SEWER INFRASTRUCTURE ASSET MANAGEMENT

CITY OF SAINT PAUL, PUBLIC WORKS

Sewer Inspection & Condition Assessment Report

DATE SUBMITTED
June 10, 2026

ASSET OWNER / CLIENT
City of Saint Paul · Public Works Dept.

SUBMITTED BY
Sewer Utility.
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Saint Paul
Programmed Sewer Cleaning and TV Inspection
Condition Assessment

Executive Summary

This report outlines the Programmed Sewer Cleaning and TV Inspection process and Condition Assessment findings of the city's sewer infrastructure. The primary objective is to document the inspection and condition assessment process, evaluate the structural and operational integrity of the city's sanitary and storm gravity mains, identify defects, prioritize repairs, and help prevent costly, catastrophic failures.

The Programmed Sewer Cleaning and TV Inspection process encompasses all phases of the sewer inspection program, including planning, bidding, data archiving, and condition assessment.

Condition assessments for the First Inspection Cycle (2004 to 2013) were conducted using Closed-Circuit Television (CCTV) inspections and NASSCO certified software to code and grade pipe conditions based on city-based coding and ratings. Condition assessments for the Second Inspection Cycle (2004 to present) are conducted using CCTV inspections and NASSCO based standardized coding and ratings.

- First Inspection Cycle (2004–2014): The city has cleaned and inspected approximately 640 miles of sanitary sewers infrastructure.
- Second Inspection Cycle (2014–Present): The city has cleaned and inspected or is currently inspecting approximately 1,076 miles of sanitary and storm sewer infrastructure.

Over 1,716 miles of sewers have been inspected from 2004 to the present through the Programmed Sewer Cleaning and TV Inspection.
During the second inspection cycle, condition ratings indicate that 95% of the total inspected sanitary sewers have a Pipeline Rating Index (PRI) of 3 or below, signifying good to fair condition. This marks an improvement from the first cycle's rating of 87%, which is largely attributable to the city's ongoing sewer infrastructure rehabilitation (lining) and replacement programs.

Saint Paul Sewer Infrastructure System

History

When Saint Paul began constructing its sewer system, it was general practice throughout the world to drain both sanitary and storm through a single pipe called a combined sewer. The city extended the sewer system based on need and development and natural topography. Since Saint Paul started as a river town, the original sewers drained to the Mississippi River to several natural streams draining to it. The original sewers were not part of one system. Sewers were built to drain a discharge point by the way of the easiest and shortest route. Therefore, many independent sewer outfalls were built. The only common element was the Mississippi River.

The oldest sewer on record was built in 1856. By the 1900, there were over 150 miles of sewers serving the new community. By 1940 a combined system served 80% of the city.

When the Mississippi River became noticeably fouled with sewage in the 1920's, the Twin Cities formed the Minneapolis-Saint Paul Sanitary District (MSSD) to address the problem. The MSSD constructed sewers the intercepted the existing sewers before they discharged to the river. During periods of dry weather, these interceptor sewers conveyed the sanitary flow to a new treatment plant constructed by the MSSD near Pigs Eye Lake in Saint Paul. During periods of wet weather, the combination of stormwater and sanitary flow exceeded the capacity of the interceptor sewers, and the combined sewage was discharged directly to the river. In the 1970's and 1980's the Metropolitan Water Control Commission (MWCC). Which now owned the regional facilities, expanded the treatment plant at the Pigs Eye Lake and treatment was greatly improved. Even with these improvements, the plant and sanitary interceptors could not handle the large influx of flow caused by sudden rains. As a result, the excess combined sewage overflowed into the river. The combined sewer systems caused two major problems: First, the overflow polluted the river; and equally important, sewage backed up into homes, businesses, and streets, leading to major property damage and hazardous health conditions.

Therefore, in 1984, Saint Paul, Minneapolis, South Saint Paul and the Metropolitan Council, under the direction of the U.S. Environmental Protection Agency and the Minneapolis Pollution Control Agency (MPCA) decided that the only way to resolve both problems was to complete the construction of separate sewer systems for sanitary sewage and stormwater in all three cities.

Saint Paul began sewer separation efforts in the early 1960s. By 1986, approximately 60% of the city had been separated. Starting that year, the Department shifted its primary focus and funding to an accelerated Combined Sewer Separation Program (CSSP). The separation process was fully completed in 1997, and the city's sewer system now operates as two distinct systems: one for stormwater and one for sanitary sewage.

Completion of Saint Paul's sewer separation program has achieved the overall purpose of cleaning up the river, showing that Saint Paul is consistently good steward of the environment.

Overview of Sewer Systems

The Sewer System provides sanitary wastewater and stormwater services for the City's residential, commercial, and industrial areas citywide.

The sanitary sewer system consists of approximately 808 miles of sanitary sewer pipes and tunnels, including twenty-five (25) sanitary pump stations located citywide, which pressurize or lift sanitary sewage and transport it from low lying areas to higher elevation ultimately connecting to the gravity sanitary sewer system.

The storm sewer system consists of approximately 455 miles of storm sewer pipes and tunnels. There are seven (7) storm water "flood" pump stations used to pump stormwater runoff: Three (3) storm water pump stations are located West Side of the Mississippi River behind a floodwall and used to pump stormwater runoff and seepage when the Mississippi River is at flood stage, Two (2) stormwater pump stations are located in the Lowertown neighborhood behind temporary flood protection measures and used to pump stormwater runoff and seepage when the Mississippi River is at flood stage, Two (2) storm water pump stations and a water re-use system which treats roof drainage used for irrigation purposes are located at Major League Soccer Stadium, Allianz Field. Table 1 (from 1997 Sewer System Rehab Report) shows the breakdowns by material types, length and age.

The city maintains the Sewer System by providing systematic sewer cleaning, inspection, and timely minor sewer system repairs and maintenance and annually identifies and prioritizes needed capital improvements and repairs. Sewer diameters range from 6 inches to over 13 feet. Sewer depths range from 6 feet to 165 feet. The materials of construction include handcrafted brick, cement, concrete (monolithic and precast), cast iron, ductile iron, corrugated metal, stone

masonry, clay and segmented clay block, modern plastics, partially lined sand rock and limestone tunnels.

Table1: Sewer Systems Material types, Length and Age

		Age			
Sewer Materials	**Length (Miles)**	**0-63**	**64-78**	**79-104**	**105-154**
Sanitary Sewers					
Vetrified Clay Pipe (VCP)	565	51	85	124	305
Reinforced Concrete Pipe (RCP)	106	20	56	30	0
Sand Rock Tunnels (SR)	60	1	3	23	33
Brick Sewers (BR)	31	0	0	0	313
Unreinforced Concrete Pipe (CP)	12	0	0	0	12
Vetrified Segmentd Block Sewers (SB)	8	0	0	2	6
Cast-In-Place Concrete Sewers	5	0	0	3	2
Polly Chloride Plastic Pipe (PVC)	3	3	0	0	0
Cast Iron Pipe (CI)	14	6	1	5	2
	804	**81**	**145**	**187**	**673**
Storm Sewers					
Reinforced Concrete Pipe (RCP)	412	392	12	8	0
Brick Sewers (BR)	3	0	0	0	3
Cast-In-Place Concrete Sewers	19	0	0	12	7
Sand Rock Tunnels (SR)	15	69	0	4	2
Miscellaneous Materials	1	0	0	0.5	0.5
	450	**461**	**12**	**24.5**	**12.5**
Ref: 1997 Sewer System Rehabilitation Report					

- 75 miles tunnels are mined in sand rock or soils
- 26 storm water ponding sites
- 25 sanitary pumps stations
- 7 storm water pump stations
- 79 major stormwater outlets in the Mississippi River
- Over 18,000 catch basins on city streets
- 84 major drop shafts conveying large amounts of flow from the surface sewer laterals to major intercepting tunnels
- Over 75,000 private services

Programmed Sewer Cleaning and TV Inspections

A ten-year Programmed Sewer Cleaning and TV Inspection initiative began in 2004 to inspect and assess aging city's sewer infrastructure, with the goal of scheduling repairs or replacements for damaged sections. Without this proactive approach, the city would face a growing number of emergency repairs, potentially leading to a serious sewer collapse that could disrupt service for many homes and businesses, or create unsafe conditions posing serious risks to field personnel.

During the first inspection cycle, the focus was on sanitary sewers, since the storm sewers—constructed during the sewer separation project between 1960 and 1997—were relatively newer. Moreover, most storm sewers are made of reinforced concrete pipe, which is more durable than the PVC, brick, and segmented tile materials used in much of the sanitary sewer system. To gain a thorough understanding of the aging sewer infrastructure, the city initiated routine sewer inspections every ten years, dividing the city into 10 major areas. Each major area is further subdivided into three to four project areas (as shown on Map 1 & 2), allowing each project to be contracted out individually.

Prior 2004, routine sewer inspection was often reactive rather than programmed. Each year, inspection crews televised sewers either in response to complaints from the public or maintenance staff or conducted inspections in conjunction to street construction projects to coordinate repairs during construction to reduce cost and neighborhood disruption.

Starting in 2004, the city standardized its sewer inspection program by introducing standardized defects and repairs codes, assigning a unique identifier to each sewer segments and access points, and developing an efficient inspection data collection and management software. In addition, the equipment and technology improved significantly. For example, current CCTV cameras come with advanced features such as the ability to tilt and rotate on their axis to examine specific details, and the videos are recorded in digital formats like DVDs and MPEGs, whereas earlier models used rigid cameras and VHS tapes.

Another major area of improvement is that inspection videos are now completer and more thorough. Before 2004, the crew would view an entire sewer line but only clean and videotape the problem areas. Today, all sanitary sewers are thoroughly cleaned and fully viewed and recorded from one access point to the other access point. This comprehensive approach provides a complete record and establishes a baseline observation of sewer conditions, enabling proper

assessment and effective scheduling of repairs or replacement for identified damaged sewers.

Overview of Sewer Cleaning and TV Inspections from 2004 to present

The city cleaned and inspected approximately 640 miles of sanitary sewers during the first cycle Programmed Sewer Cleaning and TV Inspection, and in the second cycle, 1,076 miles of sanitary and storm sewers have either been inspected or are currently in progress. In total, 1,716 miles of sewers have been inspected from 2004 to the present through the Programmed Sewer Cleaning and TV Inspection. Table 2 and Figure 1 provide a breakdown of the miles inspected per year from 2004 to present.

In addition to the programmed sewer cleaning and TV inspections, the city also inspects miles of sewers prior to street construction projects. This helps address any sewer-related issues during construction, saving costs and minimizing disruptions to residents. Table 3 and Figure 2 show that from 2003 to the present, the city has inspected 141 miles of sewers in conjunction with street construction projects.

Beyond the programmed and street construction-related inspections, the city additionally inspects an average of 5 to 7 miles of sewers each year in response to complaints from residents or the public.

Table 2: Total Inspected As PSCTVIP Per Year

Year inspected	Total Inspected (Mile)
2004	84
2005	75
2006	70
2007	58
2008	54
2009	56
2010	71
2011	59
2012	65
2013	40
2014	132
2015	43
2016	81
2017	99
2018	73
2019	107
2020	74
2021	59
2022	78
2023	88
2024	118
2025	50
2026	74
Total Inspected	**1708**

Figure 1: Total inspected as Programmed Sewer Cleaning and TV Inspection Per Year

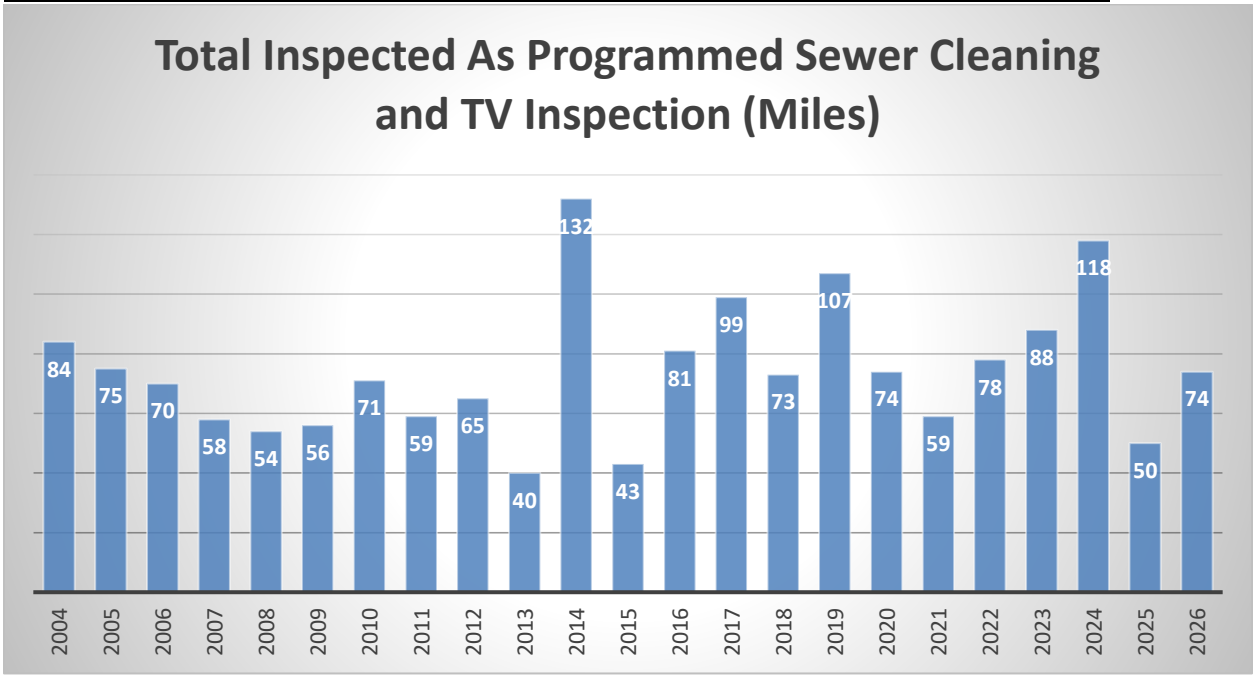


Figure 2: Total inspected in conjunction with the street construction projects per year

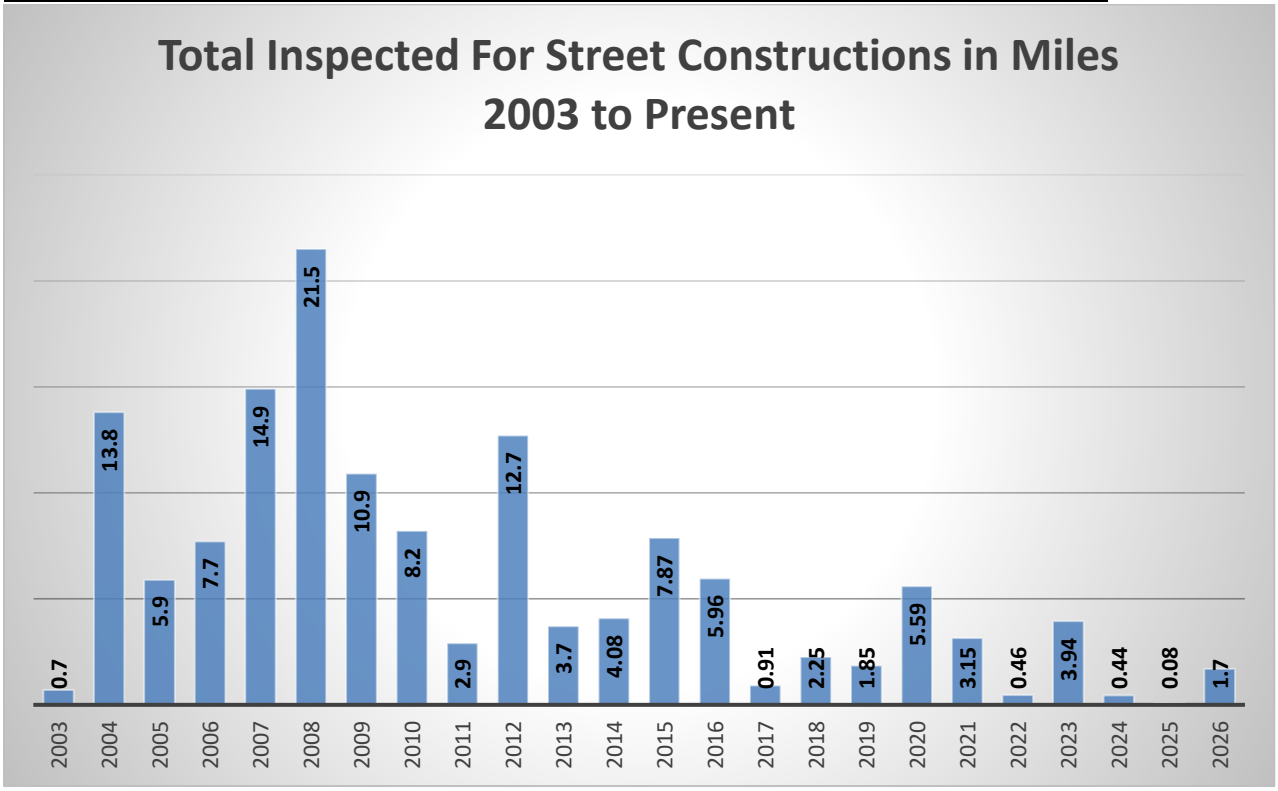


Table 3: Total inspected in conjunction with the street construction projects per year

Year Inspected	Miles Inspected For Street Const	Miles Inspected As Special Request	Total Inspected in Miles
2003	0.5	0.2	0.7
2004	13.2	0.6	13.8
2005	5.9		5.9
2006	5.5	2.2	7.7
2007	14.6	0.3	14.9
2008	7.9	13.6	21.5
2009	9.9	1	10.9
2010	5.4	2.8	8.2
2011	2.9	0	2.9
2012	11.6	1.1	12.7
2013	3.6	0.1	3.7
2014	3.78	0.3	4.08
2015	7.87		7.87
2016	5.96		5.96
2017	0.91		0.91
2018	2.25		2.25
2019	1.85		1.85
2020	5.59		5.59
2021	3.15		3.15
2022	0.46		0.46
2023	3.94		3.94
2024	0.44		0.44
2025	0.08		0.08
2026	1.7		1.7
Total inspected from 2003 to present =			**141.18**

Programmed Sewer Cleaning and TV Inspection Cost

The city invested close to 23 million dollars on Programmed Sewer Cleaning and TV Inspection from 2004 to present including those Programmed Sewer Cleaning and TV Inspections (PSCTVIP) done in-house by Sewer Utility Staff. The figures below do not include the amount invested on complaints or miscellaneous sewer inspections conducted in-house by Sewer Maintenance staff. Table 4 and Figure 3. shows the breakdown of amount invested per year from 2004 to present.

Figure 3: Cost Invested on Programmed Sewer Inspections Per Year

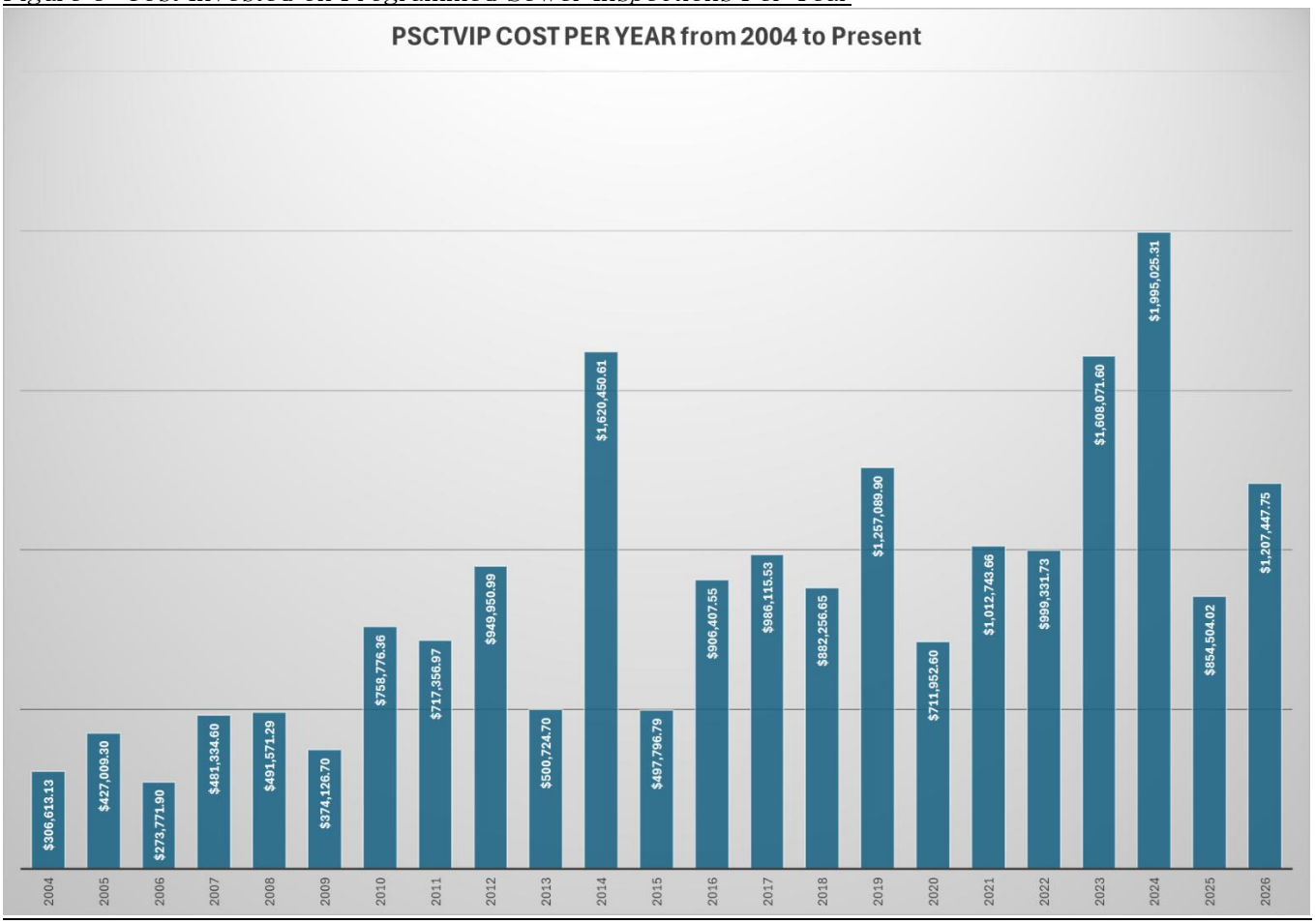


Table 4: Cost Invested on Programmed Sewer Inspections Per Year

Year	Total Amount Invested on PSCTVIP
2004	$306,613.13
2005	$427,009.30
2006	$273,771.90
2007	$481,334.60
2008	$491,571.29
2009	$374,126.70
2010	$758,776.36
2011	$717,356.97
2012	$949,950.99
2013	$500,724.70
2014	$1,620,450.61
2015	$497,796.79
2016	$906,407.55
2017	$986,115.53
2018	$882,256.65
2019	$1,257,089.90
2020	$711,952.60
2021	$1,012,743.66
2022	$999,331.73
2023	$1,608,071.60
2024	$1,995,025.31
2025	$854,504.02
2026	$1,207,447.75
Total Amount	**$19,820,429.64**

A summary of Sanitary Sewer Condition Ratings – First Cycle (2004-2013)

The first cycle of programmed CCTV sewer inspection (sanitary only) began in 2004 and was completed in 2013. The second cycle began in June 2014 and included the CCTV inspection of both sanitary and storm including all associated access points.

As shown on Table 5 and Map 3, approximately 641 miles of sanitary sewer was cleaned and inspected during the first inspection cycle. Out of the 641 miles inspected 4.9 miles identified as a condition defect rating of 5 which is the highest and most significant defect per modified NASSCO rating system; 20.6 miles identified as a condition defect rating of 4 which is the second highest and significant; 8.8 miles as a condition rating of 3 which is moderate defect; 49.4

miles as a condition defect rating of 2 which is minor to moderate and 557miles identified as a condition defect rating of 1 which is the lowest rating value of all.

In general, this data indicates that approximately 87% of city's sanitary sewers are in good shape or have minor issues. Less than 12% of city's sanitary sewer was identified as major to moderate defect and less than 1% identified as a most significant defect and needed immediate attention.

Table 5: Sanitary Sewers Pipe Condition Ratings Index (2004 to 2013)

Pipe Condition Grading System	Length (FT)	Length (MI)	No. of segments	Percentage by Length	Percentage by No. of Segment
5- Most significant defect grade	26,053.3	4.9	146.0	0.77%	0.83%
4- Significant defect grade	108,555.3	20.6	513.0	3.21%	2.93%
3- Moderate defect grade	46,229.7	8.8	248.0	1.37%	1.42%
2- Minor to moderate defect grade	261,001.3	49.4	1294.0	7.72%	7.39%
1- Minor to no defect grade	2,940,944.3	557.0	15310.0	86.94%	87.43%
Total inspected (2003-2013)	3,382,783.8	640.7	17511.0		

Programmed Sewer Condition Ratings – Second cycle (2014-Presnet)

The second cycle of programmed CCTV sewer inspections began in 2014 with the addition of storm sewer infrastructure. The estimated timeline for the second programmed inspection cycle (for storm and sanitary) was extended from 10 years to 15+ years.

Another change in the second cycle was the city's shift from its own coding system to the NASSCO standardized system for defects and repairs. As a result, contractors and Sewer Utility staff responsible for conducting and reviewing inspection reports are now required to be NASSCO Certified. Additionally, the city transitioned from its in-house MS Access database to Granite Net, a NASSCO-certified software to collect, review and manage sewer inspections data.
As shown in Table 6 and 7 and Map 4, as of May 31, 2026, approximately 604 miles of sanitary sewers and 283 miles of storm sewers had been inspected during this second cycle of the Programmed Sewer Cleaning and TV Inspection.

Based on NASSCO's Pipe Rating Index (PRI), as shown in Tables 6 and 7, the inspection of 604 miles of sanitary sewers during this second cycle indicates the following condition defect ratings: 2.8 miles were rated above 4 which is the highest and most significant defect level under the modified NASSCO system; 30.5 miles were rated above 3 but below 4 which is the second highest and significant defect level; 195 miles were rated above 2 but below 3 which is moderate defect; 177.4 miles were rated above 1 but less than 2 which is minor to moderate defect; and 198.1 miles were rated above 0 but below 1 which is the lowest rating value.

In general, this data indicates that approximately 95% of the total inspected sanitary sewers have a PRI of 3 or below, meaning they are in good to fair condition. This represents an improvement from the first cycle, which stood at 87%, primarily due to the city's ongoing sewer rehabilitation (lining) and replacement program(s).

Table 6: NASSCO Based Conditional Rating – Sanitary Sewers Inspected from 2024 to present

Pipe Condition Ratings (PRI	Length (Miles)	Percentage by Length (%)
PRI 0 to 1 Minor to no defects	198.1	32.8
PRI >1 to 2 Minor to Moderate defect grade	177.4	29.4
PRI >2 to 3 Moderate defect grade	195.0	32.3
PRI >3 to 4 Significant defect grade	30.5	5.1
PRI >4 to 5 Most Significant defect grade	2.8	0.5
	603.8	100.0

Table 7: NASSCCO Based Conditional Rating – Sanitary Sewers Inspected from 2024 to present

Pipe Condition Ratings (PRI	Length (Miles)	Percentage by Length (%)
PRI 0 to 1 Minor to no defects	92.1	32.6
PRI >1 to 2 Minor to Moderate defect grade	86.0	30.4
PRI >2 to 3 Moderate defect grade	90.5	32.0
PRI >3 to 4 Significant defect grade	11.4	4.0
PRI >4 to 5 Most Significant defect grade	2.8	1.0
	282.7	100.0

Sewer Inspection and Data Analysis Process

The sewer inspection and data assessment processes include the preparation of bidding documents, contract bidding, meetings with the selected contractors, field data collection, data archiving, and data review, as illustrated in Flow chart Diagram 1.

Once the contractor is awarded the contract, crews begin by cleaning the pipelines. Then, NASSCO-certified personnel insert a waterproof, pan-and-tilt CCTV camera into the mainline, typically through an upstream access point. The inspector remotely navigates the camera through the pipe, recording video in real time and noting each defect, along with its location and severity, during the inspection.

Following the inspection, the contractor compiles the findings into a detailed report and submits the inspection data including NASSCO logs, videos, and photos via external drives or by uploading it to the City's SharePoint. The inspection data typically includes PACP-MACP data, photos, and videos in MPEG and DVD formats. The inspection log also contains a distance log that pinpoints the exact location of each defect.

Due to the volume of data inspected each year, Sewer Utility staff currently review only sanitary sewers rated 3 or above, storm sewers rated 4 or above, and other critical defects rated below 3 on the PRI scale.

Sewer Inspection Decision Making Process

NASSCO-certified Sewer Utility staff review sanitary sewers rated 3 or above and storm sewers rated 4 or above to determine which lines require maintenance, repairs, or full replacement. During this decision-making process, staff thoroughly evaluate each sewer line and make recommendations based on material type, defect types, defect location, and severity. If the defects are structural and require major repairs or full replacement, the sewers are referred to the Sewer Utility Design Team. If the defects are operational and maintenance related to roots or debris, they are referred to the Sewer Utility Maintenance Team. Additionally, if defective lateral connections (connecting private properties to the city's mainline) are observed, those laterals are referred to the Sewer Utility Counter, which notifies the property owners. Regarding street and roadway reconstruction projects, all unlined brick and vitrified clay sewer infrastructure (pipes and structures) is requested to be replaced with modern materials during project construction.

Sewer Rehabilitation – Cured-In-Place Pipe (CIPP)

The city has been using Cured-In-Place (CIPP) sewer rehabilitation method since 1990 as it is the most cost effective, less intrusive trenchless method for rehabilitating deteriorated sewer lines. It eliminates the need for destructive digging by inserting a flexible, resin-saturated liner into the existing pipe, curing it in place to create a durable, jointless "pipe within a pipe". Map 5 shows lined sewers using CIPP from 1990 to 2023.

Sand Rock Tunnels

Sand rock tunnels are more than 100 years older. The city has approximately 75 miles of sanitary and storm tunnels. Of these 75 miles, 41 miles of tunnels are about two to three feet wide and six feet-six inches high. Map 6 shows the locations of these tunnels throughout the city.

Sewer tunnels are generally constructed in areas of the city where hard rock near the ground surface makes excavation extremely difficult and expensive. Tunnels are 30 to140 feet deep and have been constructed in a softer rock formation known as St. Peter Sandstone.

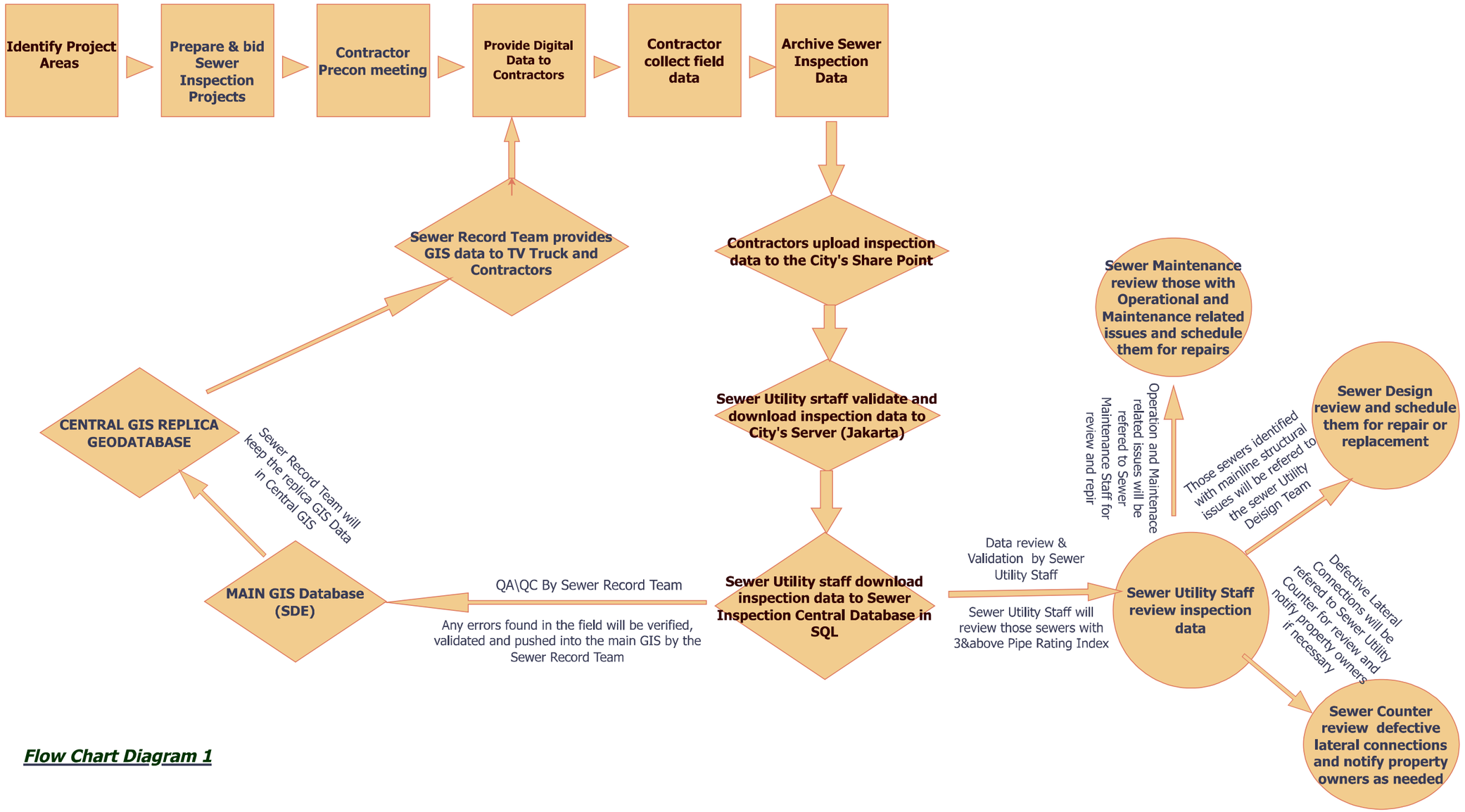
There are sanitary and storm tunnels. These are further classified as unlined and lined. Sand rock walls continuously deteriorate when exposed to flowing stormwater or sewage. When these tunnels conveyed combined flows, they would often fill up and run under pressurized conditions that would further deteriorate the wall. Unlined tunnels pose a different maintenance and rehabilitation problem than lined tunnels.

The tunnel system is very old and requires recurring and more frequent inspections than shallower/smaller sewer (pipe) infrastructure typically installed by open cut excavation methods. Unlike smaller diameter pipes, the tunnels are difficult to televise using standard CCTV cameras due to their depth, length, size and high flow volume. As a result, walk-through inspections by confined space entry are necessary.

Estimated Continuous Sewers Inspection and Monitoring Cost

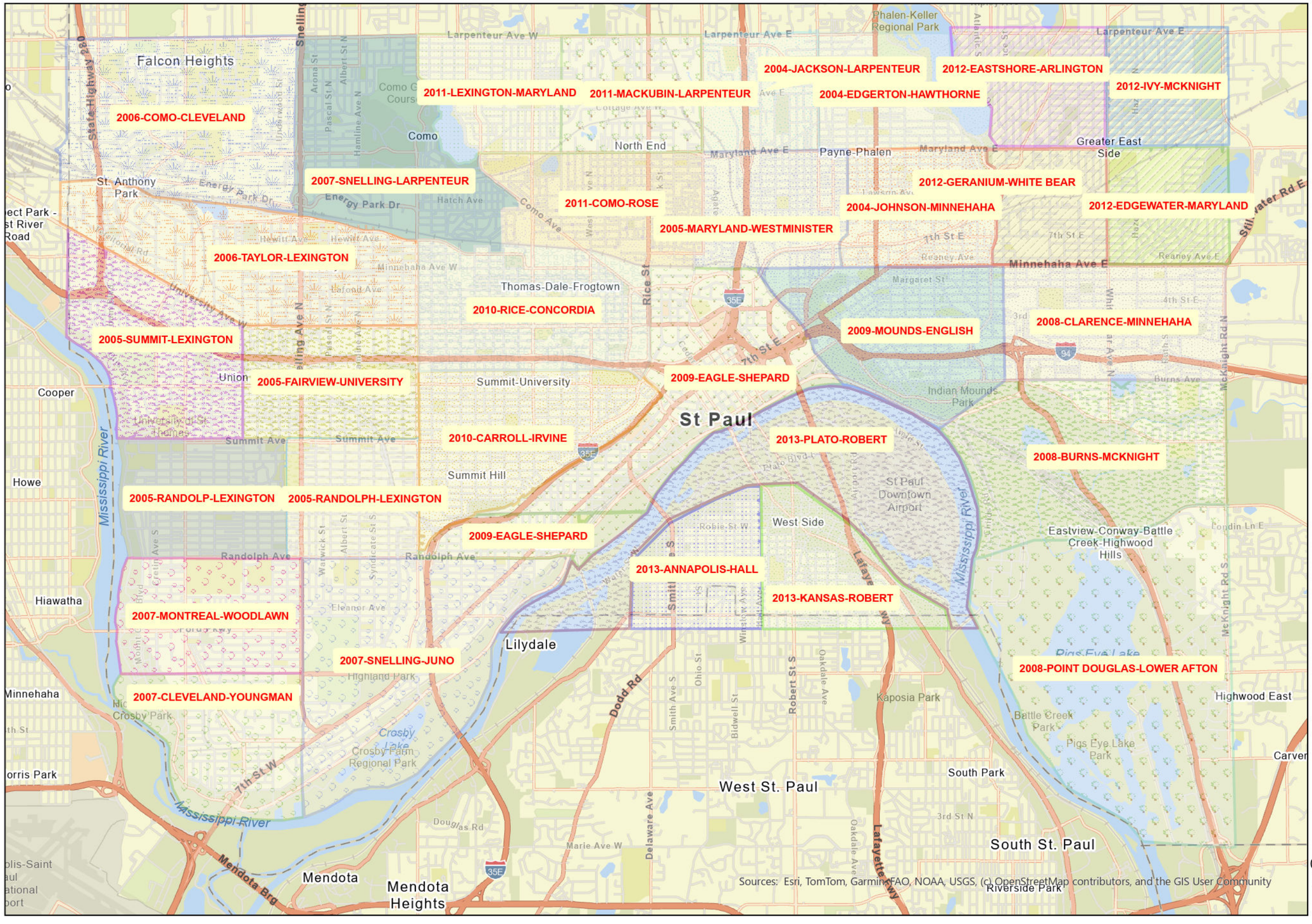
As shown in Table 4 and Figure 3, the city currently invests an average of $1.5 to $1.8 million annually on Programmed Sewer Inspections.

Sewer Inspection, Data Management, and Condition Assessment Flow Chart (Overview)



Flow Chart Diagram 1

PROGRAMMED SEWER CLEANING AND TV INSPECTION PROJECT AREA MAP - CYCLE ONE



PSCTVIP AREA MAP - CYCLE1

SINSPAREANAME

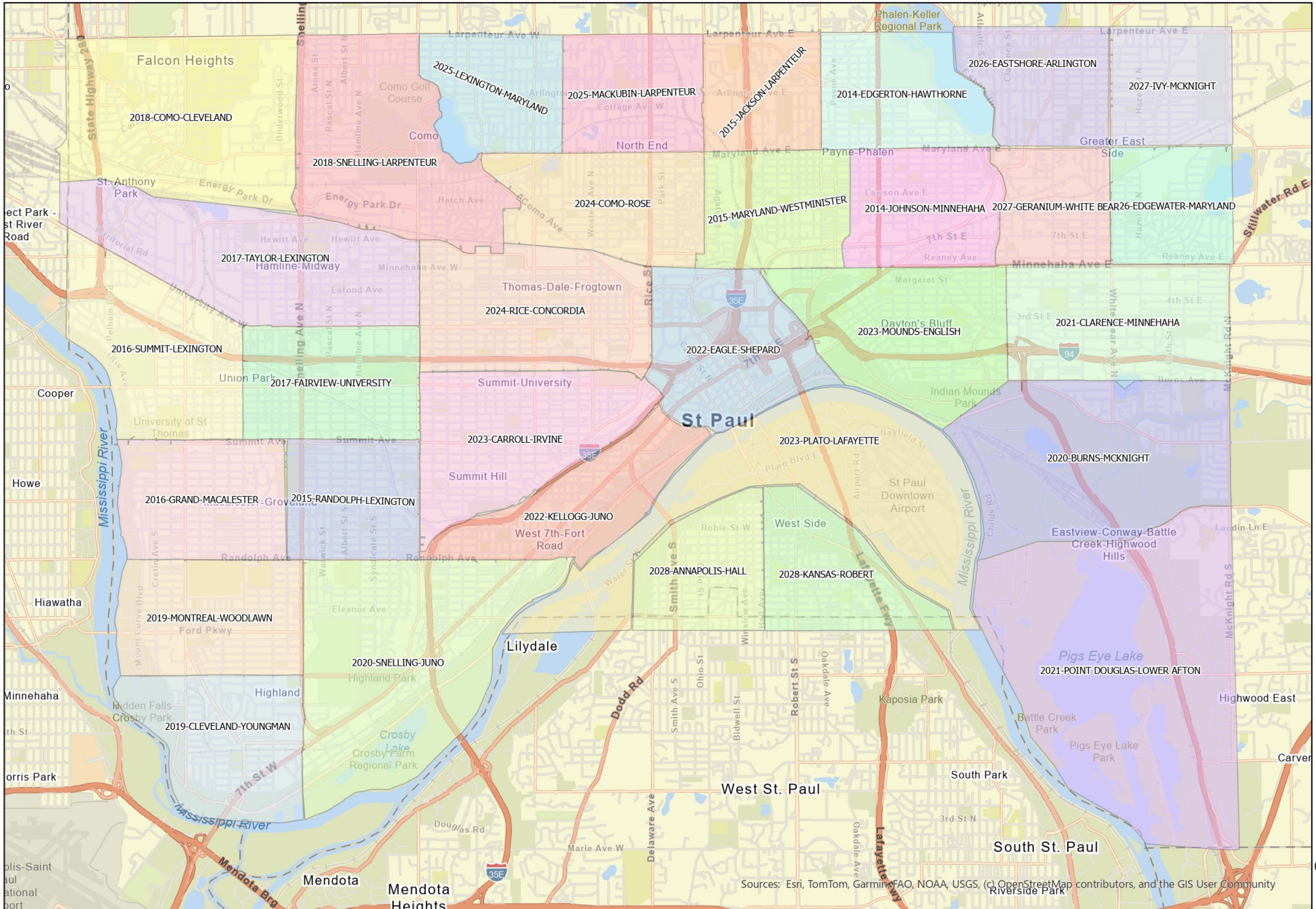
- 2004-EDGERTON-HAWTHORNE
- 2004-JACKSON-LARPENTEUR
- 2004-JOHNSON-MINNEHAHA
- 2005-FAIRVIEW-UNIVERSITY
- 2005-MARYLAND-WESTMINISTER
- 2005-RANDOLP-LEXINGTON
- 2005-RANDOLPH-LEXINGTON
- 2005-SUMMIT-LEXINGTON
- 2006-COMO-CLEVELAND
- 2006-TAYLOR-LEXINGTON
- 2007-CLEVELAND-YOUNGMAN
- 2007-MONTREAL-WOODLAWN
- 2007-SNELLING-JUNO
- 2007-SNELLING-LARPENTEUR
- 2008-BURNS-MCKNIGHT
- 2008-CLARENCE-MINNEHAHA
- 2008-CLEARANCE-MINNEAHAHA
- 2008-CLEARANCE-MINNEAHAHA
- 2009-EAGLE-SHEPARD
- 2009-MOUNDS-ENGLISH
- 2010-CARROLL-IRVINE
- 2010-RICE-CONCORDIA
- 2011-COMO-ROSE
- 2011-LEXINGTON-MARYLAND
- 2011-MACKUBIN-LARPENTEUR
- 2012-EASTSHORE-ARLINGTON
- 2012-EDGEWATER-MARYLAND
- 2012-GERANIUM-WHITE BEAR
- 2012-IVY-MCKNIGHT
- 2013-ANNAPOLIS-HALL
- 2013-KANSAS-ROBERT
- 2013-PLATO-ROBERT

N W E S

0 0.25 0.5 1 1.5 2 Miles

MAP 1

PROGRAMMED SEWER CLEANING AND TV INSPECTION PROJECT AREA MAP - CYCLE TWO



PSCTVIP MAP-CYCLE2

SINSPAREAN

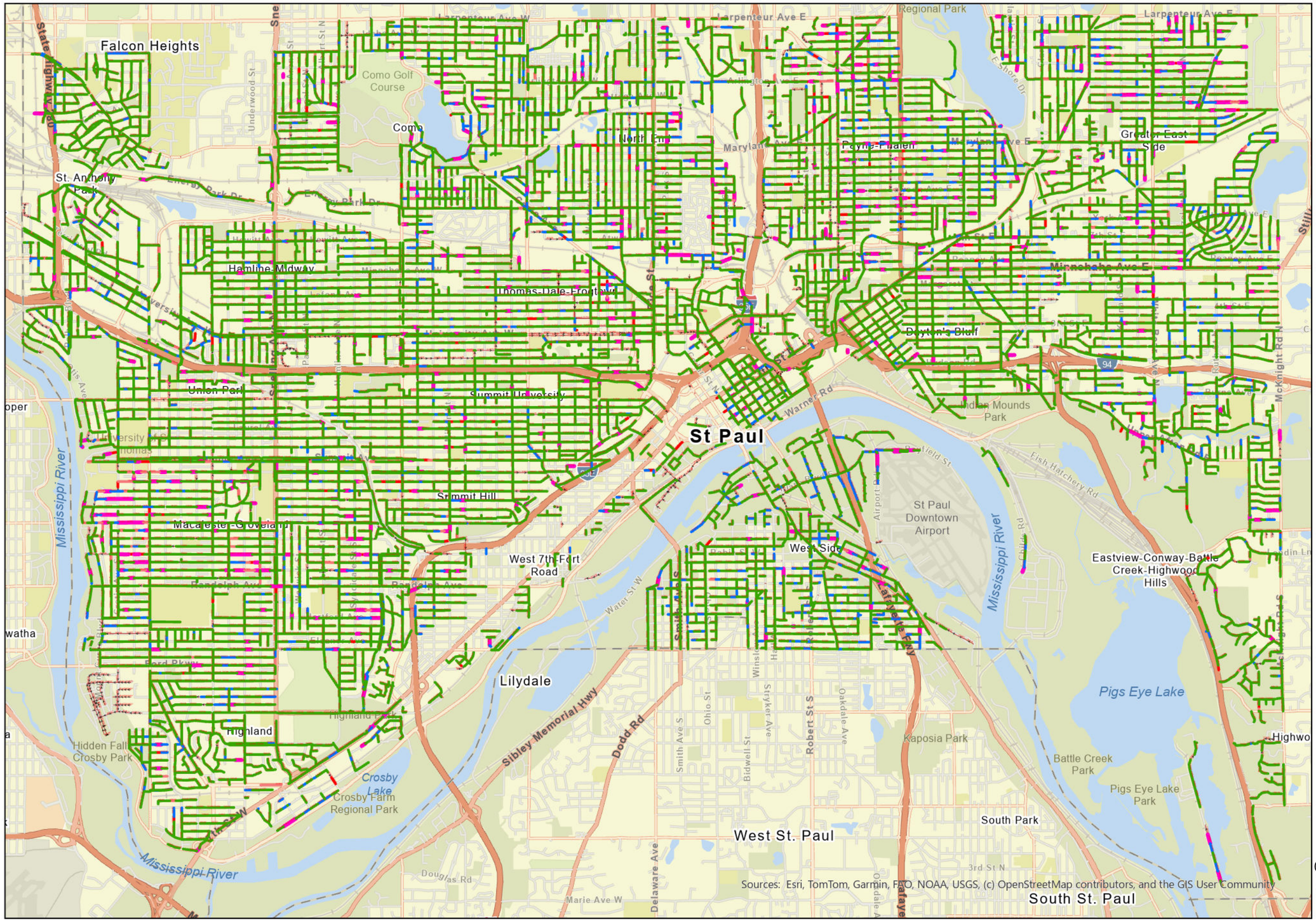
- 2014-EDGERTON-HAWTHORNE
- 2014-JOHNSON-MINNEHAHA
- 2015-JACKSON-LARPENTEUR
- 2015-MARYLAND-WESTMINISTER
- 2015-RANDOLPH-LEXINGTON
- 2016-GRAND-MACALESTER
- 2016-SUMMIT-LEXINGTON
- 2017-FAIRVIEW-UNIVERSITY
- 2017-TAYLOR-LEXINGTON
- 2018-COMO-CLEVELAND
- 2018-SNELLING-LARPENTEUR
- 2019-CLEVELAND-YOUNGMAN
- 2019-MONTREAL-WOODLAWN
- 2020-BURNS-MCKNIGHT
- 2020-SNELLING-JUNO
- 2021-CLARENCE-MINNEHAHA
- 2021-POINT DOUGLAS-LOWER AFTON
- 2022-EAGLE-SHEPARD
- 2022-KELLOGG-JUNO
- 2023-CARROLL-IRVINE
- 2023-MOUNDS-ENGLISH
- 2023-PLATO-LAFAYETTE
- 2024-COMO-ROSE
- 2024-RICE-CONCORDIA
- 2025-LEXINGTON-MARYLAND
- 2025-MACKUBIN-LARPENTEUR
- 2026-EASTSHORE-ARLINGTON
- 2026-EDGEWATER-MARYLAND
- 2027-GERANIUM-WHITE BEAR
- 2027-IVY-MCKNIGHT
- 2028-ANNAPOLIS-HALL
- 2028-KANSAS-ROBERT

N W E S

0 0.25 0.5 1 1.5 2 Miles

MAP 2

SANITARY SEWER MAINS CONDITION RATING BASED ON CITY'S PRI



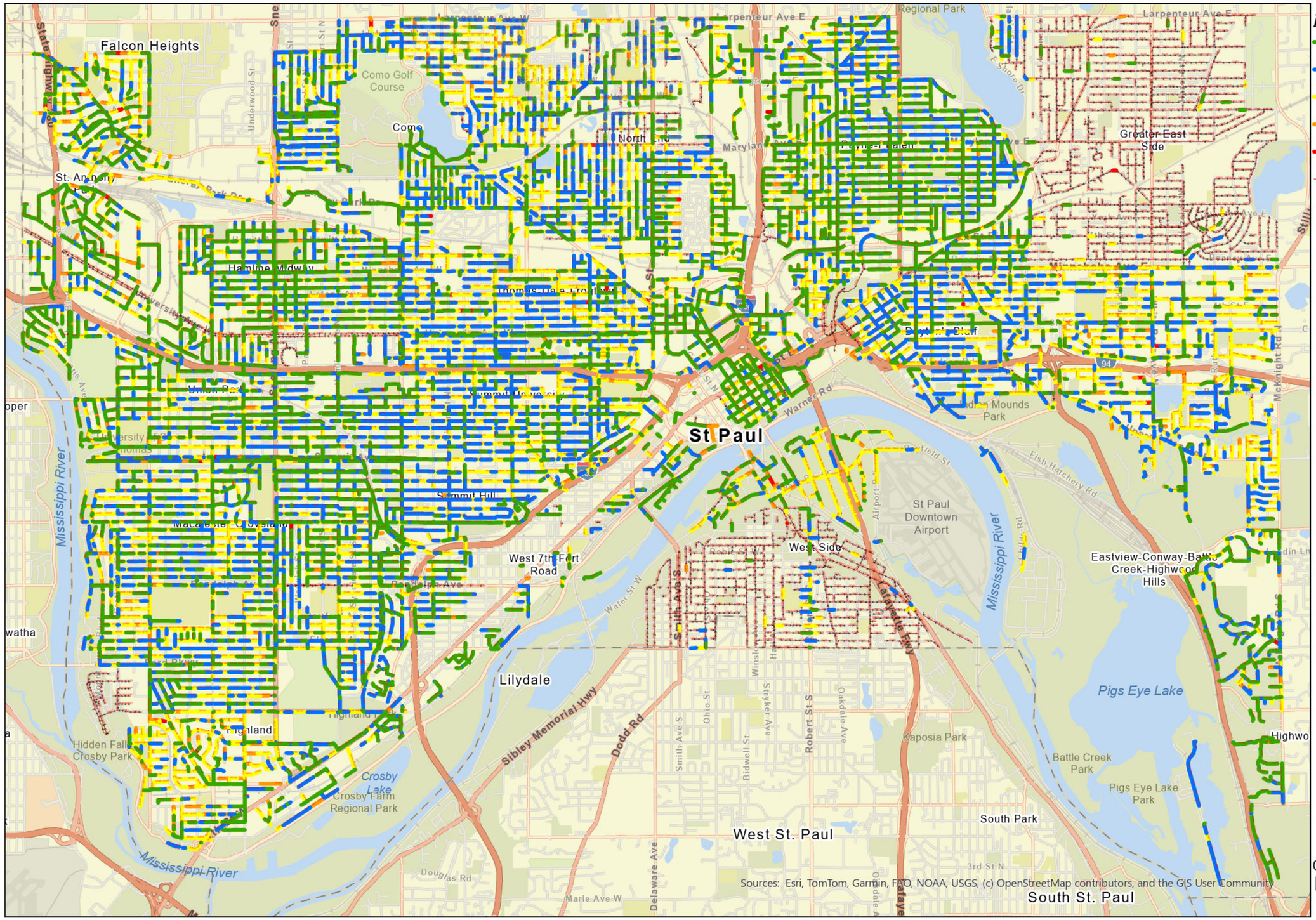
SANITARY SEWER MAIN LINES
ConditionRating_1_Very Good
ConditionRating_2_Good
ConditionRating_3_Fair
ConditionRating_4_Very Poor
ConditionRating_5_Failure

N
W E
S

0 0.23 0.45 0.9 1.35 1.8 Miles

MAP 3

SANITARY SEWER MAINLINES WITH NASSCO BASED PIPE CONDITION RATINGS INDEX (PRI)



Legend

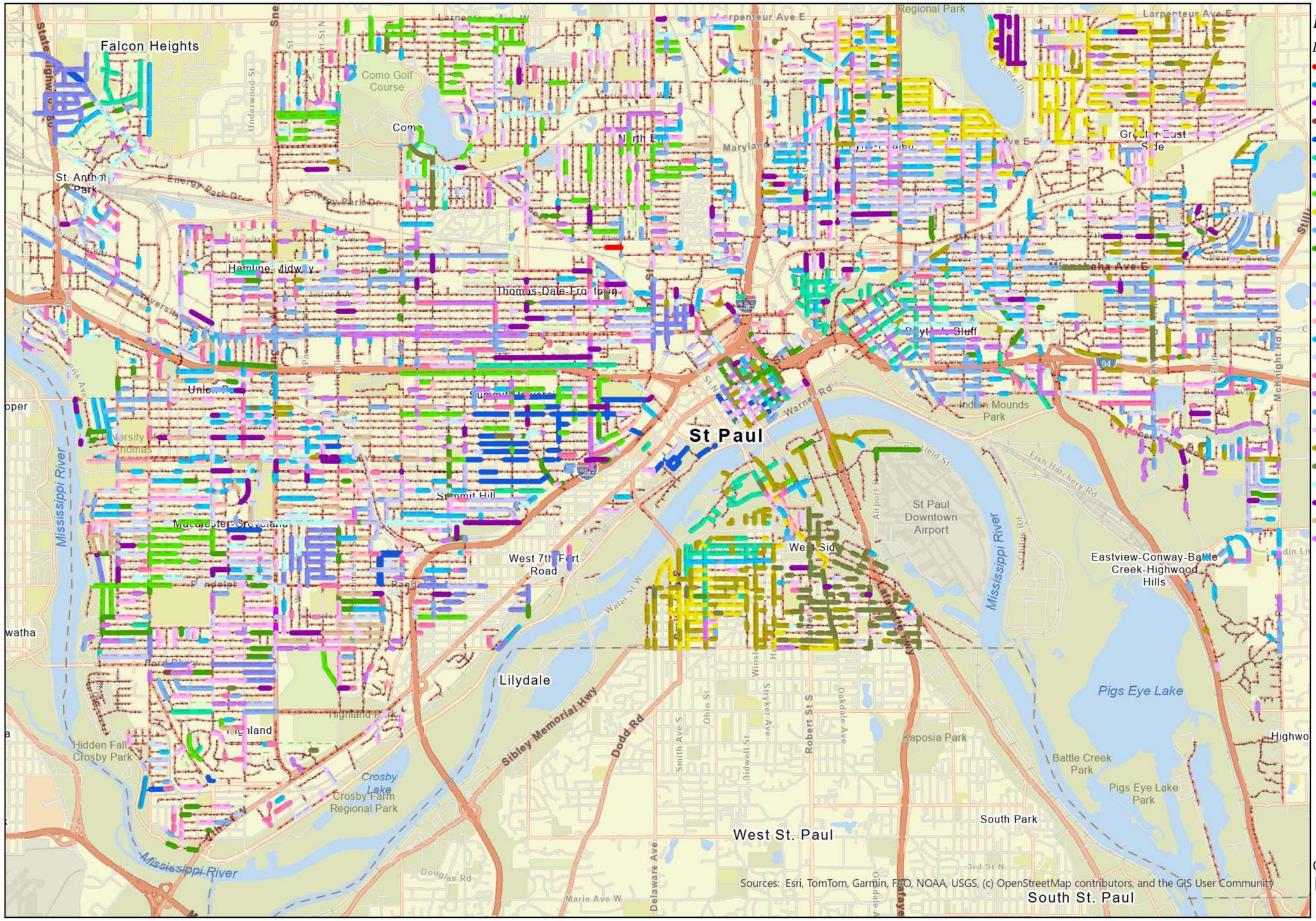
- *SANITARY MAINS WITH PRI 0-1 - VERY GOOD CONDITION*
- *SANITARY MAINS WITH PRI 1-2 - GOOD CONDITION*
- *SANITARY MAINS WITH PRI 2_3 - FAIR CONDITION*
- *SANITARY MAINS WITH PRI 3-4 - POOR CONDITION*
- *SANITARY MAINS WITH PRI 4-5 - BAD CONDITION*
- *SANITARY SEWER MAINLINES*

N
W E
S

0 0.23 0.45 0.9 1.35 1.8
Miles

MAP 4

CIPP-LINED SANITARY SEWERS PER THE YEAR LINED



Legend

LINEDYEAR

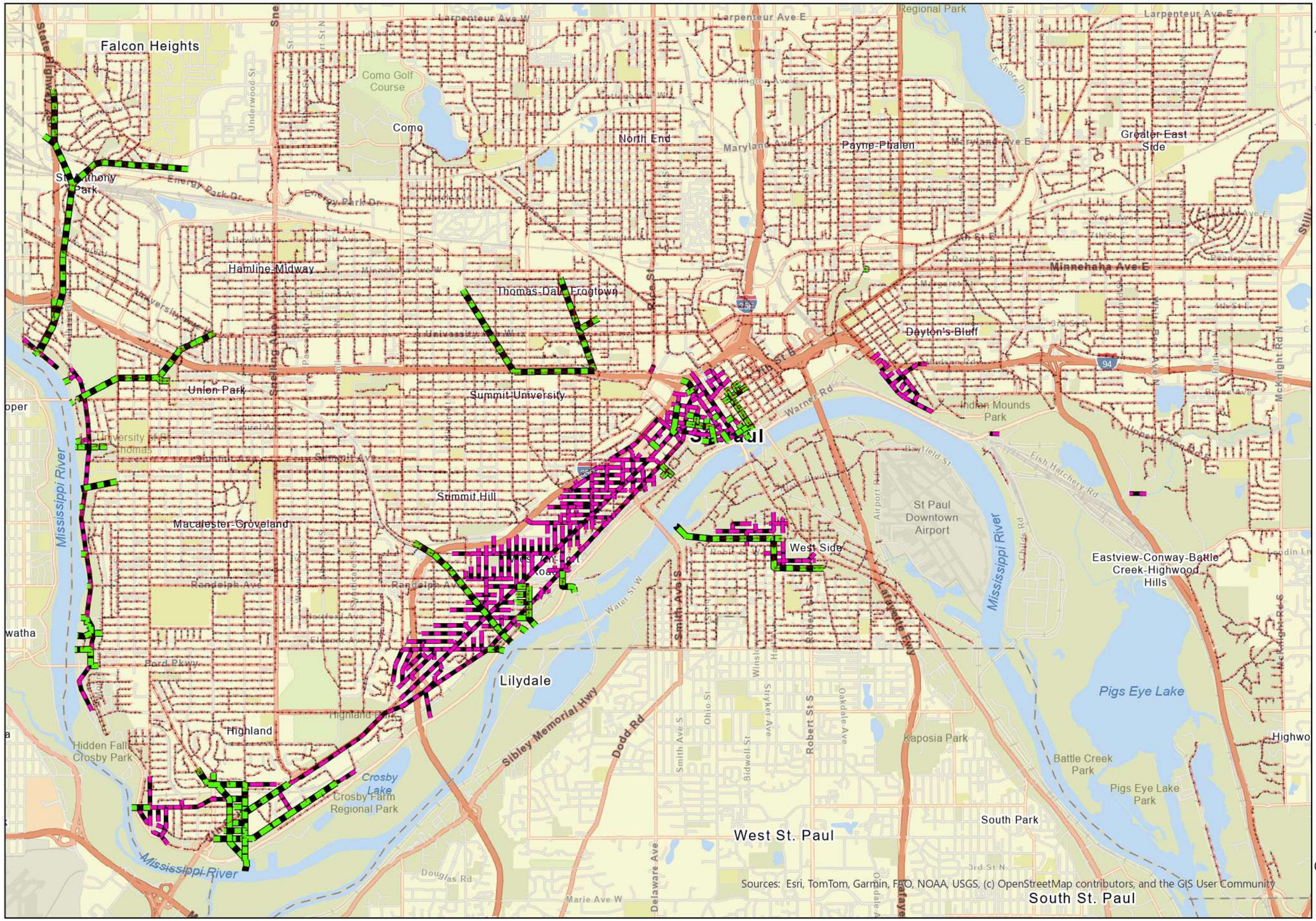
- *1990*
- *1991*
- *1992*
- *1994*
- *1997*
- *1998*
- *1999*
- *2000*
- *2001*
- *2002*
- *2003*
- *2004*
- *2005*
- *2006*
- *2007*
- *2008*
- *2009*
- *2010*
- *2011*
- *2012*
- *2013*
- *2014*
- *2015*
- *2016*
- *2018*
- *2019*
- *2023*

N W E S

0 0.23 0.45 0.9 1.35 1.8 Miles

MAP 5

SAND ROCK TUNNELS



Legend

- *STORM SAND ROCK TUNNELS*
- *SANITARY SAND ROCK TUNNELS*
- *SANITARY SEWER MAINLINES*

N
W E
S

0 0.23 0.45 0.9 1.35 1.8
Miles

MAP 6