mitigation of irreversible damage to these resources and the preservation and enhancement of their natural, aesthetic, cultural and historic values is in furtherance of the health, safety and general welfare of the City. The Rum River Scenic River is protected under St. Francis City Ordinance.

The City of St. Francis Code Chapter 9 regulates bluff land and river land development in order to protect and preserve the outstanding scenic, recreational, natural, historical, and scenic values of the Rum River in the city of St. Francis in a manner consistent with Minnesota Statutes, §104.31 - 104.40, Minnesota Regulations NR78-81, and the Management Plan for the Rum River (6 MCAR 1.2700 - 12720).

13. Pollutant Sources

The City is not aware of any landfills or significant sources of high nitrate concentrations.

The City does not keep a list of storage tanks. These records are currently kept at the Anoka County Environmental Services office.

The MPCA "What's in My Neighborhood?" website lists known and potential sources for soil and groundwater contamination. The majority of the sites listed are Voluntary Investigation and Cleanup (VIC) sites. A text based search for Anoka County and Zip code 55070 listed 4 sites; however, 1 site is in the City of Anoka. A city dump is listed even though there is no known landfill within the city limits. The sites listed in the City of St. Francis are displayed in Table 3.

Table 3

Known or Potential Sources of Soil or Groundwater Contamination

Site ID	Site Name	Address	
VP7491 (4854)	**St. Francis Auto Part**	**4140 Saint Francis Boulevard NW**	St. Francis, MN 55070
No MPCA ID	**St. Francis Sewage Ponds**	**Adjacent to South City Limits, Just West of Rum River Blvd NW**	St. Francis, MN 55070

D. **Design Requirements**

The St. Francis SWMP has a dual purpose: 1) It will serve as a guide for the construction of storm drainage facilities, and 2) It will provide a basis for a consistent approach to the preservation of lakes, wetlands, streams, and the Rum River. The following issues have been incorporated into this plan:

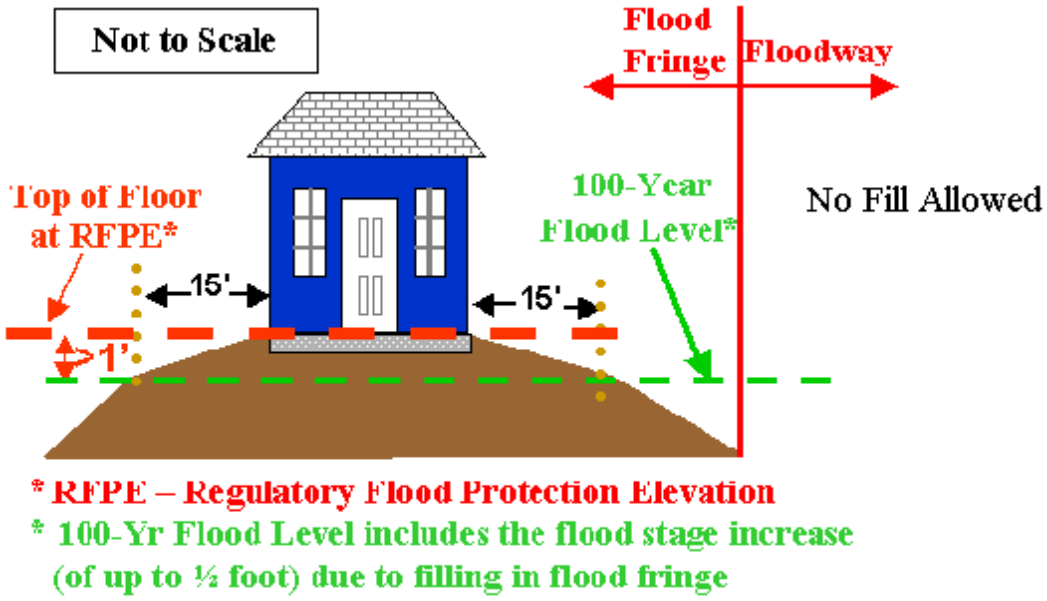
1. Division of the City into major watersheds based on contour maps and natural topography
2. Recommendations to accommodate the ultimate land use conditions
3. Recommendations for the revision of the current development ordinances
4. Recommendations for standard Operations and Maintenance procedures
5. Recommendations for specific construction site erosion control practices
6. Estimated construction and implementation costs of the SWMP
7. Recommendations for education of City residents, staff, and development community.

The primary function of an urban stormwater drainage system is to minimize economic loss and inconvenience due to periodic flooding of streets and other low-lying areas. Adequately designed stormwater drainage facilities provide flood control, minimize hazards and inconvenience associated with flooding, and protect or enhance water quality. The SWMP takes the entire drainage basin with future saturation development into consideration.

Wet water quality ponds upstream of dry regional infiltration basins (where possible) will help control the rate and the volume of stormwater runoff. To provide flood protection for adjacent property, the design storm interval for ponding areas is a 100-year storm as compared to a 10-year storm for design of storm sewer piping. Any new residential, commercial, industrial and other habitable structures shall be constructed with the following low floor elevation: Elevation of the lowest floor of a structure shall be a minimum of 1 foot above the Emergency Overflow, or 1 foot above the HWL of the nearby pond or water body, whichever is higher. The area of a pond's HWL plus 1 foot of freeboard shall be contained entirely within an outlot, or drainage and utility easement, that is owned and maintained by the City.

In areas adjacent to designated flood plains as mapped on a Flood Insurance Rate Map, the Regulatory Flood Protection Elevation (RFE) applies. The RFE is defined as the mapped 100-year flood elevation plus 1 foot. The URRWMO requires that the low floor elevation of structures be 1 foot above the 100-year high water level or regional flood level for the adjacent water or wetland. City policy requires all structures, including accessory structures, be elevated on fill so that the lowest floor including basement floor is 1 foot above the Regulatory Flood Protection Elevation or 1 foot above the mapped 100-year flood elevation. The finished fill elevation for structures shall be no lower than 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. The following drawing better defines the Regulatory Flood elevations.[6]

[6] Taken from the Minnesota DNR website: http://www.dnr.state.mn.us/waters/watermgmt_section/floodplain/rfpe.html



Minimum Standards for Structures in 100-year floodplain

The effective use of ponding areas enables the installation of outflow sewers with reduced capacities since the design storm duration is effectively increased over the total time required to fill and empty the ponding reservoirs. Storm sewers represent a sizable investment for the community and this investment can be more efficiently utilized by ponding stormwater in designated ponding areas and allowing smaller diameter pipes to be used as outfall lines.

Equally as important as flood control and cost considerations, is the use of ponding areas to:

1. Improve water quality;
2. Return stormwater to the groundwater table;
3. Increase water amenities in developments for aesthetic, recreational and wildlife purposes.

For water quality ponds, the storage below the outlet is the most important consideration. The area and depth of the ponds may differ from the values presented here. Storage below the outlet must be provided so that the prescribed pollutant loading of the system is not exceeded.

Amenity aspects are maximized by careful planning in the initial development of any residential, commercial, or industrial area and by integrating the ponding system into a regional SWMP. However, care should be given to make the developer responsible for the design water level. If development plans show a permanent water level, the City will include a provision in its development agreements requiring the developer and ultimately the subdivision or development area to be responsible for maintaining the water level. The City's review will address water quality and hydraulics and not the permanent water level. The Anoka Sand Plain is known for its high infiltration capacity as well as its

fluctuating water levels. The City of St. Francis will not participate in maintaining or engineering water levels.

The wildlife aspects of ponding areas shall be maximized through the design and proper placement of a trail system, if included in the development layout, which will allow access to these areas for wildlife observation.

It is extremely important that each area be re-evaluated at the time of final design to confirm the criteria used in this study and to make any changes that a proposed development may dictate. Special consideration must be given to areas that develop differently than shown in the Comprehensive SWMP, especially when a higher runoff coefficient (higher impervious surface ratio) is likely to result from development.

All storm sewer facilities, especially those conveying large quantities of water at high velocities, shall be designed with efficient hydraulic characteristics. Special attention shall be given during final design to those lines that have extreme slopes and create high hydraulic heads.

The Best Management Practices (BMPs) recommended by the MPCA shall be followed wherever necessary. These items should be incorporated into the design and operation of any new or existing stormwater systems.

The City's development ordinances shall be reviewed relative to the required modeling and runoff restrictions. They presently reflect the majority of the requirements of the URRWMO. Modifications to the current ordinances are included in the plan to cover items of the URRWMO Watershed Management Plan that were not previously addressed. Further restrictions are recommended to limit post development peak runoff from the 2, 10, and 100-year SCS rainfall events to 90-percent of the predevelopment peak flows from the same relative rainfall events in areas where infiltration is possible. Where infiltration is not permitted/ possible, post development rates shall not exceed existing rates. The proposed decrease in peak runoff is to provide reserve downstream capacity for the increase in volume associated with the increase in impervious surfacing.

Infiltration basins will be required in lieu of wet sedimentation basins in all areas where practical. These basins are encouraged by many review agencies as a way to mimic the original runoff conditions from a site. By incorporating infiltration, the basin provides volume control and water quality management. A water quality basin does not need to have standing water, just a permanent "dead-pool" volume to meet the water quality requirements of NURP. The infiltration basins will assist in meeting MPCA regulations as well as the 90-percent post-development runoff requirement recommended by this plan. Infiltration basins will not be allowed in a wellhead protection zone. These areas are illustrated in the DWSMA Figures in the Appendix.

E. Stormwater Modeling

1. Runoff

Stormwater runoff is defined as that portion of precipitation which flows over the ground surface during, and for a short time after, a storm. The quantity of runoff is dependent on the intensity of the storm, the length of storm, the amount of rainfall, the type of ground cover, and the slope of the ground surface.

The intensity of a storm is described by the amount of rainfall that occurs during a specific time interval. A specific rainfall amount occurring during a given time interval will statistically recur, on the average, at a certain frequency (usually measured in years). This is called a return frequency. A return frequency

designates the average time span during which a single storm of a specific magnitude is likely to occur. For example, a 100-year rainfall event in St. Francis is that 24-hour rainfall amount (5.9 inches) that recurs, on the average, once in 100 years.

The degree of protection afforded by storm sewer facilities is determined by selecting a return frequency to be used for design based on good economic sense and current engineering practices. See section E.4 for further discussion.

2. Hydrographs

Storm sewer and associated detention basin design is typically based on hydrograph analysis. A hydrograph is a graphical depiction of the time versus rate of runoff for a particular area. For example, if a rainstorm started at midnight, the first few minutes is spent with sprinkles and wetting the various surfaces. As the storm intensifies, the rainfall overwhelms the ability of the pavement and adjacent ground to absorb it, and water begins to flow across the surface. At the peak of the storm, the water runs off at its greatest rate. Finally, as the storm passes, the runoff begins to slowly taper off. Figure 12 is an example of a typical runoff hydrograph. The U.S. Soil Conservation Service (SCS) has performed extensive research in hydrograph analysis and developed a standard hydrograph. Technical Release No. 20 (SCS TR 20) describes a methodology that is generally accepted by the reviewing authorities and hydrologic engineers across the United States. The SCS procedure is based on a standard rainfall hydrograph that is modified by local parameters (i.e., rainfall, soil type, watershed size, watershed shape, the fall across the watershed, etc.). Based on local conditions, the SCS hydrograph was used for development of the St. Francis stormwater model in this plan.

A SCS 24-hour Type II storm distribution with 100-year frequency was used for the model. The Soil Conservation Service has determined from National Weather Bureau data that a Type II distribution is the storm event recommended for the upper-Midwestern United States.

The SCS hydrograph method is based on sound hydrologic theory and is commonly used to analyze runoff for the design and analysis of flows and water levels. The detailed modeling computations for this plan have been performed using the StormNET Modeling Software as developed by Boss International, Inc.

3. Rainfall Probability

Technical Publication 40 (TP-40) rainfall data for the United States shows that a 5.9-inch rainfall has a statistical probability of occurring once every 100 years in the St. Francis area. This is not to say that a 5.9-inch rainfall cannot occur more often, in subsequent years, or even on multiple occasions within the same year; it is just to say that a 5.9-inch rainfall will occur ***on the average*** once every 100 years. It is generally more accurate to refer to the 100-year rainfall as that event having a 1 percent chance of occurring in any given year.

The SCS National Engineering Handbook snowmelt data shows the 100-year, 10-day snowmelt event is 7.4 inches over 10 days.

4. Pond and Pipe Design Criteria

To provide reasonable protection of downstream facilities, analysis of flood levels, storage volumes and flow rates for water bodies and detention basins shall

be based on the range of rainfall and snow melt durations producing the critical flood levels and discharges. This plan recommends a 10-year frequency design for storm sewer pipe using the Rational Method[7]. It is further recommended that pond design be based on the greater of the 100-year, 24-hour frequency SCS rainfall event, or the 100-year, 10-day snowmelt event for overland drainage and pond storage design. In comparing the peak pond elevations for each of these events, the 100-year SCS rainfall event, with the assumption that the infiltration rate was negligible, created the highest peak pond elevations. Hence, throughout the remainder of this plan, the peak 100-year pond rates are discussed for typical pond High Water Levels (HWL). These design criteria were selected for the analysis of the drainage system for this SWMP.

Stormwater detention facilities with peak discharge rates less than 2 cfs/ 40 acres are typically susceptible to high water levels during snowmelt conditions. Special consideration of the snowmelt condition becomes critical for areas like the Anoka Sand Plain where infiltration dampens the effect of runoff from rainfall. These areas can accept high amounts of rainfall during the warm, summer months, but often remain frozen later in the season and are relatively impervious in the spring during the snowmelt. Hence, snowmelt runoff can be a greater flood hazard than a large summer rainfall due to the impermeable nature of frozen soil. Accordingly, final basin design must consider snowmelt conditions when sizing storage and outlet structures.

When rainfalls exceed the recommended 10-year storm sewer infrastructure design, the excess runoff will be accommodated by ponding in low spots in streets for short periods of time and outflow through overland drainage routes and/or EOFs. With proper planning, this short-term flooding and overland drainage should minimize damage to property that would occur if those facilities were not provided. Drainage routes and EOF locations should be protected and preserved either by ordinance or through recorded permanent easements. Where possible, stormwater pond designs shall include an emergency overflow to provide an outlet a minimum of 1-foot below the lowest floor elevation of any adjacent structure for added safety.

The Rational Method is a flow rate design method that ignores volumes and assumes a peak flow to each pipe based on hydrologic parameters such as watershed area, time of concentration, and standard rainfall intensity curves. This design method requires the selection and/or computation of a time of concentration and a runoff coefficient. The time of concentration is the time required for the runoff from a storm to become established and for the flow from the most remote point (in time, not distance) of the drainage area to reach the design point. The time of concentration will vary with the slope and type of surface that the rain falls on. Rational Method design including design methodology and hydrologic references should be based on the Minnesota Department of Transportation Drainage Manual.

A minimum concentration time of fifteen minutes for residential areas and ten minutes for commercial/industrial areas shall be used for design of the trunk storm sewer systems. These minimum times shall be considered in the design of lateral systems. As the stormwater runoff enters the system, the flow time in the

[7] The Rational Method is markedly different than the SCS methodology in that it does not deal with runoff volumes, only flow rates. An explanation of the Rational Method is made later in this plan.

storm sewer is then added to the concentration time and compared to the downstream drainage area concentration time. The maximum of these values is used downstream, which results in a longer concentration time and peak runoff rate as the flow moves downstream from the initial design point.

5. Land Use Factors in Modeling (Runoff Coefficients)

The percentage of rainfall falling on an area that must be collected by a hydraulic facility is dependent on watershed variables such as soil permeability, ground slope, vegetation, surface depressions, type of development and antecedent rainfall. These factors are taken into consideration when selecting a runoff coefficient (C) for the Rational Method or a runoff curve number (CN) for use in SCS methodology.

Under ultimate (fully developed) conditions, the values of the coefficient will increase with increases in the amount of impervious surfaces caused by street surfacing, building construction, and grading.

The antecedent moisture condition (AMC) relates to the moisture content of the soil prior to a given storm event. Curve numbers based on land use can be adjusted based on an assumed moisture condition. For purposes of the model, normal antecedent moisture condition (AMC II) was assumed. Curve number values can be adjusted for dry conditions (AMC I) or wet conditions (AMC III).

Curve numbers are also dependent on the type of soil in a given drainage area. Soil types are classified into four basic hydrologic groups as follows:

Group A - Includes soils consist of deep sand and aggregated silts.

Group B - Includes sandy loam soils.

Group C - Includes soils that are low in organic content and made up of clay loams and soils high in clay.

Group D - Includes soils consisting of heavy plastic type clay soils.

Curve numbers that were assumed in the development of the model were based on the hydrologic soil group for each watershed based on the information contained in the County Soil Survey. Development plans shall consider post-development site soil conditions when choosing runoff curve numbers for final design.

Curve numbers (CN) are given in SCS TR-55. Average CN values for each land use type are used in the design of the storm drainage facilities in undeveloped areas. For the modeling of existing facilities, CN values were determined for each type of development and current zoned land use in each subwatershed. In general, the unpaved, non-wetland areas were modeled with curve numbers that most closely represent the Anoka Sand Plain. The curve numbers were then adjusted to reflect the percentage of impervious surfacing.

It should be noted that if land use changes to more or less impervious surfacing than the model, it will affect the model and updates may be needed.

V. GOALS AND POLICIES

Problem Statement

The increase in urbanization, with its associated runoff and sediment-related pollutants will have an impact on wetlands and other water resources including the Rum River.

Mission Statement

The City of St. Francis, in cooperation with the URRWMO, Anoka County, and state and federal agencies, will prepare a Surface Water Management Plan which will accommodate anticipated community development and redevelopment while providing clear direction to the developers for controlling the quality and quantity of stormwater runoff and properly managing surface and groundwater resources and the physical habitat of existing wetlands, lakes and the Rum River in a consistent fashion. The City is committed to a goal of no adverse impact to, and nondegredation of, its water resources.

Goals

This plan identifies several specific goals to control the City's water resources planning and management functions. The goals of this plan were established in accordance with the purposes of the water management programs required by Sections 103B.201 to 103B.251. The goals of the City of St Francis are:

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

Policies

Each goal has several corresponding policies. A policy is a governing principle that provides the means for achieving established goals.

Standards

Standards are an extension of the policies. They provide specific, detailed guidance regarding water management practices. Plan standards are included in the Implementation Program (Section VIII) of this document.

A. Water Quantity

The following runoff quantity goals and policies are considered part of this plan.

Goal 1: Control flooding and minimize public capital expenditures.

Policy 1.1: Natural stormwater storage areas and manmade detention areas should be utilized to control flooding.

Policy 1.2: The storage capacity of the natural drainage system will be utilized to control rates of runoff. The City will jointly define and adhere to flow rates at municipal boundaries as established in this plan.

Policy 1.3: The City will encourage regional infiltration/ detention whenever possible.

Policy 1.4: All hydrologic studies will be based on standard hydrologic criteria and ultimate or anticipated development of the entire tributary drainage area.

Policy 1.5: Major stormwater facilities (i.e., ponds, pond outlet systems, and major conveyance systems) shall be designed using a return period of 100 years.

Policy 1.6: The peak outflow from all new developments shall be limited to 90 percent of the existing peak outflow for the 2-, 10- and 100-year SCS 24-hour rainfall events in areas where infiltration is permitted. In areas where infiltration is not permitted/ possible, proposed discharge rates shall not exceed existing rates.

Policy 1.7: All minor drainage system analyses and design (i.e., piped collection systems and minor conveyance systems) will be based on a return period of 10 years unless otherwise specified. The minor drainage system pipe will be sized using the full gravity flow capacity of the pipe. Pressure flow based on surcharging the upstream manhole or structure to near the street surface will not be allowed.

Policy 1.8: Infiltration/ detention facility design will include a paved access route or an approved equal stabilized access route; and dedicated right-of-way, outlot access and/or drainage and utility easement for maintenance of the outlet structure and to the facility in general.

Policy 1.9: Newly constructed stormwater management ponds, and existing or constructed wetlands and their required buffers shall be contained within Outlots or drainage & utility easements and shall be dedicated to the City.

Policy 1.10: The design of stormwater facilities will consider and identify location(s) of overflow(s) that prevent property damage to adjacent properties from extreme water levels.

Policy 1.11: Minimum building elevations should be above designed or designated flood levels. The minimum building floor elevation shall be one (1) foot above the 100-year level or 1-foot above the EOF. The 100-year level shall be on the highest 100-year level resulting from a single event analysis; the 100-year, 10-day snowmelt event; a multiple day runoff event analysis, or the critical event analysis.

Policy 1.12: Landlocked runoff basins shall be sized to handle back-to-back 100-year SCS 24-hour rainfall events, the 10-inch SCS 24-hour rainfall event or the 100-year, 10-day snowmelt snow melt event, whichever produces the higher peak pond elevation (Landlocked HWL). The minimum building floor elevation around landlocked basins shall be one (1) foot above the Landlocked HWL.

Policy 1.13: Emergency overflows or outlets to drainage systems will be provided to any landlocked area if the available stormwater storage capacity is inadequate to prevent flooding of residences and if the available downstream conveyance system capacity is adequate to accept additional flow.

Policy 1.14: The City will have standard hydrologic design criteria for all stormwater systems to assure consistency. Drainage calculations for the 2, 10 and 100-year events shall be approved by the City Engineer prior to the issuance of a grading permit.

Policy 1.15: The City will perform maintenance measures to assure proper function of the drainage system. Such maintenance measures include the investigation of all infiltration/ detention systems a minimum of once every 5 years.

Policy 1.16: The City will adopt ordinances that control peak runoff consistent with standards and recommendations in the URRWMO Policies and the Minnesota Stormwater Manual.

Policy 1.17: The City will amend the current Urban Storm Water Pollution Control for New Developments to require infiltration whenever possible for new development or redevelopment projects that increase stormwater volume runoff. The ordinance will provide standards to follow and provide exclusions for sensitive areas.

B. **Water Quality**

Goal 2: Achieve water quality standards in City streams, rivers, and wetlands consistent with intended use and classification, which include quantifiable limits on specific pollutants (i.e., phosphorus, turbidity, excess nutrients, etc). The City's ultimate goal is to meet these standards.

Policy 2.1: The ranking system established by the URRWMO shall dictate intended use and water quality standards.

Policy 2.2: Future outlets to DNR protected waters must first pass through a sediment pond/trap prior to discharging into the protected water body.

Policy 2.3: Phosphorus loading to a drainage system or water body will be reduced to the greatest practical extent through the use of Best Management Practices (BMPs).

Policy 2.4: All construction plans developed for the maintenance and/or improvement of water quality will include a detailed access and maintenance plan and shall require approval by the City.

Policy 2.5: A community education program relating to preserving and improving water quality will be developed and implemented.

Policy 2.6: All on-site waste water systems will be the responsibility of the owner. The owner shall be responsible for maintaining the systems and providing maintenance records to the City.

Policy 2.7: The URRWMO and the City should take an active role in implementing the necessary policies to allow development of regional water quality ponds.

Policy 2.8: A vegetated buffer strip is required between natural water bodies and improved areas to limit phosphorus loadings in accordance with the stormwater and drainage design performance standards of this plan. [8]

Policy 2.9: The City will perform maintenance measures to minimize pollutant loadings to local water bodies. This includes implementing programs and BMPs to assist in controlling sediment. An example of an item covered as part of the maintenance program would be the inspection of sump manholes a minimum of once per year. Additionally, all urban section streets with curb and gutter will be swept a minimum of once annually, and twice annually in priority areas (i.e. public water bodies and high quality wetlands).

Policy 2.10: The City will adopt best management practices for development that will result in TSS and TP reductions of 90% and 60%, respectively.

Policy 2.11: The City will adopt best management practices for redevelopment that will result in TSS and TP reductions consistent with the Minnesota Stormwater Manual.

Policy 2.12: The City will summarize or integrate the required nondegredation information into this surface water management plan when the nondegradation rules are finalized.

Policy 2.13: The City will amend the current Urban Storm Water Pollution Control ordinance for ponding areas to set forth more stringent standards to be consistent with the policies set forth in the URRWMO. This includes requiring infiltration, where appropriate, and providing requirements for pond basin design according to NURP guidelines.

C. **Recreation, Fish and Wildlife**

Goal 3: Protect and enhance water recreational facilities, fish and wildlife habitat.

Policy 3.1: Natural areas, wildlife habitat and wetlands to be protected during construction should be clearly marked and/or fenced in the field.

Policy 3.2: Buffer zones of natural vegetation are required around ponds and wetlands located within current wildlife corridors to provide habitat for wildlife. These areas are recommended to include slopes 4: 1 or flatter near these features.

[8] Reference the Current Urban Storm Water Pollution Control for New Developments

Policy 3.3: The water level fluctuation of a wetland or pond shall be maintained consistent with the management function of the water body. Wetlands used for stormwater overflow purposes shall be limited to a maximum bounce of 2-feet between the NWL and HWL.

Policy 3.4: Documentation of existing habitat, both graphically and in writing by the owner or developer, prior to modifying wetlands or stream banks, or constructing stormwater facilities is encouraged. Remaining habitat will be maintained and enhanced, or new habitat will be developed to replace lost habitat.

Policy 3.5: The City supports programs for controlling purple loose strife.

Policy 3.6: The City supports programs for controlling Eurasian water milfoil.

Policy 3.7: The City supports programs for controlling Curly leaf pond weed.

Policy 3.8: Activities related to recreation, fish and wildlife should be consistent with the Anoka County Regional Park objectives and the City's comprehensive plan.

Policy 3.9: The existing wetland ranking system, as shown in the table below, and all subsequent revisions established by the URRWMO shall dictate allowable wetland management activities.

Table 4

Wetland Classification per URRWMO

Wetland Classes	Purpose
High Priority Wetlands	Wetlands that highly serve both water quality treatment and wildlife habitat target functions
Moderate Priority Wetlands	Wetlands that highly serve one of the two above reference target functions
Low Priority Wetlands	Wetlands that do not highly perform either of the target functions
Use Wetlands	Wetlands created for stormwater management

See the URRWMO Wetland Standards attachment in the Appendix for more information related to wetland classification.

D. **Public Participation, Information and Education**

Goal 4: Increase public participation and knowledge in management of the water resources of the community.

Policy 4.1: The City will develop a public education outreach program.

Policy 4.2: The City will utilize available resources and input from the public to address local water resources issues.

Policy 4.3: Citizen water quality monitoring is encouraged and supported by the City.

Policy 4.4: The City will distribute educational material aimed at fostering responsible water quality management practices. Example topics include wetland buffers, groundwater quality and protection, water conservation, proper hazardous waste management, yard waste management, pet waste disposal, and agricultural BMPs.

Policy 4.5: The City supports Anoka County's recreation and educational programs related to the water resources of the community.

Policy 4.6: The City will support natural environment programs in the public schools.

E. **Public Ditch System**

Goal 5: Maintain the current ditch system to convey water and maintain the current defined maximum flood levels to protect businesses and residences.

Policy 5.1: The City will perform the maintenance of public ditches, with the exception of county ditches, to provide protection of private property and structures from flooding, provided that such maintenance is in accordance with the Minnesota Wetlands Conservation Act, Minnesota Statute 103E governing agricultural drainage, is acceptable to the U.S. Army Corps of Engineers, and does not adversely affect the value of wetlands or water quality.

Policy 5.2: Anoka County is recognized as having authority over all public ditches within the watershed in accordance with Minnesota Statute 103E.

F. **Groundwater**

Goal 6: Promote groundwater recharge and prevent contamination of the aquifers.

Policy 6.1: Anoka County is recognized as the lead agency regarding groundwater controls.

Policy 6.2: Recharge areas identified by Anoka County shall be protected from adverse development and from potential contamination.

Policy 6.3: Infiltration of the first 0.5-inch of runoff from new impervious areas will be required wherever the soils are appropriately permeable (i.e., hydraulic soil types A and B) to promote groundwater recharge and volume controls. Within 1 mile of impaired waters, infiltration of 1.0-inch of runoff from new impervious surfaces will be required. However, in certain

circumstances this requirement may be waived if the proposed pond is in a wellhead protection zone.

Policy 6.4: Whenever practical, detention ponds, if allowed, shall be designed as "wet ponds" with storage volume below the outlet to promote infiltration and/or groundwater recharge.

Policy 6.5: The use of grassed waterways shall be encouraged to maximize infiltration. Proper grades shall be maintained or underdrain systems installed as part of an overall site plan to insure positive drainage.

Policy 6.6: Any spring area should be identified in the field, denoted on maps by the City and protected from development within the watershed.

Policy 6.7: The appropriate jurisdiction shall use both regulatory (ordinances, permits, etc.) and non-regulatory (Best Management Practices) tools to protect the land area within designated wellhead protection areas.

G. **Wetlands**

Goal 7: Maintain the amount of wetland acreage and try to increase the wetland values within the watershed.

Policy 7.1 The City of St. Francis will act as the LGU which administers the State Wetland Conservation Act.

Policy 7.2: Restoration of poor quality wetlands shall be encouraged.

Policy 7.3: The City or Anoka County shall identify areas that can be used for wetland mitigation.

Policy 7.4: Wetland mitigation criteria will be established consistent with the Minnesota Wetland Conservation Act of 1991 and subsequent amendments and associated rules thereto (e.g., Minnesota Rule 8420), state and federal regulations, the URRWMO and the needs of the City.

Policy 7.5: Alteration of wetlands is discouraged unless for restoration. Alteration may be allowed on an individual basis if the alteration can be properly mitigated in accordance with the Wetland Conservation Act (WCA). Allowable alternatives must comply with WCA sequencing requirements including, in order, avoidance, minimization and mitigation. In general, it will require a full Technical Evaluation Panel meeting and majority approval before any wetland impact is allowed.

Policy 7.6: Wetland banking opportunities will be pursued by the City and/or the URRWMO in accordance with the Wetland Conservation Act.

Policy 7.7: The City will begin developing a Wetland Management Plan as new development occurs. Developers will be required to inventory existing wetlands within the development for function and value according to MnRAM. Pretreatment of stormwater prior to discharge is required for discharge into all wetland types.

Buffers should be consistent with the functions and values identified by the URRWMO. The use of native vegetation buffers for all wetlands shall be written into the Code for new developments.

Policy 7.8: The use of native vegetation for buffers in undeveloped and previously developed areas is strongly recommended.

Policy 7.9: It is strongly recommended that wetland replacement ratios be based on wetland classification (higher replacement amounts can be required for higher valued wetlands).

Policy 7.10: Wetland buffer widths will be based on wetland value; the higher the value of the wetland the greater width required, with a buffer width listed based on wetland classification. See the table below for wetland classification and corresponding minimum buffer width requirements.

Table 5

Wetland Classification per URRWMO and Required Buffer Width

Wetland Classes	Minimum Buffer Width
High Priority Wetlands	25 ft
Moderate Priority Wetlands	20 ft
Low Priority Wetlands	15 ft
Use Wetlands	15 ft

See the URRWMO Wetland Standards attachment in the Appendix for more information related to wetland classification and buffer requirements.

H. **Erosion Control**

Goal 8: Prevent soil erosion.

Policy 8.1: In conformance with MPCA/ NPDES rules, erosion and sediment control plans shall be submitted to the City for review for all land disturbance activities of one acre or more in size.

Policy 8.2: The City encourages the preservation of natural vegetation.

Policy 8.3: Soil erosion shall be prevented through the installation of erosion control practices in accordance with MPCA's Best Management Practices Handbook.

Policy 8.4: Topsoil stockpiled for reuse shall be protected from erosion.

Policy 8.5: It shall be the responsibility of the developer/contractor to keep streets and property adjacent to construction areas free from sediment carried by construction traffic at site entrances and access points, from sediment laden site runoff and blowing dust.

Policy 8.6: The MPCA Storm Water Permit Program for Construction Activities shall be followed.

Policy 8.7: The City has adopted an erosion and sediment control ordinance including provisions that are consistent with the NPDES Construction Stormwater permit.

I. Development Standards

Goal 9: Residential Grading

Policy 9.1: Residential lots shall have a minimum surface slope of 2 percent in all directions. Lesser slopes, between 1 percent and 2 percent may be allowed with a certificate of grading.

Policy 9.2: Four inches of topsoil shall be placed in the turf restoration areas of all new residential lots.

Policy 9.3 Where residential lots are newly graded and there is no immediate plan for new housing within the lot, the entire lot shall be covered with 4 inches of topsoil and seeded within 14 days.

Policy 9.4 When grading is proposed in High Slope Areas, the appropriate City Ordinance shall govern.

J. Regulatory Responsibility

Goal 10: Recognize the regulatory authority of other local, state and federal entities.

Policy 10.1: The City will implement a local permitting program for water resources management.

Policy 10.2: The City recognizes the following agencies with natural resource conservation priorities:

- The Upper Rum River Watershed Management Organization (URRWMO)
- Minnesota Department of Natural Resources (DNR)
- United States Army Corps of Engineers (USCOE)
- Minnesota Board of Water and Soil Resources (BWSR)
- Minnesota Pollution Control Agency (MPCA)

K. Finance

Goal 11: Equitably finance water resources.

Policy 11.1: All developments shall to the extent determined by the City, provide land, funding, or a combination of both for management of local water resources, which includes development of regional facilities and planning studies.

Policy 11.2: The City may establish a fee structure charged to developers for analyzing the impacts of the proposed development.

Policy 11.3: The City may establish a fee structure charged to developers for constructing capital improvements (i.e., trunk conveyance systems).

Policy 11.4: Grants may be sought by the City to fund watershed related projects.

Policy 11.5: The City should investigate the feasibility of alternative funding sources, such as Ad Valorem Taxes, bond sales, and user charges (stormwater utility fees).

Policy 11.6: The City should encourage donations and in-kind contributions of public and private organizations and the school systems for plan implementation.

Policy 11.7: The City shall investigate and evaluate other funding mechanisms that support implementation and enforcement.

L. Records Management and Documentation

Goal 12: The City shall preserve historic data, records, and files pertaining to the water resources of the URRWMO.

Policy 12.1: Engineering calculations will be required in a standard format.

Policy 12.2: Past studies will be documented and filed by the City.

Policy 12.3: Immediately after extreme rainfall events, high water elevations will be noted and investigated for potential problems by the City.

Policy 12.4: The City will develop a history of flooding and water quality problems by noting past events and logging complaints received from residents.

Policy 12.5: The City will perform regular wet storage volume surveys of its stormwater quality ponds on a 20-year rotating basis. If the water quality storage volume is being lost to sedimentation, the City will clean out the pond to reestablish the design storage volume below the outlet and consequently reestablish the design residence time.

Policy 12.6: The City will document all items/BMPs provided.

VI. ASSESSMENT OF PROBLEMS AND CORRECTIVE ACTIONS

This section assesses the water-related problems in the City, prioritizes the problems and includes actions to adequately solve each identified problem.

A. Specific Lakes and Streams with Water Quality Problems

Table 1 in Section IV, page 17 of this plan, lists the current (2008) MPCA 303d Impaired Waters in St. Francis. There are also waters downstream of the City of St. Francis, such as Lake Pepin, that are impaired. The process to remedy the impairment includes establishing a Total Maximum Daily Load (TMDL) allocation to each contributor to the problem. A TMDL is a calculation that determines the allowable pollutant load that can be discharged into the impaired water so that the limited load will ensure that the water improves to levels where it is no longer impaired. The typical process is initiated by the MPCA and includes a series of stakeholder meetings to formulate viable solutions and mutually work out a reasonable allocation of acceptable pollutant loading.

Since a TMDL study has not been completed for these waters, the City will participate in the development or implementation of TMDL projects through the stakeholder process.

Once a TMDL study has been completed for the Rum River, the City will include, in this SWMP, an implementation strategy including funding mechanisms that will allow the implementation of the TMDL requirements. As MPCA completes its TMDL process for each impaired water, the implementation of the measures to meet the TMDL will immediately become a priority item for the City of St. Francis.

B. **Impacts of Water Quality and Quantity Management Practices on Recreation Opportunities**

The current and proposed City ordinances together with the URRWMO, County, regional, state and federal rules and laws are designed to protect the existing land and water resources within the City of St. Francis. The City believes that it can allow continued development while maintaining or improving its resources including water quality and recreation opportunities. With the implementation of this plan and the recommended policy and ordinance changes, the developers will be held responsible for protecting water quality, mitigating the runoff quantity, and ensuring that there will continue to be recreation opportunities in St. Francis. In addition, the City will partner with the URRWMO to educate the public to better protect the city's water resources, to implement temporary and permanent erosion and sediment controls for new developments, to ensure good housekeeping of the City's municipal operations, and to detect and eliminate illicit discharges.

C. **Impacts of Stormwater Discharges on Water Quality and Fish and Wildlife Resources**

As stated in B above, the current and proposed ordinances are designed to protect the existing land and water resources within the City of St. Francis. This includes measures that are designed to maintain or improve the habitat of the fish and wildlife throughout the area.

D. **Impacts of Soil Erosion on Water Quality and Quantity**

The City established an erosion and sediment control ordinance governing construction practices. The City will also evaluate existing erosion control problem areas that may not be associated with recent construction and formulate mitigation plans to rectify those issues. Given increased regulation of the typical causes of soil erosion and sediment transport, it is anticipated impacts of soil erosion on water quality in the St. Francis area will be greatly diminished.

E. **General Impact of Land Use Practices**

As stated in Section VI.B, increases in impervious surfacing will require mitigation to reduce the impacts related to change in permeability from the natural Anoka Sand Plain conditions. The preferred mitigation method is to require infiltration, where appropriate, to duplicate the existing conditions. This preference will be incorporated into the development ordinance revisions that will be updated to meet the recommendations of this SWMP. In addition to infiltration, the City will consider low impact alternatives and oversized regional retention basins to mitigate potential downstream flow changes.

The current St. Francis Ordinance Chapter 13 regarding wetland buffer requirements will be modified to match the URRWMO's buffer requirements as follows:

Table 6

Wetland Classification per URRWMO and Required Buffer Width

Wetland Classes	Minimum Buffer Width
High Priority Wetlands	25 ft
Moderate Priority Wetlands	20 ft
Low Priority Wetlands	15 ft
Use Wetlands	15 ft

The use of native vegetation as buffers for all wetlands will be set forth in the ordinances.

F. **Adequacy of Existing Regulatory Controls**

With the proposed ordinance revisions, the City of St. Francis believes it has adequate policies in place to self-regulate the anticipated growth without sacrificing its abundant water resources. In addition to its ordinances, the existing greater area regulatory controls of the URRWMO, BWSR, the Metropolitan Council, the DNR, the US Corps of Engineers, Anoka County, etc. are more than adequate to properly manage or mitigate adverse impacts on public waters and wetlands.

The City must rely on the regulatory authority of Anoka County, the URRWMO and the regional, state, and federal plans to monitor and control the runoff entering the City from outside its jurisdiction. The City understands that it will also need to address issues brought to its attention by these outside regulating authorities.

The City is also concerned that the ordinance revisions, various permit fees and charges needed to finance the proposed changes will adversely affect development in St. Francis. To ensure that St. Francis has an equal chance of attracting development, the City must rely on outside agencies and WMOs in the area to regionally enforce similar environmental requirements with comparable financing obligations.

G. **Adequacy of Programs**

The City of St. Francis believes that this Plan, and any other BMPs deemed appropriate by the City will be adequate to:

1. Limit soil erosion and water quality degradation
2. Maintain the tangible and intrinsic values of natural storage and retention systems
3. Maintain water level control structures

H. **Future Potential Problems**

The greatest potential for future problems with stormwater planning is associated with the ever-growing impervious footprint that is inevitable with growth. As stated earlier, highly pervious nature of the Anoka Sand Plain means that the cumulative effect of development could result in drastically increased runoff volume and flow rates.

The recommended ordinance revisions are designed to:

1. Encourage infiltration and soil ripping of newly graded sites so that developed sites can adequately mimic unimproved site runoff and flow rates.

2. In areas where infiltration is possible, limit post development runoff rates to 90-percent of the existing condition so that multiple developments do not cause cumulative increases in the downstream condition. In areas where infiltration is not permitted/ possible, post development rates shall not exceed existing rates.

In addition, regional pond modifications are also recommended where plausible because of the economic and runoff management capabilities of larger scale hydrologic systems. By implementing the recommendations in the SWMP, these potential future problems are being anticipated and adequately addressed within the City of St. Francis. As stated earlier, the City must rely on the regulatory authority of Anoka County, the URRWMO and the regional, state, and federal agencies to monitor and control the runoff entering the City from outside its jurisdiction. The City understands that it will also need to address issues brought to the attention by these outside regulating authorities.

VII. FINANCIAL CONSIDERATIONS

Typically a Capital Improvement Program (CIP) is an itemized program for at least a five-year prospective period. The items and associated costs are subject to at least a biennial review. The benefits include setting forth the schedule, timing, and details of specific contemplated capital improvements by year, together with their estimated cost, the need for each improvement, financial sources, and the financial effect that the improvements will have on the local government unit or watershed management organization.

A. 5-year Capital Improvement Program

The current 5-year Capital Improvement Program includes the following:

1. Kings Highway Ditch Maintenance..... $25,000
2. Drainage Easement Maintenance $10,000
3. Jet Vac Equipment..... $250,000
4. 225th Storm Sewer..... $15,000

Total Current 5-year Plan Expenditures..... $300,000

In addition to the current 5-year Capital Improvement Plan, the following improvements are recommended to rectify the potential problems identified in Section VI of this plan:

1. Annual Sediment Pond Cleaning (1/20th of sites)..... $15,000/year
2. Annual Storm Sewer/ Sump Catch Basin Cleaning (1/5th of structures) $20,000/year
3. Annual Street Sweeping $15,000/year
4. Retrofit Existing BMPs..... $5,000/year

Total Additional 5-year Plan Expenditures..... $275,000

The financial impact of implementation of the proposed regulatory controls and programs identified in Section VI is anticipated to include the following:

1. The Preparation of This SWMP $30,000
2. Adopting the Stormwater Trunk Fees/ Stormwater Utility Fees $20,000
3. Adopting and Enforcing the SWMP Local Controls and Standards[9] $25,000/year
4. Total Current Five Year Plan Expenditures..... $300,000
5. Total Additional Five Year Plan Expenditures..... $275,000

[9] Estimated cost is based on one half-time employee at salaries (plus benefits) of $50,000 per year.

Total 5-year Financial Impact $750,000

Although the cost associated with these recommendations can be financed locally, the City will pursue all opportunities for outside funding. Without outside financing the City will need to finance the adoption of, and enforcement of, the local controls and standards, implementation of the specified programs, and capital improvements recommended in this SWMP using one or more of the following:

1. Establish stormwater development charges (stormwater trunk fees)
2. Establish stormwater utility fees
3. Create stormwater assessment districts
4. Accessing funds from other City projects and funds
5. Increasing the general levy (within levy limits)

Outside funding is greatly desired as the impact of increasing these taxes, fees and charges will increase tax burden against homes and farmsteads, increase the utility burden for all parcels or postpone other necessary improvements currently scheduled in the City's Capital Improvement Plan.

The following are potential sources of outside funding that may be available to assist in the financing of the various stormwater related issues:

1. Minnesota Clean Water Legacy funds
2. Clean Water Partnership Funds
3. Clean Water Act, Section 319 funds, administered by the MPCA
4. Minnesota Public Facilities Authority (PFA) grants and low interest loans

There is significant competition for these limited funding sources. If these sources are pursued by the City, it will likely involve innovative treatment technologies in addition to timely requests for funding.

B. Local Financing Options

1. Development Charges or Trunk Fees

   The City of St. Francis will pursue a policy where trunk storm sewer costs would be assessed on an area basis as determined by a resolution. Total lateral cost would be assessed to a development on an area basis. In lieu of paying a future charge, developers may, before a final plan is signed, agree to pay the City the storm drainage improvement charge established by Council resolution. The charge would be based upon the number of total gross square feet in the plat. The developer would be given a credit of over-sizing storm improvements in the plat. The charges collected would be deposited into a special storm drainage improvement fund and would only be used to pay for storm drainage financing and improvements. Maintenance of the storm sewer system is expected to be paid for through revenue generated from the Stormwater Utility Fund.

   Since the recommended additional costs are predominantly associated with continued new development, it is presumed to be fair and equitable to have the developers pay for their impacts. Hence, the use of a stormwater area development charge (or trunk fee), based on the cost of rectifying the downstream impact associated with the development is recommended.

2. Stormwater Utility Fees

The City of St. Francis will pursue a policy where the City may impose just and reasonable charges for the use and availability of storm sewer facilities. Rates and charges for the use and availability of the system would be determined through the use of a Residential Equivalent Factor ("REF"). For the purposes of this policy, one REF is defined as the ratio of the average volume of surface water runoff coming from one acre of land and subjected to a particular use, to the average volume of runoff coming from one acre of land subjected to typical single-family residential use within the City during a standard five-year rainfall event. Rates and charges for the use and availability of the system would be determined through the use of a Residential Equivalent Unit ("REU"). For the purposes of this policy, one REU is defined as the product of the acreage of a particular parcel multiplied by the REF. The REF would be based on the relative runoff generated by any land use compared to the expected runoff from a typical half-acre single-family dwelling. This relationship would be interpreted as a function of the percent of the total lot area that is impervious and would be applied as determined when the policy is implemented.

The City Stormwater Utility fee is intended to finance infrastructure maintenance, upgrading, reconstruction and new construction serving previously developed areas. It is not typically used to finance retrofitting the existing system to accommodate new developments. Most cities require the developer to finance the entire new storm sewer system associated with the development. Then, once the new system is accepted and turned over to the City, the municipal maintenance funds (typically stormwater utility funds) are used to maintain the new system.

3. Accessing funds from other City Projects and Funds

The costs of improvements to undeveloped land shall be borne by the developer.

4. Creating a Stormwater Assessment District or Stormwater Tax District

If a watershed is well defined and the greater majority of the property owners have a share in the benefit of the proposed storm sewer improvement, the City could form a stormwater assessment district. When improvements or repairs are needed within the district, an advertisement hearing process is required similar to that used for assessments in Minnesota Statute 429. Many cities are not choosing this financing option because it can be cumbersome. Cities also find it difficult, on occasion, to legally prove the level of benefit associated with the assessment.

5. Increasing the General Levy

This option is not favored because it resembles duplication of costs for property owners who have either directly or indirectly already financed their own developments. Unless tax expenditures for stormwater needs can be uniformly spread to all properties, political opposition is expected from entities that have already invested in stormwater facilities.

C. **Recommended Local Financing**

1. The cost of retrofitting the downstream system to accommodate new developments should be borne by newly established New Development Charges or Trunk Fees.

2. The cost of existing system retrofitting and maintenance projects should be borne by the Stormwater Utility fund as this is the primary focus of these funds.

3. The cost of new improvements in undeveloped land should be borne by the developer.

4. Creating a storm sewer assessment district is not recommended.

5. Increasing the general levy for storm sewer related costs is not recommended.

VIII. IMPLEMENTATION OF PRIORITIES AND PROGRAM

A. Special Waters

According to the MPCA's Special Waters list (January 2004), special waters in the St. Francis area include:

1. The **Rum River** is considered Scenic/Recreational from Highway 27 bridge in Onamia to Madison and Rice Streets in Anoka.

The City will meet State requirements for development near these waters as identified in the Minnesota Stormwater Manual by designing stormwater basins using the sizing criteria described in ***Design Calculations for Wet Detention Ponds***, by William Walker Jr. The City will also require stormwater practices that promote infiltration/filtration and decrease impervious areas (better site design and integrated stormwater management), where practical. In addition, the City will assist with enforcement of any NPDES Phase II permit requirements for new ponding areas when new impervious surface is created.

B. Implementation Schedule

In accordance with Minnesota Rule 8410.0010, the City of St. Francis must provide for the adoption of necessary regulatory controls, stormwater design standards, education programs, data collection programs, and maintenance programs. This SWMP must clearly distinguish the City's responsibilities versus the responsibilities of the URRWMO and Anoka County with respect to implementing each program element.

According to Minnesota Rule 8410, each organization plan must include a schedule for implementation by the organization, joint powers agreement members, and affected local units of government. All plan controls and programs to be implemented by the organization must be in effect within one year of plan adoption. All local plan controls and programs must be developed and in effect within two years of adoption of the last organization plan in the local unit of government.

The City of St. Francis fully intends to implement the ordinance revisions recommended in this plan within 180 days of plan acceptance by all regulatory agencies having jurisdiction and the City Council.

C. Enforcement

This SWMP must identify the procedure to be followed to enforce violations of the controls of the organization as well as those of the local unit of government.

The City uses a permitting process with a bond/ Irrevocable Letter of Credit requirement for new developments. If the developer fails to follow the conditions of the permit, the City can contact the bonding company requesting immediate rectification or act on the letter of credit.

The City is will amend existing ordinances and adopt others necessary to enforce requirements identified in this plan. Such ordinances include:

1. Existing Ordinances in Compliance with the URRWMO SWMP:
    a. Rum River Management- Chapter 9
    b. Flood Plain Regulations- Chapter 12
    c. Municipal and Public Utilities- Chapter 3 (ISTS)
2. Existing ordinances to be amended to incorporate requirements of the URRWMO SWMP:
    a. Urban Storm Water Pollution Control for New Developments
3. Additional ordinances to be added:
    a. Wetland Ordinance

In addition, the City will work with the DNR to satisfy shoreland requirements. Each of these ordinances will be (is) enforceable locally and will carry penalties for failure to adhere to them. In addition, the MPCA can impose significant fines for pollution discharges associated with these ordinance controls as well as any unauthorized pollution discharge.

D. **Administration Process**

This SWMP must specify the administrative process and timelines for the submittal, review, and approval of local plans and variances by the organization.

Requirement 1: All communities need to include information on the types of best management practices to be used to improve stormwater quality and quantity and the maintenance schedule for the best management practices (BMPs).

Solution 1: *The City's current development ordinances are designed to regulate stormwater quantity in accordance with the URRWMO requirements. Within a year after the acceptance of this plan, the City will review its ordinances controlling development to include the recommendations of this SWMP, chiefly the recommended runoff volume controls. In addition, the City will implement various BMPs and determine if other BMPs will be needed on an ongoing basis.*

Requirement 2: All communities need to include a Wetland Management Plan or a process and timeline to prepare a plan. The Wetland Management Plan should incorporate a function and value assessment for wetlands. Pretreatment of stormwater prior to discharge is required for discharge into all wetland types. Buffers should be consistent with the functions and values identified in the plan. The use of native vegetation as buffers for high quality wetland is strongly encouraged.

Solution 2: *This process is proposed to move forward as development occurs. A complete evaluation of wetlands on a site will be performed as development occurs, and a Wetland Management Plan for the affected wetlands will be completed.*

Requirement 3: The City needs to include funding sources for the various required activities.

Solution 3: *The required funding sources are described in detail in Section VII of this SWMP.*

Requirement 4: The City needs to include activities to be undertaken along with numerical goals, strategies and timelines.

Solution 4: *This Plan and the City's ordinances include policies and BMPs describing the necessary activities, numerical goals, strategies and timelines.*

Table 7 is an implementation process list of the recommended actions, timing, responsible party, and the cost or funding sources based upon the data compiled in this plan.

Table 7

Implementation Process List

Action	Timing	Responsible Party	Cost/Funding Source
Maintain and implement Capital Improvement Program.	On-going, updated as needed	City of St. Francis	Stormwater utility fee
Implement a stormwater maintenance program to ensure the successful operation of the drainage system.	On-going.	City of St. Francis	Stormwater utility fee
Corrective actions for stormwater problem areas.	On-going, as problems come up.	City of St. Francis	Stormwater utility fee
Enforce erosion and sedimentation control criteria for new developments.	On-going, as developments are submitted to the City for approval.	City of St. Francis	Funding by development fees
Establish regional ponding areas as described herein and implement as part of the stormwater management system.	On-going, as Developments are submitted to the City for approval. Right of first refusal purchasing at time of sale of property.	City of St. Francis	Stormwater utility fees/ Cost Sharing with neihboring jurisdictions

Action	Timing	Responsible Party	Cost/Funding Source
Standardize review procedures in-place to ensure all development within the City is in compliance with proper erosion control practices.	Currently in place. Update as necessary.	City of St. Francis	Funding by development fees/
Require detailed hydrologic analysis of all ponding areas prior to final plat approval.	Currently in place. Update as necessary.	Developer's Engineers, City of St. Francis	Developers pay for design and construction of developments. City staff funding by development fees.
Establish high water elevations governing building floor elevations adjacent to ponding areas and floodplains as development occurs and prior to drainage facility construction.	On-going.	Developer's Engineers, City of St. Francis	Developers pay for design and construction of developments. City staff funding by development fees.
Establish overflow routes and maintain them to provide relief during extreme storm conditions, which exceed design conditions.	On-going, as developments are submitted to the City for approval.	City of St. Francis	Developers pay for design and construction of overflow routes. City-conducted maintenance funded by development and stormwater utility fees.
Implement an education program for City residents, staff, and the development community.	On-going.	City of St. Francis	City of St. Francis, with help from URRWMO, DNR, University of Minnesota Extension Service, SWCD, NRCS
Low impact development/better site design for new developments encouraged.	On-going, as developments are submitted to the City for approval.	Developer's Engineers, City of St. Francis	City staff funding by development fees. Developers pay for design and construction of developments.

Action	Timing	Responsible Party	Cost/Funding Source
Regulate construction and land uses along the bluff, to prevent erosion.	On-going, as developments are submitted to the City for approval.	City of St. Francis	Funding by development fees.
Encourage landowners to retain any areas of native vegetation, and to plant species native to the area, to protect and improve wildlife habitat and maintain the historic ecological role and appearance of the steeper riverbanks.	On-going, as developments are submitted to the City for approval.	Land Owners, Developers, City of St. Francis	Landowner, City of St. Francis, Future grant opportunities
Adopt and implement amendments to the SWMP and update the SWMP as necessary.	As warranted by future standards or regulations by 2015 or earlier if needed.	City of St. Francis	Stormwater utility fees
Develop an implementation strategy for TMDLs.	Upon formulation of TMDLs	City of St. Francis, working with URRWMO	MPCA, URRWMO, BWSR, DNR, City of St. Francis

IX. AMENDMENT PROCEDURES

This Updated SWMP extends to 2015. Amendments to the plan may be adopted and implemented as warranted by future standards or regulations. The City is aware that the Upper Rum River Watershed Management Organization has adopted its watershed management plan which triggered the mandatory re-evaluation and update of this SWMP. The City will initiate any amendments by resolution of the City Council. The citizens of St. Francis, City Staff, the City Council, or any of the review authorities having jurisdiction may submit amendment requests.

The amendment request will be evaluated by City staff and a recommendation will be made to the City Council. If the Council deems the amendment necessary, it will order City staff and/or the City attorney to draft an amendment.

The draft amendment will be brought to the Council for review. If approved, the Council will pass a resolution calling for a hearing on the amendment. The amendment must be forwarded to each organization affected by the amendment. The proposed amendment will be published in the official city newspaper not less than 10 days before the hearing.

The hearing will be held in a public place, typically in the City Council chambers. At the hearing, all interested citizens will be given the opportunity to submit a written statement or voice their opinion on the acceptability of the proposed amendment.

When all have been heard, the City Council will close the hearing and vote their decision on whether to pass a resolution accepting the amendment as written.

According to State Statute 103B.235, Subd. 5, Amendments, to the extent and in the manner required by the URRWMO, all major amendments to the SWMP shall be submitted to the URRWMO for review and approval in accordance with the provisions of State Statute 103B.235, subdivisions 3 and 3a for the review of plans. All major plan updates and amendments will be submitted to the Upper Rum River Watershed Management Organization and the Metropolitan Council simultaneously. All minor amendments will be reviewed and approved by the City Council.

X. SUMMARY AND RECOMMENDATIONS

A. Summary

The St. Francis SWMP has a dual purpose: it will serve as a guide for the construction of storm drainage facilities and provide a basis for a consistent approach to the preservation of wetlands, streams, and the Rum River. The following issues have been incorporated into this plan:

1. Division of the City into major watersheds based on contour maps and natural topography
2. Determination of stormwater runoff under ultimate land use conditions
3. High water levels of major ponding areas
4. Recommendations for the revision of the current development ordinances
5. Recommendations for standard Operations and Maintenance procedures
6. Recommendations for specific construction site erosion control practices
7. Estimated construction and implementation costs of the SWMP
8. Recommendations for education of City residents, staff, and development community.

The primary function of an urban storm drainage system is to minimize economic loss and inconvenience due to periodic flooding of streets and other low-lying areas. Adequately designed storm drainage facilities provide flood control, minimize hazards and inconvenience associated with flooding, and protect or enhance water quality. The SWMP takes the entire drainage basin with future saturation development into consideration.

Wet water quality ponds upstream or dry regional infiltration basins (where possible) will help control the rate and the volume of stormwater runoff. To provide flood protection for adjacent property, the design storm interval for ponding areas with a known outfall is a 100-year storm as compared to a 10-year storm for design of storm sewer piping. For land locked ponds or wetlands, the design storm interval is a back-to-back 100-year storm or the 100-year, 10-day snow melt event, whichever is larger. Any new residential, commercial, industrial and other habitable structures shall be constructed with the following low floor elevation: Elevation of the lowest floor of a structure shall be a minimum of 1 foot above the Emergency Overflow, or 1 foot above the HWL of the nearby pond or waterbody, whichever is higher. The area of a pond's HWL plus 1 foot of freeboard shall be contained entirely within an outlot, or drainage and utility easement, that is owned and maintained by the City.

In areas adjacent to designated flood plains as mapped on a Flood Insurance Rate Map, the Regulatory Flood Protection Elevation (RFE) applies. The RFE is defined as the mapped 100-year flood elevation plus 1 foot. The URRWMO requires that the low floor elevation of structures be 1 foot above the 100-year high water level or regional flood level for the adjacent water or wetland. City policy requires all structures, including accessory structures, to be elevated on fill so that the lowest floor including basement floor is 1 foot above the Regulatory Flood Protection Elevation or 1 foot above the mapped 100-year flood elevation. The finished fill elevation for structures shall be no lower than 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.

The numerous natural depressions found throughout St. Francis have been incorporated into the SWMP as ponding areas. Wetlands may be, and are currently being used for stormwater storage for larger rainfall events. They may continue to be used for this purpose – even after upstream development, provided that:

1. There is acceptable Best Management Practice pretreatment of the runoff in accordance with the MPCA NPDES/SDS Construction Permit, Section III.C., Permanent Stormwater Management System.
2. The bounce from the normal water level to the high water level does not exceed two feet.

The effective use of ponding areas enables the installation of outflow sewers with reduced capacities since the design storm duration is effectively increased over the total time required to fill and empty the ponding reservoirs. Storm sewers represent a sizable investment for the community and this investment can be more efficiently utilized by ponding stormwater in designated ponding areas and allowing smaller diameter pipes to be used as outfall lines.

Equally as important as flood control and cost considerations, is the use of ponding areas to:

1. Improve water quality;
2. Return stormwater to the groundwater table;
3. Increase water amenities in developments for aesthetic, recreational and wildlife purposes.

For water quality ponds, the storage below the outlet is the most important consideration. The area and depth of the ponds may differ from the values presented here, storage below the outlet must be provided so that the prescribed pollutant loading of the system is not exceeded.

Amenity aspects are maximized by careful planning in the initial development of any residential or industrial area and by integrating the ponding system into an overall comprehensive SWMP.

The wildlife aspects of the ponding areas shall be maximized in design and the proper location of a trail system will allow access to these areas for wildlife observation.

B. **Model Results**

Figures 10A and 10B are watershed maps containing major watershed and subbasin boundaries that were modeled using StormNET. The main hydraulic elements used in the modeling were open channel sections, including portions of Seelye Brook, Rum

River, and roadside ditches, junctions, and outfalls. Pond elements were also used. However, detention storage was not modeled. The ponds instead represent a runoff convergence point of one or more watersheds in the location of a pond. A simple outfall was used in most situations were a detention pond exists. In all other cases, outfalls represent the subbasin outlet.

Although detailed survey information and storm sewer inventory was not available, the time of concentration was adjusted to reflect storage in the watershed, land cover, and pipe or channel flow.

Minnesota Regional Regression Equations:

Regional regression equations were developed for estimating peak flow on small, ungaged streams in Minnesota in "Techniques for Estimating Peak Flow on Small Streams in Minnesota" (USGS, Water-Resources Investigations Report 87-4170 and 97-4249). The regression equations are typically used for watersheds greater than 50 acres, where SCS methodologies tend to over- estimate peak discharge rates. Report 87-4170 uses watershed area, percent storage (lakes and wetlands), and slope to calculate the peak discharge. The 97-4249 uses percent lakes instead of overall storage to calculate peak runoff. Due to the large percentage of wetlands in St. Francis, the '87 regression equations were used to estimate the peak runoff for larger subcathcments. Figures 10A and 10B show watershed IDs and area. Table 8 is a summary of the regression analysis using equations from Report 87-4170.

Table 8

Regional Regression Equation Analysis, Report 87-4170

WATERSHED DESCRIPTION	AREA (S.M.)	STORAGE (PCT)	SLOPE (FT/MI)	RUNOFF (IN.)	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
SB10	0.89	27.2	26.4	6	15.71	30.40	42.07	59.83	74.31	89.94
SB13	0.88	33.7	19.6	6	13.17	25.24	34.75	49.16	60.85	73.43
SB16	1.12	21.2	6.8	6	13.52	25.46	34.75	48.66	59.83	71.73
SB21	1.05	15.6	15.8	6	18.56	35.76	49.41	70.08	86.92	104.97
SB23	3.09	28.8	10.6	6	29.27	55.06	75.01	104.81	128.72	153.99
SB24	2.38	31.6	31.7	6	32.49	62.61	86.36	122.34	151.61	182.89
SB26	2.39	25.6	58.1	6	42.25	82.77	115.14	164.55	205.16	248.74
SB28	1.13	8.7	89.8	6	40.55	81.80	115.72	168.23	212.23	259.92
SB29	0.90	11	68.6	6	29.17	58.38	82.27	119.14	149.89	183.24
SB30	0.73	12.5	52.3	6	22.03	43.80	61.53	88.82	111.50	136.09
SB31	0.50	7.4	116	6	25.34	51.77	73.78	108.15	137.17	168.94
SB32	1.21	25	95	6	29.91	59.51	83.47	120.43	151.07	184.31
SB46	0.64	27.2	10.6	6	9.35	17.77	24.38	34.34	42.39	51.04
SB52	1.26	30.5	7.9	6	13.53	25.40	34.60	48.37	59.40	71.16
SB53	0.95	31.5	10.6	6	11.86	22.44	30.70	43.12	53.11	63.82
SB55	2.27	55.7	5.3	6	14.84	27.27	36.71	50.68	61.72	73.38

Percent storage was taken for the NWI data for each watershed, as the NWI data contains areas of both lakes and wetlands. Slope was calculated based on 10'

topographic contours. The values of Q2, Q5, Q10, Q25, Q50, and Q100 were used to back calculate a time of concentration for the watershed that produced peak runoff values that were relatively close to those provided by the regression.

Curve Numbers:

Anoka County has detailed Minnesota Land Cover Classification (MLCCS) data. The City of St. Francis has roughly 180 unique land cover classes, each with its own associated CN depending on soil type. Using GIS, the watershed areas were intersected with hydraulic soil groups and MLCCS data. An Excel spreadsheet was then used to apply CNs to each polygon in the watershed with a unique land cover and soil group combination. From there, an overall weighted CN was calculated for each watershed and used in the modeling. MLCCS data was not available in Isanti County, so only the portions of the watershed in Anoka County were calculated. CNs for the watersheds with portions in Isanti County were adjusted in the model. Figure 11 is a map of CNs for St Francis.

Watershed Modeling:

Each subbasin falls in one of six larger watershed areas. These areas include West St. Francis, Seelye Brook, Rum River, County Ditch (CD) 18, CD 19, and Cedar Creek. Figure 13 is a map of the major watersheds within the city. Each of these subbasins are further described below. Table 9, found on page 51 of this plan, is a summary of the watershed characteristics for each subbasin.

West St. Francis:

On the west side of St. Francis, that is west of the Seelye Brook watershed to the city limits, a small portion of the city discharges to the west into Stone Lake (Sherburne County) and ultimately into the Trott Brook System. The area of this major watershed is 771 acres. Land cover is predominantly herbaceous and nonvascular vegetation, with some forest resulting in a weighted CN of 46.

Seelye Brook:

Roughly 8280 acres of St Francis, especially west of town, drains to Seelye Brook. This area includes some drainage into tributaries. Land cover consists primarily of herbaceous, nonvascular vegetation, cultivated vegetation and some forests. Also, some higher density residential development exists along the east side of the watershed. Weighted curve numbers range from 41 to 60 depending on soil type and land cover. A portion of Seelye Brook was modeled, but lacks accuracy because of the large wetland areas not modeled that would provide large amounts of storage.

The larger subbasins used regression analysis to determine times of concentration. In the residential and commercial areas, SCS methods discussed in TR-55 were used to calculate time of concentration based on sheet flow, shallow concentrated flow, and channel flow. Although storm sewer was not modeled, the time of concentration for the subbasin has a storm sewer component factored in.

Rum River:

The Rum River corridor discharges through the center of the city, with much of the high density residential flowing to it. A portion of this watershed drains to a tributary that joins the Rum River north of the city limits. The total area of this major watershed is

roughly 4120 acres. Land cover is high density residential near the south edge of town and cultivated vegetation and woodlands on the north. A low density residential development exists along the north city limits, with ponds and storm sewer as the stormwater conveyance system. Weighted CNs range from 52 to 85 in the residential and commercial areas of the south, and from 30 to 57 in the north. Again, a portion of the Rum River was modeled, but contour information lacked enough detail to model an accurate flood plain and channel cross section.

The primary stormwater conveyance system is storm sewer discharging into detention and treatment ponds before discharging into the Rum River. Times of concentration and peak runoff rates were calculated the same as with Seelye Brook.

CD 18:

CD 18 drains roughly 1085 acres of low density residential, herbaceous, and cultivated vegetation areas. CD 18 flows to the south and eventually drains into the Rum River. Weighted curve numbers range from 56 to 73. Some higher curve numbers, around 93, exists in some smaller subbasins that have a high percentage of open water. A portion of CD 18 was modeled as an open channel section, but requires additional survey to accurately model flood plain storage.

Times of concentration and peak runoff rates were calculated the same as with Seelye Brook and Rum River.

CD 19:

CD 19 also drains primarily low density residential areas. St Francis contributes roughly 1530 acres to the headwaters of CD 19, which eventually flows into the Rum River south of the city limits. Land cover is woodland, herbaceous, and cultivated vegetation, with some low density residential development. Weighted curve numbers range from 43 to 52.

Regression analysis was used to calibrate the time of concentration.

Cedar Creek:

Roughly 807 acres drains to Cedar Creek in the southeast corner of St Francis. Cedar Creek is a tributary of the Rum River; the confluence is south of Oak Grove. Land cover is primarily woodland and herbaceous, resulting in weighted curve numbers ranging from 47 to 49.

Regression analysis was used to calibrate the time of concentration.

General:

Information included in the model will continue to be updated as development occurs and additional information becomes available.

Table 9

Summary of watershed characteristics, 100-year rainfall event.

Element ID	Area (acres)	Weighted CN	Time of Concentration (days hh:mm:ss)	Total Runoff (inches)	Peak Runoff (cfs)
SB1	38.6	77	0 03:22:21	3.35	28.5
SB2	24.9	85	0 03:22:21	4.16	23.0

Element ID	Area (acres)	Weighted CN	Time of Concentration (days hh:mm:ss)	Total Runoff (inches)	Peak Runoff (cfs)
SB3	12.6	66	0 03:22:21	2.33	6.2
SB4	47.5	72	0 00:16:44	2.87	162.3
SB5	31.9	48	0 00:32:42	0.94	17.6
SB6	75.5	78	0 00:21:11	3.45	278.5
SB7	139.9	75	0 00:20:10	3.16	484.6
SB8	88.2	52	0 00:23:15	1.21	90.3
SB9	241.6	64	0 01:12:29	2.16	237.5
SB10	572.1	55	0 03:17:03	1.43	157.8
SB11	267.9	57	0 01:28:31	1.59	153.6
SB12	142.9	52	0 01:48:32	1.21	49
SB13	564.8	42	0 01:26:43	0.56	72.85
SB14	49.6	75	0 00:58:01	3.16	88.7
SB15	36.9	52	0 00:17:54	1.21	44.1
SB16	36.4	75	0 00:32:37	3.16	96.1
SB17	64.2	63	0 00:20:43	2.07	139.3
SB18	58.3	58	0 00:21:54	1.66	94.4
SB19	8.5	59	0 00:14:21	1.74	17.9
SB20	23.5	57	0 00:18:07	1.59	39.7
SB21	670.4	57	0 03:32:06	1.59	198.8
SB22	97.2	56	0 00:34:08	1.51	104.3
SB23	1975.5	46	0 04:02:11	0.81	225.3
SB24	1523.6	51	0 02:12:51	1.14	415.9
SB25	124.9	49	0 02:55:18	1	23.6
SB26	1529.4	52	0 01:43:32	1.21	543
SB27	229.5	60	0 01:10:02	1.82	188.4
SB28	722.4	41	0 01:22:17	0.51	81.1
SB29	572.9	46	0 01:07:05	0.81	152.2
SB30	468.1	50	0 01:51:21	1.07	132.8
SB31	322.4	34	0 00:43:19	0.18	7.1
SB32	771.8	46	0 01:30:42	0.81	167.3
SB33	4.1	73	0 02:55:18	2.96	3
SB34	32	73	0 00:41:40	2.97	67.6
SB35	11	93	0 00:40:20	5.04	38.5
SB36	4	93	0 00:14:28	5.04	23.5
SB37	13.6	75	0 00:15:43	3.16	52.2
SB38	15.2	75	0 00:17:58	3.16	55.5
SB39	58.8	57	0 00:37:26	1.59	63.4

Element ID	Area (acres)	Weighted CN	Time of Concentration (days hh:mm:ss)	Total Runoff (inches)	Peak Runoff (cfs)
SB40	11.4	73	0 00:15:54	2.97	40.9
SB41	27.2	59	0 00:21:16	1.74	47.3
SB42	45.6	74	0 00:19:31	3.06	155.3
SB43	164.6	51	0 02:55:18	1.14	36.8
SB44	6.1	75	0 00:18:36	3.16	21.9
SB45	283.4	60	0 01:47:08	1.82	168.6
SB46	407	56	0 04:03:02	1.51	102.5
SB47	79.8	59	0 00:20:42	1.74	141
SB48	141.5	47	0 00:30:40	0.87	72.5
SB49	34.7	52	0 00:16:48	1.21	42.8
SB50	41.2	50	0 00:22:17	1.07	36.2
SB51	33.7	50	0 00:20:41	1.07	31.1
SB52	807.8	43	0 04:19:46	0.62	63.6
SB53	608	49	0 03:42:39	1	97.3
SB54	198.9	47	0 00:35:10	0.87	92.6
SB55	1452.6	30	0 06:34:31	0.06	8.1
SB56	719	52	0 05:06:14	1.21	116.5

It is extremely important that each area be re-evaluated at the time of final design to confirm the criteria used in this study and to make any changes that a proposed development may dictate.

All storm sewer facilities, especially those conveying large quantities of water at high velocities, should be designed with efficient hydraulic characteristics. Special attention should be given during final design to those lines that have extreme slopes and create high hydraulic heads.

The Best Management Practices (BMPs) recommended by the MPCA should be followed wherever necessary.

C. **Recommendations**

The following items are included based upon the data compiled in this plan:

1. The SWMP as presented herein will be adopted by the City of St. Francis.
2. The current ordinances will be reviewed and the recommended ordinance revisions should be addressed.
3. Standard review procedures will be established, where feasible, to ensure all development within the City is in compliance with proper erosion control practices.

4. Detailed topographic surveys and storm sewer inventory should be incorporated into the hydrologic and hydraulic model when available.

5. Detailed hydrologic analysis will be required, where feasible, during final design of all new developments and ponding areas.

6. Final high water levels governing building elevations adjacent to ponding areas and floodplains will be established as development occurs or when drainage facilities are constructed.

7. Overflow routes will be established and maintained, where feasible, to provide relief during extreme storm conditions, which exceed design conditions.

8. A stormwater maintenance program will be implemented to ensure the successful operation of the drainage system.

9. The erosion and sedimentation control criteria for new developments will be enforced.

10. An education program for City residents, staff, and development community will be implemented, where feasible.

11. Amendments to the plan should be adopted and implemented as warranted by future standards or regulations, where feasible.

12. That the plan should be updated in the year 2015 or earlier if needed and feasible.

The existing storm sewer system of the City of St. Francis is not adequate to handle the continued development around the presently developed area. If development continues, the existing system will need major improvement and enlargements to effectively serve the community without excessive flooding. The proposed infiltration and oversized ponding development scenario together with strategically located regional ponds presents one method of accommodating the present growth of St. Francis. However, this plan and the proposed scenario is not necessarily the only method of accomplishing the goal of comprehensive stormwater management.

Given this, it is imperative that this plan and the StormNET model of the City is continually updated on a regular basis and compared to the baseline runoff of the existing conditions model to ensure that any adjustments in area developments continue to be coordinated. In addition, the proposed stormwater development charges should be updated annually to ensure that the associated City costs are fully financed. In this manner, the plan can maintain its usefulness as a current document.

Finally, the EPA has initiated the NPDES Phase II requirements whereby cities in several previously mentioned categories are required to apply for a Phase II permit. The City of St. Francis is not yet a mandatory small MS4 community, but it is likely that requirements will continue to increase and St. Francis may become a MS4 community in the future. One of the requirements of the NPDES permitting process is the development and implementation of a storm water pollution prevention plan.

XI. ACRONYMS AND GLOSSARY

A. Acronyms

BMP	-	Best Management Practices
BWSR	-	Minnesota Board of Water and Soil Resources
DNR	-	Minnesota Department of Natural Resources
EOF	-	Emergency Overflow
EPA	-	United States Environmental Protection Agency
EPB	-	Environmental Policy Board
EQB	-	Minnesota Environmental Quality Board
FEMA	-	Federal Emergency Management Agency
FIRM	-	Flood Insurance Rate Map
GIS	-	Geographic Information System
GPS	-	Geographic Positioning System
HWL	-	High Water Level, typically associated with the 100 year rainfall event
IDF	-	Intensity-Duration-Frequency (for precipitation)
LID	-	Low Impact Development
LUST	-	Leaking Underground Storage Tank
MnDOT	-	Minnesota Department of Transportation
MnRAM	-	Minnesota Routine Assessment Method
MPCA	-	Minnesota Pollution Control Agency
MS4	-	Municipal Separate Storm Sewer System
MSWMP	-	Metropolitan Surface Water Management Program
MUSA	-	Metropolitan Urban Services Area
NOI	-	Notice of Intent (for coverage under the NPDES Permit Program)
NPDES	-	National Pollutant Discharge Elimination System
NPDES/SDS	-	The General Permit Authorization to Discharge Storm Water Associated with Construction Activity under the National Pollutant Discharge Elimination System/State Disposal System Permit Program. Administered by the MPCA
NURP	-	Nationwide Urban Runoff Program
NWL	-	Normal Water Level or Low Outlet Elevation
SWCD	-	Soil and Water Conservation District
SWMP	-	Surface Water Management Plan
SWPPP	-	Storm Water Pollution Prevention Program
TP	-	Total Phosphorus
TEP	-	Technical Evaluation Panel, typically needed for WCA approval of wetland impacts
TSS	-	Total Suspended Solids
URRWMO	-	Upper Rum River Watershed Management Organization
USEPA	-	United States Environmental Protection Agency
UST	-	Underground Storage Tank
WCA	-	The Minnesota Wetland Conservation Act and its subsequent Minnesota Rules 6115 and 8420.
WD	-	Watershed District
WMO	-	Watershed Management Organization

B. **Glossary**

100-Year Flood: The flood reaching water levels or flow rates with a one-percent (1%) chance of occurring in any given year. On the average, a 100-year flood is statistically probable to occur only once in a 100-year period. A 100-year flood is synonymous with Base Flood, Regional or 1% Chance Flood.

100-Year Storm Event: The rainfall event having a total precipitation over a 24-hour period with a one-percent (1%) chance of occurring in any given year. On the average, a 100-year storm event is statistically probable to occur only once in a 100-year period. The value for the St. Francis area is taken from Soil Conservation Service Technical Paper No. 40 (SCS TP-40). For the St. Francis Area, a 100-year Storm Event is a 5.9-inch rainfall in 24 hours.

100-Year, 10-Day Snowmelt Event: The storm event having a total precipitation over a 10-day period with a one-percent (1%) chance of occurring in any given year. On the average, a 100-year snowmelt event is statistically probable to occur only once in a 100-year period. The value for the St. Francis area is taken from the SCS National Engineering Handbook, which shows the 100-year, 10-day snowmelt event is 7.3 inches over 10 days.

Agricultural Land: Any land designated specifically for agricultural production. This may include row crops, pasture, hay land, orchards, or land used for horticultural purposes.

Anaerobic: Conditions either in water or soil where there is a lack of oxygen.

Army Corps of Engineers (COE or USCOE): The United States Army Corps of Engineers is a regulatory agency involved in design, permitting and construction projects related to or impacting navigable waters of the United States including lakes, waterways and wetlands.

Aquatic Bench: A 10- to 15-foot bench around the inside perimeter of a permanent pool that ranges from zero depth at the shore to 1-foot depth no less than 10-feet from the shore. Normally vegetated with emergent plants, the bench augments pollutant removal, provides habitat, conceals trash and water level drops, and enhances safety.

Best Management Practice (BMP): An action, procedure, or structural improvement designed to improve water quality. BMPs include schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the State. BMPs also include treatment practices such as ponds, rain gardens, vegetated buffers and vegetated swales, treatment requirements, operating procedures, and practices to control runoff, spillage or leaks, or drainage from raw material storage.

Buffer: A vegetated area immediately adjacent to a wetland that is not mowed and/or managed. Buffers are ideally dominated by native vegetation and add to the ecological health of the wetland by adding habitat and assisting and filtering pollutants from surface water runoff.

Buffer Strip: An area of vegetated ground cover abutting a water body that is intended to remove sediment and other pollutants from runoff.

BWSR: Board of Water and Soil Resources. This is the lead regulatory agency that oversees Minnesota Statue 103B.205 to 103B.255, Minnesota Rule 8410 and the Minnesota Wetland Conservation Act.

Circular 39: A wetland classification system developed by United States Fish and Wildlife Service in 1956 that categorizes wetlands into eight types. This is the same classification system generally accepted by the State of Minnesota for wetland classification.

Comprehensive Plan: As defined in Minnesota Statutes 394.21, a Comprehensive Plan defines a City's policies, statements, goals and interrelated plans for private and public land and water use, transportation and community facilities to assist in guiding future development and growth.

Cowardin Classification: A wetland classification system developed by the United States Fish and Wildlife Service in 1979. This system defines wetlands by a tiered system and is more detailed than the Circular 39 method. The Cowardin System is the classification system used in the National Wetlands Inventory.

Design Storm: A rainfall event of specified size and return frequency that is used to calculate the runoff volume and peak discharge rate to a BMP. In St. Francis, a 10-year design storm is 4.1-inches in 24-hours and a 100-year storm is 5.8-inches in 24-hours. If designing piped storm sewer, a 10-year design storm may also refer to an IDF curve used in the Rational Method of storm sewer design.

Detention: The temporary storage of runoff from rainfall and snowmelt events to control peak discharge rates and provide an opportunity for treatment to occur. Detention storage is typically designed in basins.

Development: The construction, installation or alteration of any structure, the extraction, clearing or other alteration of terrestrial or aquatic vegetation, land or the course, current or cross section of any water body or water course or division of land into two (2) or more parcels. See also re-development, new development and existing development.

Drawdown: The gradual reduction in water level typically due to the combined effect of infiltration and evaporation, but may be the result of human interference.

Draining: The removal of surface water or ground water.

Drop Structure: Placement of logs with a weir notch across a stream channel. Water flowing through the weir creates a plunge pool downstream of the structure and creates fish habitat.

Easement: A grant of one or more property rights by a property owner for use by the public, a corporation, or another person or entity.

Emergency Overflow (EOF): A hydraulic channel, swale, weir, etc. that provides an outlet from a pond or flooded area at an elevation below the point where property damage can occur.

End of Pipe Control: Water quality control technologies suited for the control of existing urban stormwater at the point of storm sewer discharge to a receiving water. Due to typical space constraints, these technologies are usually designed to provide water **quality control rather than quantity control.**

Erosion: The wearing away of land surface and soil by the action of natural elements (wind and/or water).

Eutrophication: Process by which overabundance of nutrients in a waterbody lead to accelerated productivity and general decrease in water clarity and quality.

Exfiltration: The downward movement of runoff through the surface and into the subsoil.

Existing Development: A property or parcel of land that has previously been subject to development and no major changes are anticipated to the property in the near future.

Exotic Species or Invasive Species: Non-native plants or wild animals that can naturalize, have high propagation potential, are highly competitive for limiting factors, and cause displacement of, or otherwise threaten, native plants or native animals in their natural communities.

Extended Detention: A stormwater design feature that provides for the gradual release of a volume of water (typically 0.25 to 1.0 inches per impervious acre) over a 12 to 48 hour time period. With proper design, the extended detention period allows for an increased settling of pollutants, and can protect channels from frequent flooding or scour.

Extended Detention (ED) Ponds: A conventional ED pond temporarily detains a portion of stormwater runoff for a period of 12 to 48 hours after a storm using a fixed orifice. Such extended detention allows urban pollutants to settle out. ED ponds can be designed to be "dry" between storm events and thus do not have any permanent standing water or "wet" with a permanent pool of water. An enhanced ED pond is designed to prevent clogging and resuspension and provides greater flexibility in achieving target detention times. It may be equipped with plunge pools near the inlet, a micropool at the outlet, and utilize an adjustable reverse-sloped pipe at the ED control device. See also "wet pond" definition for diagram.

Extended Detention Wetland: A stormwater wetland design alternative in which the total treatment volume is equally split between a shallow marsh and temporary detention of runoff above the marsh. After a storm, the normal pool of the shallow marsh may rise by up to two feet. The extra runoff is stored for up to 24 hours to allow pollutants to settle before being released downstream.

Finished Floor Elevation: The lowest elevation of the first floor or basement in a residential building or other structure that will or may be inhabited by a person or persons.

Filtration Basin: A treatment area designed to treat stormwater by a process that physically removes particles from the water.

Flood: A temporary rise in stream flow or stage that results in inundation of the areas adjacent to the channel or water body.

Flood Frequency: The statistically determined average time period between events where a specific flood stage or discharge may be equaled or exceeded.

Flood Fringe: That portion of the 100-year floodplain outside of the floodway.

Flood Obstruction: Any dam, wharf, embankment, levee, dike, pile, abutment, projection, excavation, channel rectification, culvert, building, wire, fence, stockpile, refuse, fill, structure or matter in, along, across or projecting into any channel, watercourse or regulatory flood hazard area that 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 that may cause the flood level to rise and damage property or threaten life.

Floodplain: Floodplains are lowland areas adjoining lakes, wetlands, and rivers that are susceptible to inundation of water during a flood. For regulatory purposes, the floodplain is the area covered by the 100-year flood and it is usually divided into districts called the floodway and flood fringe. Areas where floodway and flood fringe have not been determined are called approximate study areas or general floodplain.

Floodplain (General) Area: The general floodplain area is determined using the best available data, in lieu of performing a detailed engineering study. These data may be from soils mapping, experienced high water profiles, aerial photographs of previous floods, or other appropriate sources. There are no associated published 100-year flood elevations with general floodplain delineations, unlike detailed study areas. General floodplain area is synonymous with approximate study area and unnumbered A-Zone.

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 to properties, water and sanitary facilities, structures and contents of buildings in a flood hazard area in accordance with the Minnesota State Building Code.

Floodway: The floodway is the channel of a river or other watercourse and the adjacent land areas which must remain open in order to discharge the 100-year flood.

Forebay: An extra storage area provided near an inlet of a pond or BMP to trap incoming sediments, reducing the amount that accumulates in a pond or BMP.

Freeboard: A factor of safety usually expressed in feet above a certain flood level. Freeboard compensates for the many unknown factors (e.g., waves, ice, debris, etc.) that may increase flood levels beyond the calculated level.

Forbs: Vegetation that does not consist of trees, grass or shrubs. Forbs are typically associated with flowering plants

Geographic Information System (GIS): Computer databases of georeferenced information on the cities various resources.

Global Positioning System (GPS): Network of satellites used to map and identify locations on the earth.

Hydric Soil: Soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. Hydric soil is one of the three criteria that define wetlands

Hydrophytic Vegetation: Macrophytic plant life growing in water, soil, or a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

Hypereutropic: A very nutrient-rich lake characterized by frequent and severe nuisance algae blooms and low transparency.

Intensity-Duration-Frequency (IDF) Curve: A graphical representation of the rainfall intensity versus time of concentration for an area. The IDF curve is typically used in the Rational Method of storm sewer design to determine design rainfall intensity in inches per hour. The following IDF curve is taken from the Minnesota Department of Transportation Drainage Manual and applies is used in the rational method of storm sewer design for the St. Francis area.

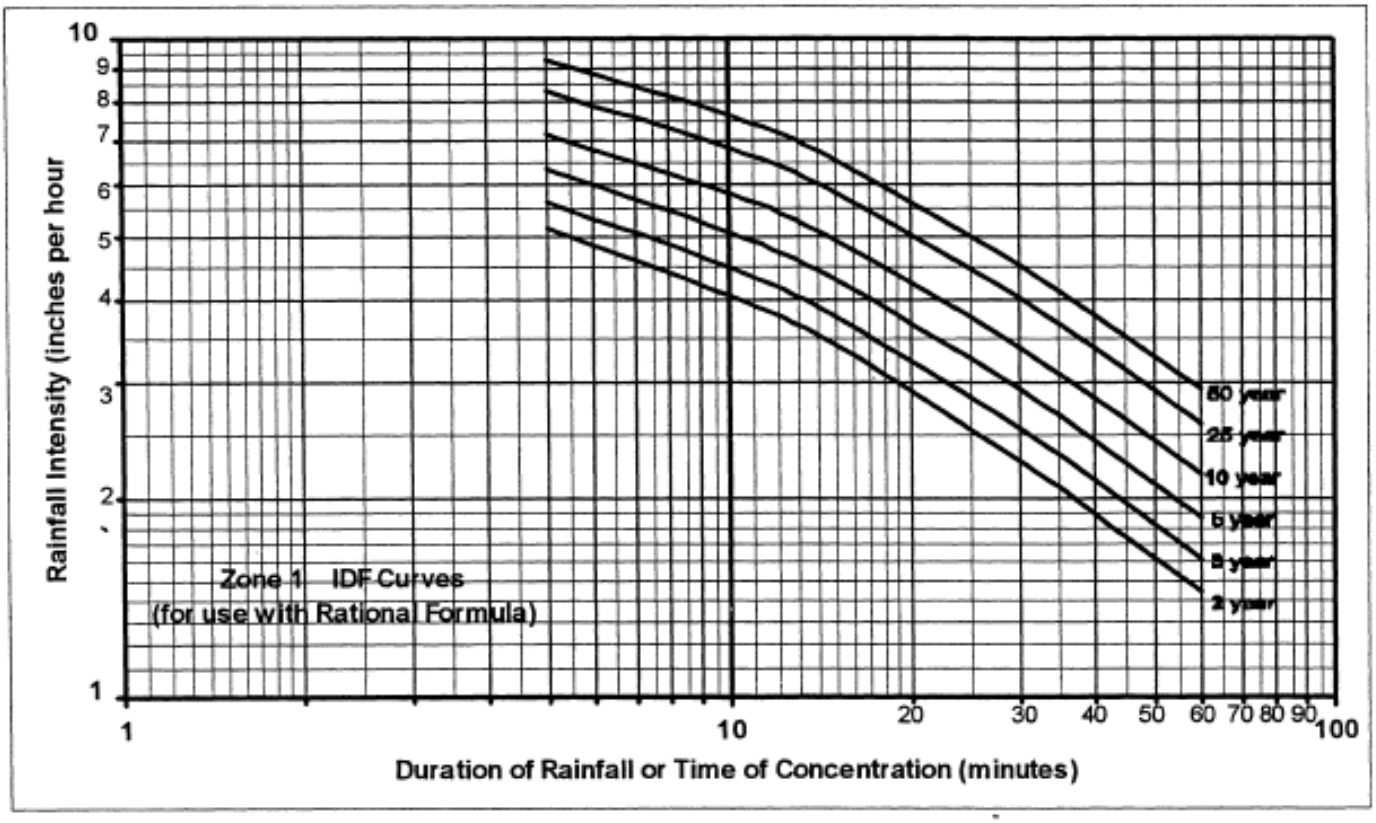


Figure 3.4 Zone 1 Southern Minnesota Rainfall Intensity - Duration - Frequency (IDF) Curves

Impervious Surface: The portion of the buildable parcel that has a covering which does not permit water to percolate into the natural soil. Impervious surface shall include, but not be limited to, buildings, all driveways and parking areas (whether paved or not), sidewalks, patios, swimming pools, tennis and basketball courts, covered decks, porches, and other structures. Open, uncovered decks are not considered impervious for the purposes of this ordinance. The use of patio blocks, paver bricks or class 5 gravel material are considered impervious surfaces as a majority of water runs-off the surface rather than being absorbed into natural soils underneath. Some exceptions to these conditions may include paver blocks or pavement systems engineered to be permeable with the underlying soils suitable for infiltration.

Infiltration Basin: An impoundment where incoming stormwater runoff is stored until it gradually infiltrates into and through the soil of the basin floor.

Infiltration Trench: A conventional infiltration trench is a shallow, excavated trench that has been backfilled with stone to create an underground reservoir. Stormwater runoff diverted into the trench gradually exfiltrates from the bottom of the trench into the subsoil and eventually into the water table. An enhanced infiltration trench has an extensive pretreatment system to remove sediment and oil. It requires an on-site geotechnical investigation to determine appropriate design and location.

Infrastructure: Public facilities and services, including transportation, stormwater pipes, structures and ponds, water and sewer pipes and structures, telecommunications, recycling and solid waste disposal, parks and other public spaces, schools, police and fire protection, and health and welfare services.

Integrated Management Practice (IMP): A range of small-scale stormwater controls or practices distributed throughout a site and intended to maintain flow patterns, filter pollutants and/or re-create or maintain existing site hydrology.

Invasive Species or Exotic Species: Non-native plants or wild animals that can naturalize, have high propagation potential, are highly competitive for limiting factors, and cause displacement of, or otherwise threaten, native plants or native animals in their natural communities.

Landlocked High Water Level or Landlocked HWL: The peak water level or high water level in a land locked basin. The HWL is the highest peak ponding elevation generated by the back-to-back 100-year SCS 24-hour rainfall events, the 10-inch SCS 24-hour rainfall event or the 100-year, 10-day snowmelt snow melt event.

Local Government Unit (LGU): Agency that has the primary responsibility of administering the Wetland Conservation Act. The City of St. Francis acts as LGU for all wetlands within the City limits and shares responsibility for basins that border adjacent municipalities.

Lowest Floor: The lowest floor of a structure, including basement.

Low Impact Development (LID): An approach to stormwater management intended to protect water resources, reduce storm sewer infrastructure costs and provide a more attractive stormwater management system. LID practices include infiltration systems, bioretention areas, rain barrels, green roofs, porous pavements and a long list of additional innovative stormwater treatment practices.

Mesotrophic: Describes a lake of moderate photosynthetic productivity.

MNRAM: The Minnesota Routine Assessment Methodology as referenced by Minnesota Rules 8420. MNRAM is the primary tool used to assess wetland functions and values on a qualitative basis. MNRAM evaluates wetlands based on vegetation, wildlife habitat, water quality, flood and stormwater attenuation, recreational opportunities, aesthetics, fishery habitat, groundwater interactions, and commercial use. The result of a MNRAM evaluation is a ranking of the wetland quality that can be used to monitor the wetland changes over time and to set appropriate protection needs and techniques. The version referenced in this plan is Version 3.0.

Monotypic: Used to describe vegetation communities in which only one dominant species is present. Most often used to describe areas that are entirely dominated by reed canary grass or cattails.

Navigable Waters: Waters defined by the United States, 33 Code of Federal Regulations Section 329.4 as those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to

transport interstate or foreign commerce. The U.S. Corps of Engineers has Federal Jurisdiction over Navigable Waters.

New Development: Development of a property or portion thereof that is currently undeveloped property.

NURP: Nationwide Urban Runoff Program, a study by the U.S. Environmental Protection Agency. A key component of this program was to assess the effectiveness of urban runoff detention/retention basins (e.g., ponds) in removing pollutants from stormwater runoff.

Off-Line BMP: A water quality facility designed to treat a portion of stormwater (usually 0.5 to 1.0 inches per impervious acre) which has been diverted from a stream or storm drain.

Off-Line Treatment: A BMP system that is located outside of the stream channel or drainage path. A flow diverter is used to divert runoff from the channel and into the BMP for subsequent treatment.

Ordinary High Water Level (OHWL or OHW): The Minnesota DNR jurisdictional boundary of public waters and wetlands that is depicted by 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 flowage, the ordinary high water level is the operating elevation of the normal summer pool. In St. Francis all of the lakes have an OHW established. For streams and waterways, the OHW is considered the top of bank. Areas below the OHW are under the jurisdiction of the Minnesota Department of Natural Resources and are not regulated by the Wetland Conservation Act.

Permanent Pool: A 3- to 10-foot deep pool in a stormwater pond system that provides removal of urban pollutants through settling and biological uptake (also referred to as a wet pond).

Porous Pavement: An alternative to conventional pavement whereby runoff is diverted through a porous asphalt or concrete layer and into an underground stone reservoir. The stored runoff then gradually infiltrates into the subsoil.

Protected Water: Any water or wetland designated by the Minnesota Department of Natural Resources and identified by statute on the Protected Waters Inventory.

Public Waters: Those waters of the state identified as public waters or wetlands under Minnesota Statutes, Section 103G.005.

Rational Method: A method of estimating the peak runoff from a watershed that is based on the formula Q = CIA. Where:

Q = peak flow rate in cubic feet per second

C = a runoff coefficient based on the percentage of impervious surface, type of vegetative cover, and soil type
I = rainfall intensity in inches per hour as determined from an area IDF curve
A = watershed area in acres

Reach: A hydraulic engineering term to describe a longitudinal segment of a stream or river influenced by the natural or man-made obstruction. In an urban area, the segment of a stream or river between two consecutive bridge crossings or between two reservoirs would most typically constitute a reach.

Redevelopment: Any development including but not limited to rebuilding, renovation, revision, remodeling, reconstruction or redesign of or at an existing development.

Regional Flood: A flood which is representative of large floods known to have occurred generally in Minnesota and reasonably characteristics of what can be expected to occur on an average frequency in the magnitude of the 100-year recurrence interval. A regional flood is synonymous with the term "base flood" used in the Flood Insurance Study.

Regulatory Flood Protection Elevation: A point not less than one-foot above the water surface profile associated with the 100-year flood as determined by the use of the 100-year flood profile and surrounding technical data in the Flood Insurance Study plus any increase in flood heights attributable to encroachments on the floodplain. It is the minimum elevation the DNR requires Cities to regulate by ordinance.

Retention: The permanent storage of runoff from rainfall and snowmelt events with volume reduction coming from infiltration, evaporation or emergency release.

Riprap: A combination of large stone, cobbles and boulders used as an erosion control BMP. Riprap is typically used to line channels, stabilize banks, reduce runoff velocities, or filter out sediment.

Runoff (Stormwater): The overland and near surface flow from rainfall and snowmelt.

Runoff Coefficient: A measure of the rate of runoff that isstatistically generated from a parcel of land that is based on the land use, percent of impervious surfacing, soil type and vegetative cover. The higher the coefficient, the higher the amount of runoff anticipated from the parcel. Rational method runoff coefficients range from 0.2 for meadow lands to 0.95 for paved surfaces.

Runoff Conveyance: Methods for safely conveying runoff to a BMP to minimize disruption of the stream network, and promote infiltration or filtering of the runoff.

Runoff Pretreatment: Techniques to capture or trap coarse sediments before they enter a BMP to preserve storage volumes or prevent clogging within the BMP. Examples include forebays and micropools for pond BMPs, and plunge pools, grass filter strips and filter fabric for infiltration BMPs.

Sand Filter: A technique for treating stormwater, whereby the first flush of runoff is diverted into a self-contained bed of sand. The runoff is then strained through the sand, collected in underground pipes and returned back to the stream or channel.

Sediment Forebay: A stormwater design feature that employs the use of a small settling basin to settle out incoming sediments before they are delivered to a stormwater BMP. Often used full in tandem with infiltration devices, wet ponds or marshes.

Sequencing: The process used by the Local Government Unit to evaluate the necessity of an activity relative to its impact on a wetland. The party proposing the impact must demonstrate that the activity proposed complies with the following principles in descending order of priority.

1. Avoids direct or indirect impacts to the wetlands that may diminish or destroy them;
2. Minimizes the impact to the wetland by limiting the degree or magnitude of the wetland activity and its implementation;
3. Rectifies the impacts by repairing, rehabilitating, or restoring the affected wetland;
4. Reduces or eliminates the impact to the wetland over time by preservation and maintenance operations; and,
5. Replaces unavoidable wetland impacts to the wetland by restoring or, if wetland restoration opportunities are not reasonably available, creating substitute wetland areas having equal or greater public value as provided for under the Wetland Conservation Act.

Shoreland: Land located within the following distances from public waters:

1. One thousand feet from the ordinary high water level of a lake, pond, or flowage
2. Three hundred 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 shoreland 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 of the DNR.

Shoreland Wetland Protection Zone: The land located within 1,000 feet from the Ordinary High Water Elevation of a Protected Water, 500 feet from the Rum River or the landward extent of the designated floodplain, and 300 feet from any stream designated in the shoreline management ordinance.

Short Circuiting: The passage of runoff through a BMP in less than the theoretical or design treatment time. For example, a properly designed treatment pond will have the inlet and outlet pipes located as far apart (along the water flow path) as possible. A short circuiting pond would have the inlet very close to the outlet and the water coming into the pond would leave the pond much sooner than if it were able to travel through the entire pond.

Stormwater Treatment: The use of accepted BMPs to treat runoff including detention, retention, filtering or infiltration of a given volume of stormwater to remove pollutants.

Stream Buffer: A variable width strip of vegetated land adjacent to a stream that is preserved from a disturbance and/or mowing to protect water quality and aquatic and terrestrial habitats. See also buffer strip.

Structure: Anything manufactured, built, constructed, erected, or a portion thereof which is normally attached to or positioned on land, whether temporary or permanent in character, including but not limited to buildings, fences, sheds, advertising signs, dog kennels, hard surface parking areas, boardwalks, playground equipment, concrete slabs.

Stormwater: (See Runoff)

Stormwater Treatment Pond: Any waterbody that has been specifically created to remove sediment and nutrients and "treat" surface water runoff. Stormwater ponds that were created from existing wetland are still regulated as jurisdictional wetlands. Stormwater ponds created from upland areas are not wetland and are exempt from regulatory jurisdiction.

Subwatershed: A subdivision based on hydrology corresponding to a smaller drainage area within a larger watershed.

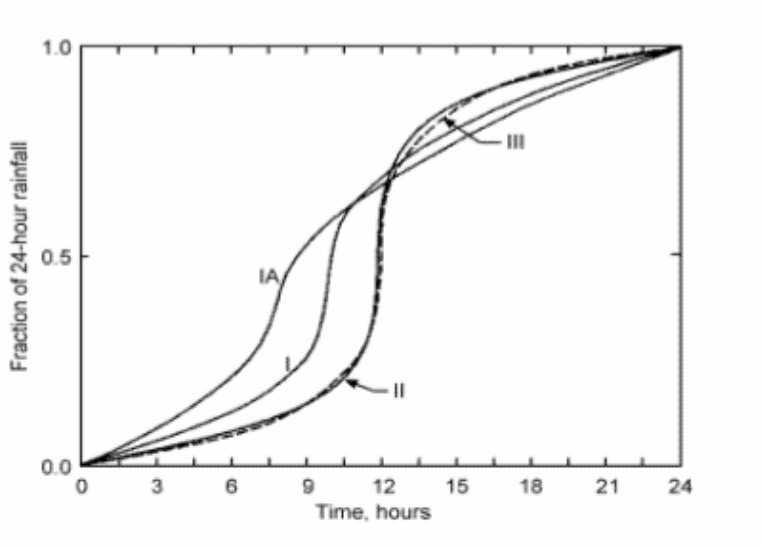
Technical Evaluation Panel (TEP): A panel of technical professionals from the Board of Water and Soil resources, the Anoka County SWCD, the URRWMO and the LGU (City of St. Francis) at a minimum. This panel may also be expanded to include a Minnesota Department of Natural Resources representative, the U.S. Army Corps of Engineers and interested citizens requesting to participate in the wetland decision making process. Invitations to a TEP meeting are typically sent to all parties listed. The DNR, COE and interested citizens (if any) may elect not to attend. The TEP provides decision making support for the LGU for many wetland and regulatory issues.

Ten-Day Snow Melt Runoff with Type "C" Distribution (100-Year/10-day snow melt runoff): A modeled runoff event that represents snowmelt conditions over a 10-day period for a return period snow depth of 100 years. The runoff event is simulated for a curve number (CN) of 100 which represents frozen soil conditions or where all surfaces are considered impervious. For some cities like St. Francis, the ten-day runoff event is critical event for identifying the high water level of the basin or water body because the Anoka Sand Plain typically reduces runoff under unfrozen conditions. The Type C distribution is similar in concept to the Type I and II distributions, and for this event, establishes the time distribution of runoff volume over the ten-day period.

Treatment Volume (Vt): The volume of stormwater runoff that is treated within a BMP or IMP stormwater treatment facility. Typically the volume is expressed in terms of inches of runoff per impervious acre.

Type I, IA, II and III Storm Distributions - NRCS: These storm types represent the time distribution of a 24-hour rainfall event for areas throughout the United States. The total storm depth is distributed according to the diagram in subpart A. Type II storms are more "flashy" (i.e., convective/thunderstorms) than a Type I or IA storm. Subpart B illustrates that all of Minnesota is within the Type II rainfall distribution area.

A. SCS 24-hour rainfall distributions (SCS, 1986):



B. Approximate geographic boundaries for SCS rainfall distributions (SCS, 1986):

Underdrain: Typically perforated plastic pipes installed on the bottom of a filtration of infiltration BMP, or sand filter. The under drain is used to collect and remove treated stormwater that exceeds the water holding and/or infiltration capacity of the soil.

Upland: General term to describe any area that is not a wetland.

Vegetated Filter Strip: A vegetated section of land designed to accept runoff as overland sheet flow from upstream development. It may adopt any natural vegetated form, from grassy meadow to small forest. The dense vegetative cover facilitates pollutant removal. Vegetated filter strips cannot treat high velocity flows; therefore, they have generally been recommended for use in agriculture and low-density development. A filter strip can also be an enhanced natural buffer, whereby the removal capability of the natural buffer is improved through engineering and maintenance activities such as land grading or the installation of a level spreader. A filter strip differs from a grassed

swale in that a swale is a concave vegetated conveyance system, whereas a filter strip has a fairly level surface.

Watershed: A topographically defined area within which all runoff water drains to a point.

Water Quality Volume: A design volume of water as defined by the MPCA that is required to be treated from a new development site. The MPCA defines the water quality volume as 0.5-inches of runoff from all new impervious surfaces associated with the development in the watershed.

Watershed-to-Lake Ratio: The relative surface area of the contributing watershed to the surface area of the lake or water body. In terms of water quality, generally the smaller the watershed-to-lake ratio, the better the quality of the lake. For example a lake with a ratio of 4 to 1 means that the watershed is four times the size of the lake (i.e., 200 acres contributing to a 50 acre lake).

Wetland: Transitional land between terrestrial and aquatic systems where the water table is at or near the surface or the land is covered by shallow water. The jurisdictionally accepted definition of a wetland includes the following three characteristics:

1. Have a predominance of hydric soil
2. Be inundated or saturated within 1-foot of the surface for at least 5 percent of the growing season. The inundation refers to a single continuous episode.
3. Support a prevalence of hydrophytic vegetation typically adapted for life in saturated soils.

Wetland Conservation Act (WCA): In 1991 Minnesota adopted the initial Wetland Conservation Act (Minnesota Laws Chapter 354) to protect the states wetland resources. This act has been amended and updated periodically, typically under Minnesota Rule 8420, and is used by reference to the current program, as well as any future amendments.

Wetland Delineation: The process and procedure by which an area is determined a wetland or non-wetland including a determination of the wetland boundary based on the point where the non-wetland areas shift to wetlands or aquatic habitats.

Wetland Mitigation: Wetlands created to replace wetland areas destroyed or impacted by land disturbances.

Wet Pond: A conventional wet pond has a permanent pool of water for treating incoming stormwater runoff and a live storage component for flood storage and additional water quality treatment detention.

Figures

City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

PWI

High Slope Areas

- 12-18% Slopes
- Greater than 18% Slopes
- City Limits

Source:
2006 FSA Photo
Digital Elevation Model - Anoka County

0 5,000 Feet

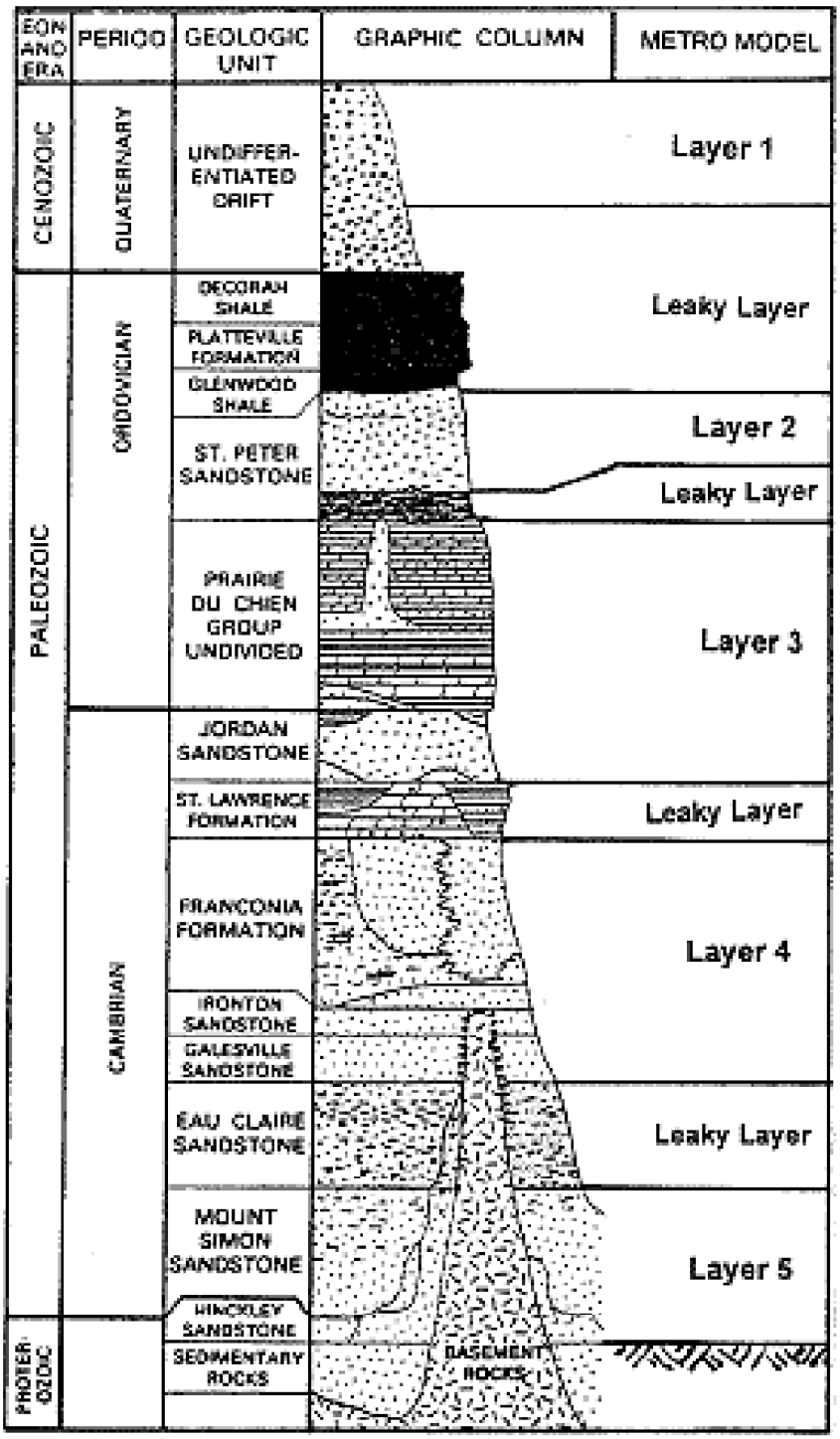
AREAS WITH HIGH LAND SLOPE

Figure 1

April, 2009

Bolton & Menk — Designing for a better tomorrow — Engineers & Surveyors

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig1-High Slopes - 11X17.mxd)
4/13/2009 -- 3:57:44 PM



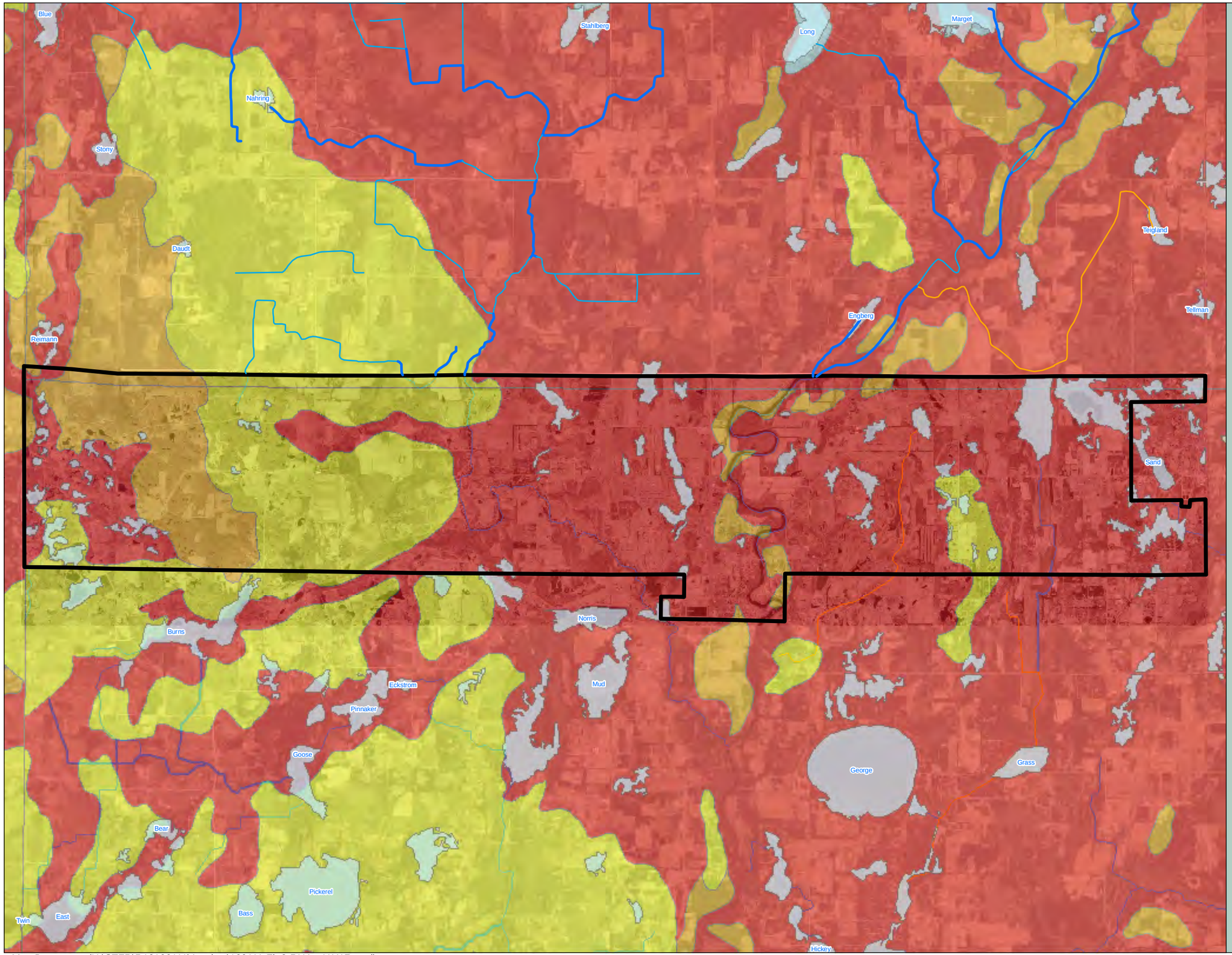
CITY OF SAINT FRANCIS, MINNESOTA
HYDROSTRATIGRAPHIC COLUMN AND CONCEPTUAL MODEL
METROPOLITAN AREA GROUNDWATER MODEL - OVERVIEW

MPCA Website: http://www.pca.state.mn.us/water/groundwater/

Figure 2

April, 2009

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig2-Hydrostatigraphic Column 8-5X11.mxd)
4/13/2009 -- 3:59:22 PM



City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

- City Limits
- PWI

Sensitivity Ratings

- Very High - Hours to Months
- High - Weeks to Years
- Moderate - Years to Decades
- Low - Decades to a Century
- Water

Source:
2006 FSA Photo
PWI - MnDNR
Streams - MnDNR
Soils - NRCS

0 5,000 Feet

GEOLOGIC SENSITIVITY OF THE UPPERMOST AQUIFER TO POLLUTION

Figure 3

April, 2009

BOLTON & MENK
DESIGNING FOR A BETTER TOMORROW
Engineers & Surveyors

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig3-RHA - 11X17.mxd)
4/13/2009 -- 4:01:45 PM

City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

- City Limits
- PWI

Rivers & Streams

- Aqueduct
- Dam or weir
- Ditch or canal
- Stream
- Stream (or river)

Parks

- City Park
- City Park (undeveloped)
- County Park
- School Land
- State Land
- Wild and Scenic River District
- Water Access Points

Source:
2006 FSA Photo
PWI - MnDNR
Streams - MnDNR
Soils - NRCS

N

0 5,000 Feet

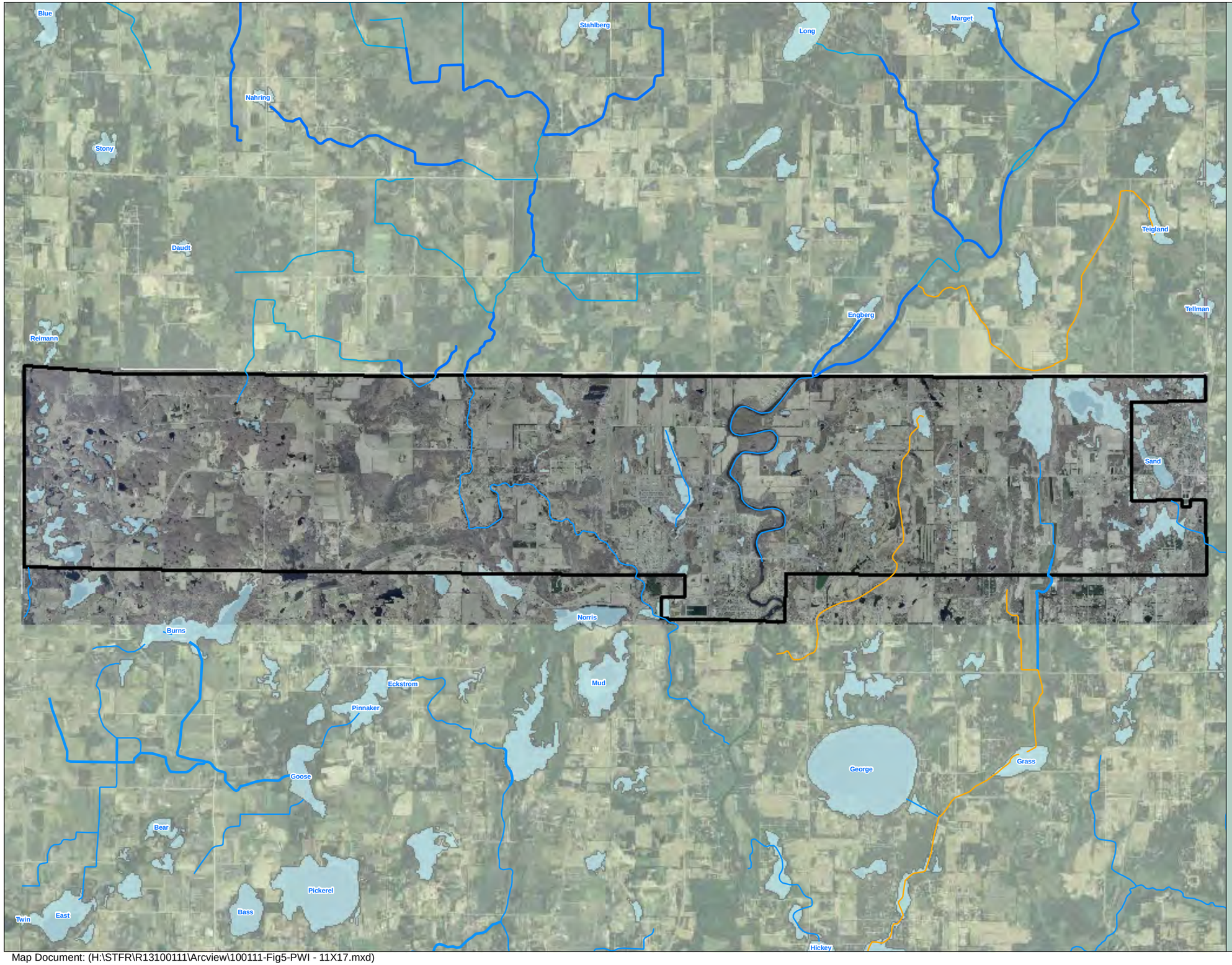
PARKS MAP

Figure 4

April, 2009

BOLTON & MENK
DESIGNING FOR A BETTER TOMORROW
Engineers & Surveyors

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig4-Parks - 11X17.mxd)
4/13/2009 -- 4:03:54 PM



City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

- City Limits
- PWI

Rivers & Streams

- Aqueduct
- Dam or weir
- Ditch or canal
- Stream
- Stream (or river)

Source:
2006 FSA Photo
PWI - MnDNR
Streams - MnDNR

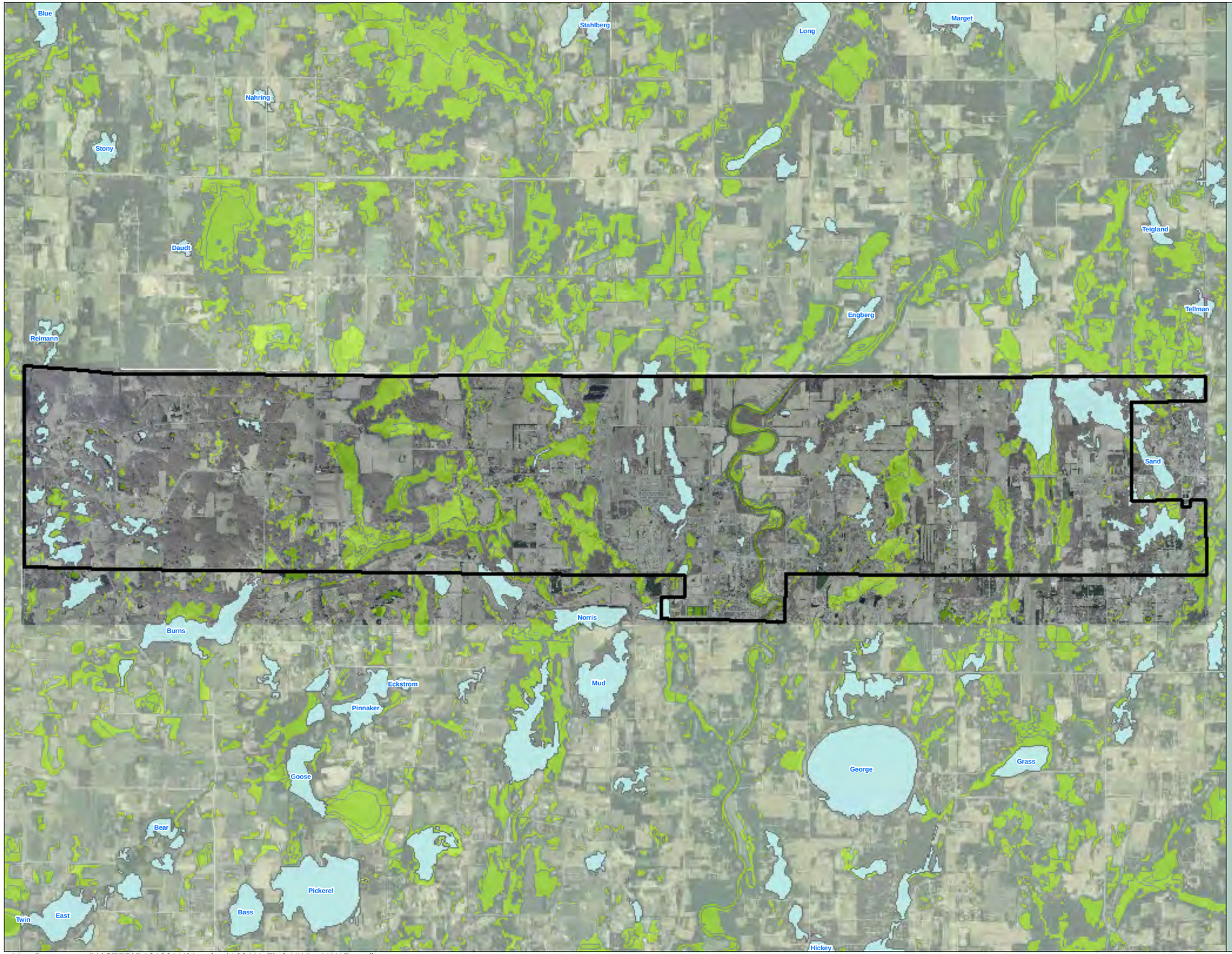
0 5,000 Feet

PUBLIC WATERS INVENTORY MAP

Figure 5

April, 2009

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig5-PWI - 11X17.mxd)
4/13/2009 -- 4:05:34 PM



City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

- Municipal_Bound2
- PWI
- NWI

Source:
2006 FSA Photo
NWI - MnDNR
PWI - MnDNR

0 5,000 Feet

NATIONAL WETLAND INVENTORY MAP

Figure 6

April, 2009

BOLTON & MENK
DESIGNING FOR A BETTER TOMORROW
Engineers & Surveyors

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig6-NWI - 11X17.mxd)
4/13/2009 -- 4:07:24 PM

City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

- City Limits
- PWI

Rivers & Streams

- Aqueduct
- Dam or weir
- Ditch or canal
- Stream
- Stream (or river)

FEMA Floodplain

- 100-Year

Source:
2006 FSA Photo
PWI - MnDNR
Streams - MnDNR
Soils - NRCS

0 5,000 Feet

FEMA FLOODPLAIN BOUNDARIES

Figure 7

April, 2009

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig7-FEMA - 11X17.mxd)
4/13/2009 -- 4:08:59 PM

City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

City Limits

Rivers & Streams

- Aqueduct
- Dam or weir
- Ditch or canal
- Stream
- Stream (or river)

Hydrologic Soil Group

- Water
- A
- A/D
- B
- B/D
- C/D
- D

Source:
2006 FSA Photo
PWI - MnDNR
Streams - MnDNR
Soils - NRCS

N

0 5,000 Feet

HYDRAULIC SOILS MAP

Figure 8

April, 2009

BOLTON & MENK
DESIGNING FOR A BETTER TOMORROW
Engineers & Surveyors

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig8-Soils Map - 11X17.mxd)
4/13/2009 -- 4:10:41 PM

City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

Municipal_Bound2

Land Cover

- Artificial Surfaces and Associated Areas
- Forests
- Herbaceous
- Nonvascular Vegetation
- Planted or Cultivated Vegetation
- Schrubland
- Woodland

Source:
2006 FSA Photo
Land Cover - MnDNR
PWI - MnDNR

0 5,000 Feet

LAND COVER MAP

Figure 9

April, 2009

BOLTON & MENK
DESIGNING FOR A BETTER TOMORROW
Engineers & Surveyors

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig9-Land Cover map - 11X17.mxd)
4/13/2009 -- 4:12:17 PM

City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

- City Limits

Rivers & Streams

- Aqueduct
- Dam or weir
- Ditch or canal
- Stream
- Stream (or river)
- PWI
- Subbasin
- Flow Direction
- Channel
- Junc
- Outfall
- Pond

Source:
2006 FSA Photo
PWI - MnDNR
Modeling - StormNET

0 2,500 Feet

WATERSHED MAP

Figure 10A

June, 2009

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig10A-Watershed Map 1 - 11X17.mxd)
4/13/2009 -- 4:13:51 PM

City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

- City Limits

Rivers & Streams

- Aqueduct
- Dam or weir
- Ditch or canal
- Stream
- Stream (or river)
- PWI
- Major Watersheds
- Subbasin
- Flow Direction
- Channel
- Junc
- Outfall
- Pond

Source:
2006 FSA Photo
PWI - MnDNR
Modeling - StormNET

0 2,500 Feet

WATERSHED MAP

Figure 10B

June, 2009

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig10B-Watershed Map 2 - 11X17.mxd)
4/13/2009 -- 4:15:39 PM

City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

City Limits

Rivers & Streams

- Aqueduct
- Dam or weir
- Ditch or canal
- Stream
- Stream (or river)
- Watersheds

Curve Number

- 27 - 32
- 33 - 52
- 53 - 71
- 72 - 87
- 88 - 98

Source:
2006 FSA Photo
PWI - MnDNR
Streams - MnDNR
Soils - NRCS

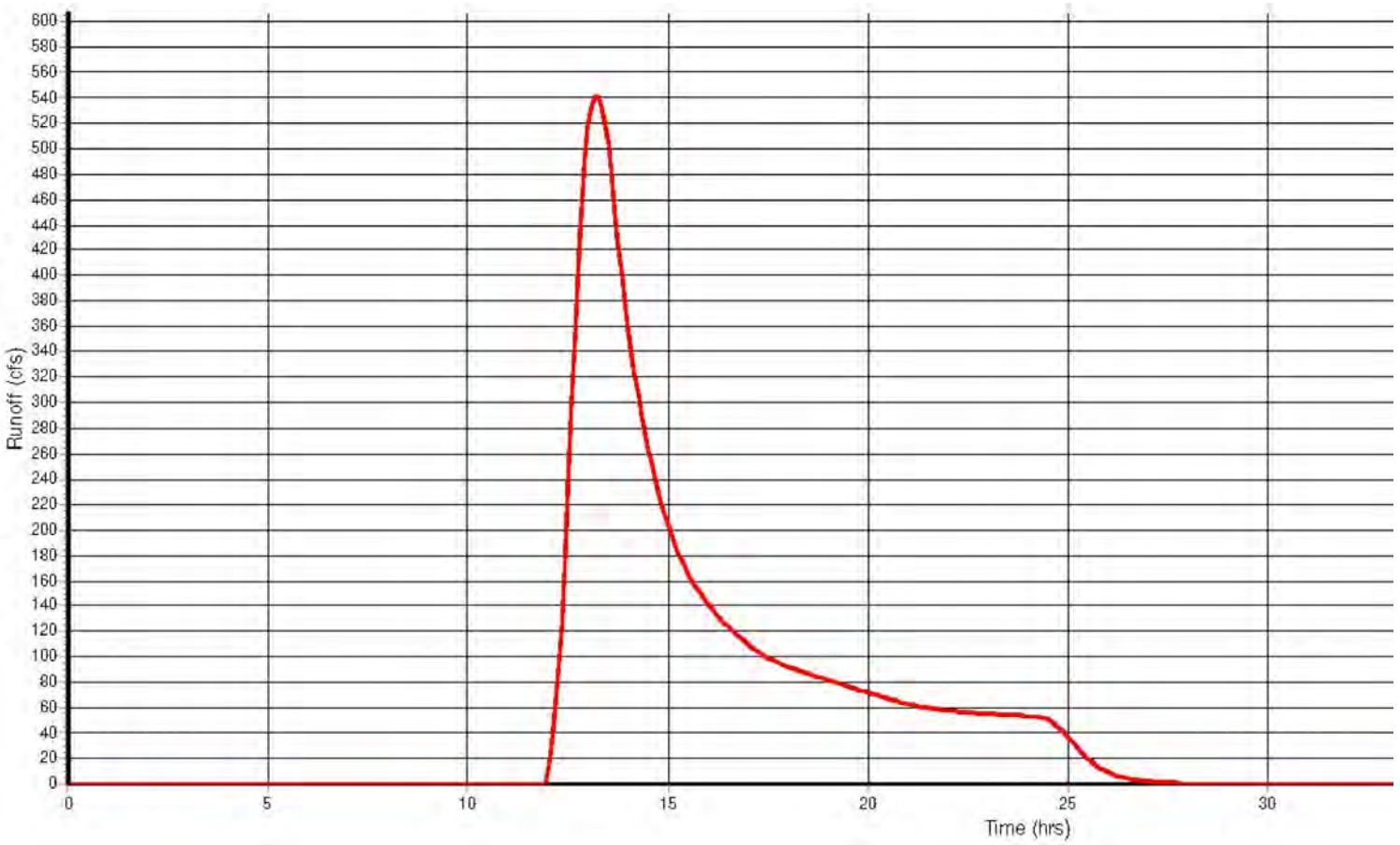
0 5,000 Feet

CURVE NUMBER MAP

Figure 11

April, 2009

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig11-CurveNumbers-11X17.mxd)
4/13/2009 -- 4:18:42 PM



CITY OF SAINT FRANCIS, MINNESOTA
TYPICAL SCS HYDROGRAPH
StormNET, BOSS International, Inc

Figure 12

April, 2009

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig12-Typical-SCS-Hydrograph 8-5X11.mxd)
4/13/2009 -- 4:22:44 PM

City of St. Francis

SURFACE WATER MANAGEMENT PLAN

Legend

- City Limits

Rivers & Streams

- Aqueduct
- Dam or weir
- Ditch or canal
- Stream
- Stream (or river)
- PWI
- Major Watersheds
- Subbasin
- Flow Direction
- Outfall

Source:
2006 FSA Photo
PWI - MnDNR
Modeling - StormNET

0 5,000 Feet

MAJOR WATERSHEDS MAP

Figure 13

June, 2009

Map Document: (H:\STFR\R13100111\Arcview\100111-Fig13-Major Watersheds Map - 11X17.mxd)
4/13/2009 -- 4:20:52 PM

Appendix

Amendment
to the
Upper Rum River Watershed Management Organization (URRWMO) Watershed Management Plan

Wetland Standards

The following standards were recommended by a Technical Advisory Committee including representation from each URRWMO member city, local and state agencies, and the Builders Association of the Twin Cities. Each member community must update their local water plan and ordinances for consistency with this amendment within two years of the effective date. However, municipalities are encouraged to do amendment-related updates with updates related to the new URRWMO Plan (deadline for those updates is 4-25-09).

Effective date: February 3, 2009 (date of URRWMO Board adoption)

Background

The URRWMO finds that wetlands serve a variety of beneficial functions. Wetlands within the URRWMO maintain water quality, reduce flooding and erosion, are groundwater recharge areas, provide food and habitat for wildlife, provide open space, and contribute to the area's rural "feel." Therefore, wetlands are important to the health, safety, economy, and general welfare of the communities. Regulating wetlands and the land uses around them is therefore in the public interest.

The state Wetland Conservation Act (WCA) provides many protections of the public benefits of wetlands, but does not address all areas of concern. These areas are left to local control. Topics not addressed by state law but considered by the URRWMO include special protections for the wetland types that are most highly valued locally, buffers, setbacks, excavations, and others. The URRMWO has set local standards and incentives for several of these topics. Each municipality must adopt standards at least as protective as the URRWMO standards in their local water plan and implement them.

Applicability

The following standards apply to all parcels where any of the following activities are proposed:

- Subdivision
- Any project with wetland impacts as defined by WCA (Minnesota Rules 8420).
- Wetland excavations >0.5 acres

Wetland Definition

For the purpose of these standards, wetlands:

- are defined in MN Statutes section 103G.005, subdivision 19
- include public waters wetlands defined in MN Statutes section 103G.005, subdivision 15a.

Wetland Classification

All wetlands do not have equal value. Some are healthier and provide more benefits to the community than others. The URRWMO seeks to identify these highly-valued wetlands and give them greater protections, and allow more flexibility in and around lower-valued wetlands. The URRWMO most highly values wetlands that provide (in order of preference):

1. Water quality treatment
2. Groundwater recharge
3. Wildlife habitat

The URRWMO allows more flexibility for wetlands that poorly provide these functions.

Classification Methodology

Proposers of applicable projects must hire a certified wetland delineator to perform a wetland delineation and MnRAM (the Minnesota Routine Assessment Method for Evaluating Wetland Functions) version 3.1 or newer. The results should be reported to the permitting authority, which will assign an appropriate wetland classification.

MnRAM scores 15 wetland functions. The URRWMO will use scores from five of these functions to classify wetlands, including:

Water Quality Treatment

1. Downstream water quality protection
2. Maintenance of wetland water quality

Wildlife Habitat

3. Vegetative diversity/integrity
4. Maintenance of characteristic wildlife habitat structure
5. Maintenance of characteristic amphibian habitat

Groundwater recharge functions will not be used in classifying wetlands because almost all URRWMO wetlands provide groundwater recharge functions and therefore the URRWMO will be protective of this function in all wetlands.

Classifications

Four wetland classes will be utilized:

1. High Priority Wetlands
2. Moderate Priority Wetlands
3. Low Priority Wetlands
4. Use Wetlands

The defining characteristics of each wetland class are summarized in the table below.

TABLE 1. Wetland Classifications

	High Priority Wetlands	Moderate Priority Wetlands	Minor Priority Wetlands	Use Wetlands
Description →	High quality natural basins that serve both target wetland functions of water quality treatment and wildlife habitat.	Wetlands that highly perform one of the two target wetland functions (water quality treatment or wildlife habitat).	Wetlands that do not highly perform either of the two target wetland functions (water quality treatment or wildlife habitat).	Wetlands created for stormwater management. These wetlands usually need periodic maintenance.

Targeted Wetland Functions	MnRAM Category				
Water Quality Treatment	Downstream water quality protection	MnRAM Score is "high" for at least one of these two MnRAM categories	MnRAM Score is "high" for at least one of these two MnRAM categories	Does not score "exceptional" or "high" for any of these MnRAM categories	Wetlands created for stormwater management. MnRAM scores are irrelevant.
	Maintenance of wetland water quality				
		AND	**OR**		
Wildlife Habitat	Vegetative diversity/integrity	MNRAM Score is "exceptional" or "high" for one or more of these three MnRAM Categories	MNRAM Score is "exceptional" or "high" for one or more of these MnRAM Categories		
	Maintenance of characteristic wildlife habitat structure				
	Maintenance of characteristic amphibian habitat				

Almost all wetlands in the URRWMO serve a groundwater recharge function, so wetland standards were designed to be protective of this function in all wetlands.

Appeals of Wetland Classification

If an applicant disagrees with a wetland classification, s/he bears the burden of supplying detailed information supporting their assertion. This may include historical aerial photography, topographic, hydrologic, floristic, or soils data deemed necessary by the permitting authority. The municipality or other permitting authority will review the appeal.

Wetland Buffers

Wetland buffers are unmowed areas adjacent to wetlands that contain non-invasive vegetation, preferably dense native vegetation. Buffers filter pollutants before they can enter the wetland, reduce erosion, protect vegetation diversity and wildlife habitat, and minimize human impacts to the wetland. The URRWMO requires buffers on wetlands, with the width dependent upon wetland classification. The buffer widths were selected based upon research literature, experiences in other communities, practical limitations, and city staff input. The largest buffers are needed to achieve wildlife habitat goals, but in sandy soils water quality goals can be achieved with lesser buffers.

Buffer Widths

The URRWMO allows minimum buffer widths and such that each municipality can choose a buffer width equal or greater that is most appropriate for their community based upon soil types, slopes, development rules, and other factors. Allowed buffer width ranges are shown in TABLE 2.

Buffer Averaging

Buffers are encouraged to have a meandering shape for a more natural appearance and in order to make reasonable accommodations for nearby features of the development or landscape. The buffer width may vary around the wetland such that:

- it may be 10 feet less than the minimum allowable (see TABLE 2), but not less than 5 feet.
- the total acreage of buffer cannot be reduced.
- in areas of concentrated inflow to the wetland the buffer cannot be less than the minimum allowable buffer width in TABLE 2 or the minimum allowed by the municipality, whichever is greater.

Buffer Variances

Variances of buffer width may, at the permitting authority's discretion, be granted for the following reasons:

- Part of the required buffer is outside of the wetland's watershed. Due to topography near the wetland, runoff flows away from and never enters the wetland through surface flows. Variances should only be for that portion of the buffer that would be outside of the wetland's watershed.

- If drainage is redirected to an area where a buffer is feasible.
- Non-conforming lots, as defined by the permitting authority.
- If the site is not generating stormwater or is using storm water minimizing techniques such as rain gardens, rain barrels, vegetated swales, and other Best Management Practices (BMP's) replace the functions of buffers.
- If the applicant is protecting additional upland, beyond that required by other ordinances or control measures, to connect existing wildlife habitat.
- Undue hardship.
- Others as determined by the permitting authority.
- Roads and other linear projects.

No Buffers Required

No buffers are required for small wetlands where the entire wetland area is less than or equal to the area of wetland impact allowed without replacement as *de minimis* under WCA.

Activities Prohibited within Buffers

Activities that disturb the roots or influence the growth of vegetation are prohibited, including:

- Mowing (except as part of municipality-approved wetland buffer management or for pedestrian trails)
- Structures
- Paving (except as allowed below in the "Activities Allowed within Buffers" section)
- Retaining walls
- Clearing and removal of vegetation (except selective clearing and pruning of individual trees and shrubs which are dead, diseased, hazards, or removal of noxious or invasive weeds)
- Introduction of non-native vegetation
- Filling, dumping, or yard waste disposal
- Fertilization
- Removal of buffer monuments
- Septic systems

Activities Allowed within Buffers

- Management needed to establish the buffer, such as mowing or burning.
- Activities consistent with municipal park management plans.
- Plantings that enhance the natural vegetation
- Selective clearing and pruning of individual trees and shrubs which are dead, diseased, or hazards
- Noxious or invasive vegetation removal
- Use and maintenance of an unimproved access strip not more than 10 ft wide for recreational access and the exercise of riparian rights
- Pedestrian trails, provided that at least 10 feet of buffer remains between the trail and wetland

- Placement, maintenance, or repair of utility and drainage systems that exist on creation of the buffer strip or are required by a permitting agency, as long as any adverse impacts have been avoided or minimized.
- Construction, maintenance, repair, or reconstruction of existing and future public roads as long as any adverse impacts have been avoided or minimized
- Others as approved by the municipality

Buffer Easements
A conservation easement (preferred), or functional equivalent such as a drainage and utility easement or outlot, is required on the wetland and buffer.

Use of Existing Vegetation as the Buffer
The existing vegetation is acceptable for a buffer and must not be disturbed if:

- It is continuous, dense perennials (can be trees and shrubs with 60% canopy cover), and
- <30% invasive plant species, and
- Not disturbed or mowed within the last 5 years, and
- Topography does not channelize runoff

Buffer Establishment and Seed
All buffers (natural or created) must be protected during construction with erosion control.

When existing vegetation is not acceptable for use as the buffer, then a buffer must be established by planting. Planting must meet these criteria:

- Planting must be identified on the wetland replacement plan or grading plan.
- Planting must be done by a qualified contractor.
- Install in accordance most current BWSR guidance.
- Replant vegetation that is unsuccessful during the first two growing seasons.
- No fertilizer may be used unless prescribed by accredited soil testing lab.
- The seed planted must be:
    i. a 100% native BWSR seed mix or equivalent approved by permitting authorities, with the exception of a 1-time annual nurse or cover crop such as oats or rye.
    ii. of local ecotype originating within 300 miles.
- Native trees/shrubs may substitute forbs at 60 per acre.

Buffer Monuments
Buffers shall be adequately marked with signage at a maximum 200 ft spacing. Signs should be erected before occupation of new developments. Monument requirements can be waived where the permitting authority deems they would serve no practical purpose.

Buffer Maintenance
First two full growing seasons –

During first two full growing seasons the applicant must replant any vegetation that does not survive.
Municipalities are encouraged to consider buffer establishment and management in escrows.

After the first two full growing seasons-

After the first two full growing seasons the buffer must be reseeded if the buffer changes at any time through human intervention or activities.

Buffer Requirements for Mitigation Wetlands

Mitigation wetlands must have equal or better functions and values than the wetlands they replace. Buffers are required on mitigation wetlands. The buffer width must be the larger of the buffer required for:

(a) the impacted wetland being replaced or

(b) if mitigation is an expansion of an existing wetland with higher classification then meet that wetland's buffer requirement.

See TABLE 2 for buffer requirements.

Structure Setbacks

Each municipality may, at its own discretion, choose to establish structure setbacks from the wetland buffer, however none is required by the URRWMO.

Sequencing

Sequencing is the process under the state Wetland Conservation Act (WCA) of evaluating wetland impacts for just cause, first by trying to avoid wetland impact, then minimizing any impacts, and finally mitigating for impacts. The URRWMO restricts the use of sequencing in their most highly valued wetlands (see TABLE 2). No impacts (as defined by WCA) are allowed in the "high priority" wetland class unless significant public benefit can be demonstrated. WCA sequencing applies for impacts to all other wetlands.

Excavations

State law restricts excavations in some wetland types, but not in other wetlands. Pond digging and excavation are common in the URRWMO and have the potential for significant negative impacts if done improperly or in improper locations.

Excavations must be denied when the following conditions exist:

- Excavation in sedge meadow wetlands.
- Excavation in forested wetlands.
- Excavation in bogs.
- Excavations in wetlands identified as Natural Heritage Communities by the Minnesota County Biological Survey.

- Excavations in wetlands deemed natural community, supporting ecologically sensitive flora and fauna, based on field visit by the Soil and Water Conservation District.
- The excavation will not provide diversity to the wetland basin or complex (e.g. excavation in the fringe of a type 3, 4 5 wetland with standing open water throughout much of the growing season).
- Wetlands which support a wide variety of plant species (i.e. approximately 50% of the area supports species which individually comprise <5% of the wetland).
- Wetlands that score high on the MnRAM vegetative diversity criteria.
- Excavations for the purpose of creating aesthetic reflecting pools.

Performance Bonds
Municipalities are encouraged to consider costs associated with compliance with these standards (for example, buffer establishment and maintenance) when determining performance bonds and escrows required of applicants.

Reporting to the Upper Rum River Watershed Management Organization
State Rules 8410 require the URRWMO inventory the functions and values of wetlands. All member municipalities must include in their annual reports to the URRWMO a summary wetlands inventoried by MnRAM, including the functions and values and assigned classifications.

TABLE 2. Summary of Wetland Standards

Wetland Class	Minimum Buffer (municipalities set buffer width equal or greater)	Structure Setbacks	Sequencing and Avoidance	Wetland Replacement Ratios	Excavation
High Priority Wetlands	25 ft	At each municipality's discretion	No impacts allowed without demonstrating significant public benefit.	Minnesota Wetland Conservation Act (WCA) ratios apply	All excavations >0.5 acres regulated per text
Moderate Priority Wetlands	20 ft		WCA sequencing applies.		
Minor Priority Wetlands	15 ft		WCA sequencing applies.		
Use Wetlands	At each municipality's discretion		WCA sequencing applies.		

Amendment
to the
Upper Rum River Watershed Management Organization (URRWMO) Watershed Management Plan

Stormwater Infiltration Standards

The following standards were recommended by a Technical Advisory Committee including representation from each URRWMO member city, local and state agencies, and the Builders Association of the Twin Cities. Each member community must update their local water plan and ordinances for consistency with this amendment within two years of the effective date. However, municipalities are encouraged to do amendment-related updates with updates related to the new URRWMO Plan (deadline for those updates is 4-25-09).

Effective date: February 3, 2009 (date of URRWMO Board adoption)

Background

Stormwater is water that flows across hard surfaces such as roofs and roads following a storm. As land is developed, it is important to manage this water because of the impacts it can have on water quality and flooding in lakes, streams, and rivers to which it drains. One approach to stormwater management is infiltration, or designing places where stormwater is allowed to soak into the ground. Infiltration is favored, especially in places with suitable soils such as sands, because it dramatically reduces stormwater volume (flooding) and water quality concerns. Infiltration also provides other benefits such as groundwater recharge, maintaining base flows in streams, and rate control.

The URRWMO is setting stormwater infiltration standards which must be incorporated into member communities' local water plans and ordinances, and accordingly enforced. Member communities are encouraged to customize their plans and ordinances within the framework established by the URRWMO standards. The purpose of the URRWMO's standards is to ensure that infiltration techniques are used in every community in a way that ensures functionality, minimizes maintenance, minimizes risks like groundwater contamination, and maximizes benefits.

Storm Water Infiltration Standards

* denotes standard is consistent with the MPCA's Construction General Permit.

Preferred Stormwater Management Techniques

The following order preference for stormwater management techniques must be followed:

1st - Better Site Design (as defined in the Minnesota Stormwater Manual Chapter 4)
2nd - Infiltration
3rd - Biofiltration, filtration, wetland treatment systems, extended detention basins, or NURP ponds (in no particular order of preference)

It is expected that a combination of techniques, used in series, will often be necessary.

In cases where stormwater facilities with unused capacity already exist near a new project, that new project may utilize those facilities to meet stormwater treatment needs. In these cases the order of preferred techniques listed above may be bypassed.

Applicability

Projects which must comply with the URRWMO stormwater infiltration standards include all projects, including redevelopment, disturbing one or more acres. This includes a disturbance to the land that results in a change in the topography, existing soil cover (both vegetative and non-vegetative), or the existing soil topography that may result in accelerated storm water runoff, leading to soil erosion and movement of sediment into surface waters or drainage systems. Examples of construction activity may include clearing, grading, filling and excavating. These projects are also subject to the Minnesota Pollution Control Agency's (MPCA) General Stormwater Permit for Construction Activity, commonly called the Construction General Permit.

State shoreland rules apply within shoreland areas.

Road construction and reconstruction are exempt, unless the roads are being built as part of another project, such as new residential, commercial, or industrial development that disturbs one or more acre.

Rate Control

As already specified in the URRWMO Watershed Management Plan,

> *"future discharge rates from new development and redevelopment will, at a minimum, not exceed the existing discharge rates for the 2-, 10-, and 100-year events. For formally identified "special waters" as defined in the NPDES general stormwater permit for construction activities, the permanent stormwater management system must be designed such that the pre and post project runoff rate and volume from the 1 and 2 year 24 hour precipitation events remains the same. NPDES permit also requires that volume of water from a site can be released at no more than 5.66 cfs per acre of surface area of the pond."*

Volume Control *

The first ½-inch of precipitation over new impervious surfaces must be infiltrated within 48 hours for portions of the project area with A or B soils. New impervious surfaces are all newly constructed impervious surfaces part of the project. In the case of redevelopment, replacement of an old feature (building, pavement, etc) with a new one is new construction, and therefore must comply with the standards. Resurfacing an existing feature is not new construction.

The volume control requirements for "special waters" also apply (see Rate Control section above).

Soil Testing *

At least three soil borings are required at proposed infiltration practice locations to determine soil type, infiltration rate, groundwater level, seasonally high water table, bedrock, and impeding layers. Borings must be done to a depth five feet below the proposed practice bottom.

Pre-treatment *

Pre-treatment of water before infiltration is required. Pre-treatment is defined as any Best Management Practice that (a) removes settleable or particulate matter and (b) removes oil and grease to a level that they do not interfere with infiltration performance.

Allowable Time with Standing Water *

Infiltration practices must not have standing water longer than 48 hours following each storm.

Vegetation

Infiltration facilities should be planted with vegetation that is appropriate for the infiltration practice and design.

Separation from the Water Table *

The bottom of infiltration practices must be separated 3 feet vertically from the seasonally high water table, bedrock, or other impeding layer.

Required Protections of Infiltration Areas During Construction *

- Stake off and mark infiltration areas to prevent compaction by equipment traffic.
- Sediment and runoff must be kept away from the infiltration area.
- Upland drainage areas must be stabilized immediately following construction and prior to construction of infiltration areas. All areas must be vegetated immediately following construction.
- Vegetation must be established at the infiltration practice inlets and side slopes immediately following construction.
- Construction of the infiltration practice should be suspended during periods of snowmelt or rainfall.

- Low-impact, light-tracked equipment should be used during infiltration practice construction to minimize soil compaction.
- Periodic inspections.

Maintenance Guidelines *

- A legally binding and enforceable maintenance plan clarifying responsible parties is required for all infiltration practices.
- Infiltration practice design should include easy access for maintenance.
- A way to visually inspect infiltration practice performance is required (example – perforated PVC observation well).

Easements and Outlots

An easement and/or outlot is required over the area inundated by a 100-year storm and adequate to provide maintenance access.

Potential Stormwater Hotspots

No infiltration of stormwater from potential stormwater hotspots is allowed. Potential stormwater hotspots are defined as a land use or activity that produces higher concentrations of trace metals, hydrocarbons, or pollutants than normally found in stormwater. Examples include fueling stations, vehicle service or washing areas, vehicle fleet storage areas, auto recycling or salvage, stockpiled snow from salted roadways, construction site inputs, manufacturing sites, public works storage areas, facilities that generate or store hazardous waste materials, and others as determined by the municipality or watershed management organization.

Infiltration in Drinking Water Supply Management Areas (DWSMA)

Municipalities and project managers must exercise extra caution when planning projects within public Drinking Water Supply Management Areas (DWSMA). Some areas may not be suitable for infiltration due to elevated risk of groundwater contamination. DWSMA boundaries are available from public water suppliers or the Minnesota Department of Health (MDH, http://www.health.state.mn.us/divs/eh/water/swp/maps/index.htm).

Projects within a DWSMA should refer to MDH guidance entitled "Evaluating Proposed Stormwater Infiltration Projects in Vulnerable Wellhead Protection Areas" (http://www.health.state.mn.us/divs/eh/water/fs.htm) to determine if infiltration techniques are appropriate. This guidance relies on the answers to the following questions:

1. Is the wellhead protection area or DWSMA considered vulnerable?
2. Does the aquifer receiving the water from the infiltration basin exhibit fracture or solution-enhanced groundwater flow conditions (secondary porosity features?
3. Is the proposed infiltration site within the 1-year time-of-travel (emergency response zone) as designated by MDH?
4. What current or proposed land uses drain to the infiltration site?

If the land use is commercial, industrial, municipal, or transportation corridors, are emergency procedures for containment of spills established and acceptable?

5. Are site planning, BMPs, pre-treatment, or secondary containment measures, or natural attenuation characteristics in the vadose zone acceptable to meet federal drinking water standards.

Minimum Permit Application Materials

Permit applications to municipalities for projects required to comply with these stormwater infiltration standards must include:

- Storm Water Pollution Prevention Plan (SWPPP)
- Maps showing contours, subwatersheds, stormwater facilities, and 100-year flood elevations
- Soil borings results for infiltration areas
- Construction plans for stormwater facilities and computations used to create the designs
- Calculations or modeling showing rate and volume requirements are met. The methodologies used must be approved by the permitting authority.
- Platting and easement documents

Additional Guidance

For additional guidance, refer to:

- MPCA Construction General Permit
- Minnesota Stormwater Manual and
- Minnesota Urban Small Sites BMP Manual

All are available from the Minnesota Pollution Control Agency website.

Amendment
to the
Upper Rum River Watershed Management Organization (URRWMO) Watershed Management Plan

Water Quality Standards
for East Twin Lake, Lake George, and the Rum River

The following standards were recommended by a Technical Advisory Committee including representation from each URRWMO member city, local and state agencies, and the Builders Association of the Twin Cities. Each member community should consider this amendment as they update their local water plan for consistency with the URRWMO Plan.

Effective date: February 3, 2009 (date of URRWMO Board adoption)

The URRWMO will implement policies designed to achieve a goal of non-degradation for water quality in their major recreational water bodies (East Twin Lake, Lake George, and the Rum River). This means that water quality will not be allowed to deteriorate. These water bodies have high water quality and high quality recreational opportunities.

The URRWMO has established water quality standards for each water body. These water quality standards are set for parameters that indicate a broad range of water quality issues and can be easily monitored (Table 1). Water quality standards are considered exceeded when the average value of any parameter over one year is poorer than the standard (Table 2). If water quality becomes worse than the specified standard, then investigative or corrective action is triggered (Table 3).

Table 1. Water Quality Standard Parameters and Data Requirements

Water body Type	Parameters	Data Requirement	What to compare to the water quality standard
Lake	Total phosphorus	10 measurements taken every two weeks from May-Sept	Average of measurements between May and September
	Chlorophyll-a		
	Secchi		
River or Stream	Total phosphorus	a minimum of 8, and preferably 10, measurements between March and November. Half of the measurements should be within 24 hours after a 1-inch or greater storm or major snowmelt, and half during baseflow.	Average of all measurements taken in a single year
	Total suspended solids		

Table 2. Water Quality Standards (Thresholds)

Water Body	Parameter	Standard/ Threshold
East Twin Lake	Total phosphorus	31.6 ug/L
	Chlorophyll-a	15.3 mg/L
	Secchi transparency	9.0 ft
Lake George	Total phosphorus	30.0 ug/L
	Chlorophyll-a	11.8 mg/L
	Secchi transparency	7.2 ft
Rum River	Total phosphorus	192 ug/L
	Total suspended solids	18.1 mg/L

Table 3. Actions Triggered by Water Quality Standard Exceedances

Waterbody Type	Scenario	Action Triggered
(1)Lakes or (2) portions of the Rum River within the URRWMO jurisdictional area	No exceedance	Continue monitoring every 2-3 years, and no less than twice in five years
	One year exceeds standard	Monitor the next year.
	Second consecutive year exceeds standard	The URRWMO Board will review the situation and determine appropriate action.
Rum River upstream of the URRWMO jurisdictional area	Rum River exceeds standards at the top of the URRWMO jurisdictional area two years in a row	The URRWMO will contact state and local agencies with jurisdiction over water management within the Rum River Watershed.

The URRWMO's water quality standards allow for natural water quality variation. The lake standards allow water quality to vary within the range observed since 1980. During that period both lakes had a trend of improving or constant water quality. Only one year of monitoring data is available for the Rum River, but the water quality standards allow the variation seen in that one year (2004). Natural variation in water quality is further taken into account by comparing seasonal averages to the water quality standard, not individual measurements, because there is a higher degree of natural variation among individual measurements.

For the lakes, water quality standards were determined from the average annual observed water quality data from 1980-2006. The water quality standard is the average of the annual averages plus 1.96 standard deviations (or minus 1.96 standard deviations for Secchi transparency). Because the historical means from each year are normally distributed, 97.5% of annual averages are less than a water quality standard that is calculated in this way. In other words, in the lake's current condition only 2.5% of years would be expected to have water quality readings poorer than the standard. Generally, this standard represents slightly poorer water quality than has been observed in any year since 1980.

For the Rum River, only one year (2004) of data from the bottom of the URRWMO area (Co. Rd. 7 bridge) was available, so the methodology used to calculate a water quality standard was different than that used for lakes. Individual samples from 2004 were used instead of the average values from several years. The water quality standard is the average of the 2004 monitoring data (N=8, 4 storm samples, 4 baseflow samples) plus 1.96 standard deviations. Both the total phosphorus and total suspended solids standards calculated in this manner are slightly worse than the maximum observed in 2004. The URRWMO

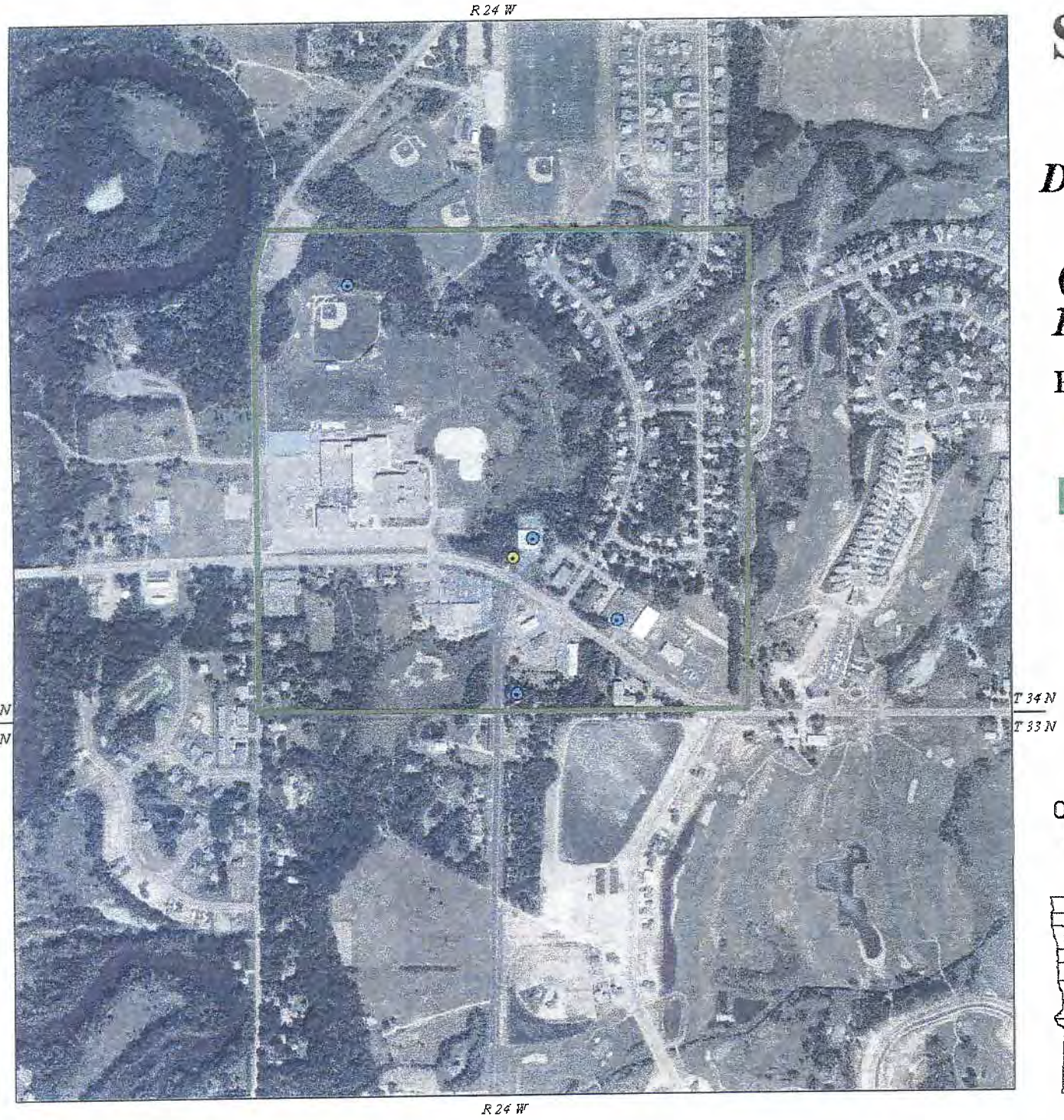
expects to revise the Rum River standard after more baseline monitoring data are collected.

In addition to the URRWMO's standards, State Rules provide additional protections for the Rum River. State Rule Chapter 7050.180 states "no person may cause or allow a new or expanded discharge of any sewage, industrial waste, or other waste" to a "state designated scenic or recreational river segments...unless there is not a prudent and feasible alternative" The Rum River throughout the URRWMO is state designated as scenic and recreational. The URRWMO relies upon this rule, in addition to the URRWMO water quality standards, to ensure Rum River water quality is not allowed to deteriorate.

The URRWMO will monitor for exceedances of water quality standards, as well as to maintain baseline data. The Rum River will be monitored annually for at least three years, beginning immediately, in order to accelerate baseline data collection so water quality standards can be refined. Monitoring will occur simultaneously at both the top and bottom of the URRWMO (or closest bridge crossings) in order to determine if the source of any problems is within the URRWMO or upstream. Monitoring will include at least eight samples between March and November. Half of the measurements should be within 24 hours after a 1-inch or greater storm or major snowmelt, and half during baseflow. At a minimum, the parameters monitored will include total phosphorus, total suspended solids, and turbidity. After the first three years the Rum River will be monitored very 2-3 years, and no less than two of every five years. East Twin Lake and Lake George already have adequate baseline data, and will be monitored every 2-3 years starting in 2008, and no less than two of every five years.

The URRWMO recognizes that baseline monitoring data for the Rum River's tributaries will be important to diagnosing the cause of any deterioration in water quality for the Rum River within the URRWMO. It may also provide early warning that the river is being negatively impacted by one or more tributaries. Therefore, the URRWMO will periodically monitor all major tributaries in the URRWMO.

The URRWMO will revisit the appropriateness these water quality standards when their Watershed Management Plan is next updated around 2017.



Saint Francis East

Drinking Water Supply Management Area (DWSMA) MN-00224 10 year Time of Travel

Public Water Supply Well

- **Primary**
- **Located Wells**
- **DWSMA**

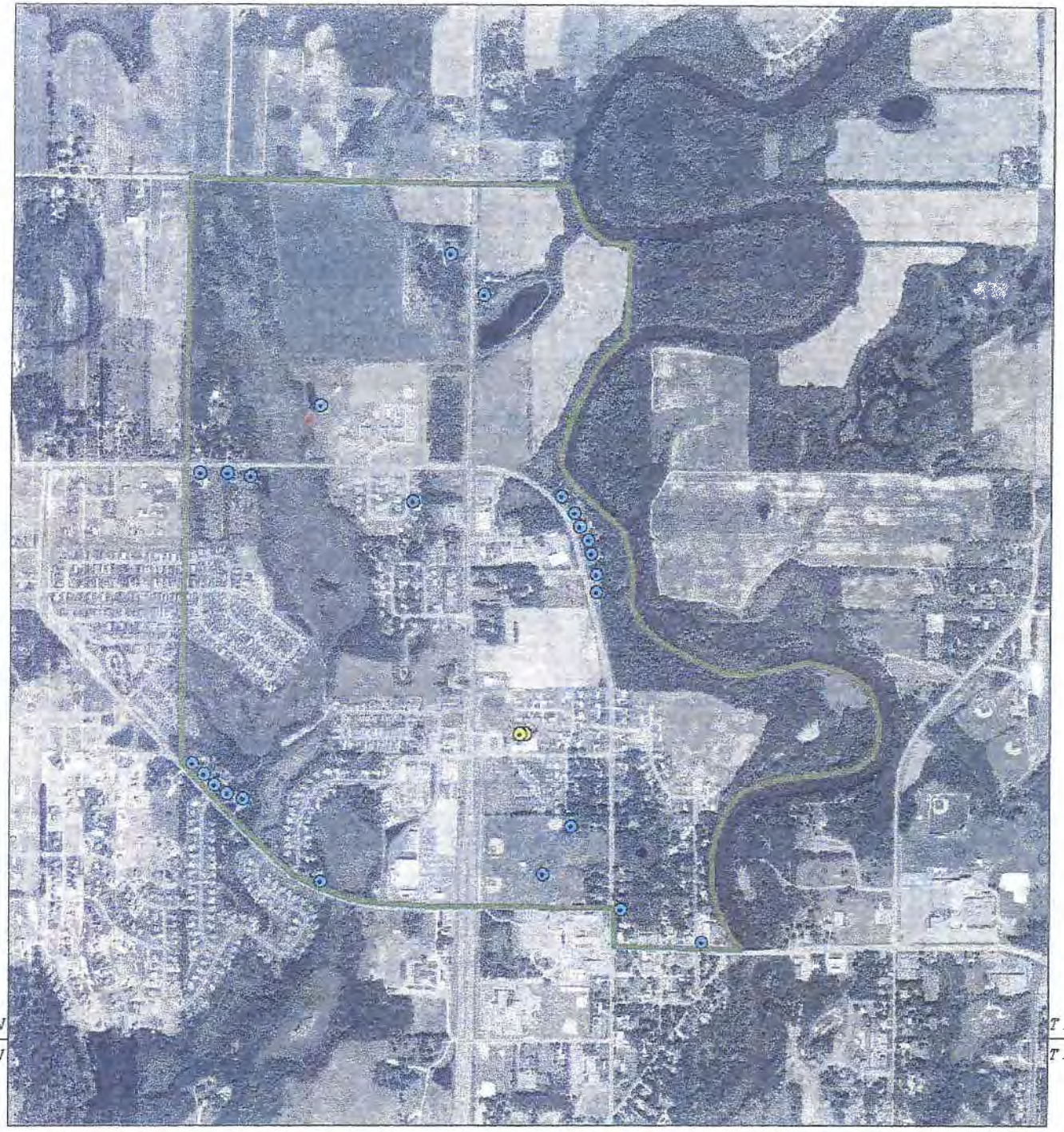
0.1 0 0.1 Miles

SWP

MINNESOTA MDH DEPARTMENT OF HEALTH

Approved July 2, 2003

R 24 W



T 34 N
T 33 N

R 24 W

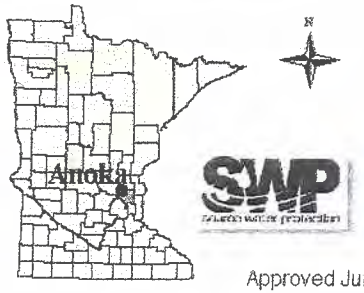
Saint Francis West

Drinking Water Supply Management Area (DWSMA) MN-00223 10 year Time of Travel

Public Water Supply Well

- **Primary**
- **Located Wells**
- **DWSMA**

0.2 0 0.2 Miles



SWP source water protection

MINNESOTA MDH DEPARTMENT of HEALTH

Approved July 2, 2003