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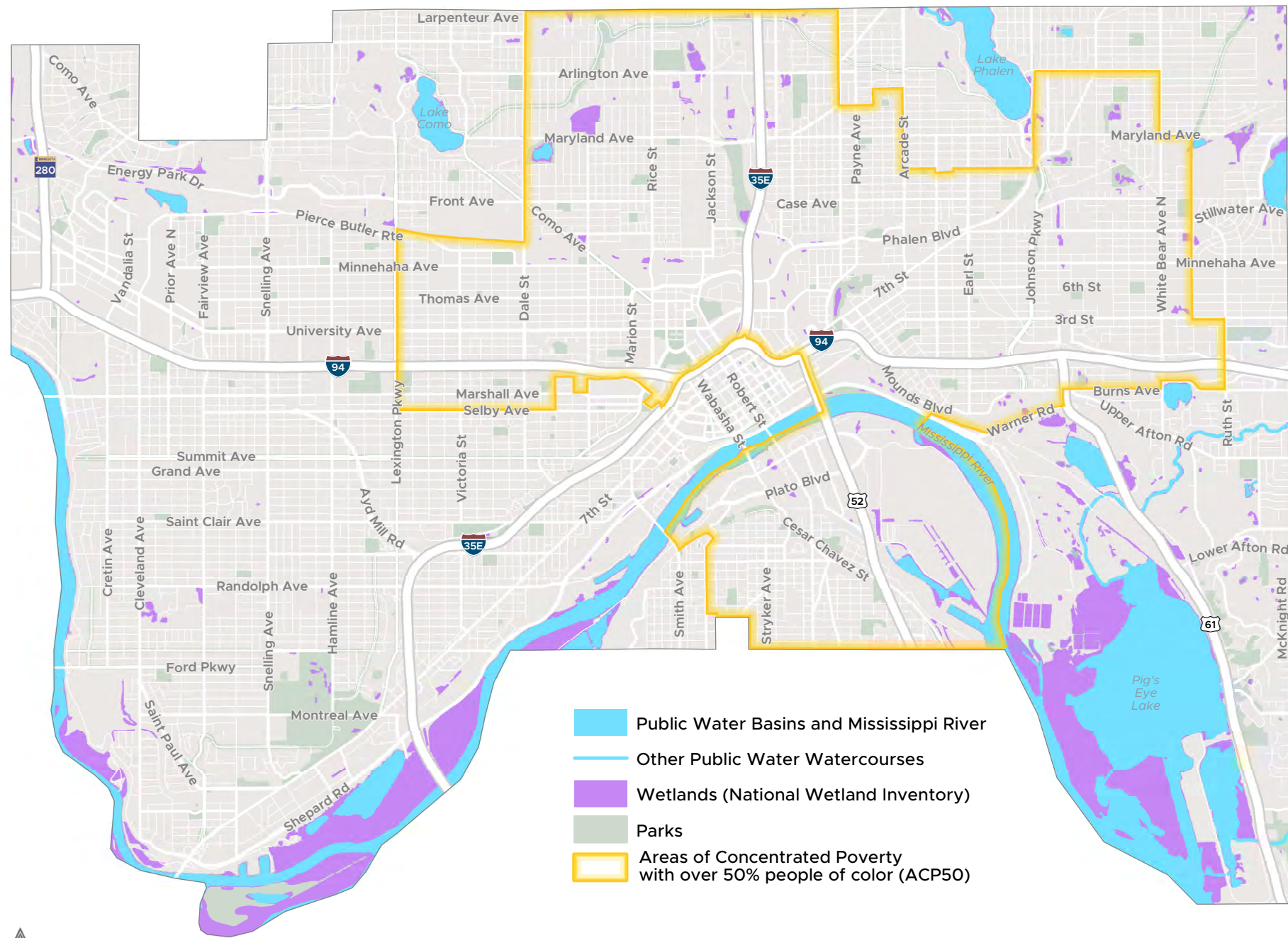
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Note: ACP50 data for all from Metropolitan Council via MN Geospatial Commons, from annual release (2/5/2018). Other data as noted.

Map WR-1: Public Waters and Wetlands

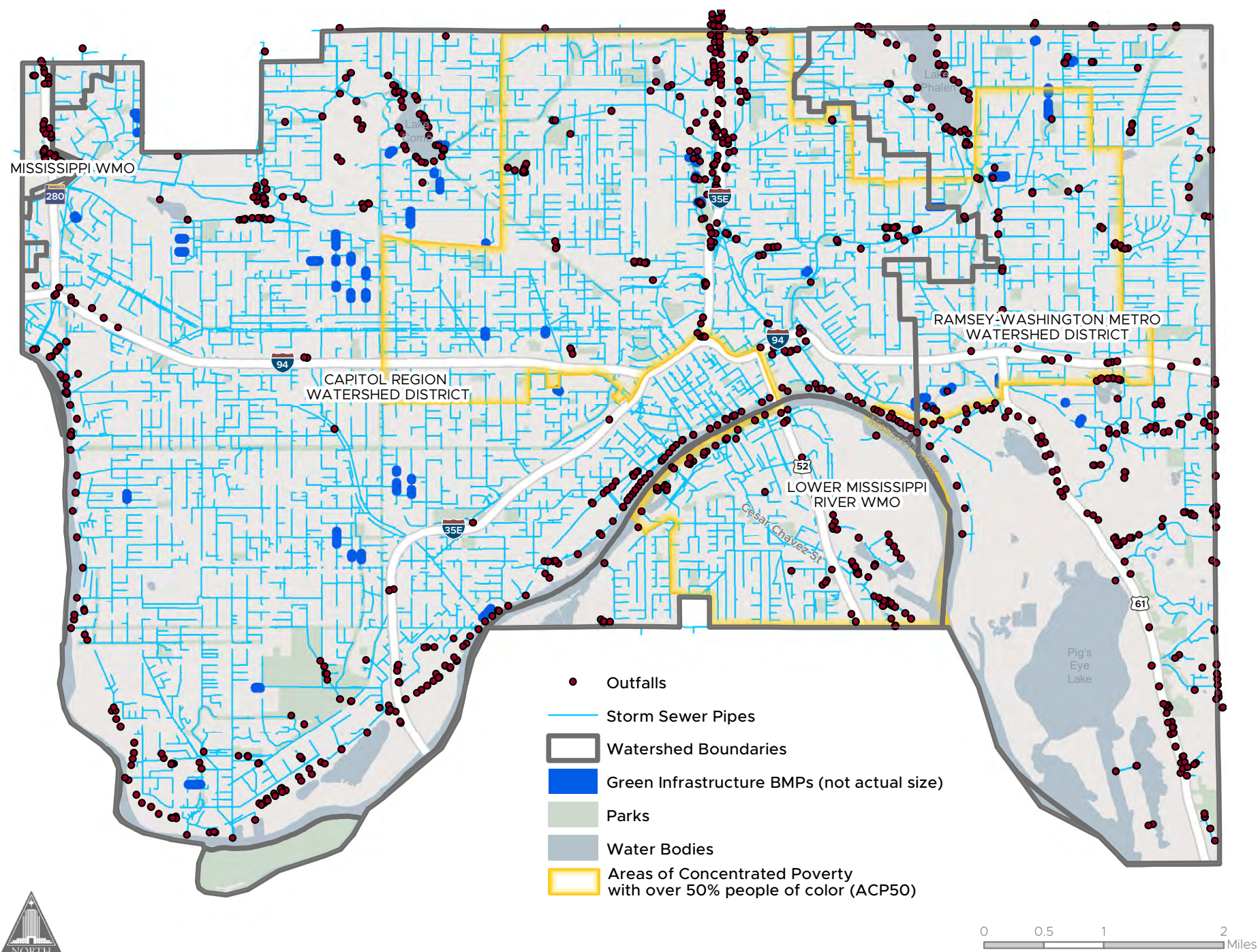


- Public Water Basins and Mississippi River
- Other Public Water Watercourses
- Wetlands (National Wetland Inventory)
- Parks
- Areas of Concentrated Poverty with over 50% people of color (ACP50)





Map WR-3: Storm Sewer and Green Infrastructure



Appendix B

Local Surface Water Management Plan

All Twin Cities Metropolitan area communities are 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 as 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 SSTs. 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.

SSTs

As of the finalization of the Saint Paul 2030 Comprehensive Plan, there were approximately 120 individual SSTs 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 SSTs are sufficiently maintained to protect public health and water quality. The standards and specifications for SST 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 SSTs 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.

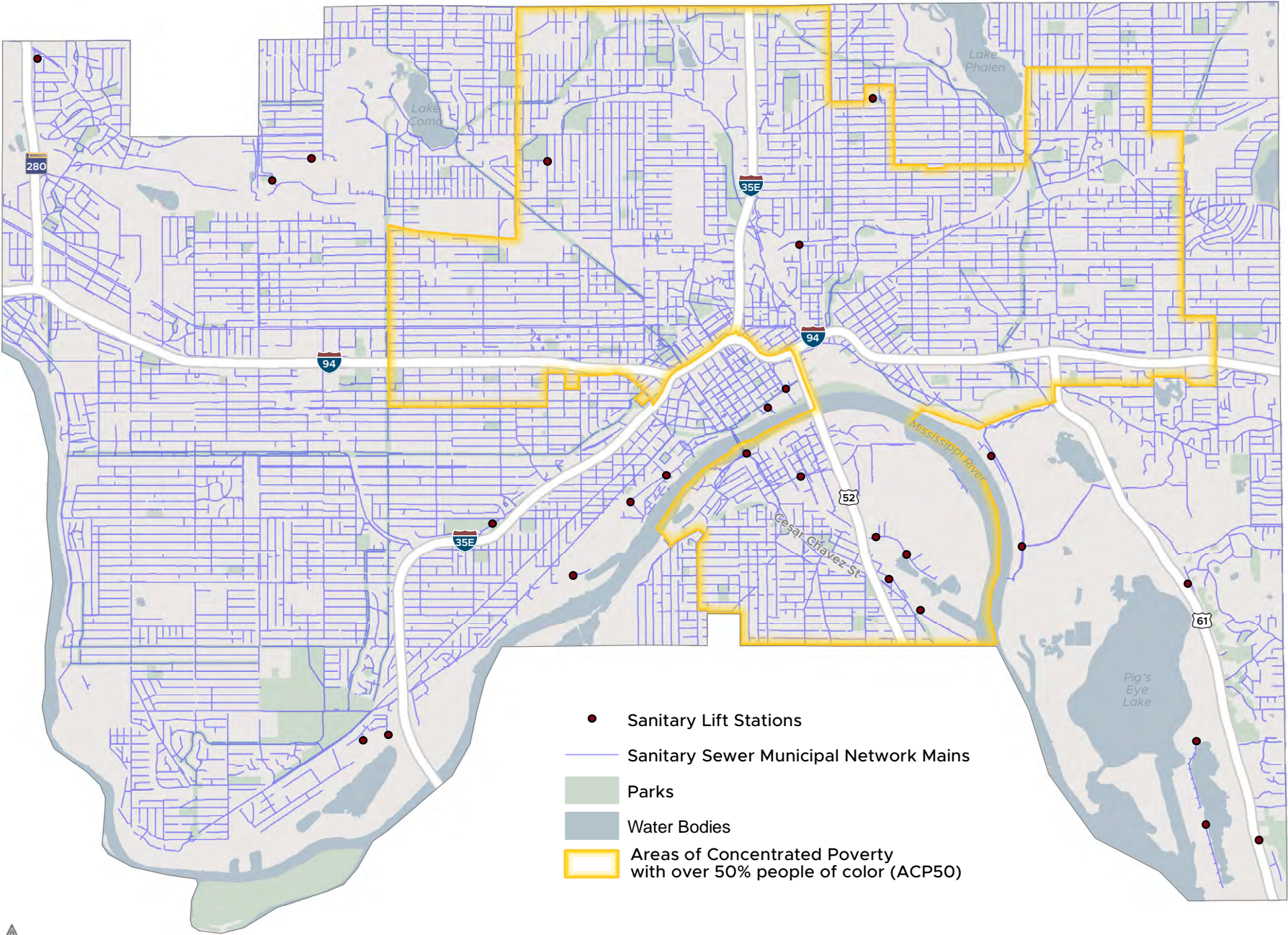
Table 1: Forecasted Population, Households, and Employment for Unsewered Portion of Saint Paul

	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



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