WATER RESOURCES MANAGEMENT

SAINT PAUL

The numbered strategies, policies, figures, and pages in the citywide plans of the *Saint Paul Comprehensive Plan* all employ the following abbreviations as a prefix to distinguish among these elements of the other citywide plans:

- IN - introduction;
- LU - Land Use Plan;
- H - Housing Plan;
- HP - Historic Preservation Plan;
- PR - Parks and Recreation Plan;
- T - Transportation Plan;
- W - Water Resources Management Plan; and
- IM - Implementation.

Table of Contents

Table of Figures

Table of Figures (Continued)

A nation that fails to plan intelligently for the development and protection of its precious waters will be condemned to wither because of its shortsightedness. The hard lessons of history are clear, written on the deserted sands and ruins of once proud civilizations.

Lyndon B. Johnson

Introduction

Only one percent of earth's total water is fresh water available for use; terrestrial life –all of us included– depends on it.

The Saint Paul *Water Resources Management Plan* (*Water Plan*) focuses on three main topics: municipal water, surface water, and sanitary sewers. On each of these topics, the City is required by state law to meet certain requirements for technical planning and enforceable standards.

- Municipal drinking water is supplied by the Saint Paul Regional Water Service (SPRWS), a distinct governmental entity associated with the City of Saint Paul. SPRWS completed a *Water Supply Plan (WSP)*, which was reviewed by the Metropolitan Council in 2007 (see Appendix W-A);
- Surface water management deals with how rain and snowmelt are handled on private and public property. Groundwater issues are also covered in this section. The Saint Paul *Local Surface Water Management Plan (LSWMP)*, reviewed by the Metropolitan Council and approved by all appropriate watershed management organizations, recently fulfilled the city's surface water management requirements (see Appendix W-B); and
- Sanitary sewers are integral to the health and functioning of our City; yet, buried underground, they are rarely considered by citizens. Saint Paul's Department of Public Works has fulfilled the Metropolitan Council's requirements for sanitary sewer planning.

Purpose

The *Water Plan* addresses the three major topics listed above. It simplifies and combines the main points from the technical plans and requirements to make them useful for a general audience. The *Water Plan* does not replace the WSP or LSWMP and is meant to be complementary and consistent with them. Additionally, the *Saint Paul Comprehensive Plan* contains broader policies and goals rather than being a specific implementation manual. On some issues the *Water Plan* goes beyond the technical plans that have already been approved and provides policy for issues that are farther out on the horizon.

The general purposes of the *Water Plan* are to:

a. Continue ensuring the safety and proper use of water for the health of citizens and the protection and improvement of water resources;
b. Strengthen, consolidate, and disseminate the City of Saint Paul's position on water issues;
c. Educate Saint Paul citizens, government officials, and city staff and raise the public profile of water issues on the City agenda; and
d. Integrate water policies with other citywide plans of the *Saint Paul Comprehensive Plan*.

Overview of Agencies and Legislation Managing Water Resources

Even more than most resources, water requires interagency collaboration.

Water is not confined by municipal boundaries and how one municipality uses its water affects water quantity and quality elsewhere. Coordination among the various water management agencies is necessary.

Water Resources

Saint Paul and the region developed alongside abundant water resources. The rivers, lakes, and streams were crucial to the development of the region, although most of them within the city were modified in some way. Early developers turned some wetlands into lakes, like Como Lake; others were drained and filled. Creeks were buried in pipes. Though water resources were integral to the area's early prosperity, they were commonly neglected and abused. Raw sewage was running into the Mississippi River as late as the 1970's.

In recent decades, pollution has been reduced in our waterways. The Mississippi River's ecology is improving and the Downtown riverfront is revitalizing. Today, Saint Paul relies on the Mississippi for trade, recreation, and our water supply. Furthermore, Saint Paul is continuing its riverfront revival with the *National Great River Park Plan*, which will bring city neighborhoods and residents into closer contact with the Mississippi River.

Plentiful water supplies characterize the city and the state. Several lakes and wetlands lie within Saint Paul including Como Lake and Lake Phalen, which are centers for major parks. Battle Creek and Fish Creek flow briefly through Saint Paul on their way to the Mississippi River. Saint Paul and the region also rest above several high-quality aquifers.

Key Trends

Growing environmental awareness.

One of Saint Paul's goals is to be a leader on environmental issues, particularly for the Mississippi River and its ecology.

Changing climate and weather patterns.

Climatologists predict that Minnesota will have heavier rains and longer droughts due to global climate change. This will affect our water supply, our water usage, erosion, and surges into storm sewers.

Tougher standards for surface water.

Some water bodies in the city have been declared "impaired" under the Federal Clean Water Act, most notably the Mississippi upstream from Lake Pepin. Studies are currently underway that will lead to new standards to correct these impairments.

Increasing importance of non-point source pollution.

While point-source pollution has decreased dramatically due to the Clean Water Act, non-point source pollution has become increasingly problematic. Non-point source pollution does not originate from a single factory or pipe and is more difficult to regulate and control.

Water bodies completely or partially within Saint Paul:

- Airport Marsh
- Ames Lake*
- Battle Creek
- Beaver Lake
- Burlington Pond
- Como Lake
- Crosby Lake
- Eagle Lake (North Star Lake)
- Fish Creek*
- Frost Lake
- Lake Phalen
- Little Pig's Eye Lake
- Loeb Lake
- Mallard Marsh/Hwy 280 Ponds
- Mississippi River
- Pickerel Lake
- Pig's Eye Lake
- Pike Island Marsh
- Suburban Pond
- Upper Lake
- The aquifer system*

* Not public water bodies regulated by the DNR.

Challenging time for funding public infrastructure.

Many parts of the city's infrastructure for water and sewers are old and need rehabilitation or replacement. A regular capital funding program for infrastructure must be set despite competing requests for more visible public projects.

Increased need for emergency preparedness.

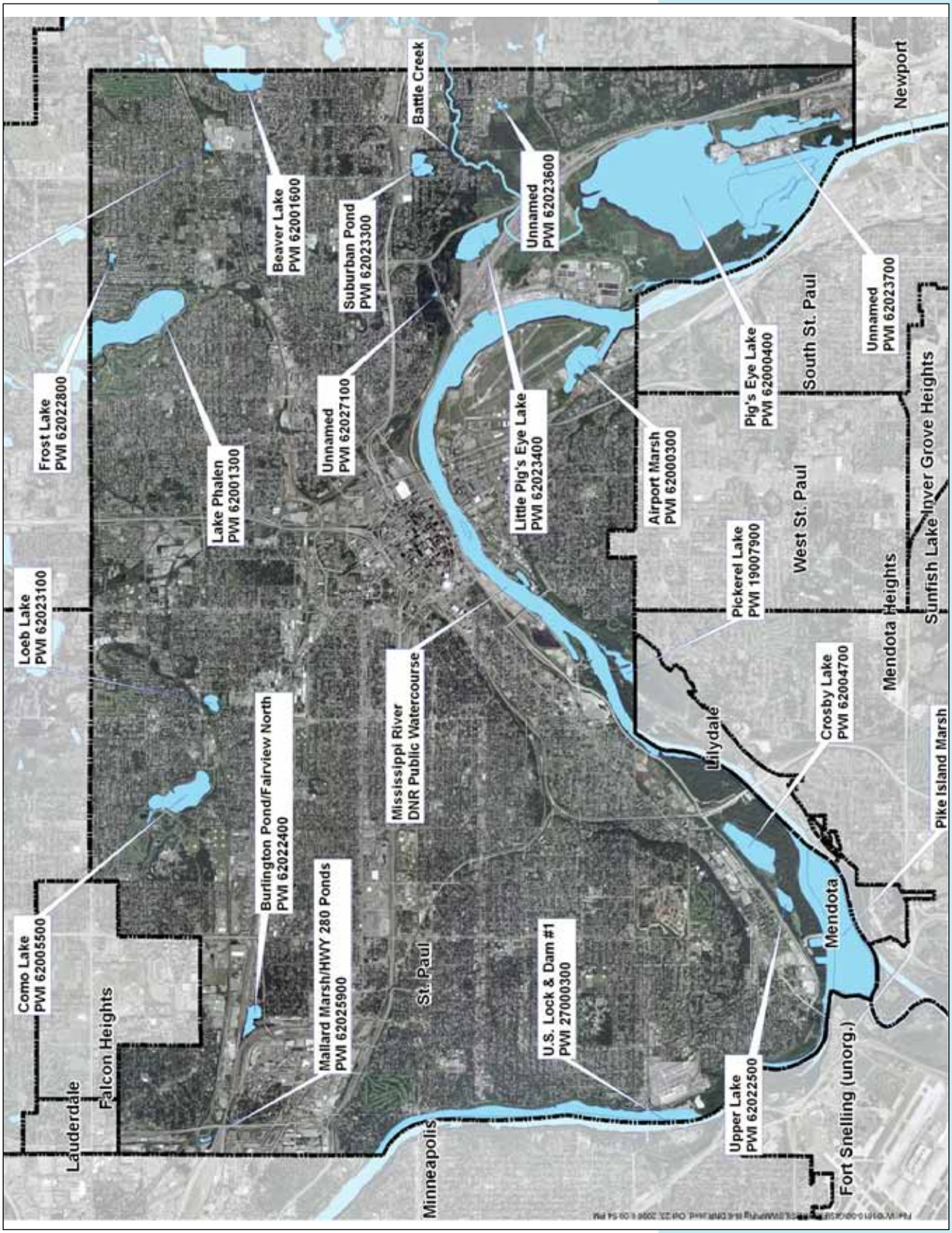
Given the risks that rainfall patterns may change or contaminants will pollute the Mississippi River, the City should, to be prudent, develop more reserve capacity in the water supply system.

Strategies

The *Water Plan* is centered around three strategies to guide the management of the City's water resources:

- Ensure a Safe and Affordable Water Supply System;
- Reduce Pollutant Loads to Water Bodies; and
- Operate and Maintain a Cost Effective Sanitary Sewer Infrastructure.

FIGURE W-A. DNR PUBLIC WATERS



Strategy 1: Ensure a Safe and Affordable Water Supply System

Description of Municipal Water System

The Saint Paul Water Company began supplying water to Saint Paul in the late 1860s. The fledgling private water supply company was bought by the City of Saint Paul in 1882 and grew quickly. A water treatment plant was built in 1921, and the Mississippi River became the source of our municipal water in 1925. Frequent improvements have been made since then to allow Saint Paul Regional Water Services (SPRWS) to serve over 400,000 residents of the East Metro today.

The City's water system is owned by the City of Saint Paul, operated by SPRWS and governed by the Board of Water Commissioners of the City of Saint Paul, as established by the Minnesota Special Laws of 1885. The seven-member Board of Water Commissioners consists of three Saint Paul City Council members, two Saint Paul citizen members representing the public, and two members representing the suburbs served by SPRWS.

SPRWS provides retail water service to the cities of Saint Paul, Falcon Heights, Lauderdale, Maplewood, Mendota, Mendota Heights, and West Saint Paul, and wholesale service to the cities of Little Canada, Roseville, and Arden Hills (via Roseville).

Municipal Water Planning and Regulations

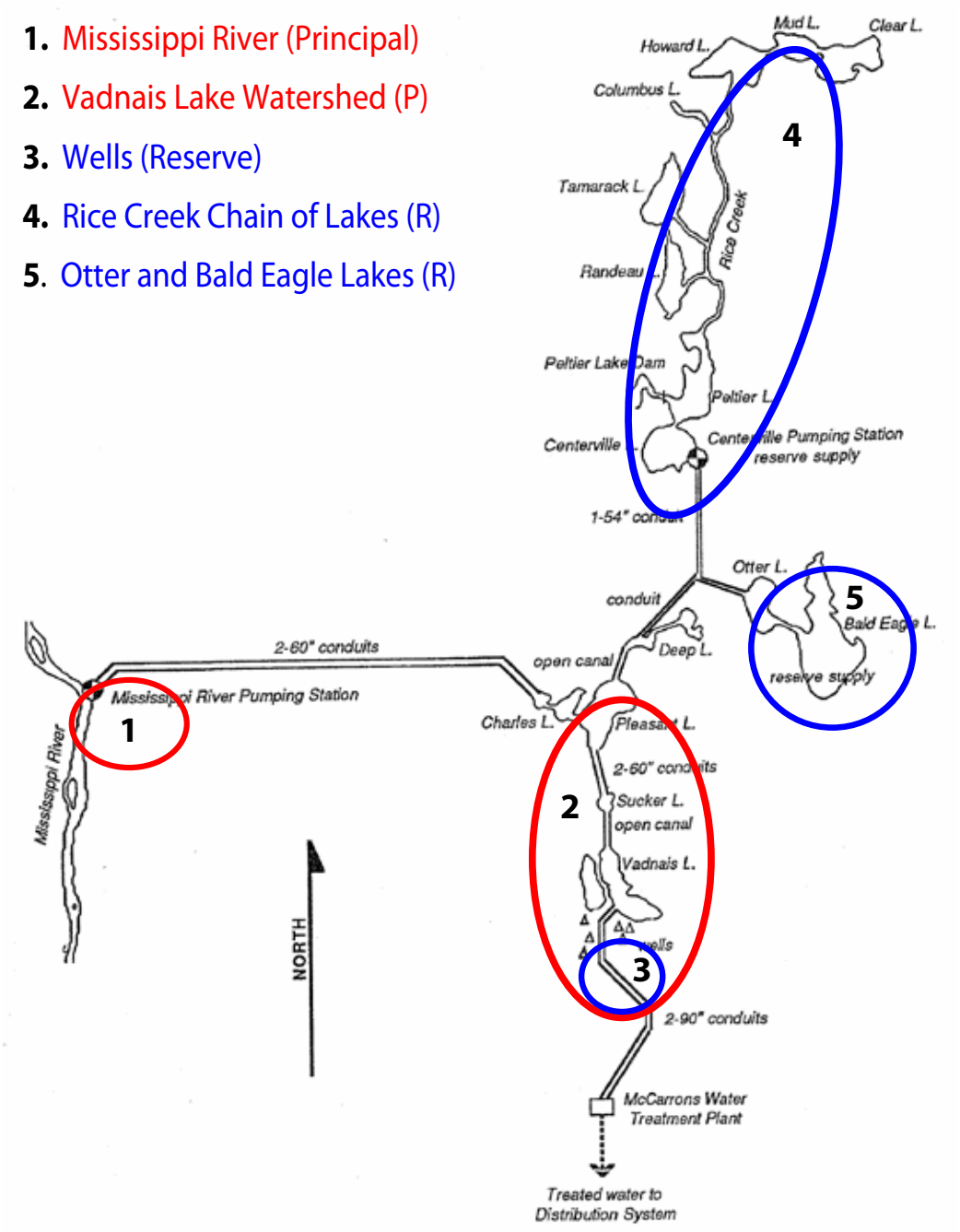
Minnesota Statute 473.859(3)(4) requires water supply plans to be completed by all local government units in the seven county metropolitan area as part of the local comprehensive planning process. SPRWS prepared a WSP, and the plan was checked for consistency and reviewed by the Metropolitan Council and the Department of Natural Resources (DNR) in 2008. Due to its length and technical detail, the WSP is not included in its entirety in this *Water Plan*, but it is herewith incorporated into the *Saint Paul Comprehensive Plan* by reference. Most of the policies below are informed by the WSP and municipal water supply trends.

Reliable Municipal Water Sources ("Raw" Water)

Most of the "raw" water processed by SPRWS comes from three principal sources–the Mississippi River, the Vadnais Lake watershed, and wells. The Mississippi River supplies around 75 percent of the total raw water. River water is pumped from the Fridley intake and flows into the Vadnais chain of lakes. The Vadnais Lake watershed consists of four interconnected, natural lakes with a combined watershed area of 28 square miles and an available supply of 3.6 billion gallons (enough water for 20 to 30 days). The Vadnais chain of lakes is an important natural purification and storage system for SPRWS. From Vadnais Lake, water flows through conduits to McCarrons Treatment Plant. Several wells are connected to these conduits to augment the flow of water to McCarrons when needed. These wells draw from the Prairie du Chien–Jordan aquifer and are currently able to pump about 26 million gallons per day (MGD).

FIGURE W-B. SPRWS RAW WATER SOURCES

1. Mississippi River (Principal)
2. Vadnais Lake Watershed (P)
3. Wells (Reserve)
4. Rice Creek Chain of Lakes (R)
5. Otter and Bald Eagle Lakes (R)



1.1 Coordinate with the State of Minnesota and local units of government to develop and implement the SPRWS' *Source Water Protection Plan* (SWPP).

The condition of source water directly impacts the quality of finished drinking water. The federal *Safe Drinking Water Act* required the Minnesota Department of Health(MDH) to conduct source water assessments for public water systems. SPRWS and the cities of Minneapolis and St. Cloud decided to do more than just an assessment. They entered into a joint powers agreement known as the Upper Mississippi River Source Water Protection Project (UMRSWPP). MDH, Metropolitan Council, Minnesota Pollution Control Agency (MPCA), and the Minnesota Rural Water Association have all assisted the UMRSWPP with their efforts. It promotes better land use and watershed management throughout north central Minnesota.

The SPRWS has also done its own SWPP for the chain of lakes and wells, which has been approved by the Board and submitted (2008) to MDH for approval.

Figure W-C. Contributions from Different Sources to Water Supply

	Mississippi River	Vadnais Lake Watershed	Deep Wells	Rice Creek Watershed	Otter and Bald Eagle Lakes	Total
1995	12,136.20	2,597.20	3,324.40	0	0	18,140.20
1996	12,982.40	283.50	5,446.60	0	0	18,966.50
1997	12,599.00	3,024.90	1,942.80	0	0	17,374.65
1998	15,666.80	782.60	986.60	0	0	17,343.18
1999	14,099.50	768.50	2,239.90	0	0	16,476.00
2000	13,760.70	2,728.61	2,296.79	0	0	18,703.05
2001	11,913.70	4,756.30	1,522.20	0	0	18,192.20
2002	12,200.30	4,383.88	446.50	0	0	17,030.68
2003	13,989.60	3,115.60	919.18	0	0	18,024.38
2004	12,513.91	4,213.23	662.87	0	0	17,269.82

1.2 Advocate for Vadnais Lake Area Watershed Management Organization (VLAWMO) to comply with its adopted *Watershed Management Plan* within its watershed.

VLAWMO oversees the surface water management for the Vadnais chain of lakes. Their Watershed Management Plan sets minimum water quality standards which, when met, will benefit the chain of lakes and reduce maintenance and purification costs for SPRWS.

1.3 Ensure the implementation of the *Wellhead Protection Plan* prepared by the SPRWS in 2007.

Near Lake Vadnais, SPRWS has six wells in the Prairie du Chien-Jordan aquifer with a capacity of approximately 26 MGD. The wells provide an alternate source to the surface water supply from the Mississippi River. SPRWS is expanding groundwater capacity to equal the average annual daily demand from surface water sources of approximately 46 MGD. Two wells were under construction in 2008.

The *Wellhead Protection Plan* establishes the drinking water source management area. Within this management area, special measures are taken to protect groundwater from potential contaminants and prevent land uses that could affect source water quality.

1.4 Minimize use of municipal well water during times when the Mississippi River has normal or high flows with normal water quality.

When the flow of the Mississippi River is sufficient for municipal water needs, SPRWS should eliminate unnecessary ground water withdrawals. SPRWS does use ground water to mitigate extremes in surface water temperatures. This practice saves money and can improve water quality; it should be continued, but monitored to minimize groundwater withdrawals.

1.5 Prohibit new private wells where public water service is available and encourage the discontinuance of existing ones. Discontinued wells should be properly sealed.

Wells are direct routes for the contamination of groundwater and should be properly sealed when they are no longer in use.

Water Conservation

SPRWS has seen per capita water consumption decrease in recent years in Saint Paul. This is a result of successful water conservation strategies, loss of major industries, and no major droughts. Water conservation programs are intended to reduce water demand, reduce water losses, and increase efficiency of use.

The city's sources of water (i.e., Mississippi River, chain of lakes, wells) are adequate to meet current and projected demands, including normal dry summer conditions. When extreme drought conditions occur, the source system is adequate to meet the foreseeable demand if demand is properly managed. This would entail a conservation strategy laid out in the WSP, and, if necessary, additional groundwater or river water pumping. However, the Minnesota Environmental Quality Board (EQB) is making a renewed call to cities and counties and especially Ramsey County, as the state's most urbanized County, to conserve water and reduce draw-downs from local aquifers.

See EQB's Report "Use of Minnesota's Renewable Water Resources: Moving Towards Sustainability" at the webpage: www.eqb.state.mn.us/resource.html?Id=19064

1.6 Become a regional leader in public education for water conservation.

The City and SPRWS have ongoing educational and information campaigns. Public education is an increasingly important aspect of water resource management and SPRWS should become a more visible leader.

1.7 Promote and advocate ways to reduce indoor water use through better fixtures and appliances and also by changing personal habits.

Indoor water use accounts for roughly 35 percent of total per capita water use. SPRWS should explore several options to reduce indoor water use:

a. Restart a retrofitting program for high efficiency water fixtures and appliances. This could be coordinated with the federal Environmental Protection Agency's (EPA) Water Sense program;
b. Raise retrofit-upon-sale regulations for statewide consideration, under which new, efficient fixtures would be required when a building is sold to a new owner; and
c. Enact green development guidelines such as Leadership in Energy and Environmental Design (LEED) or the state B3

For more information on water conservation, visit the SPRWS website and through the EPA WaterSense program.

guidelines. Saint Paul has committed to achieving LEED-silver or B3 for new City-owned buildings.

FIGURE W-D. MEAN DAILY PER CAPITA WATER USE: 12 STUDY SITES

Fixture/EndUse	Avg. gallons per capita per day	Avg. liters per capita per day	Indoor use percent	Total use percent
Toilet	18.5	70.0	30.9%	10.8%
Clothes washer	15	56.8	25.1%	8.7%
Shower	11.6	43.9	19.4%	6.8%
Faucet	10.9	41.3	18.2%	6.3%
Other domestic	1.6	6.1	2.7%	0.9%
Bath	1.2	4.5	2.0%	0.7%
Dishwasher	1	3.8	1.7%	0.6%
Indoor Total	***59.8***	***226.3***	***100.0%***	***34.8%***
Leak	9.5	36.0	NA	5.5%
Unknown	1.7	6.4	NA	1.0%
Outdoor	100.8	381.5	NA	58.7%
TOTAL	**171.8**	**650.3**	**NA**	**100.0%**

1.8 Advocate for change of the state plumbing code to allow for the safe reuse and recycling of gray water.

Gray water systems are becoming more popular and are included in guidelines for green development such as LEED. However, the state plumbing code currently does not address water reuse or recycling adequately. Gray water systems are currently not allowed in Minnesota and should not be used until a standard process and designation is developed. Eventually gray water systems could be used for landscape irrigation or even to reuse water within buildings (see Policy W-3.10).

1.9 Advocate for reduced lawn watering needs through the use of native plants, rain barrels, gray water for irrigation, drip irrigation systems etc.

Lawn watering and other outdoor water uses account for a significant percentage of municipal water use in the summer. Data from the last 10 years indicates that summer water use increases from 15 to 40 percent over winter rates.

Multiple solutions are available to reduce lawn watering needs:

a. Use drip irrigation or install and maintain moisture-sensors on sprinklers for landscaping that needs irrigation;
b. Water only in the mornings or evenings;
c. Use native landscaping, which saves water, reduces use of fertilizers and herbicides, reduces mowing (which results in less air pollution), provides habitat, and restores the soil's fertility and permeability.

1.10 Seek continuing reductions in the amount of lost (i.e., unaccounted-for) water throughout the system.

SPRWS has an excellent record of holding the amount of lost or

"unaccounted-for" water down to a minimum. The American Water Works Association (AWWA) recommends that unaccounted-for water not exceed ten percent. The average percent of unaccounted-for water for SPRWS over the last five years is 9.89%. SPRWS should:

a. Continue the leak detection and survey;
b. Continue aggressive replacement of mains; and
c. Institute new operations or maintenance if they are cost effective.

For more information on sustainable lawn care see the Ramsey-Washington Metro Watershed District website on Natural Landscaping tips and through the Blue Thumb program at bluethumb.org/

Excellent Municipal Water ("Finished" Water)

At the McCarrons Treatment plant, water is purified to meet federal drinking water standards and refine its taste and odor. The treatment plant has a capacity of 144 MGD, approximately three times the average daily demand of the service area (48 MGD estimated from 1995 – 2004). Once the water leaves the plant it can be used immediately or stored. If the water is not drawn off for immediate use, it is piped to water storage tanks, reservoirs and standpipes located throughout Saint Paul and nearby communities. The system has 131 million gallons of finished water storage capacity, nearly three times the average daily demand. Care must be taken to preserve the safety and quality of water in storage until it is delivered to consumers' taps.

1.11 Continue programs that ensure the overall safety and quality of water reaching the consumer.

The EPA imposes strict regulations that limit the amount of contaminants in water provided by public water utilities. Water is continuously tested as it leaves the plant to ensure compliance with the standards set by the EPA and MDH. By law, SPRWS is required to notify its consumers if the water is ever out of compliance with federal or state drinking water standards. SPRWS' s preeminent objective is to provide water that is both safe and appealing. Clean water, free of contaminants, is a cornerstone of good public health; it protects citizens from diseases, lead poisoning, and other harmful contaminants, while bolstering human health with adequate amounts of fluoride.

1.12 Continue efforts to increase SPRWS's customer base to include nearby municipalities. $

SPRWS projects water demand will increase by roughly 10 percent between now and 2030 due to population increases in the municipalities it serves. With an average current daily demand of around 44 MGD, an expected increase to 49 MGD, and a daily capacity of 144 MGD, SPRWS's plant is operating significantly below its capacity.

If the McCarrons Treatment Plant increased its daily output, it would achieve a higher level of operating efficiency and the cost per gallon of finished water would be lower. Providing water to additional suburbs would increase the plant's efficiency. Moreover, extending SPRWS would help to diversify the metro area's water supply and reduce groundwater demands since the suburbs that are not connected to the Saint Paul or Minneapolis systems rely on groundwater as their only water source.

Figure W-E. SPRWS Demand Projections

Year	Population Served[1]	Projected Demand[2] (MGY)	Average Day Demand[3] (MGD)	Maximum Day Demand[4] (MGD)
2010	442,340	16,145	44.2	84.0
2020	464,560	17,003	46.5	88.3
2030	488,200	17,819	48.8	92.8

1. Population projections are made consistent with those in the Metropolitan Council's *2030 Regional Development Framework*. See Table IV.B-2.
2. The same methodology is used to predict the demand as in Part I, Section D. Projected annual demand = (Overall per capita daily demand) × (Days in the year) × (Population served). Overall per capita daily demand is assumed to be 100 gallons from 2010 to 2030.
3. Average day demand = (Projected demand)/(Days in the year).
4. The ratio of maximum day demand to average day demand is 1.9.

1.13 Promote Saint Paul public drinking water as a safe and cheaper alternative to bottled water.

The City and SPRWS should promote the high quality water that SPRWS distributes. As an alternative to single-serving bottled water, tap water is at least as safe, comparable in taste, and much cheaper. Furthermore, single-serving bottled water has high environmental costs due to shipping and the plastic in the bottle. The following steps should be considered:

a. Reduce further or eliminate altogether City purchases of bottled water for events and canceling its bottled water contracts;
b. Revive the "Quality on Tap" marketing program of SPRWS; and
c. Endorse or join the national "Think Outside the Bottle" campaign as Minneapolis has done.

1.14 Encourage the provision of clean drinking fountains in public spaces.

Drinking fountains can be an essential service in public spaces. They can be heavily used, especially during special events or hot weather. Knowing that clean public drinking fountains are available is likely over time to decrease private purchases of bottled water.

Being Prepared for Emergencies

In the event of an emergency (e.g., drought, spill of contaminants, sabotage, power outage, etc.), SPRWS maintains an emergency plan to reduce the extent and duration of any service loss.

1.15 Review and update SPRWS's Emergency Preparedness and Response plan every year.

1.16 Continue to seek funding for the connection of the Minneapolis and Saint Paul municipal water supply systems. $

For the benefit of the entire Twin Cities, SPRWS and Minneapolis Water Works systems should be interconnected. The connection would provide a partial backup if one or the other of the major treatment plants went offline. If river water became unusable for any reason, Saint Paul with its chain of lakes, has at least 20 to 30 days of raw water available in reserve, whereas Minneapolis has much less.

Future Capital Investments

SPRWS is entirely self-supporting with revenue obtained through the sale of water and receipts for its other services. State law provides that the rates charged be adequate to cover all costs of facilities, operations, and maintenance. The utility receives no tax money.

1.17 Maintain the SPRWS's capital budgeting system to preserve and improve infrastructure for the municipal water supply system. $

The municipal water supply is an essential public service; capital budgeting for it must provide for its long-term maintenance, repair, and updating.

Capital Investments Planned: 2008–2017

- Water main replacement;
- Lead service replacement;
- Hydrant replacement;
- Drill new wells;
- Aeration system at Pleasant Lake;
- New water meters and metering system; and
- Saint Paul – Minneapolis interconnect

An Educated Public on Water Supply

Increasing public education on water conservation can reduce water usage. Technical and mechanical improvements increase water use efficiency, but residential customers are the primary end users of water from SPRWS. Changes in customers' daily habits could conserve significant amounts of water.

1.18 Augment existing educational programs for school-age children.

SPRWS should do more to educate children about our municipal water supply. SPRWS should explore allowing school groups to visit the treatment plant, as personal experience can be the best educational method.

1.19 Expand and broaden general public education efforts.

Small amounts of educational information are currently included in the water bill and SPRWS quarterly reports. More could be done. Efforts to reach and engage a broader population should be initiated, although SPRWS should not be solely responsible for their initiation or implementation. Some topics for future educational efforts might be:

- The inter-relationship of the water cycle and water users across geographic scales and through time;
- Antibiotics, drugs and water. An initiative describing the dangers of flushing antibiotics and drugs into the water (leftover drugs should be discarded in the garbage);
- Groundwater protection. The public should have a greater appreciation of the need to protect groundwater, for example, finding and sealing abandoned wells; and
- Communicating to a multicultural population. Different cultures learn and spread knowledge in various ways; thus, different media may be needed to reach different demographic groups.

Strategy 2: Reduce Pollutant Loads to Water Bodies

Sources of Water Pollution

Water pollution comes from many sources. For regulatory purposes, they are divided into two broad categories: point source pollution and non-point source pollution (see sidebar). Point source pollution (e.g., from industries, sewage treatment plants, etc.) has been largely regulated by the Clean Water Act of 1977 and has become a relatively smaller threat. However, as urbanization has expanded, non-point source pollution (e.g., from rooftops, parking lots, roads, etc.) has become the larger source of urban water pollution and it is more complicated to control and regulate. Therefore, managing surface water runoff has gained importance as a method of improving urban water quality. The techniques for managing runoff are also rapidly evolving. Therefore, this section of the *Water Plan* contains more policy changes than the sections on the municipal water supply and sanitary sewers.

Saint Paul's original drainage system of wetlands, creeks and streams flowing into the Mississippi River had roughly 10 percent of rain water run off the land. Over time the area has become urbanized and few wetlands or streams remain. The smaller water features were filled in decades ago and trunk storm sewers were built deep under the city. Returning to any semblance of the natural drainage system is, with rare exceptions, infeasible. We have to start from what we have and make incremental improvements.

With urban development, impervious surfaces–the rooftops, parking lots, and roads–prevent water from soaking into the ground. More and more water runs off the surface, disrupting an essential part of the water cycle. Runoff is captured by storm drains and sewers which pipe the water underground to ponds, lakes and rivers. Over 90 percent of the runoff in Saint Paul goes directly to the Mississippi River through storm sewers and surface drainage; the rest goes to the area's lakes before ending up in the Mississippi River.

Point source pollution: a single, localized and identifiable source of pollution, such as a smokestack, storm sewer or effluent pipe.

Non-point source pollution: a general, diffuse pollution source such as surface runoff or atmospheric deposition.

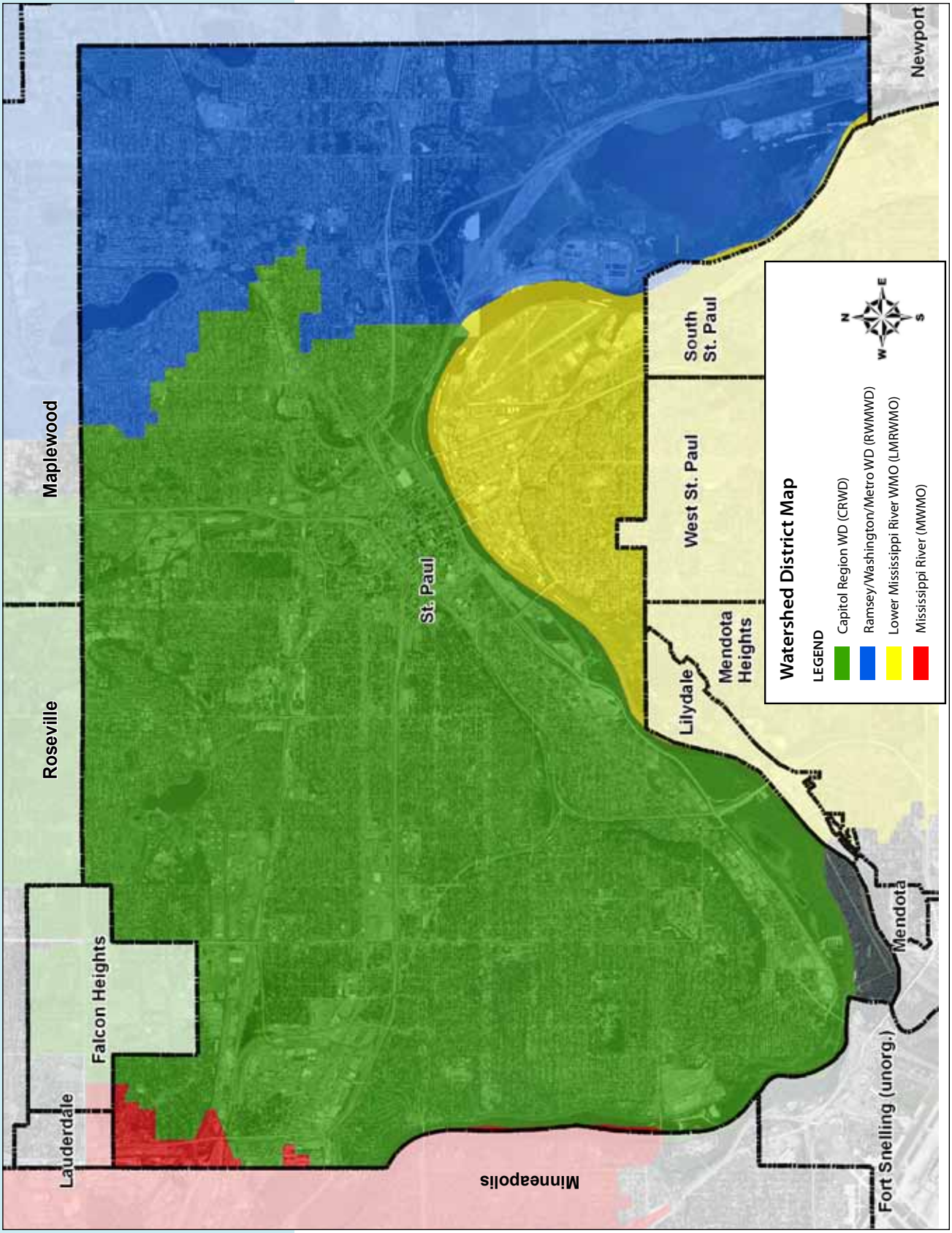
Intergovernmental Roles

Governmental roles in surface water management are confusing due to the multiple layers of regulation and governmental units that have a role in carrying them out. A web of laws and organizations regulate surface water management.

Minnesota statute 103B provides for special purpose governmental units that govern a particular watershed's surface water management. These units, which can take the form of joint powers watershed management organizations (WMOs) or watershed districts (WDs) follow the natural boundaries of a watershed, cutting across municipal lines. WDs are independent governmental bodies that can levy their own taxes and set rules that the City and citizens must follow. WMOs are established by joint powers agreements among the affected cities and counties and they typically choose to exercise fewer powers than WDs.

Two watershed districts encompass the majority of Saint Paul: the Capitol Region Watershed District (CRWD) and the Ramsey-Washington Metro Watershed District (RWMWD). The two districts' regulations are virtually identical. The West Side and a section of Saint Anthony Park are each controlled by separate WMOs:

Figure W-F. Watershed Management Organization Boundaries in Saint Paul



respectively, the Lower Mississippi River and the Mississippi River WMOs.

The *Saint Paul Local Surface Water Management Plan* (LSWMP; see Appendix W-B)is for legal purposes hereby incorporated by reference as an addendum to this *Water Plan* of the *Saint Paul Comprehensive Plan*. The policies and recommendations for surface water management that follow are consistent with the LSWMP; they both summarize the approved plan and extend its recommendations into emerging issue areas.

Cleaner Run-off Through Public Education

Runoff from rooftops, parking lots, roads, and even lawns flows into storm sewers and directly into the Mississippi River or a lake. Pollutants that are washed into storm sewers are carried into public water bodies. As a practical matter, water must be treated or filtered before it reaches a storm sewer and drops underground. This means that in order to improve water quality in the metropolitan region both public and private property owners must change their management of surface water on their own properties. Therefore, all Saint Paul property owners should act as though their property were waterfront property. Significant water quality improvements in Saint Paul will come from minor changes made by many property owners.

2.1 Ensure delivery of public education programs on urban water quality in collaboration with other organizations.

Public education is critical to changing habits that cause water pollution. A variety of governmental and non-profit organizations offer education about water quality. The City should assist and coordinate these efforts and fill in gaps where they exist. Some of the educational material should be targeted to developers and City staff to inform them of various best management practices (BMPs) and to become comfortable using them.

2.2 Disseminate knowledge of the regulations regarding surface water management and engage citizens and other stakeholders in meeting regulations through best management practices.

Saint Paul and the watershed districts need to raise the level of public knowledge surrounding regulations and stormwater management techniques. There are many ways this can be done, such as:

a. Investigate the creation of a City website dedicated to information regarding regulations, storm sewers, BMPs, sanitary sewers, etc.;
b. Work closely with district councils to incorporate water quality into local planning and encourage active communication between district councils, the City Water Resources Coordinator, watershed districts and other partners to effectively leverage opportunities for achieving Saint Paul's water-related goals;
c. Collaborate with both traditional and non-traditional partners on water issues. Organizations and entities that may not normally

deal with water issues, such as churches or school groups can help the city reach a wider audience;

d. Raise public awareness of watershed management organizations;
e. Undertake demonstration projects; and
f. Use the *National Great River Park Plan* to help meet this policy.

Behavioral changes that improve urban water quality:

- Pick up pet waste and trash;
- Redirect downspouts from pavement to landscaped areas;
- Remove leaves and debris from storm sewer grates;
- Reduce erosion;
- Reduce the use of fertilizers and de-icers; and
- Wash cars at car wash businesses (their drains connect to sanitary sewers) instead of on the street.

These individual choices and actions can reduce non-point source pollution.

Cleaner Lakes/Cleaner River

High quality water is an expectation of Minnesotans and many believe pollution controls could be stricter, according to the *Minnesota Report Card on Environmental Literacy* (2002). The general goal of surface water management is to move back toward more natural, "predevelopment" conditions by reducing surges of runoff and minimizing pollutants.

Impervious cover disrupts the normal water cycle by blocking water from infiltrating into the ground and causing runoff. The watershed districts have done estimates of the amount of impervious cover in their parts of the city. Taken as a whole, about 40 percent of Saint Paul is covered with impervious surfaces; the major categories are streets, parking areas, and rooftops.

The major contaminants of non-point source pollution include sediment, organic compounds (in excess of natural levels), trace metals, and chlorides. These pollutants are contaminating and disrupting the natural balance in many of Saint Paul's water bodies. The primary method for achieving better water quality and reducing surges of runoff is to infiltrate more water into the ground.

Cleaner rivers and lakes improve the environmental health of the ecosystem and everyone associated with it. Water quality and quantity that mirrors predevelopment conditions is best for the plant and animal life that live in or depend on the local waterway.

Partners with Saint Paul on water issues:

- Watershed Management Organizations;
- •Ramsey Conservation District ;
- Friends of the Mississippi River;
- Great River Greening;
- Lower Phalen Creek Project;
- Clean Water Action;
- Mississippi National River and Recreation Area;
- Metro WaterShed Partners; and
- BlueThumb.

2.3 Comply with existing and future plans, permits, laws and rules for surface water management and update them when required.

Surface water management regulations are becoming tougher due to both federal and local requirements. Total maximum daily load (TMDL) studies, a result of the Clean Water Act, are becoming increasingly common and require local reduction of pollutant loads to impaired waters.

2.4 Establish a Litter-Free Saint Paul campaign in conjunction with district councils and other non-profits.

Not all trash makes it to landfills; in fact the amount found on our roadways is staggering. Litter is not only unsightly, it harms wildlife and, as it degrades, releases pollutants into the water.

2.5 Strengthen the City ordinance against raking leaves into the street, and disseminate information about the damage autumn leaves do to water quality (see *City Legislative Code*, Section 106.02).

The current ordinance allows property owners to rake leaves into the street if they have fallen from trees on public property. The ordinance should be revised

to prohibit raking any leaves into the street. Leaves in the street that are flushed down storm sewers cause high phosphorus levels in the receiving water bodies. Instead, leaves should be composted, used, or taken to yard waste drop-off sites.

2.6 Participate in total maximum daily load (TMDL) studies and implement programs and projects to comply with load requirements set by approved TMDLs.

The MPCA has found that several water bodies in Saint Paul are impaired (see sidebar). Each of these will require its own TMDL study and will have localized effects.

The largest TMDL study in Minnesota to date is the Lake Pepin TMDL. Saint Paul, lying upstream from Lake Pepin, will be impacted by the findings and requirements to reduce sediment loads reaching the Mississippi River. Other impairments for the Mississippi River have been found and will be addressed through other TMDLs.

As part of Battle Creek's TMDL for chlorides, an educational or citizen engagement component should be developed and communicated citywide to help local government officials and staff, citizens, and businesses understand the importance of appropriate salt use and application.

2.7 Reduce erosion throughout Saint Paul.

Within the CRWD section of Saint Paul, nearly 3,000,000 pounds of suspended solids entered city water bodies from 11,000 acres of land during the months from April to November (*CRWD Monitoring Report*, 2006). That means roughly 270 pounds per acre of suspended solids washed into water bodies in less than one year. This is a staggering amount, and it needs to be reduced through the following methods:

a. Improve Saint Paul's regulatory enforcement and management of erosion control in construction zones. The City must do this in accordance with the National Pollution Discharge Elimination System (NPDES) permit issued to the City by the Pollution Control Agency; and
b. Identify erosion-prone areas of publicly-owned land and determine solutions case by case, which may involve revising mowing and snow clearing practices, replanting with native vegetation, re-grading, or adding retaining walls (see Policy W-2.15).

2.8 Reduce the negative impacts that roadways in the city have on water quality and water resources.

Impervious cover associated with transportation infrastructure has the highest pollutant load of any land use (*Storm Water Strategies: Community Responses to Storm Water Pollution*, 1999). While roads do not actually produce pollutants, they hold pollutants until they are cleaned up or washed into storm drains. Current BMP programs such as street sweeping and cleaning out catch basins reduce the amount of pollution that reaches local waterways.

Saint Paul's impaired waters list as of 2008, MPCA:

- Mississippi River adjacent to Saint Paul: fecal coliform, turbidity, PCBs, PFOs in fish tissue, and mercury in water column and fish tissue
- Como Lake: phosphorus, mercury in fish
- Beaver Lake: phosphorus, mercury in fish
- Battle Creek: chlorides
- Lake Phalen: PFOs in fish tissue

What is a TMDL?

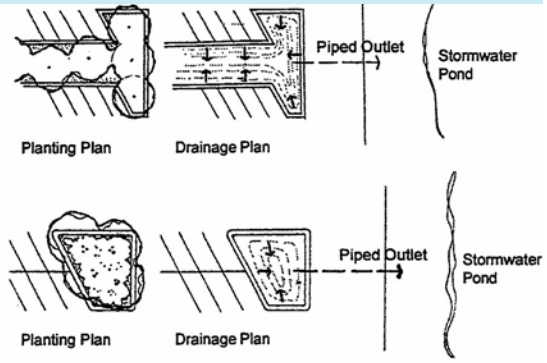
As part of the Clean Water Act, states are required to submit a list of impaired waters to the U.S. EPA every two years. A water is impaired if it fails to meet one or more basic federal water quality standards. As a result of an impairment, the state (administered by the MPCA) must evaluate the pollutant sources and make reasonable progress towards addressing the impairment.

A TMDL study is undertaken for each of the impairments. Each study is composed of several parts. The study determines the amount of a pollutant that is currently entering the water. Then, it determines the maximum amount of the pollutant that can be present in the water while meeting water quality standards. The difference between these two levels is how much pollutant must be removed from the system. A list of the contributing water bodies and sources must be prepared, indicating how much of the pollutant they contribute and how much they will have to reduce their pollutant loads. Timelines are created for actions to be taken within two years, within five years, and longer term. More information on TMDLs can be found either through the EPA or the MPCA.

Total suspended solids (TSS) is the dry-weight of particles trapped by a filter, typically of a specified pore size i.e. dirt and other particles suspended in a liquid.

Seattle's Street Edge Alternatives (SEA) Streets Project reduced stormwater runoff by 99%.

After adding rain gardens to a Burnsville neighborhood, stormwater runoff decreased nearly 90% compared to the control neighborhood. (www.burnsville.org/DocumentView.asp?DID=450)



Two alternative designs for parking lot infiltration islands. Parking lot sheet flow is directed to depressed islands, overflow drains to stormwater pond.

Figure W-G. Alternative Parking Lot Designs to Improve Stormwater Retention and Infiltration.

Paved roads cover more acres in the city than any other category of impervious surface. The Residential Street Vitality Program (RSVP) is the City's primary paving program. Most RSVP projects fall under Watershed District requirements for infiltrating water. During RSVP projects, the City should:

a. Work with district councils to meet city and neighborhood needs while also meeting watershed, regional, and State requirements. (see Policy W-2.2b.);
b. Use Low Impact Design (LID) concepts and tools where feasible;
c. Undertake demonstration projects or programs; and
d. Encourage the construction of residential rain gardens without sacrificing boulevard tree health or residential densities (see Policy W-2.19).

2.9 Reduce the negative impacts that parking lots in the city have on water quality and water resources.

Parking lots are another major source of impervious surfaces in the city. Many methods exist to reduce runoff and pollutant loads from these areas. As with streets, the solutions tend to be more difficult and costly to accomplish in urban areas. The City should change its off-street parking requirements and implement other actions to reduce the size of surface parking lots. Pervious pavement also works well in areas of low traffic or overflow parking (see Policy T-2.16).

2.10 Reduce the negative impacts that alleys in the city have on water quality and water resources.

The City should consider alternatives to standard alley resurfacing, such as giving citizens the option to repave their alley with porous pavement, which will reduce alley runoff and be more aesthetically appealing.

2.11 Review and Implement improvements in the City's day-to-day operations (i.e., housekeeping) in order to reduce adverse impacts on water quality and resources, (e.g., de-icing, lawn mowing, tree removal, street sweeping, catch basin cleaning, vehicle washing, sidewalk sweeping, etc.).

Tidy "housekeeping" on the city's streets and alleys can reduce water pollution significantly. This is an important category for action in the City's National Pollution Discharge Elimination System (NPDES) permit.

2.12 Reduce the negative impacts of rooftop runoff on water quality and water resources. $

The final major category of impervious surface in the city is rooftops. Many strategies exist to reduce runoff and pollution from rooftops. The City should control runoff from its municipal buildings and encourage others to do likewise at their buildings through the following techniques:

a. Use cisterns and rain barrels, which first reduce runoff and then conserve on municipal water needed for irrigating lawns and gardens;

b. Redirect downspouts towards pervious areas or through planter boxes; and
c. Construct green roofs. Green roofs come in a variety of depths and costs. Depending on the desired function, they can be as thin as a few inches planted in succulents or as thick as a foot of soil planted with grasses, shrubs or even vegetables. Depending on rain intensity and green roof depth, between 15 and 90 percent of potential runoff can be absorbed; 50 to 60 percent is typical. Green roofs have additional benefits such as decreasing the urban heat island effect, decreasing building energy costs, extending roof lifespan, and making the cityscape more beautiful.

2.13 Continue to use site plan review as an opportunity to improve surface water management on proposed developments.

While maintaining the density and economic feasibility of projects undergoing site plan review, the City should:

a. Encourage designs and landscaping that clean and minimize runoff (i.e., above-ground BMPs);
b. Encourage above-ground BMPs, which may or may not use runoff, as a placemaking amenity and for public art.
c. Encourage maximization of pervious areas; and
d. Encourage preservation of natural areas and mature trees.

The City should also:

a. Maintain a catalog of BMPs to be used during site plan review;
b. Encourage the use of Low Impact Development (LID) concepts and tools during larger redevelopment projects; and
c. Continue to work with the watershed district staff on projects that trigger their rules (projects over one acre in size).

2.14 Explore ways to reduce stormwater runoff and improve water quality from existing sites. $

Only new construction at sites larger than one acre is subject to watershed district rules. Therefore, improvements in overall water quality due to the existing regulations will be tediously incremental. Additional methods that encourage retrofitting current sites to reduce stormwater runoff should be pursued. The City should:

a. Reevaluate, as information systems grow, whether it would be practical to change the City's storm sewer service charge from generalized land use categories to site-specific charges, that is, a system for charging each property for the actual amount of runoff it contributes to the storm sewer system;
b. Develop incentives for property owners to retrofit their stormwater systems voluntarily to meet infiltration and water quality standards;
c. Encourage the use of cisterns and construction of rain gardens in appropriate areas; and
d. Evaluate the need for a standardized process to determine requests for curb openings to residential rain gardens.

Green Roof at the Bureau of Criminal Apprehension at 1430 Maryland Avenue East.

A rain garden in the Saint Anthony Park neighborhood with a curb opening to accept street runoff.

2.15 Develop and adopt appropriate standards for stormwater management on development sites smaller than one acre.

Within the CRWD, 85 percent of all parcels are smaller than an acre in size. These parcels make up roughly 3,000 of the 11,000 acres of the district, over 25 percent of the district, including virtually every residential lot. These smaller lots should also contribute to water quality improvements. The City should:

a. Set up an interagency process to establish criteria for parcels smaller than an acre (see Policy W-2.17); and
b. Revise Saint Paul's stormwater ordinance (*Saint Paul's Legislative Code*, Section 52).

2.16 Work on an area-wide or citywide scale to identify and use sites to meet volume reduction requirements in the best and most cost-effective manner. The results must recognize different land uses and emphasize cooperation and communication between City departments. $

A 2008 study categorizes the infiltration potential of land citywide. Different areas of the City have good or bad infiltration potential. The City will identify infiltration opportunities on good sites in order to bank infiltration credits. City departments will have to cooperate and communicate about the amount of water to be infiltrated, who will maintain the BMPs, and how it will balance with other uses of the site. Other factors to consider:

- The City and WMOs may need to acquire land in certain situations to help meet area-wide requirements;
- The City should work to establish area-wide infiltration "banks" to meet volume reduction requirements; and
- The City will need to solicit input and assistance from other agencies, and local government units such as Watershed Districts, Minnesota Department of Transportation, Ramsey County, Saint Paul Public Schools, and adjacent municipalities.

2.17 Strive toward consistent surface water management regulations throughout the city.

Multiple layers of regulation exist and, due to watershed district boundaries, part of Saint Anthony Park and all of the West Side neighborhood have different regulations than the rest of Saint Paul (see Figure W-G). Steps toward simplifying the rules and regulations could aid development and public participation in water management. Saint Paul should form an interagency coordination committee to harmonize and streamline requirements citywide. The committee should review stormwater guidelines and the Wetland Conservation Act (WCA) authority with respect to areas outside of watershed district jurisdiction. Erosion control authority should also be reviewed.

A Water-Wise City Landscape

Nearly 70 percent of Saint Paul is developed, half of that with housing. The other 30 percent is open space and includes parks, cemeteries, golf courses, lakes, and the Mississippi River. This variety of land uses contributes to a gradation of landscapes in the city. Some areas, like Downtown, are almost completely

covered in impervious surfaces with little greenery, while most residential districts have boulevard trees, lawns and gardens. There are also areas along the Mississippi River that are largely unmanaged and left wild.

This objective focuses on the non-built environment. In terms of water management, plants and soils are not all equal. Some areas are good at infiltrating water, some are erosion-prone, some are polluted, and some are too compacted to soak up much water. Sand and undisturbed, un-compacted native soils are the best at infiltrating water. Wetlands can remove pollutants from water as can other plants and soil. Green areas of the city provide many benefits; among them is the improvement of water quality. More policies related to this objective for a water-wise city landscape can be found in the *Parks and Recreation Plan*.

2.18 Encourage the use of native vegetation for appropriate land uses.

Deep-rooted plants can improve soil conditions by building and loosening soil, increasing infiltration, and reducing erosion. They are especially useful on urban soils which are compacted or disturbed. Saint Paul has a preference for native plants and cultivars, but non-native plants that are deep-rooted and non-invasive are acceptable. Invasive non-natives should be discouraged. The City should collaborate with partners to provide technical assistance about desirable and undesirable plant species.

2.19 Promote tree planting and improved tree planting strategies to reduce runoff by increasing the survival rates and lifespans of trees.

Trees play a role in stormwater management as well as overall city aesthetics. The City requires trees to be planted in parking lots, around developments and along boulevards. Unfortunately, many trees die young before their benefits are realized. Research from Chicago estimates that trees must live between nine and 18 years before the benefits outweigh the costs to the community (*Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project*, McPherson E.G, 1994). Typical problems for urban trees include limited soil volume and organic matter, compacted soil, elevated temperatures, and lack of watering. Therefore, the City should:

a. Evaluate proposed landscaping requirements for parking lots in the Mississippi River Corridor and possibly apply them citywide. Draft regulations for parking lots in the Mississippi River Critical Area, which are under review by the City Council in 2009, would require two square feet of landscaped area for every ten square feet of paving (double the current level); one canopy tree per six parking spaces in lots with less than 100 spaces and one canopy tree per eight parking spaces in lots with greater than 100 spaces;
b. Promote better designs, planting, and management techniques such as increasing soil volumes, reducing soil compaction before planting, using pervious pavement and ensuring adequate amounts of topsoil are used;
c. Promote design standards for trees that incorporate stormwater collection and infiltration that improve tree survival rates and reduce stormwater volumes;

Stormwater Benefits of Trees

Trees intercept rainfall in their leaves and bark, decreasing the amount that reaches the ground. Tree canopies also decrease the intensity of rainfall, decreasing erosion and runoff. Trees also delay the onset and reduce the intensity of peak runoff flows. Of course trees provide many benefits beyond their hydrological ones—they improve aesthetics, decrease energy costs, reduce air pollutants, sequester carbon, decrease air temperatures, increase property values, and provide habitat. For more information see the Midwest Community Tree Guide from the United States Department of Agriculture (USDA).

d. Encourage increased tree planting by private property owners by assisting and strengthening tree planting programs; and
e. Identify tree canopy cover citywide (see Strategy PR-3).

2.20 Preserve and restore native shorelines to improve water quality.

Shoreline land use and vegetation type and quality can affect water quality, habitat value and human health. Regulations for shoreline buffers depend on whether they are for the Mississippi River or other water bodies in the city. For the Mississippi River, the Mississippi River Critical Area amendments, which are under review by the City Council in 2009, propose stricter regulations for its shorelands.

For other water bodies, the DNR has authority to require local adoption of model shoreland standards by ordinance. The DNR has not exercised this authority in Saint Paul because virtually all of Saint Paul's water bodies are surrounded by parkland, and the DNR has higher priorities for its shoreland program elsewhere. Whenever the DNR requests the City to adopt a shoreland ordinance, Saint Paul will do so.

Even in the absence of an ordinance, the Parks and Recreation Department has been and will continue to redesign and renaturalize shorelines of many of the lakes and streams in the city. Doing so is broadly consistent with the City's own goals. Additional policies are found in the *Parks and Recreation Plan*.

2.21 Preserve or improve accessibility to water bodies.

Saint Paul has more Mississippi River shoreline than any other city. Preserving public access to the Mississippi River and to other city water bodies–consistent, of course, with public safety and environmental protection–is a priority. Places where one can see, hear, and touch bodies of water grip the imagination and lend a special charm to the city. This topic is also discussed in the *Parks and Recreation Plan*.

2.22 Implement the *Trout Brook-Lower Phalen Creek Small Area Plan*.

The plan calls for daylighting a stream that is currently buried in stormwater pipes. The stream would create wetlands and on-site park amenities, capturing all stormwater at the end of streets and channeling it into wetlands that would cleanse the water before it is discharged into the storm sewer. The Bruce Vento Nature Sanctuary below Mounds Park and the Trillium site, located between the North End neighborhood and I-35E, is an example of an environmental restoration project with educational components that can serve as examples for other parts of the city.

2.23 Analyze the relationship between density and water quality as proposals for higher densities and taller buildings occur at particular locations.

For many years, lower density housing and development has been presumed to be better for water quality because each site has less impervious cover. But recent research shows that, at the metro scale, lower density development can lead, regionally, to increased runoff and greater water pollution, primarily due to

the increased amount of developed land (*Protecting Water Resources with Higher Density Development*, EPA, 2006). Higher densities in neighborhoods designed for walking and public transit can redirect urban sprawl and reduce rooftops, roads and parking lots in the metro area. In addition, with higher densities the costs of implementing BMPs can be decreased per person by sharing the costs with greater numbers of people.

Aquifers With Pure Water

Groundwater is an invaluable resource, but it is hard to regulate since it flows with no relationship to jurisdictional boundaries, not even watershed boundaries. Aquifers are used primarily for municipal water supplies, but they are tapped for other uses as well. Groundwater movement and its interactions with surface water are not completely understood. Contaminated surface water and leaking pollutants seep into the groundwater and can move into rivers and lakes through shallow aquifers or may continue sinking over a long period of time into the deeper aquifers that are used for well water. Thus, restrictions on hazardous materials or land uses in areas with sensitive groundwater can protect groundwater quality and human health (see Policy LU-1.3).

2.24 Strongly encourage an update to the *Ramsey County Groundwater Quality Protection Plan* that will include specific action steps for municipalities.

Within Minnesota, counties typically are the entities to monitor and protect groundwater resources. The 1996 *Ramsey County Groundwater Quality Protection Plan* was written to provide:

- An assessment of groundwater resources in Ramsey County and threats to it;
- A framework for coordinating groundwater protection among local governmental units; and
- Programs and techniques for the protection of this resource.

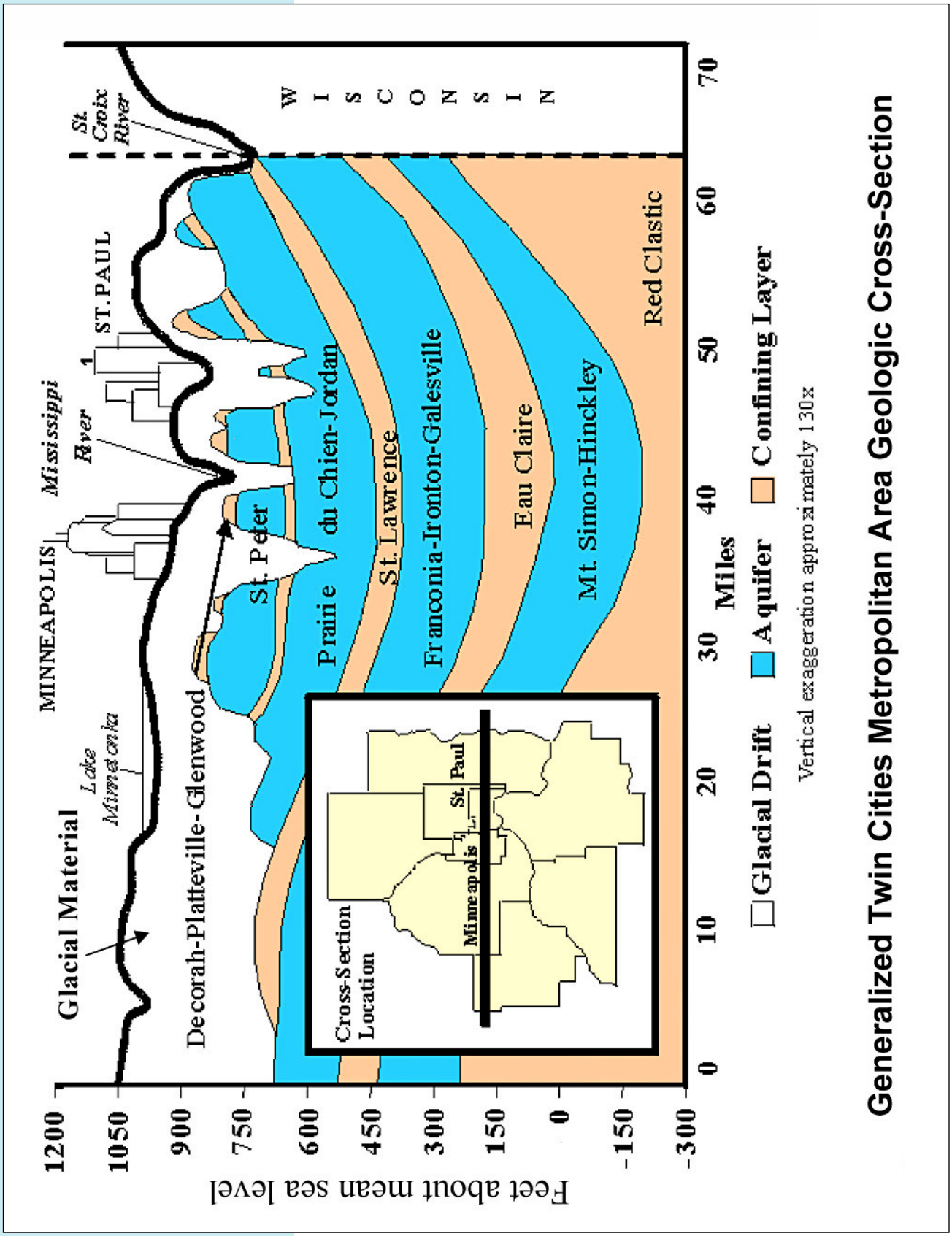
Implementation of the plan is voluntary and relies on proactive preventive activities to maintain the amount and quality of groundwater. However, the plan needs to be updated and should contain at least the following:

- Action steps to protect groundwater from contamination;
- Recommendations for each municipality; and
- Identification of abandoned wells in Saint Paul that need to be sealed as required by MDH rules.

2.25 Advertise and communicate the importance of well-sealing programs.

While no one in Saint Paul still uses well water for their drinking water, there are thousands of abandoned wells in the area. Wells provide direct routes for contaminants to enter groundwater. More emphasis could be placed on finding these abandoned wells and properly sealing them to protect groundwater for human health. The watershed districts and county currently have well-sealing cost share programs that should be more widely advertised and expanded if necessary. The City should assist in advertising the programs. The Ramsey Conservation District should also advertise the abandoned well rules of the MDH and rehire a groundwater specialist.

FIGURE W-H. GENERALIZED TWIN CITIES METROPOLITAN AREA GEOLOGIC CROSS-SECTION



Wetlands

Wetlands provide valuable functions such as cleaning runoff; infiltrating water; recharging aquifers; and providing habitat for plants and animals, including some on threatened and endangered species lists such as Minnesota's state flower, the Ladyslipper. One such habitat is the Mississippi River Flyway, which is the largest flyway for migratory birds in North America. Historically Saint Paul had many more wetlands than today, but most have been drained or converted into lakes. Wetlands are regulated largely by the Minnesota's Wetland Conservation Act (WCA), which is administered locally and generally requires no-net-loss of wetlands.

2.26 Complete a Wetland Management Plan for Saint Paul and implement its findings.

In order to protect and restore wetlands, the Wetland Management Plan will conduct assessments, coordinate departments and agencies, and develop management strategies. The City will cooperate with WMOs to implement the plan. To start the process in 2008, the City completed a wetland inventory that classified them and rated their environmental values.

Effective Water Infrastructure

Providing storm drains and sewers for the city is a valuable function that increases safety and health. However, many of them were constructed a hundred or more years ago and are expensive to maintain or replace.

2.27 Remain abreast of the rapidly evolving field of stormwater BMPs in order to find the most efficient and cost-effective ones. Work to minimize maintenance costs and improve the functioning of BMPs.

With continuous improvement in stormwater BMPs in the coming decade, ongoing training and feedback will be essential for staff, policy leaders, and construction companies that install them (see Policy W-2.2). Monitoring the performance, maintenance, and cost effectiveness of various BMPs will be important.

2.28 Provide adequate funding to operate and maintain adequate storm sewer infrastructure and service in all parts of the city.

Saint Paul operates over 450 miles of storm sewer pipes and tunnels. There are 106 discharge points from the storm sewer system, of which almost 60 go to the Mississippi River. In addition, there are over 26,000 catch basins and 20 stormwater ponds. The operation of separate sanitary and storm sewer systems has eliminated combined sewer overflows and minimized flooding.

The Sewer Utility's 2007 budget is $54 million, of which the major expenditures include: debt service of $11 million, payment to the regional treatment facility (MCES) of $16 million, capital improvements of $11 million, and six million for operations and maintenance. This includes both storm and sanitary sewers. In addition, $1.2 million is budgeted annually to implement watershed rules on street projects.

2.29 Advocate for an equitable share of the funds from the 2008 state constitutional amendment for environmental funding to be allocated to the improvement of urban water quality.

Saint Paul should be engaged in the allocation process for this new state funding source to see that water quality improvements are undertaken in all parts of the state, including cities and towns.

Strategy 3: Operate and Maintain a Cost Effective Sanitary Sewer Infrastructure

Collecting and treating sanitary sewage is a shared responsibility between Saint Paul and the Metropolitan Council. The sanitary sewers collects wastewater from homes and other buildings and conveys it to huge regional sewer interceptor pipes leading to the Metropolitan Wastewater Treatment Plant (Metropolitan Plant). After treatment, the water that is put back into the Mississippi River is cleaner than the normal flow. An effective sewage treatment system is critical for public health and the natural environment.

Saint Paul owns and operates 806 miles of sanitary sewers and 23 sanitary sewage pumping stations, which would cost more than a billion dollars to replace. This section of the *Water Plan* is about the maintenance and operation of the City's sanitary sewer system.

The Metropolitan Council Environmental Services (MCES) is charged with planning for wastewater treatment throughout the Twin Cities area. In addition, they own and operate the regional interceptors. The Metropolitan Plant treats nearly 80 percent of the Twin Cities' wastewater. Designed to treat 251 MGD of wastewater, the plant treated an average of 185 MGD in 2006. The Metro Plant has an outstanding record of compliance with state and federal clean water discharge permits. Beyond what is included in this plan, MCES has additional requirements for municipal wastewater planning that are being met separately by the Saint Paul Public Works Department.

Figure W-I. Total Annual Volume (Millions of Gallons) Treated at the Metropolitan Wastewater Treatment Plant

Community	2003	2004	2005	2006
Minneapolis	18,851.24	18,475.09	18,046.90	18,042.54
St. Paul	11,038.47	8,634.70	8,666.79	8,674.07
Edina	2,302.62	2,264.76	2,276.52	2,271.41
Plymouth	2,718.51	2,733.53	2,727.12	2,719.82
Coon Rapids	2,160.32	2,087.16	2,147.14	2,142.26
Brooklyn Park	1,912.22	1,904.78	2,082.74	2,089.34
St. Louis Park	2,210.84	2,122.90	2,046.92	2,079.70
	41,194.22	38,222.92	37,994.13	38,019.14
Metro WWTP	70,921.40	68,789.00	68,318.80	67,681.80
7 City Total % to WWTP	58.08	55.57	55.61	56.17
St. Paul % to WWTP	15.56	12.55	12.69	12.82

History of Saint Paul's Sanitary Sewer System

Middle-1800's: General sewer system follows natural topography and drains to the Mississippi River; one pipe for both sanitary and stormwater flows

1920's: Major sewer reconstruction due to flooding and sewer back-ups

1933: Saint Paul and Minneapolis form the Minneapolis-Saint Paul Sanitary District to treat sewage from both cities and the suburbs

1938: Metropolitan Wastewater Treatment Plant is built; however, combined sewer overflows (CSOs) are still a problem

Middle 1950's: Severe flooding and back-ups contribute to a long-range program for sewer relief

1969: Metropolitan Council took over the region's sewage treatment from the Sanitary District

1984: Saint Paul, South Saint Paul, Minneapolis and the Metropolitan Council decide to completely separate the storm and sanitary sewer pipes

1996: Saint Paul finishes the Combined Sewer Separation Project, eliminating sewer over-flows to the Mississippi River and back-ups into neighborhoods

Sanitary Sewer Operating Procedures

3.1 Operate and maintain the sanitary sewer infrastructure, and provide service throughout the city.

Ongoing sanitary sewer operation, maintenance, and rehabilitation programs include:

- Major Sewer Repair. The purpose of this program has been to repair both sanitary and storm sewer systems throughout the City to extend service life and reduce inflow and infiltration (I&I);
- Sewer Inspection. In 2004, the City began inspecting its sanitary sewers on a ten-year cycle. Since then, 35 percent of the City's sanitary sewers have been cleaned and inspected;
- Sewer Lining. The Sewer Utility has been lining approximately 14 miles of sewer annually since 1997 with another 150 miles scheduled to be lined. The linings prolong the life of pipes by 50 years; decrease friction within pipes, which increases flow speed; and eliminate inflow and infiltration (see Policy W-3.5);
- Tunnel Rehabilitation. This program was started in 2006 and includes the rehabilitation of both storm and sanitary sewer tunnels. Each year needed repairs are funded through this program; and
- Maintenance. Routine maintenance keeps sewers in good and safe condition by repairing defects as they occur including removal of debris, tree roots, and other blockages and repair of minor sewer defects.

3.2 Provide sanitary sewer service, wherever practical, to properties now operating on-site disposal systems with a goal of eliminating on-site systems by 2025.

As of 2008, about 120 residential properties are not served by sanitary sewers, down from about 200 in 1998 (see Figure W-AI). These properties remain unconnected to the sanitary system because of high bedrock, low density development, and other reasons that lead to high costs for sewer construction. They are concentrated in the Highwood neighborhood.

A step toward implementing the goal of eliminating on-site systems would be for planning staff who review plans for new houses in Highwood to advise builders on whether the elevation of the lowest floor is compatible with a gravity connection to a future sewer or will require pumping.

3.3 Ensure that individual sewage treatment systems are operated effectively within the standards set by the MPCA.

Saint Paul's management and control program of individual sewage treatment systems (ISTS) meets the current MPCA standards. A description of Saint Paul's program and a copy of the ordinance, which was updated in 1998, are included in Appendix W-D.

Inflow and Infiltration

"Inflow" refers to clear water or rainwater that enters the sanitary sewers through connections or leaks in the plumbing systems of buildings. "Infiltration" refers to groundwater that seeps into the sanitary sewers through cracks or joints of manholes and pipes, and leaking water lines to houses. Infiltration occurs most often in areas with clay soils and high groundwater levels. Inflow and infiltration (I&I) result in higher sewage treatment costs because clean water is being piped to the sewage treatment plant. I&I also increases the risk of a sewer pipe collapse, sinkhole, or surface depressions. Lastly, it also can cause Combined Sewer Overflows (CSOs) if the combined clear water and wastewater are greater than the treatment plant's capacity.

3.4 Ensure adequate sanitary sewer capacity for more intensive redevelopment. $

Sanitary sewer capacity is ample for the city's projected growth in population and employment although it is important wherever major redevelopment is planned to verify that sewer capacities in the vicinity are adequate for the projected increases (see Appendix W-D).

3.5 Coordinate with Metropolitan Council Environmental Services (MCES) towards a fair, comprehensive, and cost-effective resolution to the reduction of inflow and infiltration into the sanitary sewer system. $

In 2006, MCES adopted a Surcharge Program to impose significantly higher wastewater treatment fees in municipalities that have excess amounts of I&I and fail to implement programs to reduce it over time. Fifty-six communities including Saint Paul and Minneapolis exceeded their I&I allowances, and therefore face the threat of high wastewater treatment bills (which come to property owners as a line item on their water bills). Reducing I&I is much more cost-effective than building additional sewer capacity.

The biggest source of inflow in the city used to be rain leaders from rooftops connected directly to the sanitary sewers. Since 1985, almost all of the rain leaders have been disconnected and now discharge onto the ground.

In 2007, Saint Paul did a pilot study of I&I in the Highland Park neighborhood, where "smoke" was forced through the pipes to find where leaks were. The City is working with MCES to seal up leaks and apply the findings in other areas of the city (see Appendix W-D).

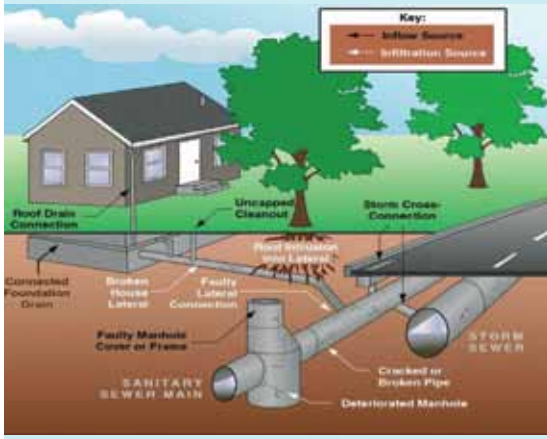
Saint Paul is concerned about the I&I occurring in the MCES interceptor pipes as they flow under the city. Saint Paul has many more MCES interceptors carrying more wastewater from other communities than any other municipality. MCES does recognize that I&I occurs on its own pipes and it is undertaking efforts to reduce the problem, but Saint Paul may be charged for I&I that is occurring on MCES interceptors.

3.6 Provide adequate funding to support replacement of deteriorating infrastructure and to maintain the integrity of the Sewer Utility Enterprise Fund. $

MCES bills the City monthly for sanitary sewer treatment charges based on the volume of water measured by MCES. The City in turn bills property owners as part of the water billing system. The payments go into the Sewer Utility Enterprise Fund, which receives no tax money from the City's General Fund. The Sewer Utility Enterprise Fund is dedicated to the maintenance and operation of the storm and sanitary sewer system.

It is estimated that the replacement cost of the entire sewer system would be well over one billion dollars. The Sewer Utility's 2007 budget is $54 million, of which the major expenditures include: debt service of $11 million, payment to the regional treatment facility (MCES) of $16 million, capital improvements of $11 million, and six million dollars for operations and maintenance.

Figure W-J. Inflow and Infiltration Sources



A sanitary sewer overflow is an overflow, spill or diversion of wastewater from a sanitary sewer system.

3.7 Prevent, minimize and report sanitary sewer overflows according to EPA standards.

The City shall properly operate and maintain all facilities and systems of treatment to prevent and minimize sanitary sewer overflows. Overflows must be reported to the MPCA as required.

3.8 Report inter-municipal sanitary sewer connections to the MCES as required.

The City has several small inter-municipal connections on the edges of Saint Paul. Just over 200 properties citywide are connected to other municipalities (see Appendix W-D).

Future Opportunities

3.9 Investigate alternative systems that reuse gray water and advocate changes in the state plumbing code to allow alternative treatment systems as long as health and safety are maintained.

Alternative ways to reduce water demands and reuse wastewater are being devised in other parts of the country. Water reuse is becoming more popular, and gray water alternative treatment systems are included in many green building standards. Minnesota's Sustainable Building Guidelines contain alternative proposals for gray water treatment.

The City should be supportive of experimental and educational models for using gray water–within the constraints of public health–for non-potable purposes such as watering lawns and flushing toilets (see Policy W-1.8).

Oberlin College's living machine purifies wastewater which is then recycled within the building.

Implementation

Water issues always cross jurisdictional boundaries and thus involve more than one unit of government. Effective cooperation among agencies is essential for this plan to be implemented. The matrix below identifies the roles that City departments and other water-related agencies will have in implementing this plan.

Figure W-K. Implementation Matrix

Policy	Departments of the City of Saint Paul	Saint Paul Regional Water Service (SPRWS)	Watershed Management Organizations	Ramsey Conservation District	District Councils & Advocacy
1.1: Source Water Protection Plan		X			
1.2: VLAWMO	PW	X			
1.3: Wellhead Protection Plan		X			
1.4: Minimize well water withdrawals		X			
1.5: Prohibit new private wells where…	DSI	X		X	
1.6: Public education for water conservation	DSI, M	X		X	X
1.7: Reduce indoor water use	DSI	X			
1.8: State plumbing code and gray water	DSI	X			
1.9: Reduce lawn watering needs		X	X	X	X
1.10: Reduce "lost" water		X			
1.11: Ensure safety		X			
1.12: Increase SPRWS' customer base		X			
1.13: Promote public drinking water	PR, L	X			X
1.14: Public drinking fountains	X				X
1.15: SPRWS Emergency Preparedness Plan		X			
1.16: Minneapolis and Saint Paul interconnection	M	X			
1.17: Clear capital budgeting		X			
1.18: Education programs for children	PR, L	X			
1.19: Educational programs on municipal water use		X			

Designations for City Departments: DSI= Department of Safety and Inspections, L= Libraries, M=Mayor's Office, PED=Planning and Economic Development, P R=Parks and Recreation, PW=Public Works, SPPA=Saint Paul Port Authority.

Figure W-K. Implementation Matrix (Continued)

Policy	Departments of the City of Saint Paul	Saint Paul Regional Water Service (SPRWS)	Watershed Management Organizations	Ramsey Conservation District	District Councils & Advocacy
2.1: Education on urban water quality	PW		X		X
2.2: Spread knowledge of regulations and BMPs	DSI, PW		X		X
2.3: Comply with existing plans	DSI, PW, PED, PR				
2.4: Anti-litter campaign	M		X		X
2.5: Prohibit raking leaves into street	PW				X
2.6: Participate in TMDL studies	PW		X		
2.7: Reduce erosion	PW, DSI, PR				
2.8: Reduce roadway impacts	PW		X		
2.9: Reduce parking lot impacts	DSI		X		X
2.10: Reduce alley impacts	PW		X		X
2.11: "Housekeeping" on streets and alleys	PW				
2.12: Reduce rooftop impacts	DSI, PED		X		X
2.13: Site plan review	DSI, PED, PW		X		X
2.14: Reduce impacts from existing sites	PW, DSI, PED, SPPA		X		X
2.15: Develop standards on small sites	DSI, PED, PW		X		
2.16: Work on area-wide scale	PW, PR, PED		X		X
2.17: Consistent regulations	DSI, PED, PW		X		
2.18: Encourage native vegetation	DSI, PR		X	X	X
2.19: Promote tree planting	PR, DSI		X	X	X
2.20: Native shorelines	PR, PED, SPPA		X	X	X
2.21: Access to water bodies	PR				X
2.22: Trout Brook/Phalen Creek	PR, PW		X		X
2.23: Benefits of density for water quality	PED		X		
2.24: Update Ramsey County Groundwater Protection Plan			X	X	
2.25: Well-sealing programs	DSI		X	X	
2.26: Wetland Management Plan	PW, DSI		X		
2.27: Follow development of BMPs	PW, DSI		X		
2.28: Adequate funding for storm sewers	PW				
2.29 Funding from constitutional amendment	PW, PR	X	X	X	X
Wastewater section (all policies in Strategy 3)	PW				

Credits

Water Comprehensive Plan Task Force

George Johnson, Chair*
Cliff Aichinger
Sarah Clark
Marj Ebensteiner
Bruce Elder
Bob Fossum
Steve Johnson
Boa Lee
Yung-Kang Lu*
Hokan Miller
Gregory Page
Tom Petersen
Shirley Reider
Steve Schneider
Obi Sium
Ron Struss
John Wells
Rebecca Wooden

* Planning Commission member

Department of Planning and Economic Development

Cecile Bedor, Director
Larry Soderholm, Planning Administrator (to February 2009)
Donna Drummond, Director of Planning

Research and Planning

Larry Soderholm, Planner-in-Charge
Andrew Jacobson
Phil Belfiori
Anne Hunt
Brian Tourtelotte
Anne Weber
Larry Zangs
Jie Zhao
Kou Vang

Report Production

Joan Chinn
Emily Goodman
Christina Morrison

Mayor Christopher B. Coleman

City Council

Melvin Carter III, Ward 1
Dave Thune, Ward 2
Pat Harris, Ward 3
Russ Stark, Ward 4
Lee Helgen, Ward 5
Dan Bostrom, Ward 6
Kathy Lantry, Ward 7

Saint Paul Planning Commission

Brian Alton, Chair
Eduardo Barrera
James Bellus
Jon Commers
Kathi Donnelly-Cohen
Carole Faricy
Erick Goodlow
Steven Gordon
George Johnson
Richard Kramer
Yung-Kang Lu
Michael Margulies
Susan McCall
Gladys Morton
Gaius Nelson
Marilyn Porter
Kristina Smitten
Bob Spaulding
Daniel Ward II
Barbara A. Wencl

Appendix W-A

Water Supply Plan Executive Summary, 2006

This Water Supply Plan was prepared by staff of Saint Paul Regional Water Services (SPRWS) in accordance with Minnesota Statutes 103G.291. This plan is an update of the first plan that SPRWS submitted in 1996.

The plan contains four parts: water supply system description and evaluation, emergency response procedures, water conservation plan, and water demand projections required by the Metropolitan Council.

The plan first compiles and evaluates the water demand of SPRWS service areas in the past ten years (1995-2004). Despite the growth in population, water consumption has declined over the 10-year period. The per capita daily water demand has been fluctuating; however, it shows a slightly decreasing trend. On average, a person used approximately 111.4 gallons per day in 2004 compared to 121.8 gallons in 1995. This trend reflects the increased consciousness of residential and commercial/industrial customer bases to employ water conservation measures. SPRWS expects the per capita daily demand will continue to decline steadily in the next five years and will reach a plateau of 100 gallons per capita per day starting in 2010.

Part I provides a description of the treatment process used in SPRWS' McCarrons Water Treatment Plant: softening, coagulation, sedimentation, fluoridation, chlorination, and filtration. Since the plant was built in the 1920s, it has been enlarged and modernized frequently to provide up-to-date treatment techniques and to increase redundancy and dependability. Now the treatment plant has a capacity of 144 million gallons per day (MGD), approximately 3 times the average daily demand in 1995-2004 (47.8 MGD). With 21 underground reservoirs, elevated tanks and standpipes in service, SPRWS has a finished water storage capacity of 131.3 million gallons, approximately 2.7 times the average daily demand.

Part I also includes water resources of SPRWS. The Mississippi River and Vadnais Lake watershed are the two principal sources; deep wells, Rice Creek watershed, and Otter and Bald Eagle Lakes are the reserve sources. The Mississippi River supplies from 65 to 90 percent of the total raw water that supplies the customers. Water is pumped from the river at the Fridley intake and delivered through two 60-inch conduits to Lake Charles of Vadnais Lake watershed. This watershed consists of a number of natural lakes, including Charles, Pleasant, Sucker, and Vadnais. The lakes are connected by conduits and canals and have an available supply of 3.6 billion gallons when at optimum elevations. From Vadnais Lake, water is transported to the water treatment plant via two 90-inch conduits. Currently SPRWS has six wells that connect to the two 90-inch conduits. The capacity of these wells is 27.7 MGD. SPRWS' capital improvement plan includes the expansion of the groundwater supply to a capacity equal to the average day demand.

Part II of the plan discusses water emergency response procedures. This part presents sources of water that can be used to augment SPRWS system in an emergency. For raw water supply, the available sources include the three reserve sources mentioned in Part I and the Headwaters Reservoirs of the Mississippi River. For finished water supply, currently there are interconnections to South

Saint Paul, Woodbury and Inver Grove Heights systems that can help a small area near each interconnection on an emergency basis.

SPRWS has established short-term demand reduction procedures during declining source situations. The procedures are categorized into six stages, from voluntary to mandatory. Stages 1 and 2 are to issue voluntary appeals for citizens to reduce any unnecessary use of water. Stages 3 to 6 are mandatory; the Board of Water Commissioners would order the implementation of water consumption restrictions, such as lawn sprinkling ban and car washing ban, as the emergency conditions warrant. On Stage 5, the Board would caution all customers that consumption must be no more than their base winter consumption. On Stage 6, the Board would order consumption reductions below the winter base usage. The triggers that are used for implementing the above Stages 1 to 6 demand reduction actions are the Mississippi River flows at Anoka Dam.

The third part of this plan describes the water conservation programs implemented by SPRWS that are intended to reduce the demand of water, improve the efficiency in use and reduce losses and waste of water. Long-term conservation measures that improve overall water use efficiencies can help reduce the need for short-term conservation measures.

SPRWS' meter operations are charged with maintaining water meter accuracy and keeping the metering system in good working order so as to facilitate meter reading collection and reliability. SPRWS tests and maintains all its meters on a regular basis. Meters of different sizes have different schedules. Approximately 1,600 meters are tested and replaced every year.

SPRWS keeps track of unaccounted-for water. Over the last ten years, the unaccounted-for water was approximately 9.7 percent, not exceeding the 10% goal recommended by the American Water Works Association. This results from SPRWS' efforts to reduce water leakage from mains, service lines, hydrants, valves, etc. SPRWS conducts leak detection and survey for the entire system every two years. SPRWS has also an aggressive main replacement program to prevent main breaks and therefore water and revenue losses. SPRWS is replacing all lead services and the goal is to have all of the remaining lead services replaced by 2040.

SPRWS has a conservation rate structure that is based on higher seasonal rates in summer to curtail peak demand. SPRWS uses various methods to educate and inform customers on how to improve water use efficiencies, such as newsletters, brochures, open houses, and tours of the McCarrons Water Treatment Plant.

The last part of this plan was developed per Minnesota Statutes 473.859. This part studies the population growth trend in the communities served by SPRWS and projects future demands. Based on the Metropolitan Council's population projections and SPRWS' estimate of the per capita daily demand, the projected average daily demands are 44.2 MGD, 46.5 MGD and 48.8 MGD for 2010, 2020 and 2030, respectively.

Based on the information collected in the plan, SPRWS feels that its water supply system is adequate to meet current and future water demands into the foreseeable future. SPRWS has on-going water conservation programs to help improve water use effciencies and reduce water losses. SPRWS also has short-term water demand reduction measures for emergency conditions.

Appendix W-B

Local Surface Water Management Plan (LSWMP) - Executive Summary

WSB Project No. 1610-00, October 2006

Prepared by City of Saint Paul Public Works Department and WSB & Associates, Inc. Water Resources Department.

Section I

I. Executive Summary

This Local Surface Water Management Plan for the City of St. Paul has been developed to meet local watershed management planning requirements of the Metropolitan Surface Water Management Act and Board of Water and Soil Resources Rules 8410. It has also been developed to be in conformance with the requirements of local Watershed District and Watershed Management Organizations, Metropolitan Council requirements, and applicable State and Federal laws. This document and its referenced literature are intended to provide an inventory of pertinent water resource related information that affects the City and management of those resources.

Section II

Section II of this plan provides an introduction and purpose. The Local Surface Water Management Plan has been developed to provide the City of St. Paul with direction concerning the administration and implementation of water resource activities within the City. This plan is intended to meet the requirements for a local watershed management plan as required by the Metropolitan Surface Water Management Act and be in conformance with Board of Water and Soil Resources (BWSR) Rules Chapter 8410. This section also lists the personnel contacts involved in the assistance and implementation of this plan, including the staff from the Capitol Region Watershed District, Ramsey-Washington Metro Watershed District, Lower Mississippi River Watershed Management Organization, and the Mississippi Watershed Management Organization.

Section III

Section III of this plan provides an inventory of land and water resources within the City including a general description and summary of data related to precipitation, geology, topography, flood problem areas, existing flood insurance studies, shoreline ordinances, surface and ground water appropriations, ground water, soils, land use, public utilities services, public areas for water-based recreation and access, fish and wildlife habitat, unique features, scenic areas and pollutant source locations within the City.

This section contains general summary information about the soils within the City, fishery information, historical sites, and the location of various pollutant sources. A number of maps were also developed as part of the Plan to assist in summarizing this information.

Section IV

Section IV of this plan outlines water resource management related goals and policies of the City. Goals and policies have been developed for the City concerning water quantity, water quality, recreation, fish and wildlife management, enhancement of public participation, information and education, ground water, wetlands, and erosion.

Section V

Section V of this Local Surface Water Management Plan provides an assessment of the existing and potential water resource related concerns within the City. These concerns were identified based on an analysis of the land and resource data collected as part of this plan preparation and through public input. This section summarizes the problems and corrective actions that were identified through this process.

Section VI

Section VI outlines implementation priorities and develops an implementation program. This section contains a prioritized listing of the studies, programs and capital improvements that have been identified as necessary to respond to the water resource needs within the City.

The implementation period identified within this report for the programs, studies and capital improvements is from the year 2006 through 2015. This plan is to be used for planning purposes only. Detailed feasibility analysis has not been completed to develop this section; therefore, cost estimates are subject to change and updates as more detailed information is obtained.

Section VII

Section VII discusses the financial considerations of implementing the proposed regulatory controls, programs and improvements, which have been identified in this plan and their financial impact on the City. Funding sources available for implementing the policies and corrective actions identified within this plan are identified. The plan indicates that the majority of funding for the policies and corrective actions will be from the City's Storm Water Utility Fund. Other possible funding sources for the implementation of this plan include special assessments and grant monies, which may be secured from various local, regional, County, State or Federal agencies. These other funding sources will be necessary to aggressively implement the Plan.

Section VIII

Section VIII discusses the procedures to be followed in the event this Local Surface Water Management Plan is amended. Once this Local Surface Water Management Plan is approved, no significant changes to this plan can be facilitated without the approval of the proposed revisions by the Watershed Management Organizations and Districts within the City that are affected by the change. Significant changes to the plan shall be made known to the Mayor, City Council, City Staff, the Metropolitan Council, and the affected Watershed Management Organizations and Districts within the City.

Section IX

Section IX provides references to supplemental documents.

Additional material is referenced within this report and is available in the St. Paul Department of Public Works. This Local Surface Water Management Plan will be in effect through the year 2015, at which time this plan will be updated. However, if significant changes to the plan are deemed necessary prior to that date the City may revise this plan in its entirety.

Figure W-L. Sensitive Groundwater Areas in Saint Paul

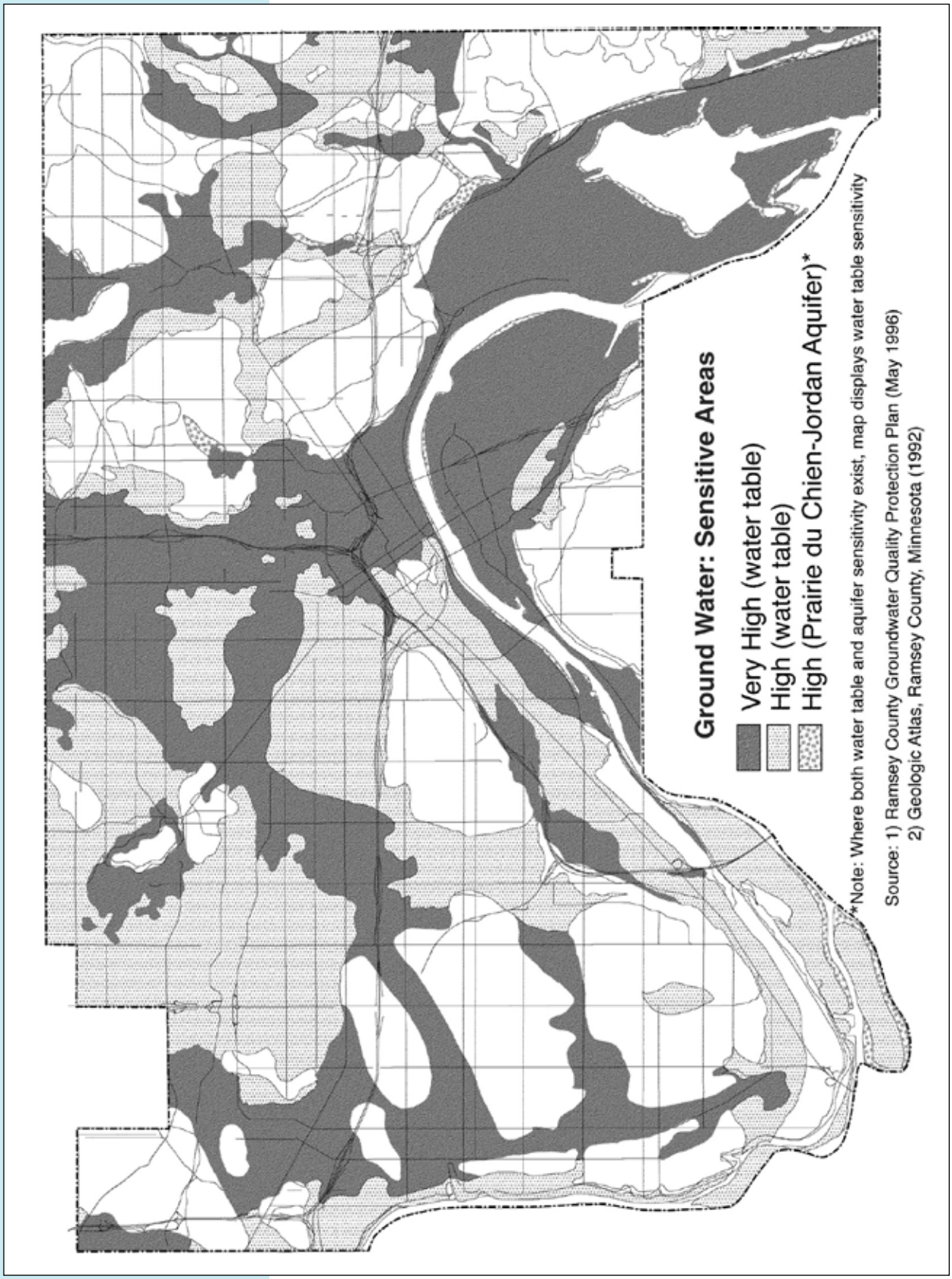


Figure W-M. Major Storm Sewers in Saint Paul

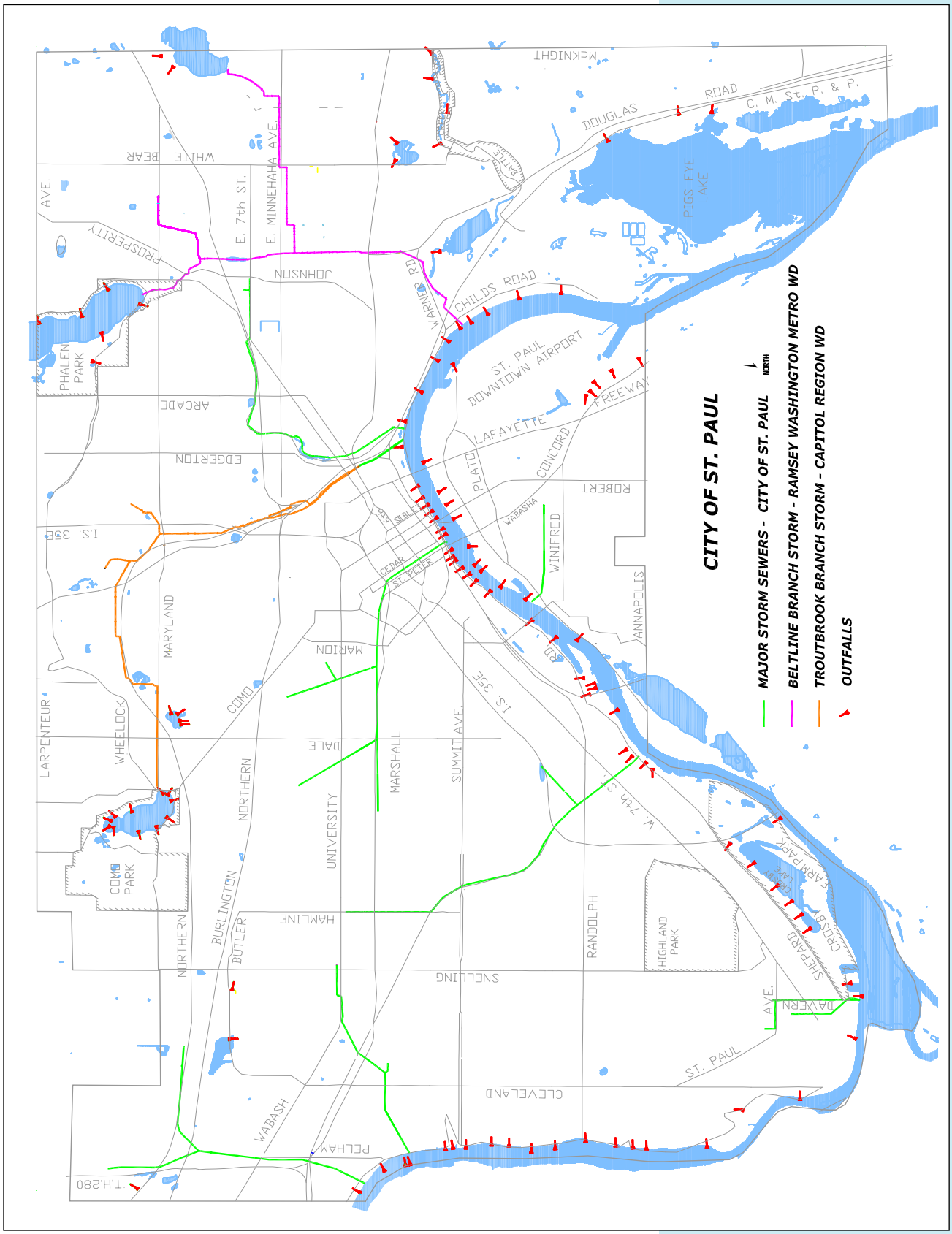
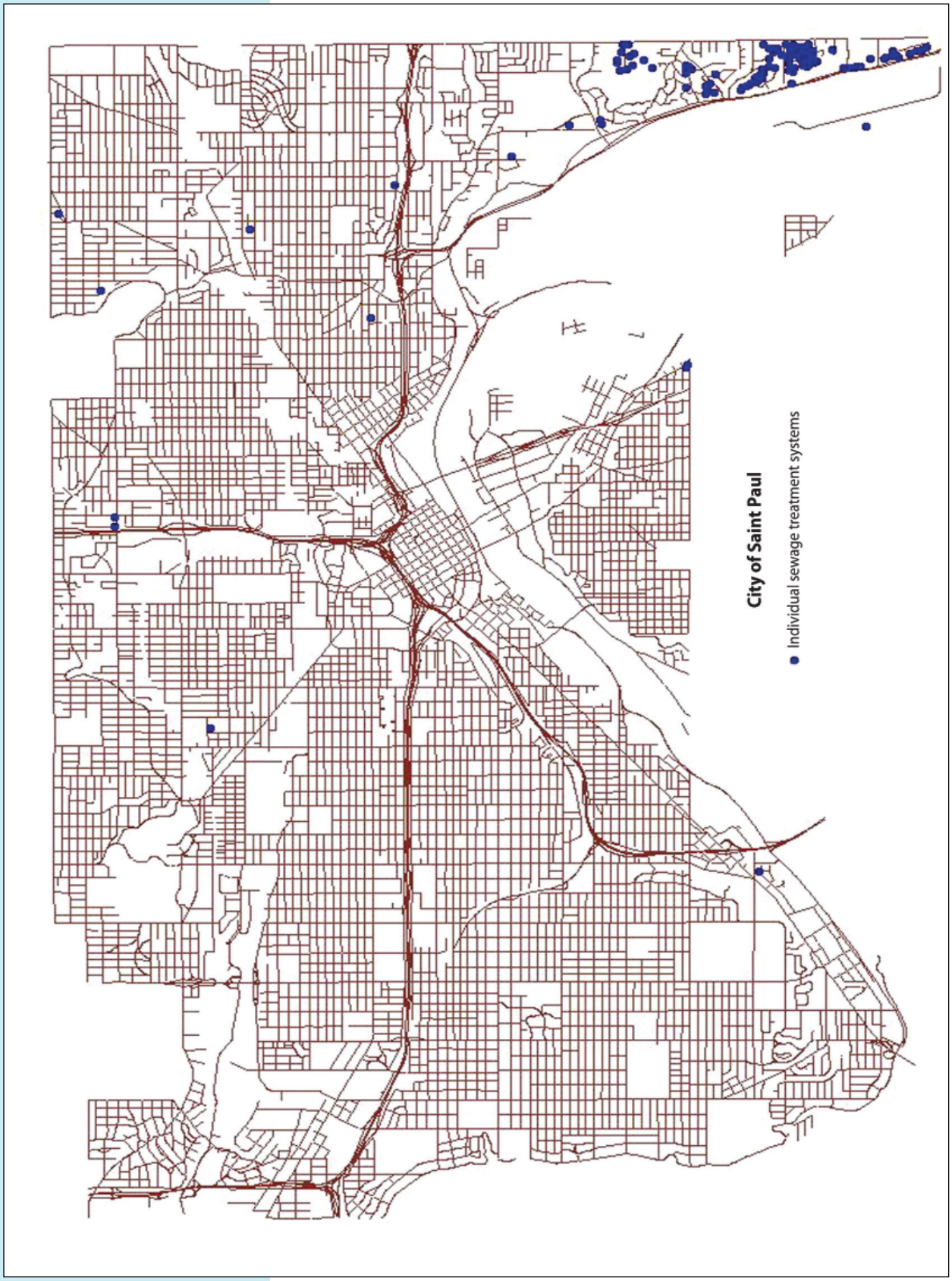


Figure W-N. Individual Sewage Treatment Systems Locations in Saint Paul



Appendix W-D

Figure W-O. MCES Interceptors and Lift Stations

Section I: Sanitary Sewer System

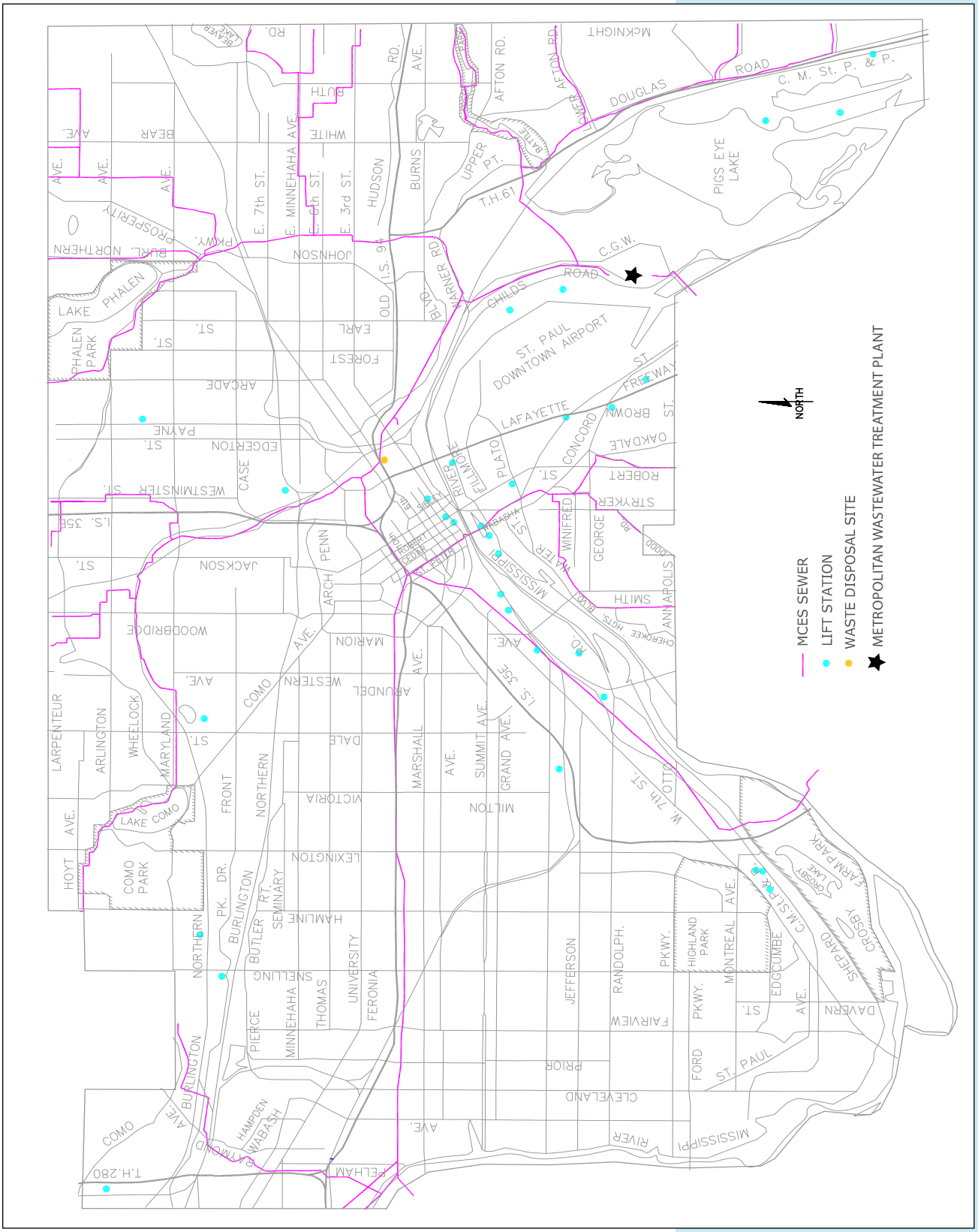


Figure W-P. City of Saint Paul Sanitary Sewer System and Meters

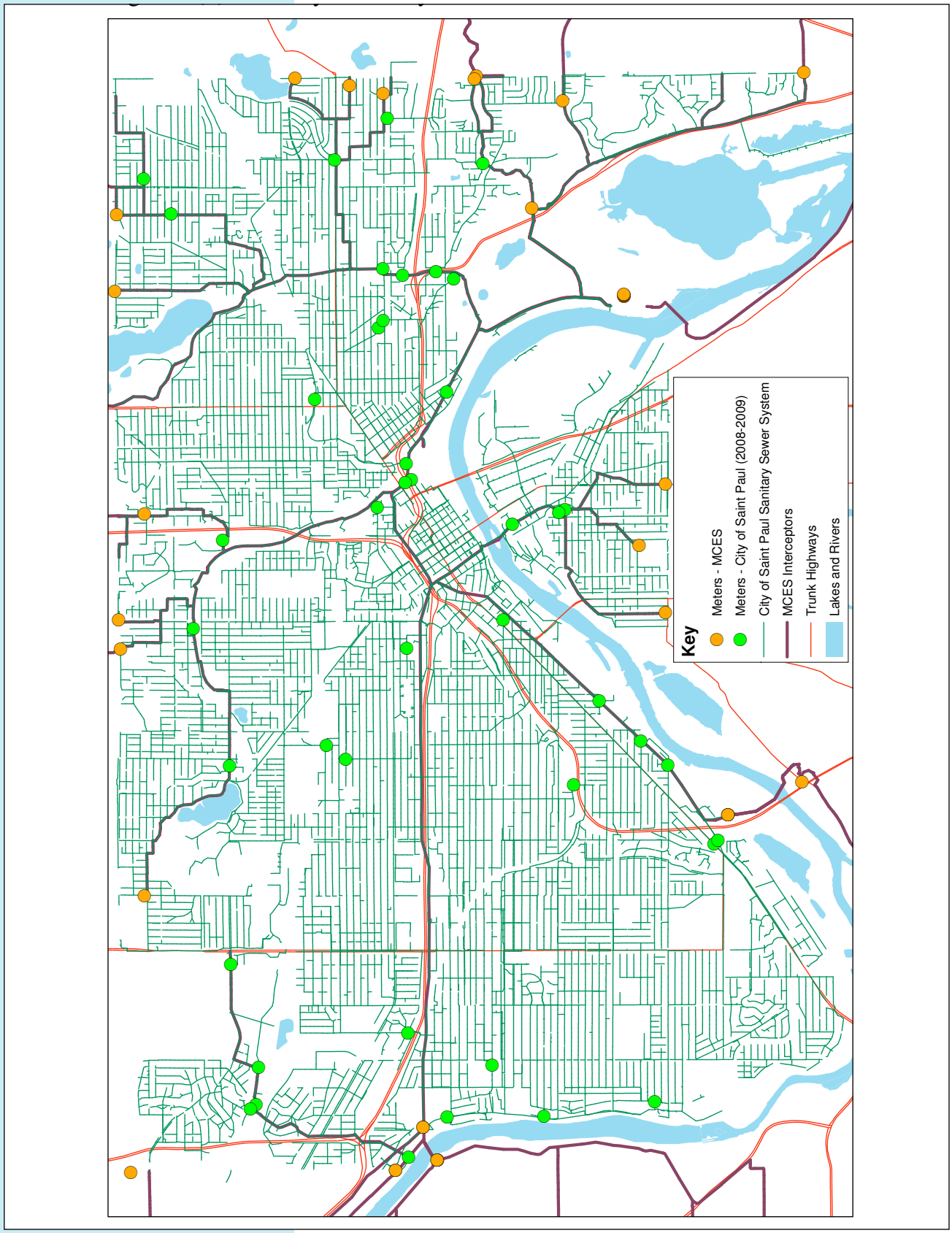
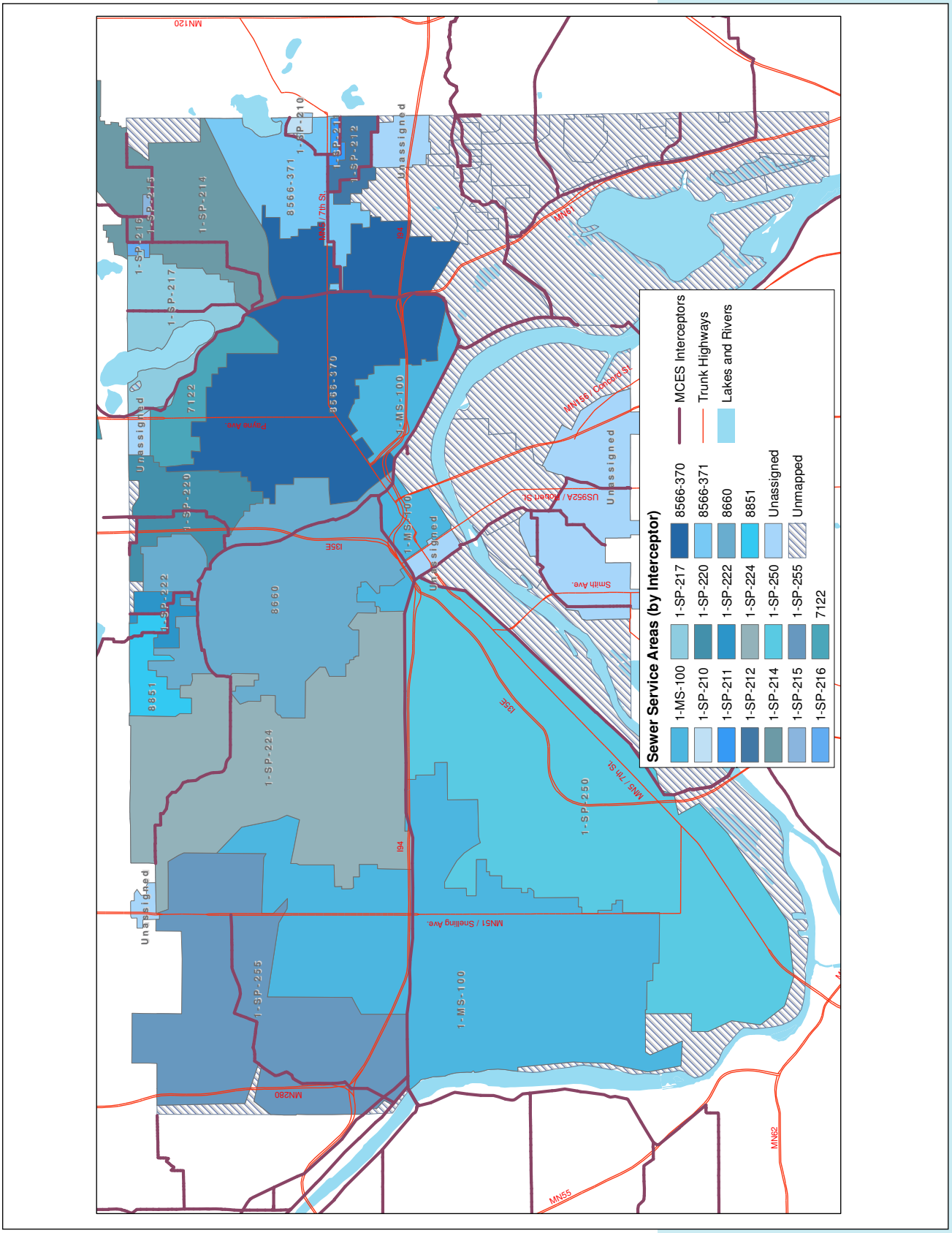


Figure W-Q. Sewer Service Areas



			2006		2010	2020	2030
Interceptor	Acres	% of Total Area	Est. Baseflow (mgd)*	Est. Peak Flow (mgd)**	Avg. Flow (mgd)	Avg. Flow (mgd)	Avg. Flow (mgd)
7122	720.2	2.64%	0.69	2.6	0.74	0.77	0.80
8660	2357.3	8.63%	2.27	3797.7	2.41	2.53	2.61
8851	240.2	0.88%	0.23	0.9	0.25	0.26	0.27
Unassigned	1390.8	5.09%	1.34	5.3	1.42	1.49	1.54
Unmapped	376.7	1.38%	0.36	1.5	0.38	0.40	0.42
1-MS-100	5207.5	19.06%	5.02	15.1	5.32	5.58	5.77
1-SP-210	25.2	0.09%	0.02	0.1	0.03	0.03	0.03
1-SP-211	35.6	0.13%	0.03	0.1	0.04	0.04	0.04
1-SP-212	186.3	0.68%	0.18	0.7	0.19	0.20	0.21
1-SP-214	1342.1	4.91%	1.29	5.1	1.37	1.44	1.49
1-SP-215	13.7	0.05%	0.01	0.1	0.01	0.01	0.02
1-SP-216	17.3	0.06%	0.02	0.1	0.02	0.02	0.02
1-SP-217	619.2	2.27%	0.60	2.3	0.63	0.66	0.69
1-SP-220	562.4	2.06%	0.54	2.2	0.57	0.60	0.62
1-SP-222	121.0	0.44%	0.12	0.5	0.12	0.13	0.13
1-SP-224	3115.0	11.40%	3.00	9.3	3.18	3.34	3.45
1-SP-250	4898.3	17.93%	4.72	14.4	5.00	5.25	5.43
1-SP-255	2621.7	9.60%	2.53	9.3	2.68	2.81	2.91
8566-370	2746.5	10.05%	2.65	8.9	2.81	2.94	3.05
8566-371	726.5	2.66%	0.70	2.5	0.74	0.78	0.81
Total	**27323.6**	**100.00%**	**26.33**	**3878.4**	**27.91**	**29.29**	**30.29**

* Baseflow based on three-year average measured flow (2004-2006)

** Est. Peak Flow is calculated on a sub-sewershed basis by muliplying baseflow by the Peak Factor supplied by Met Council on the basis of sub-sewershed size. The number given is the summed total of the estimated peak flow for all sub-sewersheds draining to a given interceptor.

From K:\Zorn\Comp Plan Resubmittal\Docs to be submitted\28-Sewer Service Areas Table.doc -- *Summary Table*

Section II: Inflow and Infiltration (I&I) Abatement Plan

Background Information

Over the past 25 years the city has completed aggressive program(s) for sewer separation and I&I reduction. In the past the largest source of inflow in the city used to be from:

- Combined sewer systems that conveyed both storm water runoff and sanitary flows. The city first adopted a sewer separation program in the 1960's. In 1984 the city accelerated its effort to completely separate its storm and sanitary sewers. In 1996 the city completed a Combined Sewer Separation Program. Main goals for the sewer separation program were to remove storm water from the sanitary collection system and eliminate the discharge of untreated combined sewage overflow into the Mississippi River. Saint Paul is one of the few cities of its size in the nation to have completed a sewer separation program. The program was funded by City, State, and Federally funds that cost over $400 million; and
- Rain leaders from rooftops connected directly to the sanitary sewers. In the 1980's and 90's the city completed a rain leader disconnection program where rain leaders now discharge onto the ground or to a storm sewer. About 370 properties (as of 2008) within the city have been granted time extensions to continue to have their rain leader(s) connected to the sanitary sewer. The total surface area of these connected properties is about 9.5 acres. Each year city staff investigates whether or not these properties have changed ownership. If so, the city contacts the new property owner informing them of the conditions and fees associated with the time extension. For situations where the mobility limitation no longer applies, the city requires the new property owner to disconnect.

In 2006, Metropolitan Council Environmental Services (MCES) adopted an I&I Surcharge Program which sets the I&I goals or peak wet weather flow limits for municipalities. Originally fifty-six communities including Saint Paul and Minneapolis exceeded their I&I goals. Municipalities that continue to exceed their I&I goal may face the possibility of receiving an I&I surcharge or demand charge being added to their wastewater treatment bills.

In 2007, the city completed an I&I pilot study in the Highland Park neighborhood, where sewer flows rates were monitored; and smoke testing was performed through the sewer pipe system to find sewer defects and faulty connections where I&I can enter. The findings from the I&I pilot study are being used in other parts of the city to help quantify, identify, and reduce I&I.

Between 2005 and 2007 the city identified and disconnected approximately 3.7 acres of impervious areas from the sanitary sewer system.

In 2008 the city initiated a Sewer Flow Monitoring Study in which sanitary sewer flow data from many sewer shed areas was collected and analyzed. This study was completed with the aid of the city's consultants, Brown & Caldwell and S.E.H. The sewer sheds were monitored for months, and in total comprised an

area that is more than 50% of the city. The information and results of this study has helped the city focus its resources in finding and removing I&I sources. Figures W-S through W- Z summarize the results of the Sewer Flow Monitoring Study completed in 2008:.

Also in 2008, Saint Paul completed two smoke testing projects where more than 700 acres of the city was tested. In total approximately 7.0 acres of impervious area (inflow sources) were identified by the two smoke testing projects. Figures W-AA through W-AB show the areas tested in 2008:

For 2009, the city is in the process of completing another Sewer Flow Monitoring Study that is in cooperation with the Met Council. This study is planned to include analyses of flow data collected by Saint Paul flow meters, existing Met Council flow meters, and several temporary Met Council flow meters that are anticipated to be installed as part of the Met Council's North East Interceptor Improvement Project. The sewer flow data anticipated to be collected and analyzed will cover about 80% of the city.

This study will help:

- The city focus its resources in finding and removing I&I sources; and
- The city and Met Council gain a better understanding of peak wet weather flows generated within the City of Saint Paul, other municipalities, and I&I in the Met Council interceptors.

In 2009, Saint Paul is also planning to complete three smoke testing projects that include over 1,400 acres of the city to be tested. Figures W-AC through W-AE show the areas to be tested in 2009.

FIGURE W-S. SAINT PAUL FLOW METER AND METER BASIN MAP

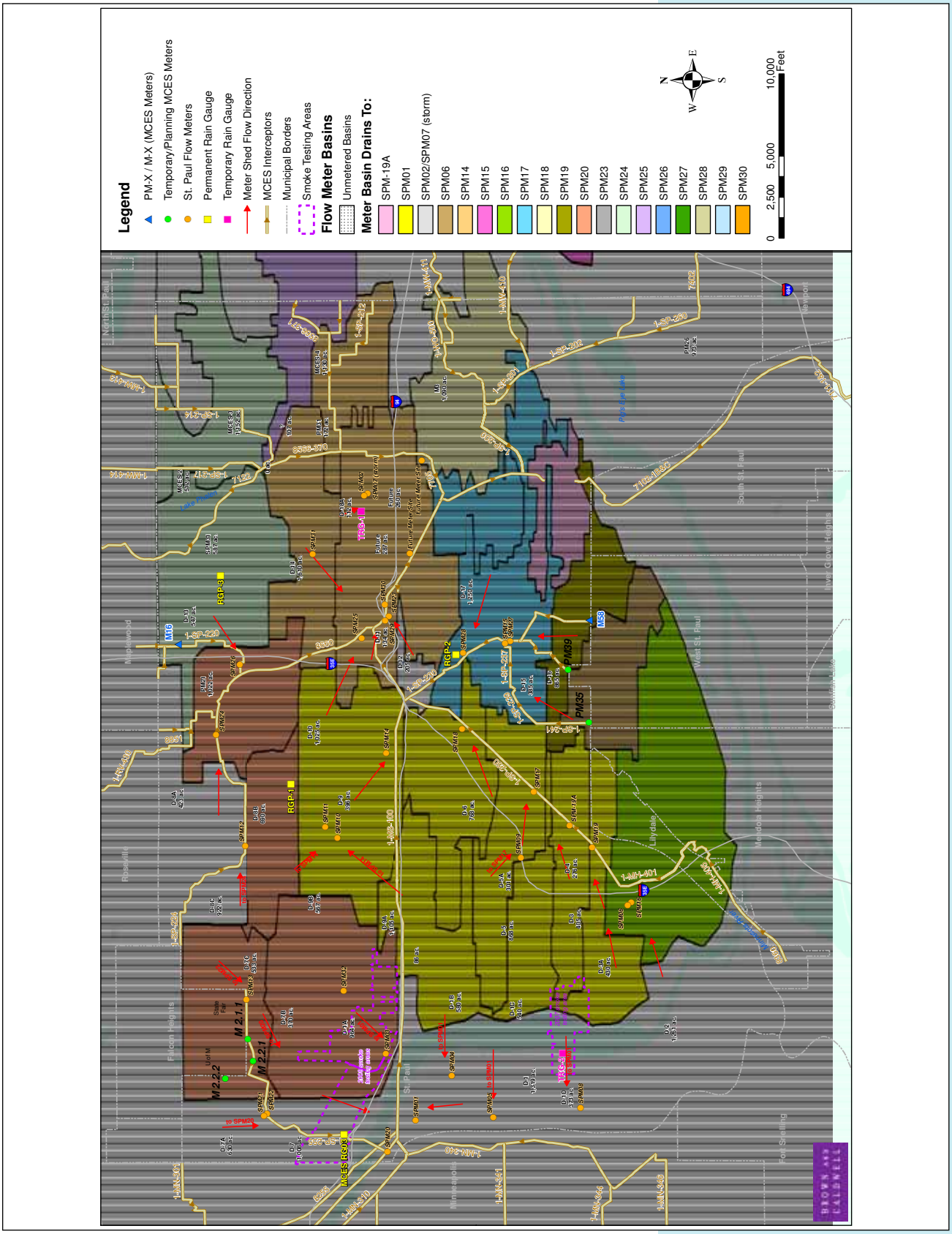


FIGURE W-T. INFLOW PRIORITIZATION MAP: INFLOW MILLION GALLONS PER DAY (MGD), AUGUST 27, 2008 EVENT

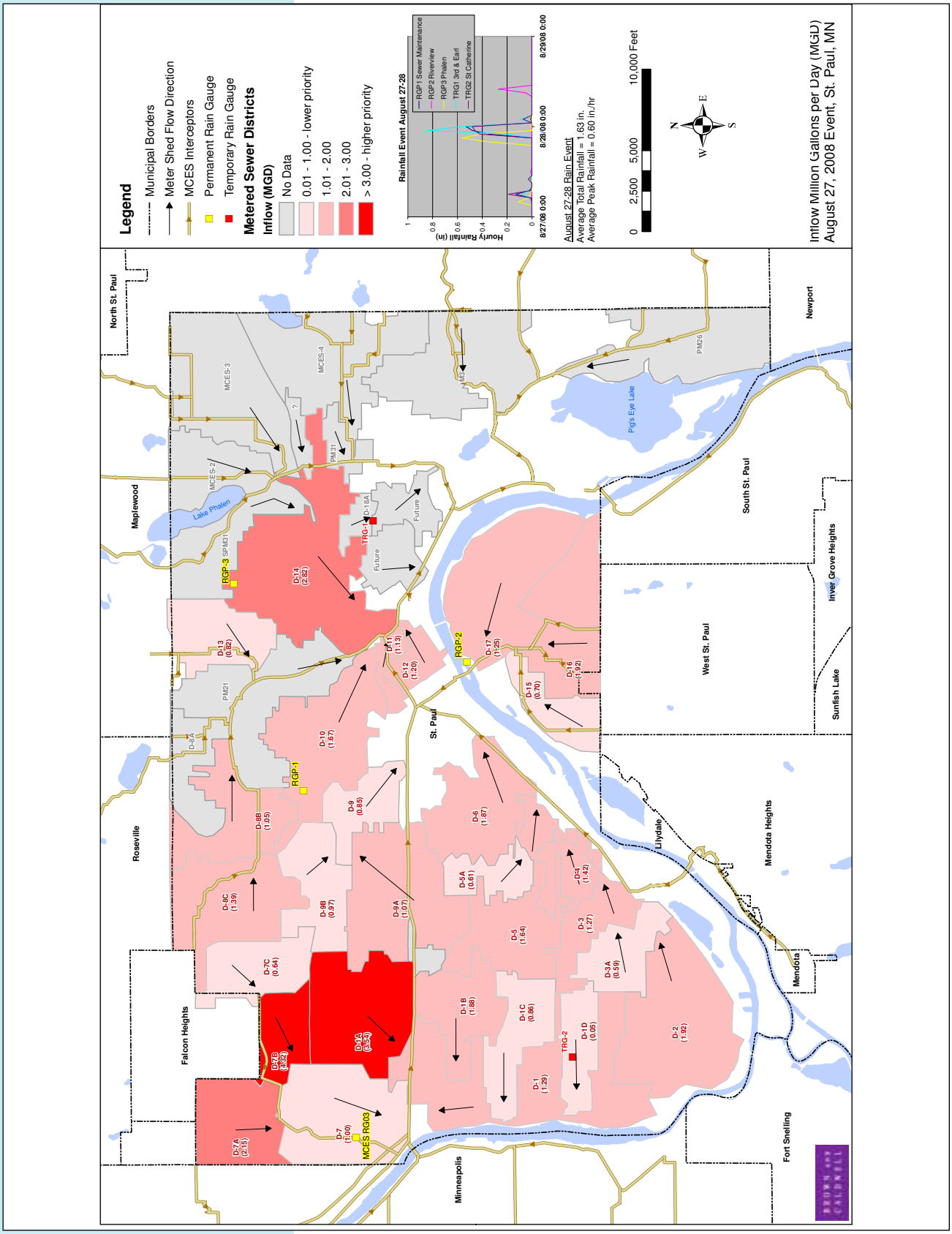


FIGURE W-U. SAINT PAUL INFLOW PRIORITIZATION CHART: AUGUST EVENT PEAK INFLOW AT EACH BASIN IN MGD

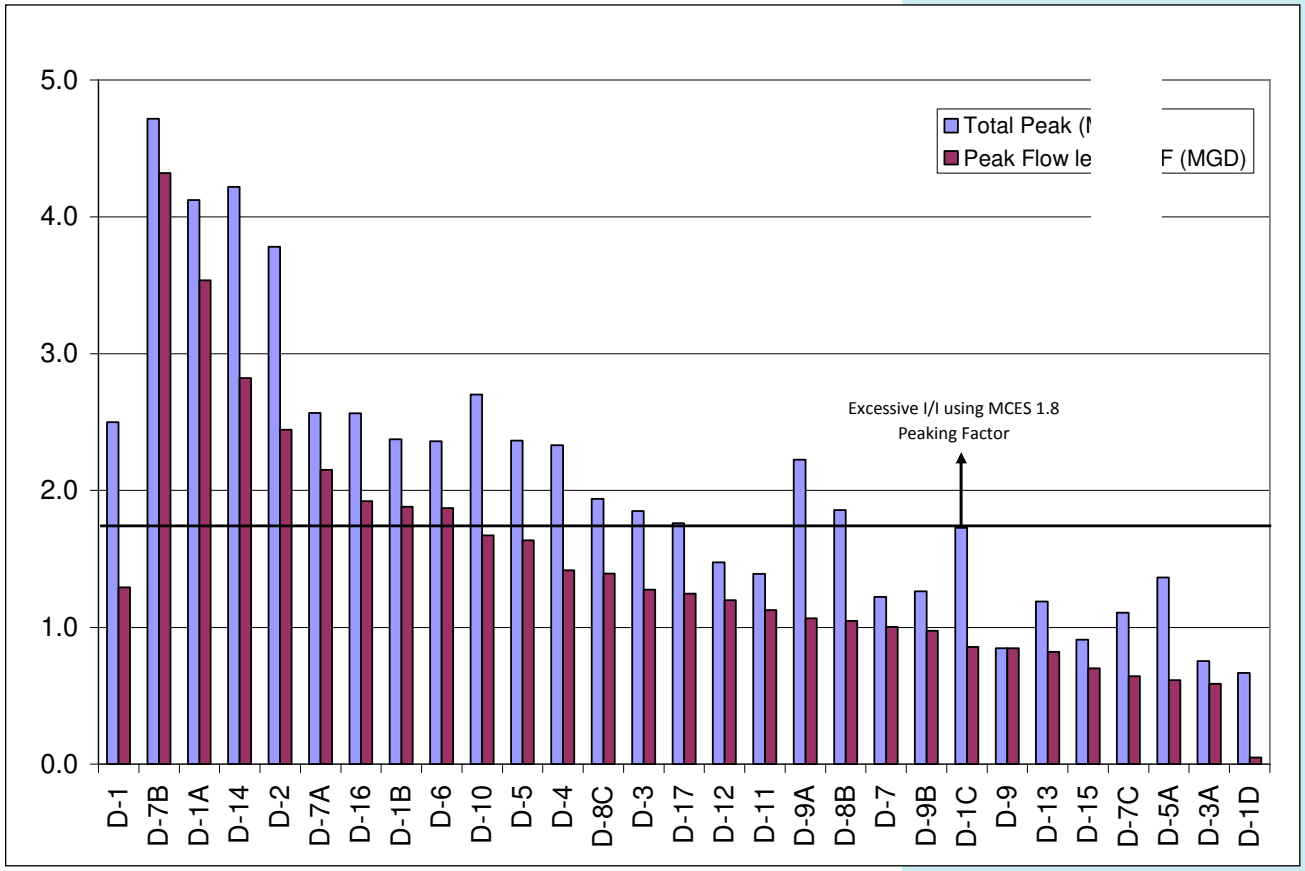


FIGURE W-V. INFLOW PRIORITIZATION MAP: RATIO OF PK INFLOW TO CONTRIBUTING AREA, AUGUST 27, 2008 EVENT

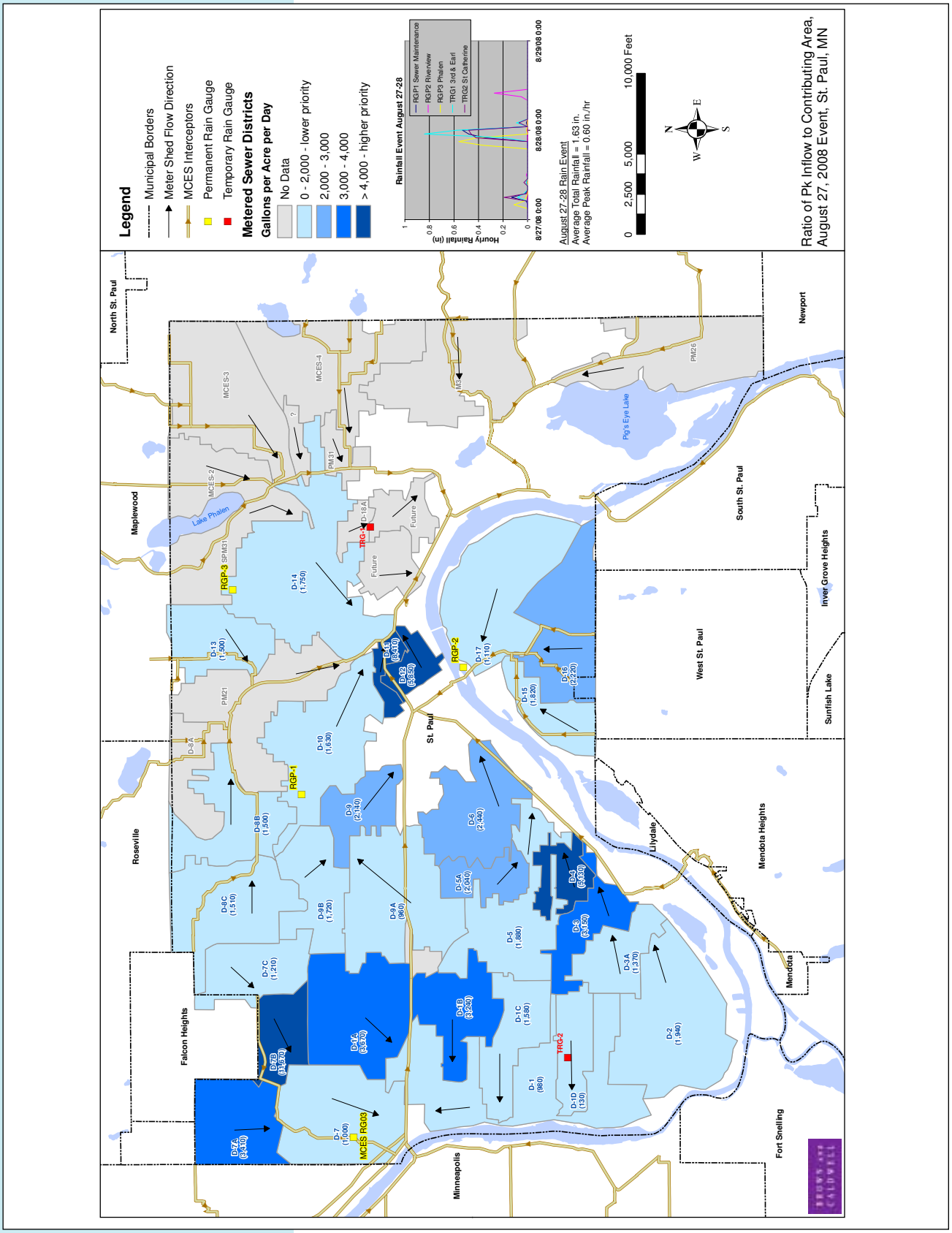


FIGURE W-W. SAINT PAUL LAND USE

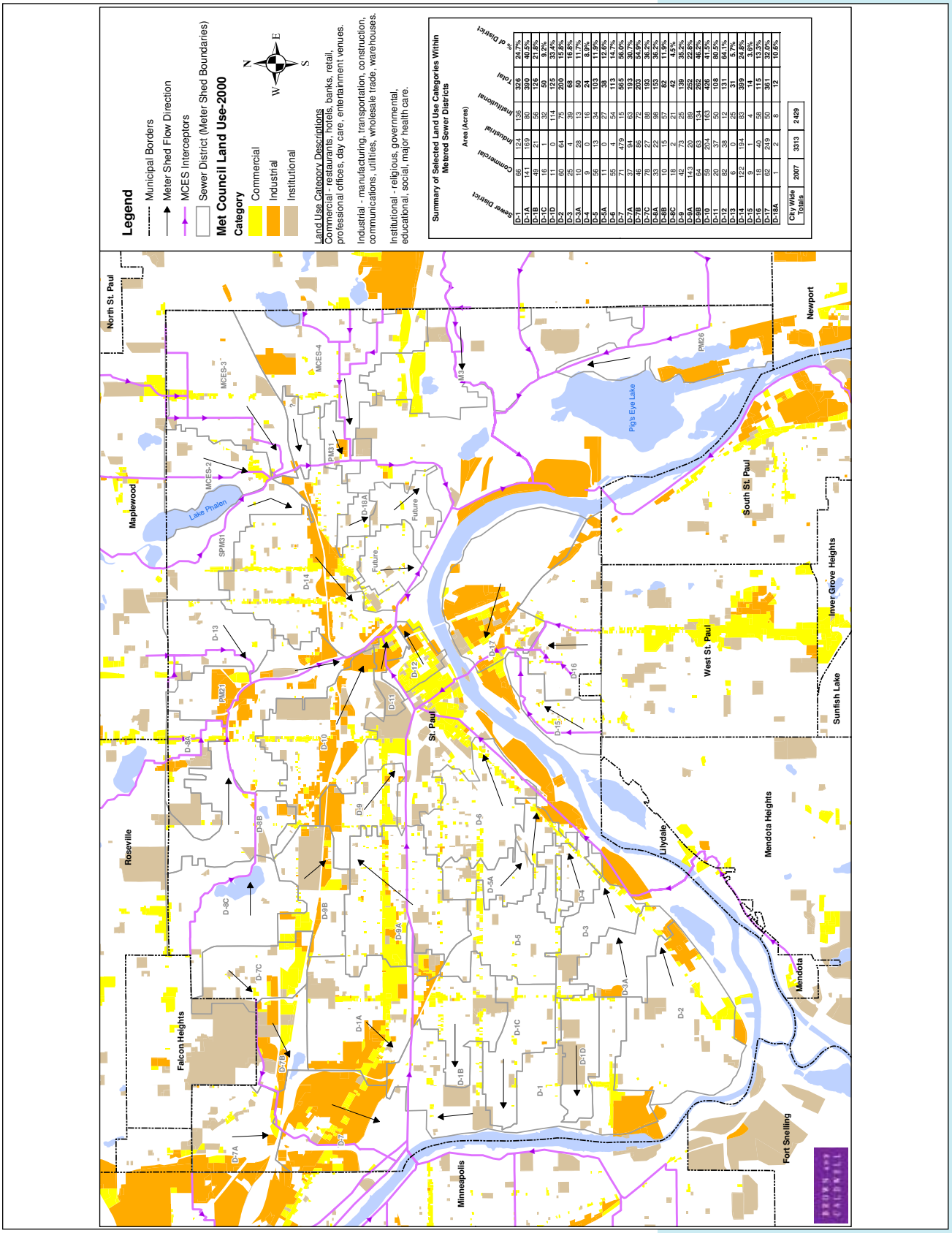


FIGURE W-X. INFLOW PRIORITIZATION MAP: INFLOW VOLUME (GAL), AUGUST 27, 2008 EVENT

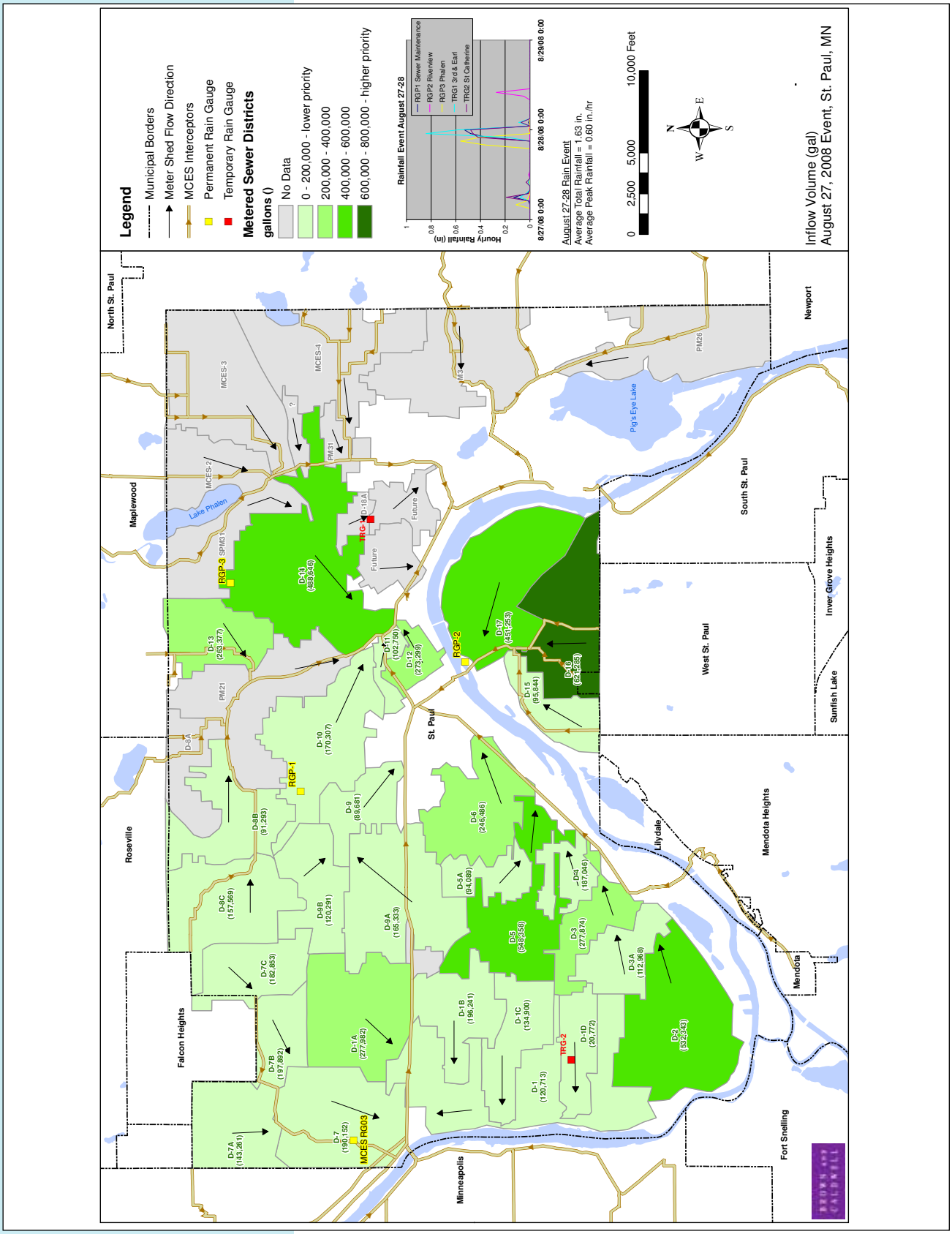


FIGURE W-Y. INFLOW PRIORITIZATION MAP: RATIO OF PEAK WW AND DWF, AUGUST 27, 2008 EVENT

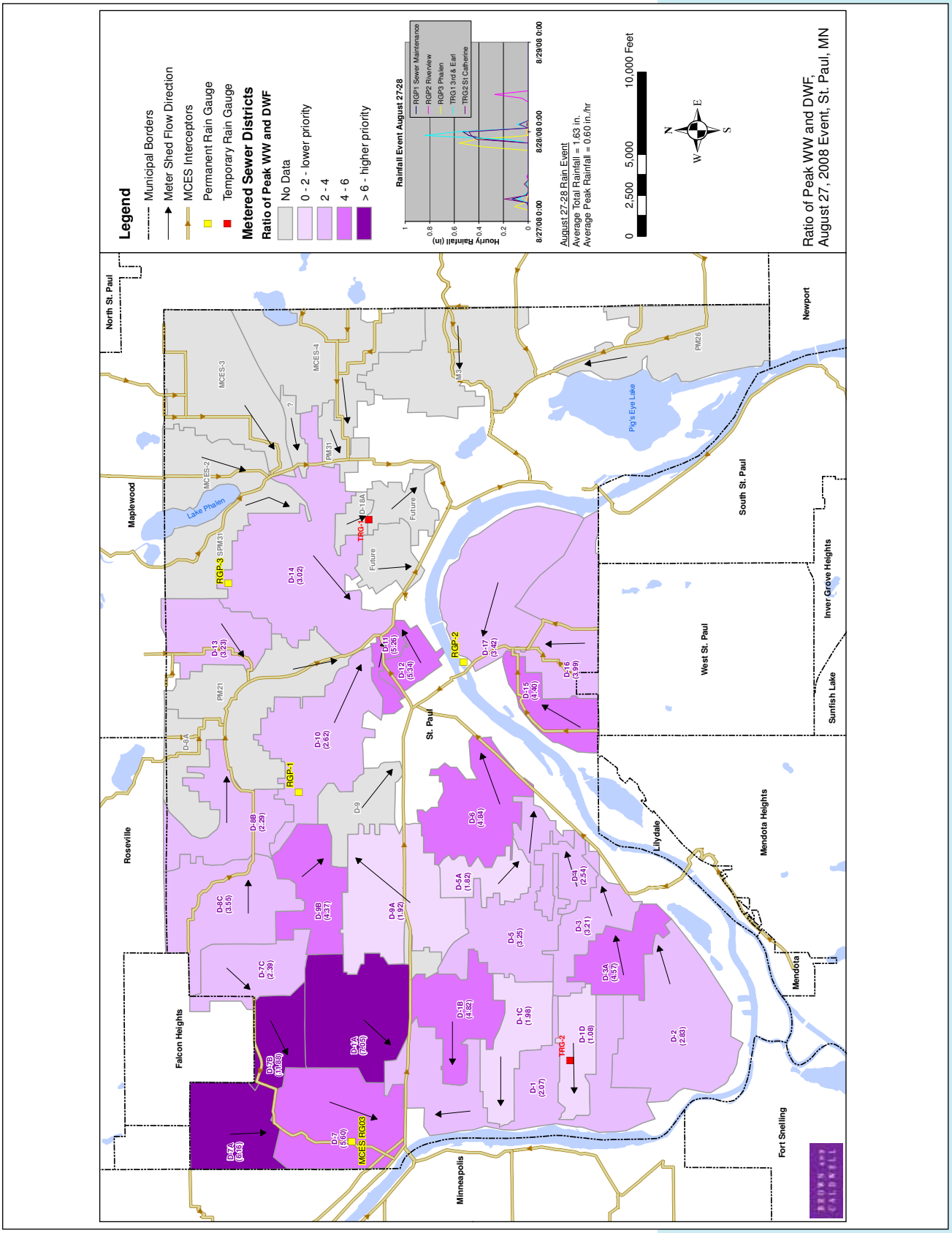


FIGURE W-Z. SAINT PAUL INFILTRATION PRIORITIZATION MAP: GALLONS PER MINUTE (GPM), AUGUST 27, 2008 EVENT

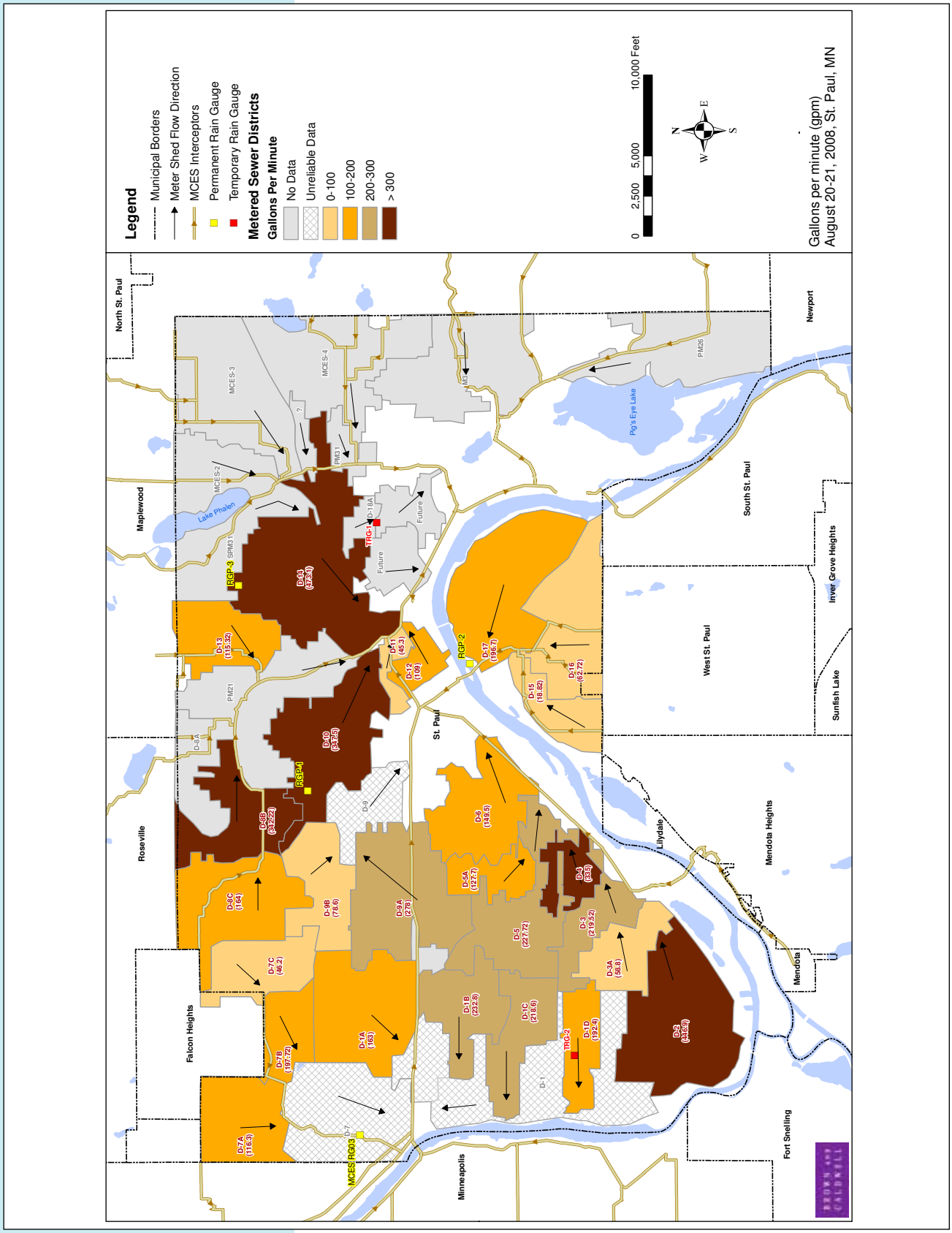


Figure W-AA. 2008 Smoke Testing Project Area (University - Prior Avenue)

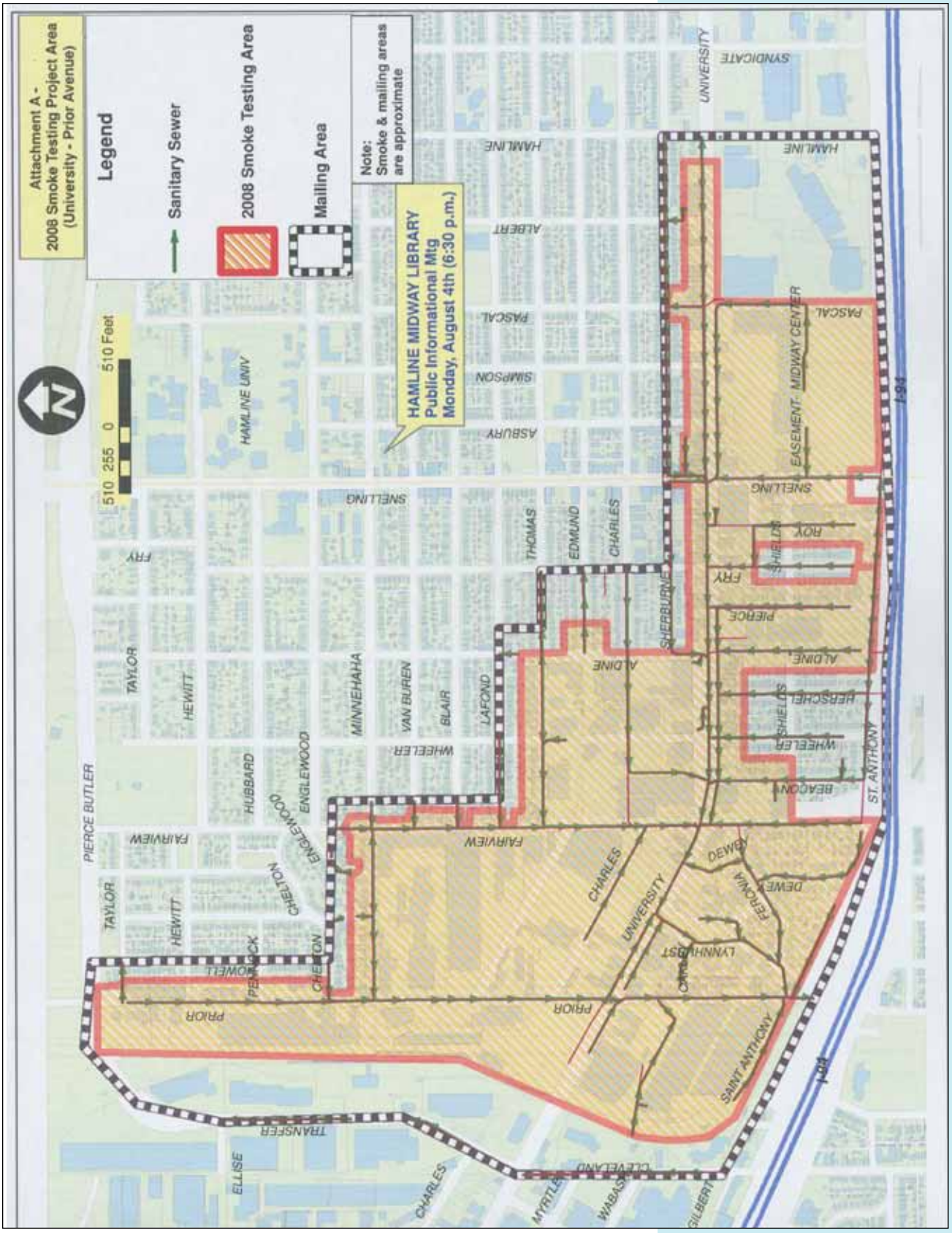


Figure W-AB. 2008 Smoke Testing Project Area (University - Raymond Avenue)

FIGURE W-AC. SMOKE TESTING PROJECT AREA: PROJECT #09-01 (DOWNTOWN CAPTIOL CAMPUS AREA)

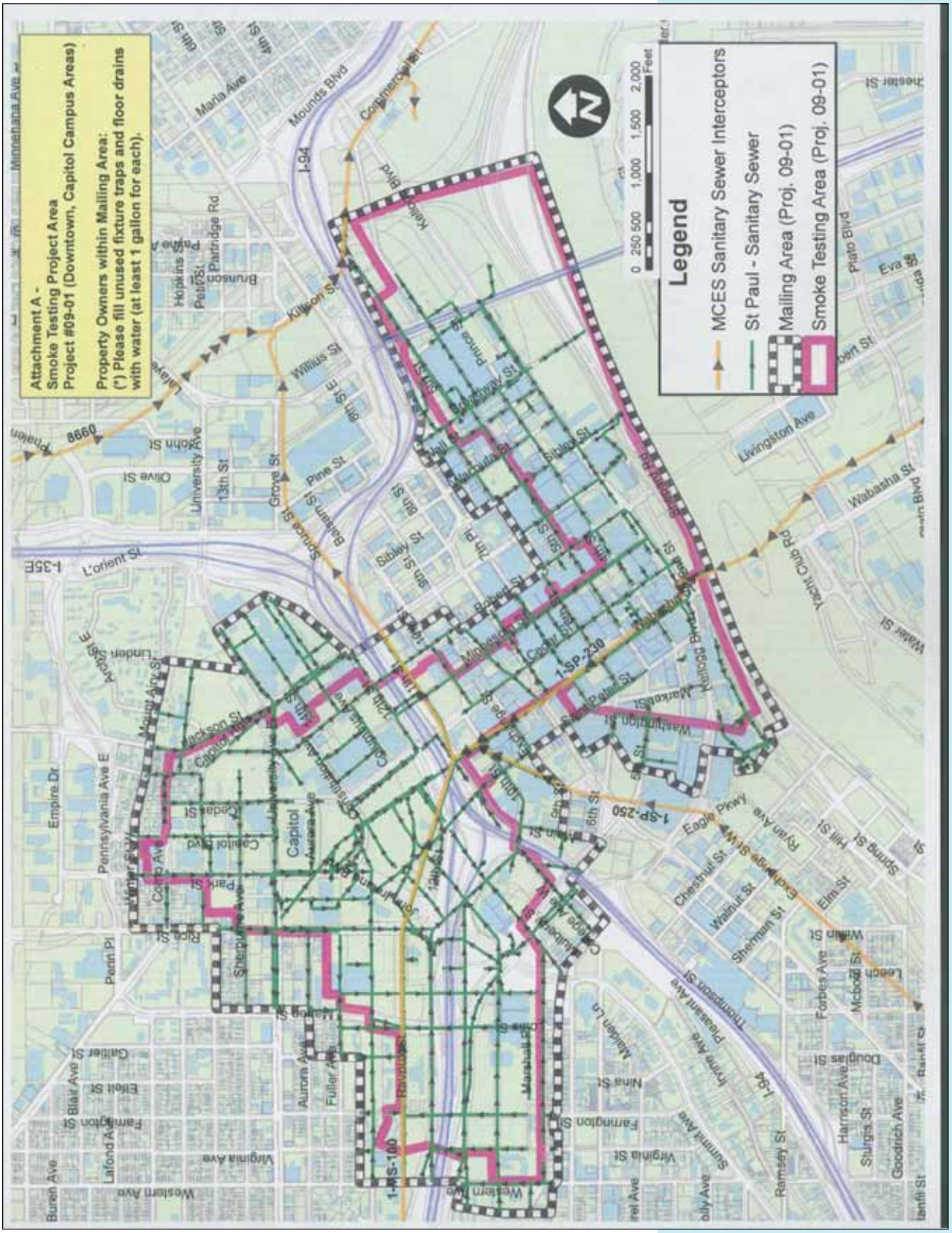


FIGURE W-AD. SMOKE TESTING PROJECT AREA: PROJECT #09-02 (HAMLINE TO RICE STREET)

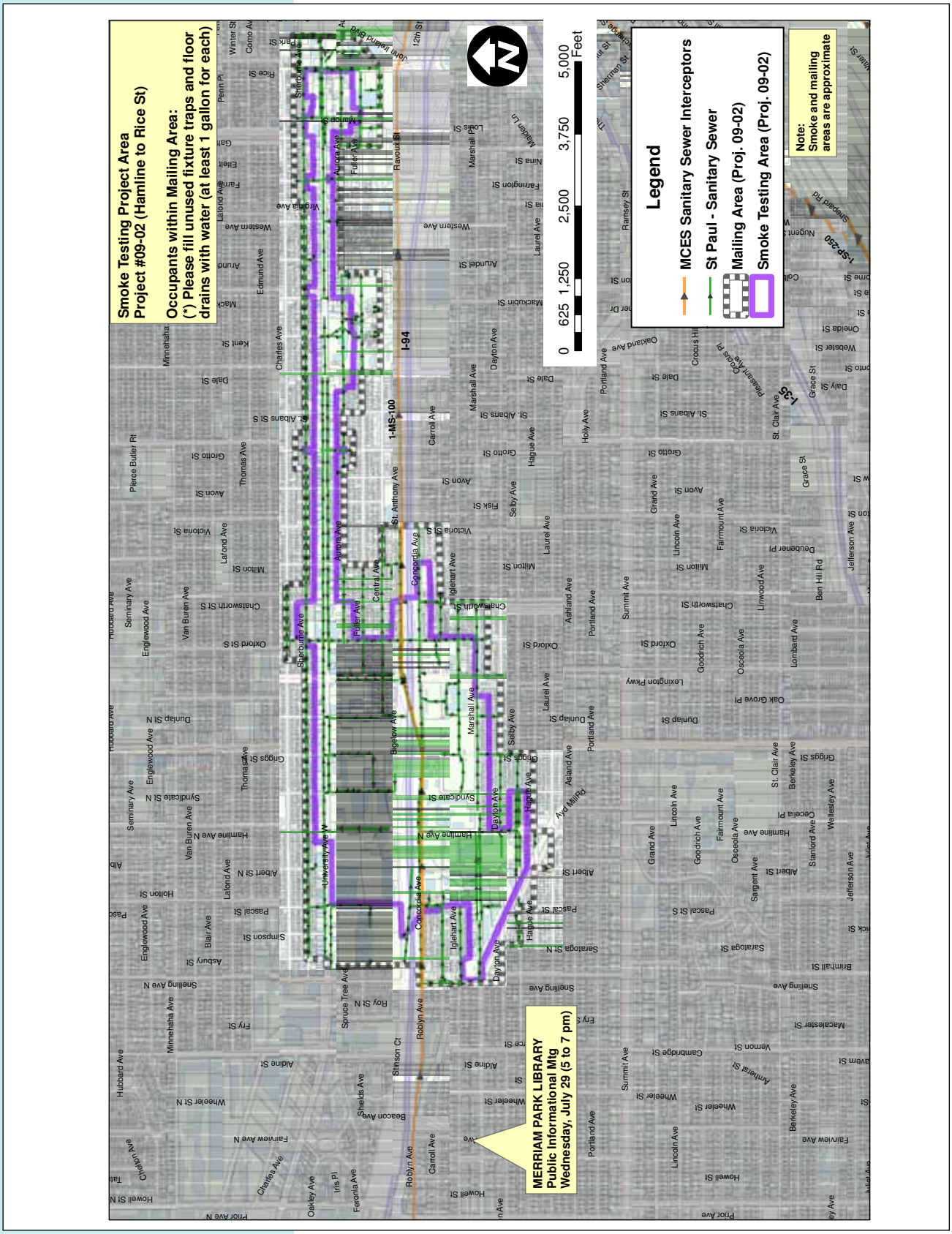
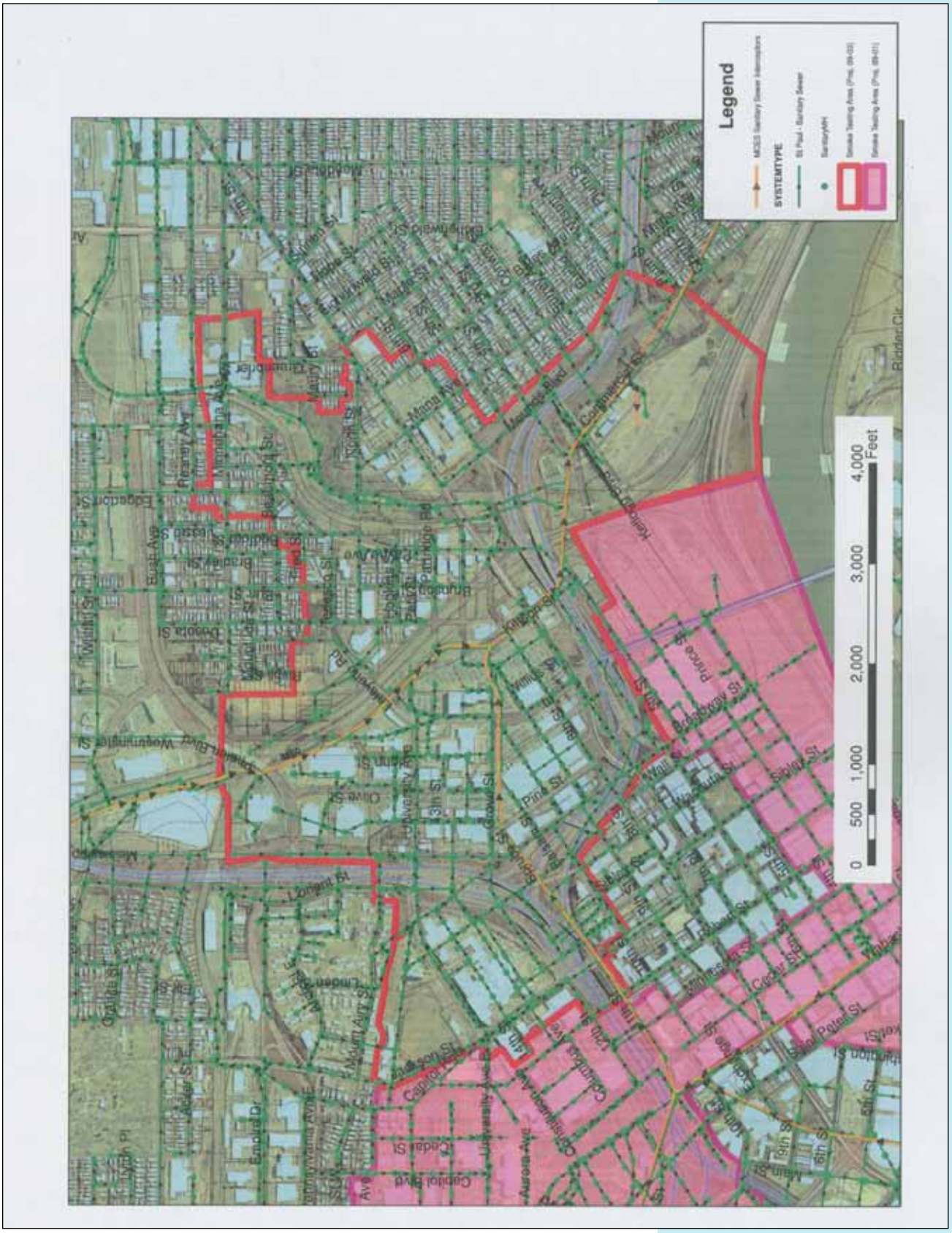


Figure W-AE. Smoke Testing Project Area: Downtown West



I & I Abatement Plan

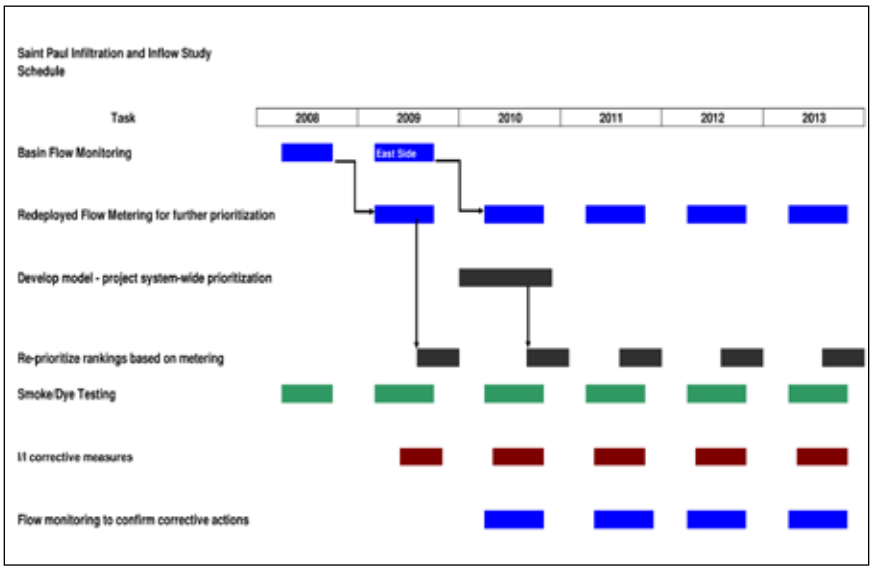
On a regular basis the city will re-evaluate its I&I abatement plan in consideration of:

- Maintaining public health and safety;
- Increasing the service life of the collection system; and
- Reducing I&I in a cost effective manner.

On November 13, 2007, the Met Council extended the city's I&I surcharge time period through 2015. The city assumes that any possible I&I demand charges from the Met Council will not occur until after December 31, 2015.

As part of the city's 2008 sewer flow monitoring study, the city with the aid of its consultant, Brown and Caldwell, prepared a bar chart to help define the city's approach for I&I abatement over the next 5-years. See Figure W-AF below as presented in the 2008 sewer flow study report titled *St. Paul Citywide Flow Monitoring – 2007/2008*. The city's approach involves a programmed cycle of activities that include flow monitoring, re-prioritization, smoke testing, and corrective action.

Figure W-AF. Saint Paul 5-Year Progression Schedule Approach



In connection with the I&I abatement approach presented above (Figure 4.1) the city plans to implement the following activities, programs, and mechanisms to help quantify, identify, and remove I&I:

Public Outreach

Increase the public's knowledge regarding:

- Available city programs that can help property owners repair their sewer service(s);
- Good practices to properly maintain private sewer services; and
- The costs and benefits of maintaining public and private sewer systems.

Sewer Flow Studies

On an annual basis monitor and analyze sanitary sewer flow rates in targeted areas such that sewer sheds contributing the largest amounts of I&I can be prioritized for further I&I abatement activities.

Smoke Testing Investigations

The purpose of smoke testing is to find sewer defects and faulty connections where I&I can enter the sanitary sewer system. Over 7,700 acres within the city is categorized as commercial, industrial, or institutional land. Smoke testing efforts will in large part be focused on testing most these areas by the end of 2013.

Enforcement of Existing Ordinances

The city will continue to enforce its Rain Leader Disconnection Ordinance (city legislative code 41.03).

Financing Programs– Private Sewer Service Repairs, Rain Leader Disconnections

To help expedite the repair or replacement of sanitary sewer services, the city offers two finance options to property owners:

- Residential Street Vitality Program (RSVP): Since 1994 property owners located within RSVP projects can have their sanitary sewer services repaired or replaced within the public right of way. Repair costs are fixed and are assessed to the property owner over a 20-year period; and
- Sewer Utility Assessment Program: Since 2000 the City has provided financing to property owners who need or wish to have their sanitary sewer services repaired or replaced, or rain leaders disconnected. Sewer repair costs, administrative fees, and interest is assessed to the property owner over a 20-year period. Between 2000 and 2007 close to 300 property owners have participated in this program.

Sewer Inspection Programs

Saint Paul's sanitary sewer system consists of approximately 804 miles of sewer pipes and tunnels. The city's inline inspection program consists of Closed Circuit Televising (CCTV) and walk through inspections.

In 2004 the city began a program to clean and inspect its entire sanitary sewer system on a 10-year cycle; 10% of its system annually or about 80 miles per year. Sewer Utility staff has divided the collection system into ten distinct geographic areas for the purpose of inspecting and cleaning In addition, sewers are inspected and cleaned in conjunction with: planned street construction projects, in response to complaints, and by special request usually from engineering staff seeking information for project purposes. Manhole inspections are performed concurrently with inline inspections. The city's cleaning and inspection efforts are summarized in FIgure W-AG.

FIGURE W-AG. SAINT PAUL SEWER INSPECTION AND CLEANING EFFORTS
SANITARY AND STORM SEWER SYSTEMS

Purpose	Miles per Year	% of System
Programmed Inspection (Sanitary)	80 (since 2004)	10
Street Projects - Mostly involving St. Paul's Residential Street Vitality Program, or RSVP Projects (Storm & Sanitary)	15	1.3
Complaints (Storm & Sanitary)	4	<0.5
Special Requests (Storm & Sanitary)	1	<0.5
Total	~100	~12.5

When I&I is observed via CCTV inspection the source and other possible defects are documented in a Microsoft Access Database and WinCan. WinCan is a computer software program used to capture CCTV inspection data. Tunnel walk through and manhole inspections are documented on standardized forms and entered into a Microsoft Access Database. Findings of the inspections are reviewed by Sewer Utility staff.

- Tunnel Inspections (Storm and Sanitary): The city inspects its tunnel systems every two or four years based upon their conditions. Tunnel inspection forms are completed as the result of any inspection; and
- Storm Sewer System: Saint Paul's storm sewer system consists of approximately 450 miles of sewer pipes and tunnels. Currently, storm sewers are inspected only in conjunction with street construction projects, in response to complaints, or special requests. After 2013 the city plans to include the (CCTV) inspection of its storm sewer system within the Programmed Inspection of its sanitary sewer system.

Sewer Lining (Rehabilitation) Program

Approximately $5 to $6 million dollars/year is budgeted to line sewers to reduce I&I and extend the service life of the system. Since 1991, over 160 miles of sewer has been lined. From 1997 to 2007, the city expended approximately $43 million dollars (capital cost) to line about 20% of the sewer system.

Major Sewer Repair Program.

Over the past 30 years the purpose of this program has been to repair (non-lining projects) both sanitary and storm sewer systems throughout the city to extend service life and reduce I&I. The budget for this program is approximately $1.8 million/year.

Manhole Rehabilitation

When necessary sanitary sewer manholes are replaced and/or repaired within the Residential Street Vitality Program (RSVP) and Sewer Lining Program.

Tunnel Rehabilitation Program

This program began in 2006 and includes the rehabilitation of both storm and sanitary sewer tunnels. The budget for this program is approximately $3.0 million/year.

Section III: Sanitary Sewer Connections to Other Municipalities

FIGURE W-AH. SAINT PAUL PROPERTIES WITH SANITARY SEWER SERVICES CONNECTED TO OTHER CITIES

Address				Sewer Permit #	Property Type		Units
Minneapolis							
2530	Kasota	Ave		A-96674	Ind		
2565	Kasota	Ave		A-97183	Ind		
2578	Kasota	Ave		A-101381	Com		
2564	Como	Ave		A-66517	Ind		
Roseville							
1677	Fernwood	St		A-93316	SFD		
1673	Fernwood	St		A-93311	SFD		
1671	Fernwood	St		A-89174	SFD		
1659	Fernwood	St		A-89376	SFD		
1655	Fernwood	St		A-90556	SFD		
1649	Fernwood	St		A-91131	SFD		
1656	Fernwood	St		A-89177	SFD		
1660	Fernwood	St		A-89176	SFD		
1664	Fernwood	St		A-89096	SFD		
1670	Fernwood	St		A-89499	MFD	apartment	17
South St. Paul							
750	Concord	St	S	NROC	SFD		
754	Concord	St	S	NROC	SFD		
585	Annapolis	St	E	NROC	SFD		
577	Annapolis	St	E	NROC	SFD		
573	Annapolis	St	E	NROC	SFD		
565	Annapolis	St	E	NROC	SFD		
556	Wyoming	St	E	A-108930	SFD		
555	Wyoming	St	E	A-108375	SFD		
549	Annapolis	St	E	A-89448	SFD		
539	Annapolis	St	E	NROC	SFD		
535	Annapolis	St	E	A-91936	SFD		
West St. Paul							
435	Wyoming	St	E	A-83572	MFD	duplex	2
423	Wyoming	St	E	A-91726	SFD		
411	Wyoming	St	E	A-95664	SFD		
403	Wyoming	St	E	A-91917	SFD		
395	Wyoming	St	E	A-97009	SFD		
43	Annapolis	St	E	A-39238	MFD	duplex	2
39	Annapolis	St	E	A-39256	MFD	triplex	3
253	Annapolis	St	W	NROC	SFD		
261	Annapolis	St	W	R-7072	SFD		
267	Annapolis	St	W	A-88565	Vac lot		
299	Annapolis	St	W	A-70258	SFD		
305	Annapolis	St	W	A-75576	SFD		
313	Annapolis	St	W	A-54357	MFD	triplex	3
315	Annapolis	St	W	NROC	SFD		
323	Annapolis	St	W	NROC	SFD		
327	Annapolis	St	W	A-60390	SFD		
337	Annapolis	St	W	A-96064	SFD		
379	Annapolis	St	W	A-53068	Church		
Maplewood							
118	Larpenteur Ave. W.			A-85702	SFD		
112	Larpenteur Ave. W.			A-88628	MFD	apartment	12
104	Larpenteur Ave. W.			A-85749	SFD		
94	Larpenteur Ave. W.			A-86943	SFD		
8	Larpenteur Ave. E.			A-91419	SFD		
16	Larpenteur Ave. E.			A-85945	SFD		
20	Larpenteur Ave. E.			A-85496	SFD		
1661	Gurney Ave.			A-97447	SFD		
1657	Gurney Ave.			A-90522	SFD		

Figure W-AH. Saint Paul Properties with Sanitary Sewer Services Connected to Other Cities (Continued)

Maplewood				
1652 Gurney Ave.	A-89977	SFD		
1656 Gurney Ave.	A-90440	SFD		
1660 Gurney Ave.	A-88213	SFD		
1666 Gurney Ave.	A-88214	SFD		
1672 Gurney Ave.	A-88215	SFD		
1676 Gurney Ave.	A-88898	SFD		
366 Larpenteur Ave. E.	A-88881	SFD		
372 Larpenteur Ave. E.	?			
380 Larpenteur Ave. E.	A-90810	MFD	duplex	2
390 Larpenteur Ave. E.	A-110982	SFD		
396 Larpenteur Ave. E.	R-5515	SFD		
440 Larpenteur Ave. E.	A-108976	SFD		
1649 Desoto St.	A-98540	SFD		
480 Larpenteur Ave. E.	A-97207	MFD	townhome	8
488 Larpenteur Ave. E.	A-97205	MFD	townhome	8
500 Larpenteur Ave. E.	A-97206	MFD	townhome	8
516 Larpenteur Ave. E.	A-89533	SFD		
522 Larpenteur Ave. E.	A-90262	SFD		
528 Larpenteur Ave. E.	A-90023	SFD		
534 Larpenteur Ave. E.	A-88904	SFD		
540 Larpenteur Ave. E.	A-110983	SFD		
546 Larpenteur Ave. E.	A-85665	SFD		
552 Larpenteur Ave. E.	A-85218	SFD		
558 Larpenteur Ave. E.	A-87254	SFD		
564 Larpenteur Ave. E.	A-86749	SFD		
610 Larpenteur Ave. E.	A-88745	MFD	duplex	2
620 Larpenteur Ave. E.	A-86231	SFD		
624 Larpenteur Ave. E.	A-86232	SFD		
1676 Payne Ave.	A-97019	SFD		
650 Larpenteur Ave. E.	A-97020	SFD		
656 Larpenteur Ave. E.	R-15720	SFD		
662 Larpenteur Ave. E.	A-97028	SFD		
668 Larpenteur Ave. E.	A-97029	SFD		
674 Larpenteur Ave. E.	A-97030	SFD		
680 Larpenteur Ave. E.	A-97031	SFD		
686 Larpenteur Ave. E.	A-97032	SFD		
690 Larpenteur Ave. E.	A-97033	SFD		
696 Larpenteur Ave. E.	A-97034	SFD		
704 Larpenteur Ave. E.	A-93665	MFD		4
712 Larpenteur Ave. E.	A-93666	MFD		4
720 Larpenteur Ave. E.	A-93511	SFD		
726 Larpenteur Ave. E.	R-14112	SFD		
728 Larpenteur Ave. E.	A-97514	SFD		
734 Larpenteur Ave. E.	A-97515	SFD		
740 Larpenteur Ave. E.	A-97585	SFD		
760 Larpenteur Ave. E.	Maplewd Proj	SFD		
772 -774 Larpenteur Ave. E.	Maplewd Proj	SFD	duplex	2
780 -782 Larpenteur Ave. E.	Maplewd Proj	SFD	duplex	2
643 California Ave.	A-97021	SFD		
647 California Ave.	A-96655	SFD		
654 California Ave.	A-98496	SFD		
655 California Ave.	A-97022	SFD		
659 California Ave.	A-96529	SFD		
660 California Ave.	A-99476	SFD		
665 California Ave.	A-97023	SFD		
666 California Ave.	A-99477	SFD		
670 California Ave.	A-96639	SFD		
671 California Ave.	A-96588	SFD		
676 California Ave.	A-96854	SFD		

Figure W-AH. Saint Paul Properties with Sanitary Sewer Services Connected to Other Cities (Continued)

Maplewood		
677 California Ave.	A-97180	SFD
682 California Ave.	A-96700	SFD
683 California Ave.	A-97314	SFD
689 California Ave.	A-97606	SFD
695 California Ave.	A-97607	SFD
703 California Ave.	A-100921	SFD
706 California Ave.	A-98547	SFD
757 Parkway Dr.	A-95407	SFD
715 California Ave.	A-85747	SFD
761 Parkway Dr.	A-95406	SFD
721 California Ave.	A-83033	SFD
725 California Ave.	A-85948	SFD
1618 Payne Ave.	A-84587	SFD
655 Idaho Ave.	A-81823	SFD
658 Idaho Ave.	A-81873	SFD
663 Idaho Ave.	A-85068	SFD
664 Idaho Ave	A-81874	SFD
674 Idaho Ave.	A-81850	SFD
675 Idaho Ave.	A-81852	SFD
681 Idaho Ave.	A-81881	SFD
689 Idaho Ave.	A-81813	SFD
695 Idaho Ave.	A-87633	SFD
716 Idaho Ave.	R-19624	SFD
718 Idaho Ave.	R-19625	SFD
722 Idaho Ave.	A-93626	SFD
726 Idaho Ave.	R-19626	SFD
730 Idaho Ave.	R-19627	SFD
734 Idaho Ave.	R-19628	SFD
742-744 Idaho Ave.	R-19629	SFD
756 Idaho Ave.	R-19630	SFD
762 Idaho Ave.	R-19631	SFD
766 Idaho Ave.	R-19632	SFD
770 Idaho Ave.	R-19633	SFD
776 Idaho Ave.	R-19634	SFD
782 Idaho Ave.	A-84597	SFD
790 Idaho Ave.	R-19635	SFD
800 Idaho Ave.	R-19636	SFD
1601 Arcade Ave.	A-86860	SFD
1607 Arcade Ave.	A-86844	SFD
1615 Arcade Ave.	A-84994	SFD
1621 Arcade Ave.	A-83821	SFD
714 Parkway Dr.	A-89458	SFD
726 Parkway Dr.	R-19643	SFD
1585 Greenbrier St.	A-84685	SFD
704 Iowa Ave.	A-86725	SFD
710 Iowa Ave.	A-85594	SFD
716 Iowa Ave.	A-85136	SFD
719 Iowa Ave.	A-89624	SFD
720 Iowa Ave.	A-85135	SFD
723-725 Iowa Ave.	A-90623	SFD
726 Iowa Ave.	A-83961	SFD
729-731 Iowa Ave.	A-90624	SFD
730 Iowa Ave.	R-7534	SFD
734 Iowa Ave.	A-83967	SFD
739 Iowa Ave.	R-21248	SFD
743 Iowa Ave.	A-83682	SFD
744-746 Iowa Ave.	A-84600	SFD
747 Iowa Ave.	A-83681	SFD
750 Iowa Ave.	R-12204	SFD

FIGURE W-AH. SAINT PAUL PROPERTIES WITH SANITARY SEWER SERVICES CONNECTED TO OTHER CITIES (CONTINUED)

Maplewood		
751 Iowa Ave.	A-83680	SFD
755 Iowa Ave.	A-84180	SFD
756 Iowa Ave.	A-83968	SFD
757 Iowa Ave.	A-83679	SFD
760 Iowa Ave.	A-83502	SFD
761 Iowa Ave.	A-83742	SFD
765 Iowa Ave.	A-90173	SFD
768 Iowa Ave.	A-84935	SFD
771 Iowa Ave.	A-84008	SFD
775 Iowa Ave.	A-85419	SFD
776 Iowa Ave.	A-83724	SFD
780 Iowa Ave.	A-85462	SFD
781 Iowa Ave.	A-83907	SFD
786 Iowa Ave.	A-86435	SFD
787 Iowa Ave.	A-84601	SFD
792 Iowa Ave.	A-84763	SFD
793 Iowa Ave.	A-84638	SFD
1583 Arcade St.	A-85791	SFD
1587 Arcade St.	A-83696	SFD
1595 Arcade St.	A-95538	SFD
712 Parkway Dr.	A-82542	SFD
721 Parkway Dr.	A-76774	SFD
725 Parkway Dr.	A-107102	SFD
727 Parkway Dr.	A-81851	SFD
731-733 Parkway Dr.	A-86722	SFD
783 Parkway Dr.	A-97584	SFD
789 Parkway Dr.	A-97583	SFD
793 Parkway Dr.	A-97531	SFD
806 Parkway Dr.	A-96297	SFD
1592 Greenbrier St.	A-82133	SFD
1596 Greenbrier St.	R-19615	SFD
720 Parkway Dr.	A-86217	SFD
1610 Greenbrier St.	A-89985	SFD
745 Parkway Dr.	A-81962	SFD
1643 Greenbrier St.	A-87702	SFD
1669 Arcade St.	A-82910	SFD
1970 Larpenteur Ave. E.	A-88622	SFD
1976 Larpenteur Ave. E.	A-110984	SFD
1984 Larpenteur Ave. E.	A-110985	SFD
2000 Larpenteur Ave. E.	A-84731	SFD
2006 Larpenteur Ave. E.	A-110986	SFD
1475 McKnight Rd. N.	A-102564	SFD
1045 McKnight Rd. S.	A-102356	SFD
1051 McKnight Rd. S.	A-102929	SFD
2247 Ogden Ct.	A-100386	SFD
1085 McKnight Rd. S.	A-100734	SFD
1101 McKnight Rd. S.	A-100672	SFD
1111 McKnight Rd. S.	A-105124	SFD
1119 McKnight Rd. S.	A-105364	SFD

Note: SFD - single family dwelling
MFD - multiple family dwelling
NROC - no record of connection

Section IV: Individual Sewage Treatment Systems

General

Within the City of Saint Paul, there are approximately 120 homes utilizing individual on site facilities for disposal of their wastewater. Figure S in Appendix E shows the locations of the existing septic systems within the City of Saint Paul. The greatest concentration of individual sewage treatment systems (ISTS) is in the South Highwood area. Much of this area is not currently served by public sanitary sewer facilities.

The City of Saint Paul permits the building and usage of ISTS in areas of the city that are not served by public sewer or are unable to connect to an existing sewer system. The City's management program for on site sewage treatment includes provisions for the regulation and monitoring of all ISTS. The maintenance, design, construction and location of septic systems are required to conform to Minnesota Pollution Control Agency Minnesota Rules 7080, Minnesota State Building Code, Minnesota Plumbing Code and Minnesota Water Well Construction Code.

On Site System Management

The City of Saint Paul ordinance regulates the installation of new on site systems as well as the maintenance and reviews of existing systems. A permit issued by the Department of Safety and Inspections (DSI) must be attained prior to any new installation, alteration, repair or extension of any sewage treatment system. The Saint Paul management and control program implements the current Minnesota Pollution Control Agency (MPCA) standards and includes:

- Inspection of new systems;
- Inspection and maintenance of existing systems;
- Correction of nonconforming systems; and
- Testing of water supply wells.

Inspection of New Systems

New ISTS requires a construction permit issued by the City's building official. The building official is responsible for administration and enforcement of the design, construction and installation provisions of the City ordinances relating to septic systems. New treatment systems are permitted only where sewer service is not available to the property owner. The permit application must include the identification and location of various physical features and characteristics, ground slope, details of the proposed installation, soil and percolation test data, location of an alternate site and a site evaluation as well as evidence of compliance with all state and other jurisdiction regulations, including Minnesota Rules 7080. Permit applications are evaluated by the DSI to determine compliance with all the above stated regulations. No alternative or experimental systems are allowed.

Inspection and Maintenance of Existing systems

Existing systems must be inspected and maintenance reviews conducted at least once every 2 years by a MPCA certified inspector or pumper. Each septic tank must be maintained in proper operating conditions at all times. Septic

tanks are required to be pumped as inspection indicates or at least once every 2 years. Septic tank pumping must be performed by a MPCA licensed pumper and must be reported to City officials. City officials manage the maintenance of all septic systems; monitoring and filing the inspection reports, and see that the necessary pumping is performed.

Correction of Nonconforming Systems

Those systems not in compliance with the provisions indicated in the City ordinance must be modified and brought into compliance within 10 months with the exception of those built between May 27, 1989 and January 23, 1996 which are allowed 5 years. If the system is an imminent threat to public health or safety, corrections must be made within 90 days. Seepage pits, drywells, cesspools or leaching pits are considered to be failing systems and must be upgraded, replaced, or the use of these systems discontinued within 10 months of notice of noncompliance.

Testing of Water Supply Wells

Water supply wells located on properties with ISTS must be tested for coliform bacteria and nitrate every 2 years. The property owners are notified every 2 years requesting that these tests be performed and the results submitted to the DSI Office.

Record keeping

The DSI maintains the records pertaining to individual treatment systems. The records maintained include the following:

- A list of all active septic systems.
- Permit applications for new systems.
- Inspection and maintenance reports, performed and recorded by a licensed inspector and submitted by the property owner. This report includes a location map of the septic system, well and building structure.
- Test reports of private water supply wells.
- Pumping reports periodically submitted by a licensed pumper or the property owner.

The property owners with septic systems are notified by letter every 2 years requesting submittal of maintenance reviews. Maintenance reviews must be completed by individuals licensed by the MPCA.

The results of this review can be used to determine whether the property owner is issued a correction notice. Records of these reviews have been maintained by the DSI over the last five years. Property owners failing to submit these reviews are issued citations and are subject to fines.

Enforcement

The DSI enforces the provisions outlined above of the recently amended Saint Paul Legislative Code, Chapter 50, regulating the installation and maintenance reviews of individual treatment systems. A copy of this ordinance can be found at http://library1.municode.com/4472/DocView/10061/1/56/75. The building official has the authority to inspect and review all individual treatment systems.

This official may:

- Issue orders to revoke or suspend permits where work is not performed in compliance with the provisions of this chapter;
- Require property owners to stop use of a system that is operating in a manner creating a hazard to the public health, safety or welfare;
- Condemn a dwelling that is a hazard to the public or the dwelling occupants; and
- Require correction of any defective system.

The City will consider variances to this code if there is undue hardship on the property owner, as long as there is no threat to public health, safety or welfare.

Appendix W-E

There are currently approximately 120 ISTS in service in the City of Saint Paul. Policy W-3.2 sets a goal of eliminating all ISTS by 2025. The majority of these properties are single family homes located in the Highwood neighborhood in the southeast quadrant of the city (see Figure W-N). Figure W-AI below shows sewered and unsewered population, households, and employment forecasted for 2010, 2020, and 2030. Currently, the major barrier to extending service to homes in the Highwood neighborhood is one of cost; limited depth to bedrock, topography, distance to existing mains, and relatively low-density, single family housing make connecting to the sanitary sewer system infeasible from a cost per unit perspective.

Figure W-AI. Sewered and Unsewered Populations

Metropolitan Council Population Forecasts	2010	2020	2030
Households	120,000	127,000	133,000
Populations	305,000	320,000	331,000
Employment	196,600	210,000	220,600

Sewered	2010	2020	2030
Households	119,880	126,880	133,000
Populations	304,699	319,699	331,000
Employment	196,575	209,975	220,600

Unsewered	2010	2020	2030
Households	120	120	0
Populations	301	301	0
Employment	25	25	0