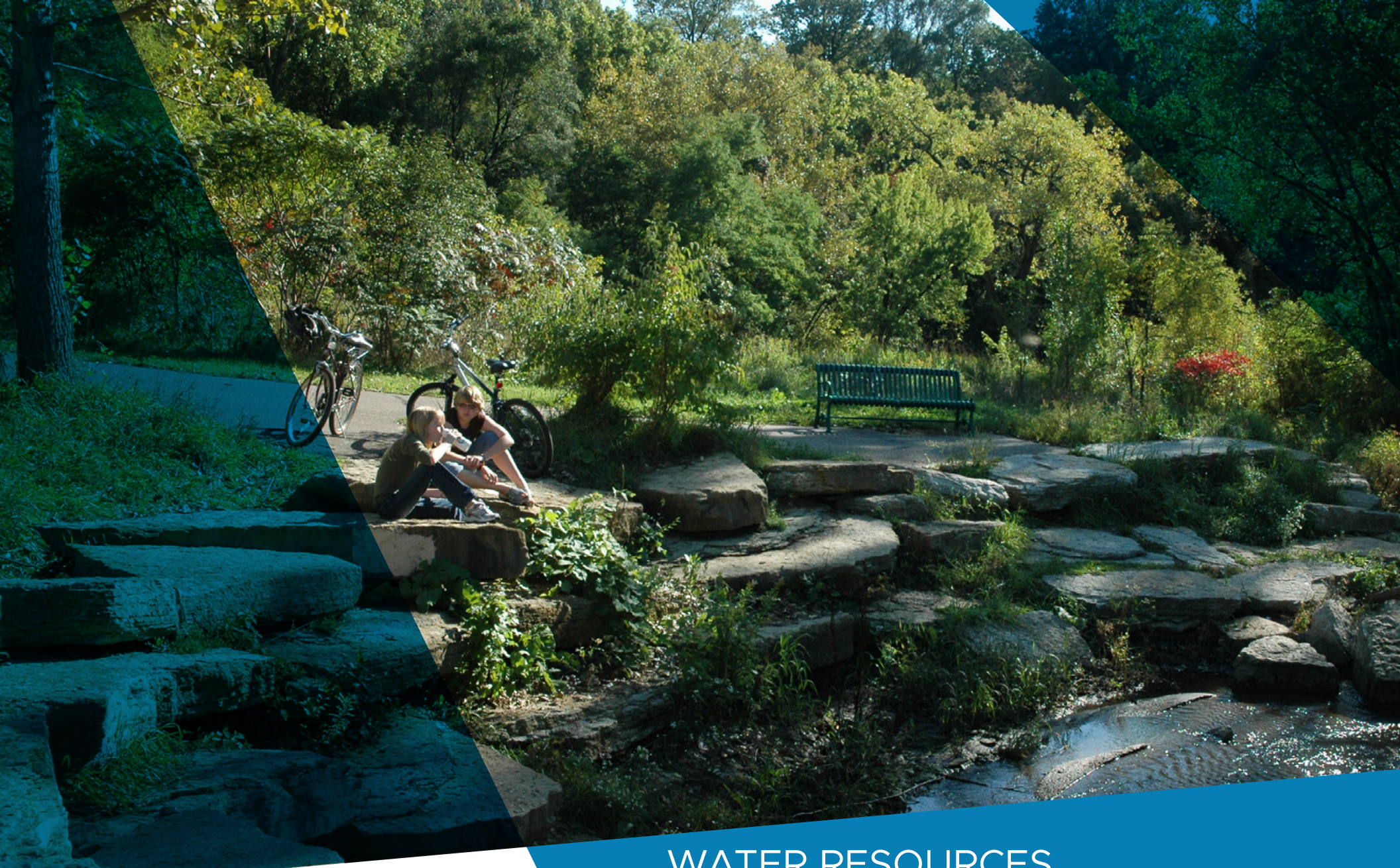

WATER RESOURCES MANAGEMENT

Introduction

The Water Resources chapter provides guidance and a comprehensive policy framework for the use and integrated management of water resources and related infrastructure. These resources include surface water, ground water, water supply and the potable water distribution system, stormwater and stormwater management infrastructure, and the wastewater conveyance system. The chapter also provides a high-level summary of the policy guidance found in the City's adopted Local Surface Water Management Plan (LSWMP) and Water Supply Plan (WSP), and describes City policy related to the management of inflow and infiltration (I & I) in the City's wastewater conveyance system. (Note: The Mississippi River Corridor Critical Area Chapter contains policies and implementation ations for the State-designated Ctrical Area.)

Water is vital to everything—human life and the natural ecosystems that support us, our economy, and the things we use and consume every day. While water is abundant, it is finite; it is estimated that less than 1% of the Earth's water is freshwater available for human use. Saint Paul's drinking water system that is connected to abundant supplies of both treatable surface water and abundant, clean ground water. Protecting that supply, using water sensibly, and maintaining the infrastructure that treats and distributes clean water are all key to maintaining a safe, reliable and sustainable water supply.

The City of Saint Paul and partner agencies such as the Capital Region Watershed District (CRWD) and Ramsey-Washington Metro Watershed District (RWMWD) have made great progress in the last 10 years in improving stormwater management practices in Saint Paul. The goals and policies in this plan are aimed at maximizing and balancing the occasionally competing goals of achieving excellent surface water quality and maintaining right-sized gray stormwater infrastructure to prevent localized flooding during storm events.

The proper treatment of wastewater is vital to both public health, and continued surface water and groundwater quality. In an older, built-up city like Saint Paul, maintenance of and improvements to aging metropolitan, municipal and privately-owned wastewater conveyance and treatment infrastructure are critical to meeting the needs of current citizens and accommodating new demand as the city grows.

The following goals guide the Water Resources chapter:

1. Integrated water resource management.
2. A safe, reliable and sustainable water supply.
3. Excellent surface water quality.
4. Rehabilitated and upgraded gray stormwater infrastructure.
5. Sustainable wastewater conveyance and treatment infrastructure.

Goal 1: Integrated water resource management.

Policy WR-1. Utilize rain as a resource to achieve multiple benefits when managing stormwater, such as harvesting water for irrigation or flushing toilets.

Policy WR-2. Work with development partners to support district green stormwater approaches.

Policy WR-3. Promote visible green infrastructure landscape features, such as rain gardens, constructed wetlands and tree trenches, that contribute to placemaking and welcoming public spaces.

Policy WR-4. Advance municipal policy and financing solutions to support district green stormwater infrastructure.

Policy WR-5. Advocate for expanded water reuse capacity, including code and policy changes to make water reuse cheaper and easier.

Policy WR-6. Support a healthy urban forest and urban forestry initiatives to capture stormwater through canopy interception, evapotranspiration and increased infiltration.

Policy WR-7. Continue to explore and support the implementation of green infrastructure practices to increase resiliency to flooding, drought and climate change.

Policy WR-8. Support regional efforts to address groundwater usage and recharge.

Water is All around Us

Water is all around us—in lakes and rivers, trapped in snow and glaciers, underground, even in the air. Water moves constantly and freely between these states in a single continuous cycle.

Surface water

Surface water refers to oceans, lakes, rivers, streams and wetlands. Subsurface exchanges between groundwater and surface water are common; surface waters are also fed by atmospheric water vapor via precipitation and stormwater. In turn, large bodies of surface water evaporate into the atmosphere as water vapor.

Groundwater

Groundwater is water beneath the surface of the ground. It includes everything from the soil moisture you might find digging in a garden to deep bedrock aquifers. Generally, groundwater levels fluctuate where water is close to the surface, and can rise in times of more frequent or intense precipitation, like in springtime. Shallow groundwater is typically impacted by infiltration of stormwater, and can cause problems with infiltration into pipes and basements. In these areas, groundwater contamination can be a problem. Deep bedrock aquifers are hundreds of feet underground. An individual water molecule entering a bedrock aquifer at a recharge zone (where surface or other groundwater enters the aquifer, typically close to the surface) may remain in the aquifer for thousands of years. Four levels of bedrock aquifers—separated from each other by layers of less-permeable rock—underlay Saint Paul.

Stormwater

Stormwater is water that falls as rain. The amount of stormwater absorbed by permeable surfaces—those areas not covered by roads, buildings or other constructed surfaces – depends on a number of factors, including rate of rainfall, soil types, and amount and type of vegetation. Water that cannot be immediately absorbed by permeable surfaces or that falls on impervious surfaces becomes stormwater runoff. In urban environments, stormwater runoff has traditionally been directed away from structures and roads by curb and gutter, and conveyed to receiving surface waters by the storm sewer system. However, contemporary "green infrastructure," such as rainwater gardens or tree trench systems, is increasingly being used to capture and infiltrate stormwater into the ground. This is important to both reduce the volume of stormwater discharged to receiving surface waters, and to help capture pollutants and sediment picked up from impervious surfaces that would otherwise end up in lakes and streams.

Best Management Practices

When dealing with stormwater, a Best Managemetnt Practice (BMP) is used to describe structural or nonstructural approaches to intercepting, infiltrating and/or treating stormwater runoff, with a focus on green infrastructure. Common examples include rainwater gardens, tree trenches, bioswales and sand filtration. Different development and redevelopment sites and different types of projects present very different challenges to addressing stormwater runoff, and therefore require different approaches; the term BMPs is a catch-all to describe the diverse sets of tools and practices for managing stormwater. BMP tools and practices continue to evolve and grow through research, innovation and use.

Minimal Impact Design Standards

At the direction of the Minnesota Legislature, the Minimal Impact Design Standards (MIDS) system was created in 2013 by a diverse group of stakeholders with experience designing, building and regulating stormwater BMPs. The overall goal of MIDS is to promote - especially in dense urban areas - Low Impact Development, which focuses on keeping rain where it falls to the maximum extent practical. MIDS include performance goals for managing stormwater volumes, credit calculations for a range of structural stormwater techniques, design specifications for green infrastructure BMPs and an ordinance guidance package to help communities (and developers) implement MIDS.

Goal 2: A safe, reliable and sustainable water supply.

Policy WR-9. Apply an equity lens to policy and funding decisions relating to providing assistance to or coordinating with owners to improve private water connections to the public distribution system.

Policy WR-10. Continue education and conservation measures identified in the 2016 Water Supply Plan to increase efficiency and reduce water demand.

Policy WR-11. Work with partners to update and implement Saint Paul's Wellhead Protection and Source Water Protection plans.

Policy WR-12. Fund the strategic capital projects outlined in the 2016 Water Supply Plan and 2016-2018 Saint Paul Regional Water Services Strategic Plan.

Policy WR-13. Maintain response readiness for emergencies related to water supply contamination or interruption, and for damage to treatment and distribution infrastructure.

Goal 3: Excellent surface water quality.

Policy WR-14. Collaborate with partner agencies on water quality improvement efforts, including capital projects and programming.

Policy WR-15. Educate the public on urban water quality issues and stormwater best management practices.

Policy WR-16. Work with partners to address known surface water quality impairments outlined in the Saint Paul Local Surface Water Management Plan (LSWMP). (The LSWMP is a required plan developed in accordance with the requirements of the Metropolitan Surface Water Management Act and Minnesota Rules Section 8410. The plan includes an inventory of water resources and management concerns, outlines water resource management goals and policy, and sets water resource management implementation priorities.)

Policy WR-17. Utilize best management practices for "good housekeeping," including salt application, street sweeping and facility maintenance.

Policy WR-18. Encourage the use of Minimal Impact Design Standards (MIDS) for new development.

Policy WR-19. Apply an equity lens to policy and funding decisions relating to surface water quality and flooding/climate resiliency.

Goal 4: Rehabilitated and upgraded gray stormwater infrastructure.

Policy WR-20. Continue to maintain the serviceability of existing gray stormwater infrastructure, and incorporate or upgrade Best Management Practices to reduce pollution and respond to stormwater management regulations.

Policy WR-21. Rehabilitate existing gray stormwater infrastructure to protect the previous significant public investment.

Policy WR-22. Respond to changing precipitation patterns and ensure the adequacy of existing gray stormwater infrastructure and stormwater management regulations.

Shared, Stacked Green Infrastructure (SSGI)

The term "shared, stacked green infrastructure" (SSGI) describes an approach to handling stormwater that leverages funds spent on stormwater management to achieve multiple benefits. "Shared" means that stormwater from both public rights-of-way and private development sites is treated in the same system. "Stacked" means that the stormwater facility has two functions: treatment of stormwater and provision of passive green space. "Green infrastructure" refers to the use of plants and soil to filter stormwater and promote infiltration of water into the ground. These elements are in contrast to the more traditional approach to stormwater management, which treats parcels individually, and relies on curbs, gutters, and underground tanks and pipes to collect and rapidly convey stormwater away. A common example of green infrastructure is a rainwater garden. Generally, green infrastructure practices attempt to mimic natural "hydrology," or the ways in which water moves across and through the landscape in undisturbed natural systems. With SSGI, green infrastructure practices are scaled up to create district-wide systems that not only treat stormwater from the public right-of-way and multiple surrounding properties, but also provide open space and other amenities in urban areas.

An existing example is the tree trench providing stormwater treatment along most of University Avenue. The City of Saint Paul is currently working to incorporate SSGI into the redevelopment of multiple sites, including Snelling-Midway, Ford and the West Side Flats.

Goal 5: Sustainable wastewater conveyance and treatment infrastructure.

Policy WR-23. Continue to reinvest in critical sanitary collection and conveyance infrastructure by rehabilitating the existing system.

Policy WR-24. Continue I&I identification and correction efforts for municipal sanitary conveyance systems and connecting private infrastructure.

Policy WR-25. Encourage the Metropolitan Council to identify and correct I&I on Metropolitan Council Environmental Services (MCES)-owned facilities in Saint Paul and those in surrounding communities that impact MCES infrastructure serving Saint Paul.

Policy WR-26. Reduce reliance on individual sewage treatment systems where financially feasible.

Policy WR-27. Continue to reduce non-compliant Individual Sewage Treatment Systems (ISTS) and ensure maintenance of compliant systems.

Policy WR-28. Discourage new ISTSs where public sanitary conveyance infrastructure is available.

Policy WR-29. Prohibit new community treatment systems where public sanitary conveyance infrastructure is available.

Policy WR-30. Plan for adequate municipal conveyance infrastructure and support adequate metropolitan system capacity to serve more intensive redevelopment in appropriate locations.

Inflow and Infiltration

Conveyance and treatment of wastewater is energy-intensive, and extra water in the system means extra expense. Extra water in the sanitary sewer system can also reduce system capacity for treating wastewater, and in extreme cases will overload treatment plants and cause bypass events where untreated sewage is discharged into surface waters. Yuck!

Inflow and Infiltration (I&I) is a term used to describe the pathways by which extra water enters the sanitary sewer system.

Inflow occurs where groundwater or stormwater, which does not require treatment in a wastewater treatment plant, discharges to the sanitary sewer system. Although direct connections between groundwater/stormwater and the sanitary sewer system are not allowed in new construction, and many pre-existing connections have been eliminated, some still exist.

Infiltration occurs where stormwater runoff or groundwater enters the sanitary system through pipe joints, cracks in aging pipes, manholes, etc. These infiltration pathways can be identified through techniques such as "smoke testing." In smoke testing, smoke is pumped into sanitary sewers; where visible smoke emerges, it suggests an infiltration pathway. Once problems have been identified, maintenance crews can perform repairs, including sewer lining, to seal the infiltration pathways.

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Appendix **A**

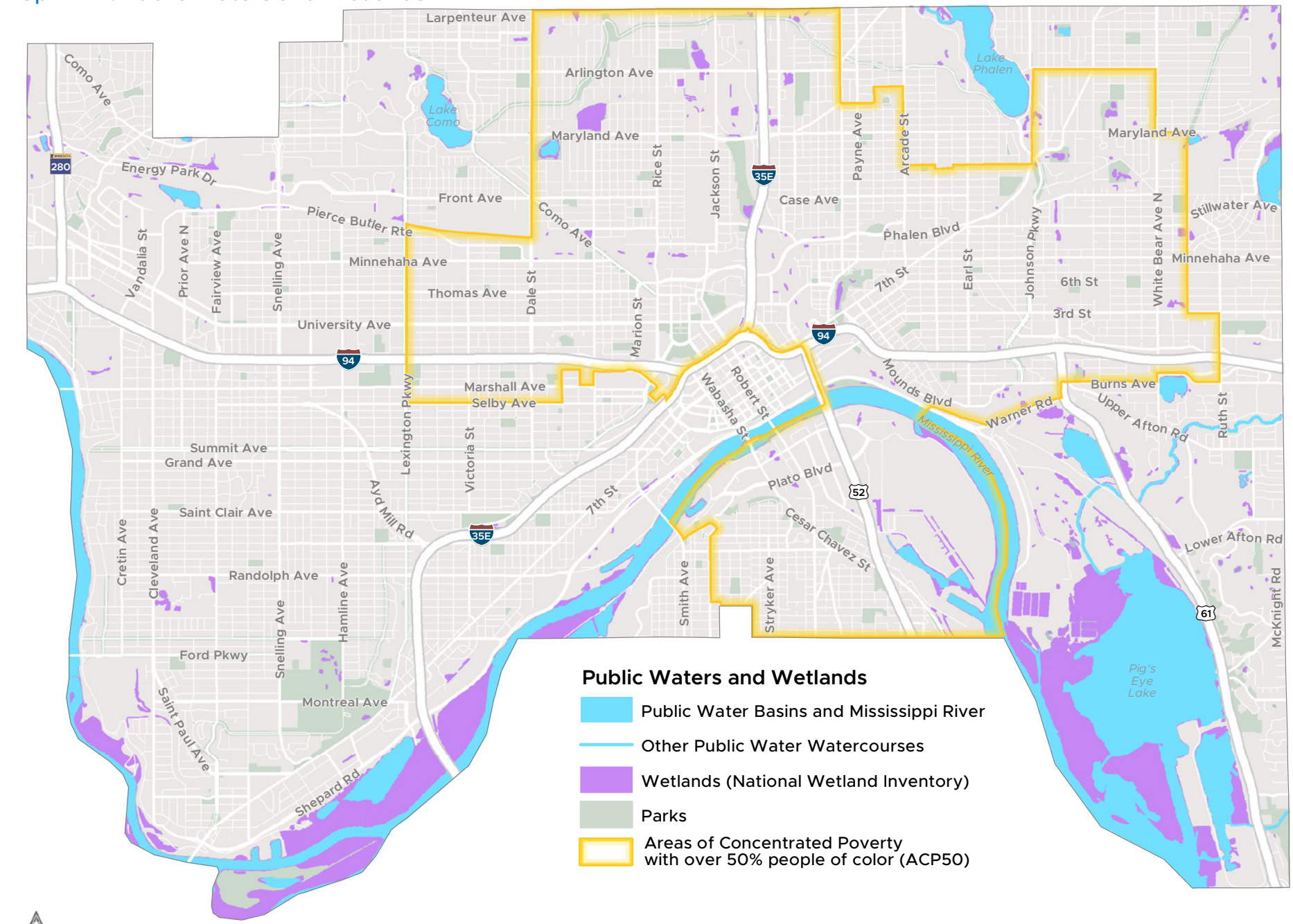
Appendix **B**

Appendix **C**

Appendix **D**

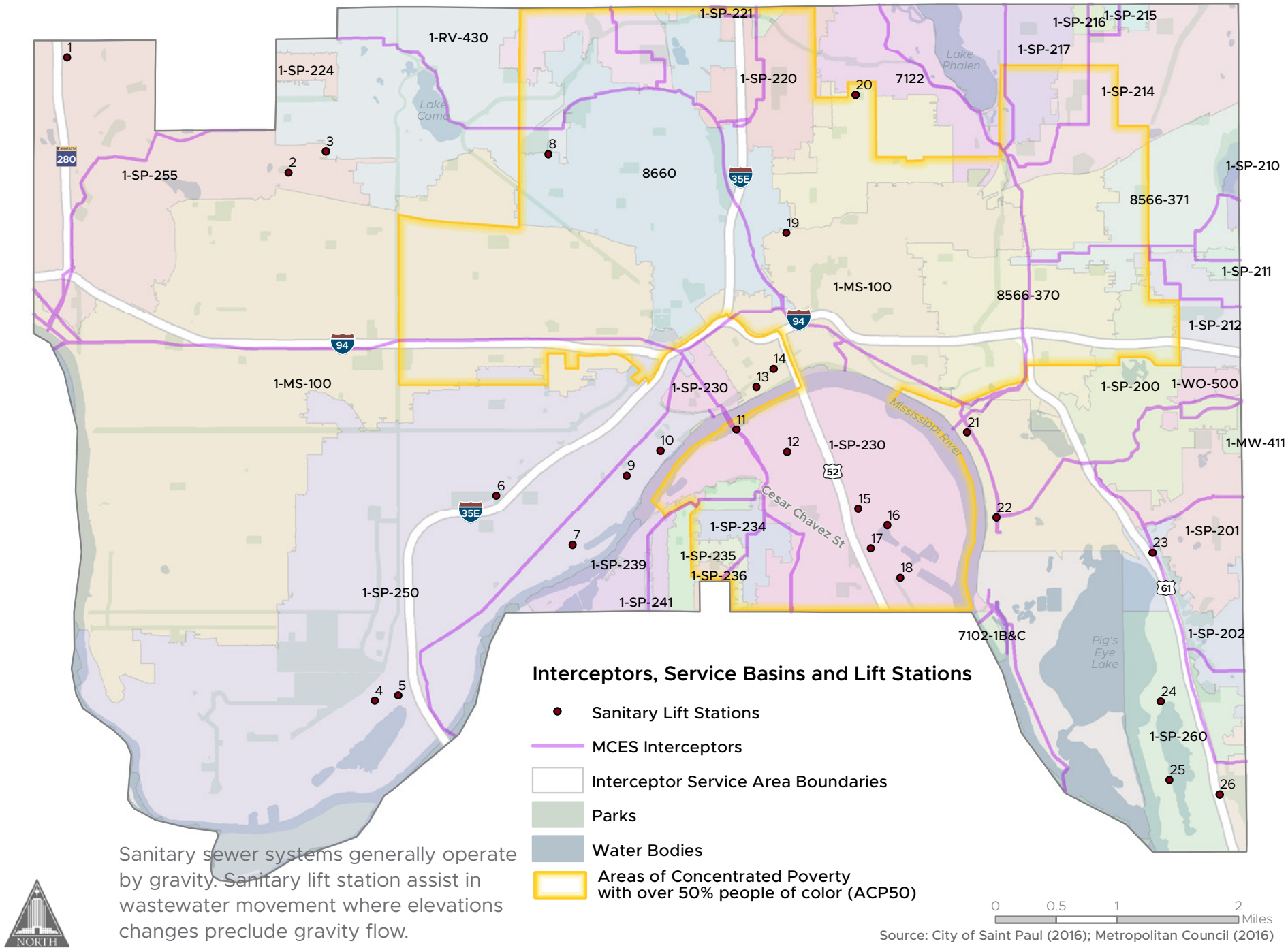
Note: ACP50 data for all from Metropolitan Council via MN Geospatial Commons, from annual release (2/5/2018). Other data as noted.

Map WR-1: Public Waters and Wetlands



Source: City of Saint Paul (2016); Metropolitan Council (2016)

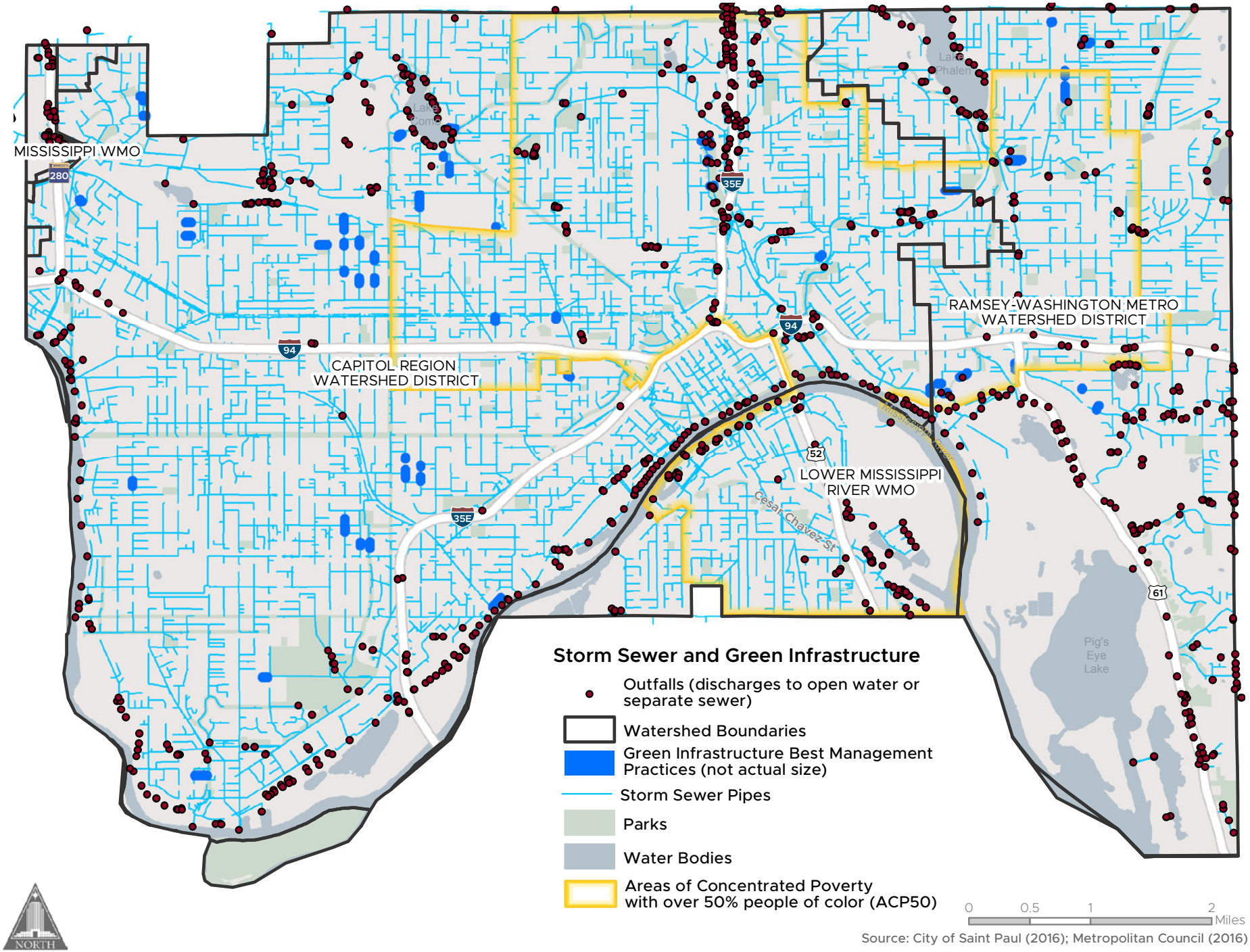
Map WR-2: Interceptors, Service Basins and Lift Sations



Source: City of Saint Paul (2016); Metropolitan Council (2016)

Sanitary sewer systems generally operate by gravity. Sanitary lift station assist in wastewater movement where elevations changes preclude gravity flow.

Map WR-3: Storm Sewer and Green Infrastructure



Source: City of Saint Paul (2016); Metropolitan Council (2016)

Appendix B

Local Surface Water Management Plan

All Twin Cities Metropolitan area communities and required to have a Local Surface Water Management Plan (LSWMP). The plans must be updated every 10 years, and, additionally, in response to any changes to watershed district (WD) or watershed management organization (WMO) plans with overlapping jurisdiction. In addition, they are a required component of all Twin Cities Metropolitan Area community comprehensive plans.

Updates to the Saint Paul LSWMP were completed in 2017. The plan is consistent with content and purpose requirements of Minn. Statutes 103B.235 and 103B.201, as well as with Minn. Rules 8410, promulgated by the Board of Water and Soil Resources. The LSWMP consists of the following six sections:

- Executive Summary
- Land and Water Resources Inventory
- Agency Cooperation
- Assessment of Problems and Issues
- Goals and Policies
- Implementation Program

The Saint Paul Local Surface Water Management Plan is hereby adopted by reference as part of the Saint Paul 2040 Comprehensive Plan and as Appendix B to the Water Resources Chapter thereof.

Appendix C

Water Supply Plan

Under Minn. Statute 103G.291, a Water Supply Plan (WSP) is required for all public water suppliers serving more than 1,000 persons. Twin Cities Metropolitan Area communities. In addition, they are a required component of all Twin Cities Metropolitan Area community comprehensive plans.
Saint Paul Regional Water Services (SPRWS) provides water for almost all Saint Paul residents, businesses, and institutions, as well those of several neighboring communities.
An update to the SPRWS Water Supply Plan was completed in 2016, and is hereby adopted by reference as part of the Saint Paul 2040 Comprehensive Plan and as Appendix C to the Water Resources Chapter thereof.

Appendix D

Wastewater Component

This Appendix addresses the required Comprehensive Plan wastewater system plan elements. The majority of Saint Paul's residents and businesses are served by the municipal sanitary sewer system, which conveys wastewater to the Metropolitan Wastewater Treatment Plant, located in Saint Paul along the Mississippi River and just west of Pig's Eye Lake. Seventy-nine households, primarily clustered in the Highwood area, rely on privately-owned and -maintained septic or other type of individual treatment systems, collectively known as subsurface sewage treatment systems, or SSTSs. There are no private communal wastewater treatment systems in Saint Paul. The Saint Paul Legislative Code does not provide for new private communal wastewater treatment systems.

SSTSs

As of the finalization of the Saint Paul 2030 Comprehensive Plan, there were approximately 120 individual SSTSs remaining in operation in Saint Paul. As of late 2018, this number has been reduced to 79. Of those 79 systems, 20 are older systems of a type and design that is not adequate to protect groundwater. The City of Saint Paul has an ongoing monitoring, inspection, and enforcement program for the purpose of ensuring that all SSTSs are sufficiently maintained to protect public health and water quality. The standards and specifications for SSTS placement, maintenance and monitoring are codified in Chapter 50 of the Saint Paul Legislative Code.

The City is currently considering changes to Chapter 50 to bring it into compliance with State policy. Shallow bedrock, high groundwater, and steep slopes makes the siting of new or replacement systems in the Highwood Area of Saint Paul, where most remaining SSTSs are located, challenging or, in some cases, impossible on a given lot. Similarly, the relatively low-density, generally large lots and shallow bedrock in the area make the extension of the public wastewater conveyance system (i.e. sanitary sewer), as well as connection to that system, very expensive. This unusual expense presents a practical hardship both for the City of Saint Paul and residents of the Highwood Area.

Forecasts for population, households, and employment in 10-year increments through 2040 in the unsewered portion of the city are shown in Table 1.

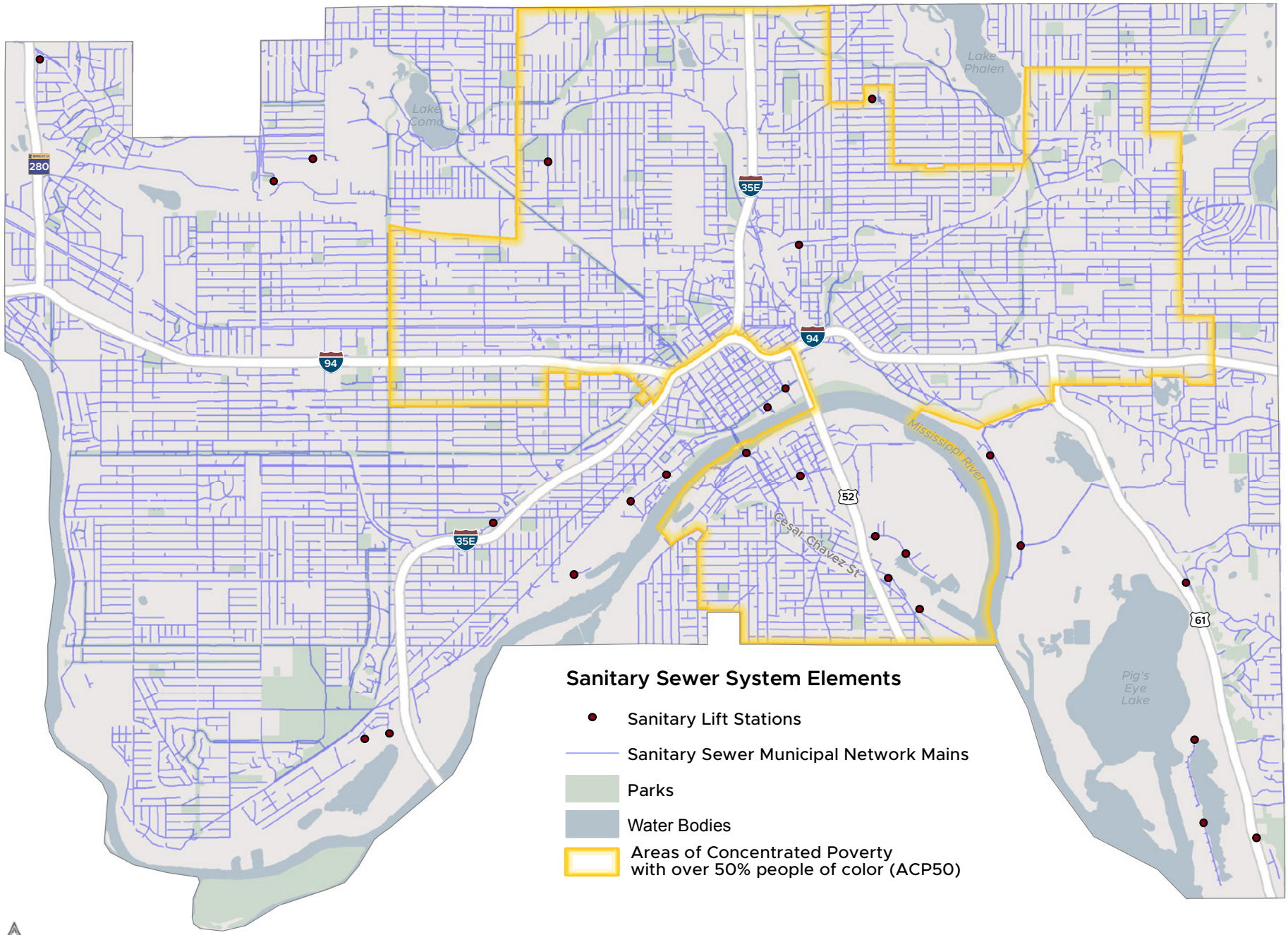
Table 1: Forecasted Population, Households, and Employment for Unsewered Portion of Saint Paul

	Decade		
	2020	2030	2040
Pop	199	0	0
HH	79	0	0
Emp	0	0	0

Table 2: Forecasted Population, Households, and Employment for Portion of Saint Paul Served by Metropolitan System

Interceptor Service Area	2020			2030			2040		
	POP	HH	EMP	POP	HH	EMP	POP	HH	EMP
1-MS-100	103,499	39,489	69,542	108,084	42,103	73,869	112,719	44,487	77,965
1-SP-200	5,872	2,333	1,352	6,420	2,516	1,236	6,959	2,676	1,123
1-SP-201	4,056	1,484	166	4,130	1,508	108	4,192	1,528	54
1-SP-212	3,325	1,420	633	3,518	1,498	665	3,725	1,565	700
1-SP-214	13,665	5,140	1,315	14,105	5,310	1,290	14,615	5,480	1,280
1-SP-216	493	513	200	63	528	205	65	543	210
1-SP-217	4,293	1,640	253	4,618	1,765	255	4,978	1,870	255
1-SP-220	7,140	2,690	1,570	7,630	2,880	1,510	8,180	3,070	1,460
1-SP-224	16,580	6,800	3,500	16,470	6,830	3,800	16,650	6,890	4,090
1-SP-230	12,847	4,934	37,935	13,826	5,511	38,368	13,703	5,657	38,627
1-SP-234	3,227	1,205	331	3,294	1,214	371	3,409	1,230	408
1-SP-237	2,443	901	281	2,491	904	310	2,575	918	339
1-SP-239	1,652	632	116	1,697	652	119	1,768	674	113
1-SP-250	57,650	25,900	34,030	58,440	26,410	37,120	59,660	26,850	40,370
1-SP-255	13,720	6,040	27,340	15,740	6,820	29,560	18,220	7,690	31,840
1-SP-260	0	0	340	0	0	230	0	0	130
7122	3,963	1,494	721	4,152	1,569	798	4,368	1,638	866
7402	1,390	450	120	2,130	690	120	2,660	870	130
8566-370	28,753	10,473	5,838	29,964	10,964	5,749	31,353	11,476	5,729
8566-371	7,985	3,075	730	8,590	3,275	715	9,320	3,470	700
8660	19,560	7,200	12,870	20,550	7,620	12,580	21,630	8,040	12,470
8851	4,870	1,950	1,100	4,980	1,950	950	5,130	1,960	820

Figure 1: Sanitary Sewer System



Source: City of Saint Paul (2016); Metropolitan Council (2016)

Area Served by the Regional Sanitary Sewer System

The vast majority of the City of Saint Paul is served by the municipal wastewater conveyance system and the Metropolitan Wastewater Treatment Plant at Pig's Eye. Table 2 shows forecasted growth in population, households, and employment in 10-year increments through 2040, allocated by metropolitan interceptor.

At this time, the City of Saint Paul is not proposing any new trunk sewers connecting to the metropolitan system. New service connections in the 2040 planning horizon will be allocated across the sanitary sewer basins serving Saint Paul as shown in Table 2 (sanitary sewer basins forecasts are consistent with the TAZ forecasts for the TAZs corresponding to respective sanitary sewer basins).

Inflow and Infiltration

Inflow and Infiltration (I&I) is the term for stormwater runoff, ground water, and other clear water that ends up in the sanitary sewer system when it shouldn't. Conveying and treating wastewater is expensive, and any extra water in the system means both reduced capacity for treating actual wastewater and additional costs for everyone.

Metropolitan Council Environmental Services (MCES) operates the Metropolitan Wastewater Treatment Plant (also known as the "Metro Plant), which is located in Saint Paul and serves our city as well as much of the rest of the Twin Cities. While some level of I&I is inevitable, MCES and municipal sanitary system owners are continually working to reduce I&I to maximize system capacity and reduce costs. For communities' 2040 Comprehensive Plans, MCES requires each municipality that is part of the MCES service area to define goals and strategies for eliminating I&I. These are paired with annual work plans, developed by the municipalities in conjunction with MCES and based on MCES monitoring of flows in the system.

Sources

Sources of Inflow and Infiltration (I&I) in Saint Paul include defective private service laterals, compromised manhole frames, manhole cover pick holes, connected rainleaders and groundwater infiltration. The City of Saint Paul completed separation of the previously-combined sanitary and storm sewer systems between 1985 and 1996, at a cost of approximately $400 million. This included a property-by-property identification and disconnection of rainleaders. The Metropolitan Council adopted an I&I Surcharge Program in 2006. The City of Saint Paul conducted an I&I pilot study in the Highland Park neighborhood in 2007, consisting of flow monitoring and smoke testing. The City has been making annual investments to address I&I in both the public and private components of the Saint Paul sanitary sewer conveyance system since 2008, with an average annual investment of approximately $5 million. In 2014, the City conducted a system-wide capacity analysis, which helped identify areas of higher wet-weather flow, an indicator of I&I, which has also informed investigation priorities and metering activities.

Goal

The overarching I&I goal for the City of Saint Paul is to reduce the current observed levels of I&I, and to reach sustained annual compliance with MCES-assigned targets for I&I by the end of the current implementation period. Adjusted Average Flow, and associated I&I goals, for future years will be determined by MCES.

This goal will be achieved through a "whole system" approach that prioritizes:

- continuous/cyclical inspection and evaluation of the public system to inform investment needs and priorities;
- maintenance, repair and rehabilitation of the public system based on identified needs and priorities; and
- support of private infrastructure repair, rehabilitation, and replacement as opportunities arise.

The City of Saint Paul will use the strategies and financial mechanisms described below to reach the stated targets, working with MCES through at least the current implementation period (ending 2022) and making annual investment consistent with MCES-approved annual work plans.

Strategy
Saint Paul uses ongoing investigative tools (smoke testing, flow monitoring, programmed CCTV inspection) I&I reduction strategies to guide private (rainleader disconnect, private service lateral replacement) and public (cured-in-place pipe lining, manhole sealing and mainline pipe replacement) system investments to abate I&I. More information on the City's private and municipal sewer inspection, cleaning and maintenance/replacement programs, including those related to I&I, is provided below. Progress in implementing these strategies is documented annually through the I&I Work Plan Documentation Form administered by Metropolitan Council Environmental Services.

Schedule
Many of the I&I strategies above are implemented on an annual basis, depending on what specific I&I defects are detected during investigative procedures. Repair/replacement of private service laterals is partially dependent on the number of street reconstruction projects (City, County, State) occurring within the city limits each year.

Financial Mechanisms
Financial mechanisms to mitigate I&I in Saint Paul primarily come from the Sewer Service Fund. Funding for the repair/replacement of private service laterals comes from individual property owners. Saint Paul has been successful in obtaining grant funding from the Metropolitan Council for the repair/replacement of private service laterals and for rehabilitation of the public sanitary system.

Sewer System Inspection

Programmed Sewer Cleaning and Inspection Program
Implemented in 2004, this program entails the systematic cleaning and televised inspection of the City-owned sanitary sewer network on a ten-year cycle. The Program divides the City-owned sanitary sewer system into ten subareas, with one area being addressed per year. Upon completion of the cleaning and inspection in a subarea, the televised inspection videos are reviewed for sewer deficiencies, and deficient pipe sanitary segments are prioritized for repair, replacement or rehabilitation. The City of Saint Paul has completed one ten-year cycle; the current cycle is from 2014-2023.

Roadway Reconstruction Sewer Inspection Program
Similar to the Programmed Sewer Cleaning and Inspection Program, this program is focused on inspecting the sewer system as part of street improvement projects. These projects can be initiated by the City of Saint Paul, Ramsey County and/or MnDOT. Depending on the observed deficiency, the sewers are prioritized for repair, replacement or rehabilitation.

Manhole Inspection
In addition to manholes inspected as part of the Programmed Sewer Cleaning and Inspection or Roadway Reconstruction Inspection programs, the City of Saint Paul also has a program to inspect brick manholes on arterial streets constructed with either concrete base layers or concrete pavement. This program was implemented to assess the condition of brick manholes that do not exhibit traditional failure indicators (cracking, settlement, etc.) on the street surface. Depending on the observed deficiency, the sewers are prioritized for repair, replacement or rehabilitation

Tunnel Inspection
Various locations within Saint Paul are served by a tunnel system, mined through geologic formations. Tunnel inspections occur on a two-to-four year cycle, and are completed via a walk-through inspection. Depending on the observed deficiency, the sewers are prioritized for repair, replacement or rehabilitation.

Inflow and Infiltration Detection and Abatement

Flow Monitoring
Implemented in 2008, this program entails the systematic installation of flow meters to determine excessive contributions of rainfall derived from inflow and infiltration. The program includes delineation of the sanitary system into various sub-sewersheds, meter installation to obtain dry weather and wet weather flow data, rainfall data acquisition, and analysis.

Sanitary Capacity Modeling
This model applies current census block data to ensure that adequate capacity exists, allowing for allocation of metered flows upstream in the sub-sewersheds. Also incorporated into the model are multiple years' worth of observed flow metering data from Saint Paul.

Smoke Testing
The City is engaged in smoke testing in various areas in Saint Paul. The program includes the delineation of the sanitary system into various sub-sewersheds, isolation of the sewer system to test specific segments, application of simulated smoke, and visual inspection and documentation of smoke exit points. In addition, significant effort is dedicated to public education on I&I at neighborhood meetings, on the City's website and via door hangers. Once an area is tested, the deficient element (manhole cover, rain leader, rathole, etc.) is identified, and appropriate parties are notified.

Animal Control
Saint Paul Animal Control investigates ratholes and performs baiting within the sanitary sewer system. Upon receiving a complaint of ratholes, Animal Control representatives will perform smoke testing of the rathole, and observe smoke exit points on private soil stacks or in the public sanitary system. Additionally, Animal Control performs baiting within the sanitary sewer system in an effort to remove vermin that are compromising sewer integrity.

Public System Repair, Rehabilitation, and Replacement

Sewer Lining
Implemented in 1991 on a situational basis and expanded to a regular rehabilitative measure in 1997, Cured-In-Place Pipe Lining is a rehabilitative measure to extend the useful life of an in-place sanitary sewer, and to combat inflow and infiltration. The pipe liner itself is a structural repair classified as a "pipe within a pipe," and seals sources of inflow and infiltration such as leaking pipe joints, unused services to vacated homes or businesses, and cracks.

Manhole Sealing
Cementitious manhole sealing is a rehabilitative measure to extend the useful life of the infrastructure and combat I&I, manhole collapse, etc. The cementitious manhole sealant is a structural repair, typically utilized on brick manholes; however, it can be used on other materials and construction types as well.

Major Sewer Repair
Major sewer repair is done when other less-intrusive measures are inadequate to correct deficiencies. Major sewer repairs typically occur either as a stand-alone project, or are integrated into another project (such as street reconstruction) where entire sewer mains and/or manholes necessitate replacement. On street reconstruction projects where other public entities (Metropolitan Council, MnDOT, Ramsey County, Watershed Districts, etc.) own sewer infrastructure, coordination is critical to upgrade their facilities at the same time.

Tunnel Rehabilitation: Depending on the original construction parameters, geologic conditions and inspection, tunnel rehabilitation measures vary. Rehabilitative measures have included grouting, wall repair and invert replacement.

Private Sanitary System Repair, Rehabilitation and Replacement

Private Sewer Assessment Program
Addressing I&I originating from private sanitary system components is an important part of Saint Paul's overall approach. There are approximately 129,700 dwelling units in Saint Paul, of which 100,304 were built prior to 1970. The Private Sewer Assessment Program assists property owners with financing the repair or replacement of their sanitary sewer service. The program allows a property owner to hire a contractor to repair or replace their sanitary sewer service, with the City of Saint Paul paying for the initial work. The cost of the repair or replacement, plus a fixed interest rate, is then assessed back to the property owner as a special assessment on real estate taxes over a period of up to 20 years.

Street Reconstruction Sewer Assessment Program
Similar to the Private Sewer Assessment Program, this program allows for the repair or replacement of private sanitary sewer service in conjunction with a street reconstruction project. The assessment process is similar to the above program. An incentive for this program is that the City's Sewer Utility subsidizes the cost of the repair/replacement. All property owners on a project will pay the same price per foot of pipe repaired or replaced, regardless of unique property issues (depth of excavation, traffic control, etc.). As a further incentive, the repair or replacement is not done under an emergency situation, and the contractor is selected by the City for the street project. This results in a more positive experience for the property owner.

Emergency Deferred Payment Loan
Administered by the City of Saint Paul Department of Planning and Economic Development, this program allows for a forgivable loan, at 0% interest, of up to $25,000 (with conditions). The program also has allowances for other eligible improvements, such as heating and electrical systems.

Municipal Separate Storm Water Systems (MS4)

Saint Paul Legislative Code, Chapter 41: Banning and Requiring Disconnect of Storm Drainage from Sanitary System.

Table 3: Sanitary Sewer Pump Station Capacity

	Location No. (Map WR-2)	Design Capacity (MGD)	Expected Discharge* (MGD)
Como & Eustis	1	600	-
Energy Park	2	700	920
Brewster	3	200	240
Jessamine & Mackubin	8	320	-
Bush & DeSoto	19	550	660
Phalen Arena**	20	150	-
Glen Terrace	4	210	-
Elway South	5	320	-
Pleasant Arena**	6	142	-
James***	7	-	690
Sherman	10	800	-
Sibley**	13	300	350
Broadway	14	1300	1384
Plato	12	1450	-
Robie	17	1200	1300
Airport**	15	425	-
Southport**	18	100	120
Peller	26	100	-
Red Rock South**	25	200	-
Red Rock North**	24	1000	1100
Childs Road South**	22	650	-
Childs Road North**	21	200	250
Highbridge**	9	250	-
Riverview	11	4000	4720
MCES L-12	23	5300	-
MAC**	16	500	-

* Expected discharge based on pump curve

** No or minimal upstream users

*** Design capacity unknown; expected discharge based on pump curve