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INTRODUCTION

The City of St. Paul Park is required to prepare a Comprehensive Plan that aligns with the Metropolitan Council’s Metropolitan System Plan every ten years per Minnesota Rule 473.858. An important part of the Comprehensive Plan is the Sanitary Sewer Plan, which describes the existing sanitary sewer system and outlines the timing and sequence of future improvements. The Sanitary Sewer Plan allows the City and the Metropolitan Council to build and improve their sanitary sewer collection and treatment systems so that development can occur in the most efficient and cost-effective manner. This document serves as the sanitary sewer component for the City of St. Paul Park’s 2040 Comprehensive Plan.

The City of St. Paul Park’s Sanitary Sewer Plan was developed to align with the Metropolitan Council’s Thrive MSP 2040 Water Resources Policy Plan. The Thrive MSP 2040 Plan was approved in May 2015 and outlines regional goals for the wastewater system, including environmental sustainability, water reuse, and water conservation. Additionally, the Thrive MSP 2040 Plan includes population, household, and employment projections, and projected wastewater flows.

As a result of projected population increases and land use changes in St. Paul Park, the Metropolitan Council estimates that sanitary sewer flows will increase approximately 38 percent between 2010 and 2040. This Sanitary Sewer Plan outlines the locations in which the Metropolitan Council can expect to see increased wastewater flows, allowing the Council to determine if capacity upgrades will be required at regional wastewater treatment plants and interceptors. This plan also serves as a guiding document for City infrastructure improvements and expansion.
BACKGROUND

The City of St. Paul Park is located in Washington County five miles south of St. Paul on the east bank of the Mississippi River. It is bordered by Newport to the north, Cottage Grove to the east, Grey Cloud Island Township to the south, and Inver Grove Heights to the west. The bulk of St. Paul Park is residential, but it also includes a sizable industrial region in the north, a light industrial region along the western edge of the railroad, and an agricultural region in the south. Approximately 16 percent of the area of the City is occupied by the Mississippi River.

St. Paul Park has been designated entirely as an emerging suburban edge community. This designation indicates that the City is in the early stages of transitioning into urbanized development. The Metropolitan Council expects St. Paul Park to, “plan for forecasted population and household growth at average densities of at least 3-5 units per acre for new development and redevelopment … and to target opportunities for more intensive development near regional transit investments.”

EXISTING SANITARY SEWER SYSTEM

Public Collection Systems

The City of St. Paul Park’s existing sanitary sewer system collects and conveys wastewater to the Metropolitan Council Environmental Services (MCES) Meter M604 which discharges into MCES Interceptor 7102-2. A summary of St. Paul Park’s existing lift stations is presented in Table 1, and a map of the existing sanitary sewer system is shown in Figure 1. Each lift station contains two Flygt submersible pumps with a capacity of 200 gpm per pump.

Table 1. Existing Lift Station Summary

<table>
<thead>
<tr>
<th>Lift Station</th>
<th>Year Constructed</th>
<th>Pumping Capacity (gpm)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2003</td>
<td>200</td>
<td>West Pullman Avenue (District 1)</td>
</tr>
<tr>
<td>2</td>
<td>2004</td>
<td>200</td>
<td>River Woods Drive West (District 1)</td>
</tr>
</tbody>
</table>

The existing sanitary sewer system is nearly all connected by one gravity main network, which can be roughly divided into western, eastern, and southeastern regions, labeled districts 1, 2, and 3, respectively, in Figure 2. There are two lift stations in the western region which discharge flow into the trunk system along 1st, 2nd, and 3rd Streets. Wastewater generated in the eastern region is collected towards the north into the trunk gravity mains along Summit Avenue and Broadway Avenue. Wastewater generated in the southeastern region is collected at the lower branch of Pleasant Avenue, crosses the railroad at 13th Avenue, and subsequently flows north through the western region.

All wastewater collected in the City of St. Paul Park is conveyed through the MCES system to the MCES Metropolitan Wastewater Treatment Plant (WWTP) to the north on the east bank of the Mississippi River. The Metropolitan WWTP has a capacity of 251 MGD, provides advanced secondary treatment with chlorination/dechlorination, and discharges treated effluent to the Mississippi River. It also generates energy from the treatment of biosolids for in-plant use.
Andeavor Oil Refinery
Private Treatment Plant
Discharges to Mississippi River

Legend
Gravity Main
Diameter
8"
10"
12"
16"
Forcemain
Lift Station
MCES Flow Meter
MCES Gravity Main
MCES Forcemain
Sewer District Boundary
City Boundary

St. Paul Park Comprehensive Plan
Figure 1 - Existing Sanitary Sewer System
St. Paul Park, MN
St. Paul Park Comprehensive Plan
Figure 2 - Sanitary Sewer Districts
St. Paul Park, MN
Individual Sewage Treatment Systems

A portion of the properties in St. Paul Park are served by individual sewage treatment systems (ISTS, septic systems, or on-site sewer treatment systems). A majority of the ISTS are located in the southwestern part of the City because the high bedrock in that area made the installation cost of sewers for single-family housing impractical. At the writing of the City’s last Comprehensive Sewer Plan in 2008, there were 70 ISTS in the City. That number has decreased to 55 ISTS currently. A map of existing ISTS in St. Paul Park is shown in Figure 3. The section of St. Paul Park City Code regarding ISTS, Chapter 5: Planning and Land Use, is consistent with Minnesota Pollution Control Agency (MPCA) regulations (Minnesota Rules Chapters 7080-7083). City Code also stipulates that properties adjacent to the City sewer system are required to connect to the system, as excerpted below.

Sec. 70-77. - Regulations for disposal of waste.

In order to protect the health and welfare of the inhabitants of the city, the following regulations shall apply to all garbage, animal excrement, and other noxious, disease-spreading or otherwise objectionable waste:

…

(4) The owner of any house, building or property used for human occupancy, employment, recreation, or other purposes capable of producing sewage which is located on any property abutting upon a street, alley or way in which there is located any public sanitary sewer of the city is hereby required at his expense to install suitable toilet facilities therein and to connect such facilities with the city sanitary sewer in accordance with the provisions of this article within 90 days after date of official notice to do so, provided that any such sanitary sewer is within 100 feet of the property line.

ISTS permitting and inspections in the City of St. Paul Park are performed by the Washington County Department of Public Health and Environment. Washington County’s management program is responsible for initial installation, post-installation inspection, maintenance, record keeping, and home-owner notification. The County has financial assistance available to help residents replace non-compliant ISTS.
St. Paul Park Comprehensive Plan

Figure 3 - Individual Sewage Treatment Systems

St. Paul Park, MN
Private Treatment Plant
The Andeavor Oil Refinery site in the northwest corner of St. Paul Park includes a private wastewater treatment facility. It operates under a National Pollution Discharge Elimination System/State Disposal System (NPDES/SDS) permit. This type of permit governs the discharge of stormwater and treated wastewater into open water bodies, in this case into the Mississippi River at discharge point SD001 at the end of Broadway Avenue. The NPDES permit allows for a flow rate of up to 3.06 MGD.

The following treatment units are included in the wastewater treatment plant:

- Prescreening
- Neutralization
- Stormwater diversion
- Velocity reduction/splitter box
- API oil/water separator
- API solids tank
- API slop oil tank
- Flow equalization tank
- DGF sludge tanks
- Dissolved gas flotation
- Rotating biological contactors
- Aerated lagoon
- Settling lagoon
- Multimedia filtration
- Granular activated carbon

The facility does not have a separate stormwater sewer system, so most of the stormwater runoff generated on the site is treated at the WWTP. Other non-oily precipitation is discharged in accordance with the facility’s General Industrial Stormwater Permit.
FORECASTS

Population
The Metropolitan Council publishes population and sewer usage forecasts for each city in the Metropolitan Area. These forecasts serve to help cities prepare infrastructure for growth and to promote continued maintenance of municipal infrastructure. The forecast data in Table 2 is from the Metropolitan Council’s Local Planning Handbook Community Page for St. Paul Park and includes both total and sewered population, households, and employment. As mentioned previously, all existing and future wastewater flow generated in the City of St. Paul Park is and will continue to be metered at MCES Meter M604 and discharged to MCES Interceptor 7102-2.

Table 2. Population Projections

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Population</th>
<th>Total Households</th>
<th>Total Employment</th>
<th>Sewered Population</th>
<th>Sewered Households</th>
<th>Sewered Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>5,273</td>
<td>1,967</td>
<td>1,515</td>
<td>5,180</td>
<td>1,924</td>
<td>1,515</td>
</tr>
<tr>
<td>2015*</td>
<td>5,637</td>
<td>2,134</td>
<td>1,758</td>
<td>5,535</td>
<td>2,087</td>
<td>1,758</td>
</tr>
<tr>
<td>2020</td>
<td>6,000</td>
<td>2,300</td>
<td>2,000</td>
<td>5,890</td>
<td>2,250</td>
<td>2,000</td>
</tr>
<tr>
<td>2025*</td>
<td>6,500</td>
<td>2,555</td>
<td>2,100</td>
<td>6,430</td>
<td>2,525</td>
<td>2,100</td>
</tr>
<tr>
<td>2030</td>
<td>7,000</td>
<td>2,810</td>
<td>2,200</td>
<td>6,970</td>
<td>2,800</td>
<td>2,200</td>
</tr>
<tr>
<td>2035*</td>
<td>7,450</td>
<td>3,055</td>
<td>2,300</td>
<td>7,420</td>
<td>3,040</td>
<td>2,300</td>
</tr>
<tr>
<td>2040</td>
<td>7,900</td>
<td>3,300</td>
<td>2,400</td>
<td>7,870</td>
<td>3,280</td>
<td>2,400</td>
</tr>
</tbody>
</table>

*Interpolated values

From the data in Table 2, it can be observed that from 2010 to 2040 the total number of households in the City of St. Paul Park is expected to increase by 68 percent. Total employment, however, is only projected to grow by approximately 58 percent by 2040. The Metropolitan Council’s forecasts for the number of sewered households and employment increase similarly.
Wastewater Flows

All of the existing sewage flow from the City of St. Paul Park is treated at the Metropolitan WWTP, and all of the increase in sewage flow will be treated at the Metropolitan WWTP as well. Table 3 lists projected total average wastewater flow for St. Paul Park from this Sanitary Sewer Plan and MCES. Note that the projections used in this report for 2030 and 2040 are significantly greater than the MCES projections since they rely on flow estimates for each parcel of developable land, rather than population estimates.

Table 3. Total Wastewater Projections

<table>
<thead>
<tr>
<th></th>
<th>2020 Projected Flow (MGD)</th>
<th>2030 Projected Flow (MGD)</th>
<th>2040 Projected Flow (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCES</td>
<td>0.41</td>
<td>0.46</td>
<td>0.51</td>
</tr>
<tr>
<td>Sanitary Sewer Plan</td>
<td>0.39</td>
<td>0.57</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Land Use

Analysis of the City of St. Paul Park’s sanitary sewer considered five general land use designations: residential, commercial/industrial, institutional, agricultural, and park/recreational. The Mississippi River and associated parkland and the railroad occupy a significant non-waste-generating area within the City. The residential and commercial/industrial regions located in the northern two-thirds of the City are the most populous users of the public sewage system.

Private Systems

A significant number of residential properties in southwest St. Paul Park have ISTS because the high bedrock in that area makes the installation cost of sewers for single-family housing impractical, as mentioned previously. Because the City Code states that any new development adjacent to the City sanitary sewer system must connect to the system, and since most new developments over the lifetime of this plan will be built adjacent to the public system, it is unlikely that many new ISTS will be installed in future years.

The Marathon Petroleum oil refinery site also has a private treatment system, as described previously. Since there is no planned expansion of the industrial land in that area, it is anticipated that this facility will continue to have sufficient capacity to treat the industrial wastewater generated on site.
SANITARY SEWER DESIGN CRITERIA

Land Use
The City’s existing and 2040 land-use maps were used in the development of this plan. Detailed information and figures regarding St. Paul Park’s land use is included in the City’s 2040 Comprehensive Land Use Plan. Using existing land-use, metering data, and future land use information, current and ultimate flows were calculated and divided by meter service area as described below.

Estimated Average Flows – Existing
To estimate the flows in trunk mains throughout the City, metering data was retrieved from the Metropolitan Council. Flows were assigned proportionally to each meter service area based on the acreage of agricultural, park/recreational, institutional, commercial/industrial, and residential land within each area and typical flows per acre for each particular land use type.

Estimated Average Flows – 2040 Build Out
Once average flows were estimated, future flows were projected based on the planned 2040 land use in the Land Use Plan. Parcels that are planned to be developed were assigned wastewater flow rates in accordance to their land use types. Table 4 lists the assigned flow rates, which include design considerations for inflow and infiltration (I/I). (Refer to the Inflow and Infiltration section of this report for more information about I/I as it relates to St. Paul Park’s sanitary sewer system.)

Table 4. Assumed Wastewater Generation by Land Use Type

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Daily Flow (gallons/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest Density Residential</td>
<td>360</td>
</tr>
<tr>
<td>Low Density Residential</td>
<td>540</td>
</tr>
<tr>
<td>Medium Density Residential</td>
<td>900</td>
</tr>
<tr>
<td>High Density Residential</td>
<td>1,800</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>1,500 (West) 1,300 (East)</td>
</tr>
<tr>
<td>Commercial/Industrial</td>
<td>800</td>
</tr>
<tr>
<td>Institutional</td>
<td>600</td>
</tr>
<tr>
<td>Agricultural</td>
<td>0</td>
</tr>
<tr>
<td>Park/Recreational</td>
<td>0</td>
</tr>
</tbody>
</table>

Future flows were added to existing flows to determine if the existing pipe capacities will be sufficient. In locations where development will result in flows greater than the capacity of the service pipes, recommendations are provided in this document to address the issue. Areas that are anticipated to be served in the future were evaluated to determine the required sewer diameters and improvements.
Peak Flow Factors
To ensure that the sanitary sewer system is capable of handling flow fluctuations throughout the day, peak flow factors are assigned based on average flows. The peak factors are outlined by the Metropolitan Council and are based on average flow volumes. Pipes that serve lower waste generating customers are more likely to experience large fluctuations in flows. Therefore, the peak factor decreases as average flow increases. The Metropolitan Council peak flow factors used in this report are shown in Figure 4 below. These factors include consideration of inflow and infiltration.

Figure 4. MCES Peak Factors for Sanitary Sewer Design

Intercommunity Flows
The City has no inter-community agreements for sanitary sewer service. After collecting at MCES Meter M604 along the northwest boundary of the City, the wastewater generated in St. Paul Park travels west along the boundary between St. Paul Park and Newport, then west and north through Inver Grove Heights towards the Metropolitan WWTP.
SANITARY SEWER TRUNK RECOMMENDATIONS

The proposed future sewer system for the City of St. Paul Park, including gravity mains, forcemains, and lift stations, is shown in Figure 5. The required infrastructure additions were determined based on the areas that the City is planning to develop by 2040. By evaluating topography and existing sewer invert elevations, the locations of future lift stations were approximated. The length of forcemain was minimized to the greatest extent possible to reduce construction costs. This report includes only oversized sewer lines (greater than 8-inch diameter) and does not depict lateral lines. The design and siting for lateral lines should be completed in conjunction with development plans and platting. The location of such lines will be dependent on parcel layout and the design of new roads. It is possible that small scale lift stations will be required within developments.

The exact alignment of the proposed mains and lift stations may change during the design phase of each project. The purpose of this report is to provide the City with a document that can be used to plan for large infrastructure additions and replacements.

List Station Analysis

There are two existing, small lift stations in the City of St. Paul Park, located on the western edge of the City where elevations drop along the banks of the Mississippi River. The expansion of the sanitary sewer system includes plans for two additional lift stations, Lift Station 3 and 4. Lift Station 3, provisionally located at the intersection of 15th Avenue and 6th Street, will serve future sewer district 4. Lift Station 4, provisionally located to the west of Grey Cloud Island Drive South approximately 0.4 miles south of 15th Avenue, will serve future sewer district 5. The capacities of these lift stations and the projected future flows to them are shown in Table 5.

<table>
<thead>
<tr>
<th>Lift Station</th>
<th>Pumping Capacity (gpm)</th>
<th>Existing Average Flow (gpm)</th>
<th>Existing Max Flow (gpm)</th>
<th>2040 Average Flow (gpm)</th>
<th>2040 Max Flow (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>200</td>
<td>4</td>
<td>24</td>
<td>7</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>200</td>
<td>15</td>
<td>83</td>
<td>22</td>
<td>106</td>
</tr>
<tr>
<td>3</td>
<td>Future</td>
<td>0</td>
<td>0</td>
<td>60</td>
<td>240</td>
</tr>
<tr>
<td>4</td>
<td>Future</td>
<td>0</td>
<td>0</td>
<td>103</td>
<td>410</td>
</tr>
</tbody>
</table>

Both of the City’s existing lift stations have adequate pumping capacity through the year 2040. The required pumping capacities for future Lift Stations 3 and 4 to accommodate peak flows through the year 2040 are 240 gpm and 410 gpm, respectively.
Trunk Sewer Analysis
The City of St. Paul Park’s existing sanitary sewer system can be roughly divided into three sewer districts. The districts numbered 1, 2, and 3, as shown in Figure 2, correspond to the western, eastern, and southeastern regions of the system, respectively. Districts number 4 and 5 correspond to future sewer expansion. The projected flows and remaining capacity in the trunk sewers that serve each district are listed in Table 6.

Table 6. Trunk Sewer Capacity Analysis

<table>
<thead>
<tr>
<th>District</th>
<th>Location</th>
<th>Diameter</th>
<th>Capacity (gpm)</th>
<th>Phase 1 (District 4) Max Flow (gpm)</th>
<th>Phase 2 (District 4 &amp; 5) Max Flow (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1st St (9th Ave to Broadway)</td>
<td>10</td>
<td>427</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>3rd St (Pullman to 8th Ave)</td>
<td>8</td>
<td>297</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>Parallel flows combined</td>
<td>-</td>
<td>724</td>
<td>1,223</td>
<td>1,633</td>
</tr>
<tr>
<td>2</td>
<td>Broadway (Summit to 1st St)</td>
<td>12</td>
<td>765</td>
<td>687</td>
<td>687</td>
</tr>
<tr>
<td>3</td>
<td>Railroad (15th Ave to 13th Ave)</td>
<td>10</td>
<td>520</td>
<td>140</td>
<td>140</td>
</tr>
</tbody>
</table>

The trunk gravity main serving Sewer Districts 2 and 3 is adequate for existing and projected flows. The trunk gravity main in Sewer District 1, however, will require upsizing to accommodate future development as shown in Figure 5. For Phase 1, which includes the full redevelopment of existing Sewer Districts 1-3 and the full development of future Sewer District 4 per the 2040 Land Use Plan, the 10-inch gravity main along 1st Street from 10th Avenue to Broadway Avenue will need to be upsized to 16-inch diameter. For Phase 2, which includes the full development of the entire City per the 2040 Land Use Plan, the 10-inch gravity main along 2nd Street from 10th Avenue to 13th Avenue and along 10th Avenue from 2nd Street to 1st Street will need to be upsized to 16-inch diameter.
District 1

The projected increase in wastewater flow from the western half of the system is due to the potential redevelopment of mixed use properties in the northwest corner of the district, high density residential properties beside Oltman Middle School and at West 11th Avenue and Main Street, and medium density residential properties throughout the district. Some segments of gravity main will need to be upsized to accommodate projected flows at full build-out, as discussed previously and indicated in Figure 5.

District 2

The projected increase in wastewater flow from the eastern part of the system will primarily come from potential new commercial and mixed use properties in the north part of the district along Broadway Avenue and Hastings Avenue. The existing 12-inch gravity main along Broadway Avenue which receives all of the wastewater from District 2 has sufficient capacity for current and projected flows. Therefore, there is currently no anticipated need for improvements in District 2.

District 3

The small projected increase in flow from the southeast part of the system is due to the potential development of low density residential properties along the railroad. The existing 10-inch gravity main along the railroad has sufficient capacity for current and projected flows.

District 4

Phase 1 of sanitary sewer expansion to the south will be built to serve medium density residential and industrial properties along 14th Avenue and 15th Avenue, as well as low density residential properties further south. This expansion will require a lift station which can discharge to the existing gravity main along 6th Street.

District 5

Phase 2 of sewer expansion further south is planned to include one area of commercial development and a significant amount of very low density residential development. This expansion will require a lift station which can discharge northward to the existing 10-inch gravity main along 2nd Street at 13th Avenue. At full build-out of all districts, the trunk gravity main along 1st Street and 2nd Street will need to be upsized, or a new parallel gravity main installed, as indicated in Figure 5.
Figure 5 - Proposed Sanitary Sewer System
St. Paul Park, MN

Phase 1
Upsize 2,750 LF of 10" to 16" (1st St from 10th to Broadway Ave)

Phase 2
Upsize 2,450 LF of 10" gravity main to 16" (2nd St from 10th-13th Ave & 10th Ave from 1st-2nd St)
Individual Sewage Treatment Systems
As development continues to occur throughout St. Paul Park, it is recommended that the City encourage homeowners to connect to the municipal sanitary sewer system as it becomes available. Having residents abandon ISTS will improve groundwater quality and will reduce the risks associated with noncompliant systems.

MCES Interceptor Facility Forecasts
The City of St. Paul Park’s sanitary sewer system discharges to MCES Interceptor 7102-2. The average and maximum flows forecasted to discharge to this Interceptor by the year 2040 are listed in Table 7. These flows were estimated based on historical MCES flow data and the areas of the City that are expected to develop by that time and the associated conservative flows for those areas.

Table 7. Projected 2040 MCES Interceptor Use

<table>
<thead>
<tr>
<th>MCES Meter</th>
<th>MCES Interceptor</th>
<th>2040 Average Flow (MGD)</th>
<th>2040 Max Flow (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M604</td>
<td>7102-2</td>
<td>0.75</td>
<td>3.34</td>
</tr>
</tbody>
</table>
INFLOW AND INFILTRATION

General

Inflow is water, typically stormwater, which enters the sewer system through broken manhole covers, sewer cleanouts, sump pumps, foundation drains, and rain leaders. Infiltration is water, typically groundwater, which leaks into the sewer system through cracks in the sewer mains, laterals, joints, and manholes.

Water from inflow and infiltration (I/I) can consume available capacity in the wastewater collection system and increase the flow into treatment facilities. In extreme cases, the added flow can cause bypasses or overflows of raw wastewater. This extra flow also requires a larger capacity in the city's collection and treatment components, which results in increased capital, operation and maintenance, and replacement costs. As a sewer system ages and deteriorates, I/I can become an increasing burden on a City's system. Therefore, it is imperative that I/I be reduced whenever it is cost effective to do so.

In 2006, the MCES began an Ongoing I/I Program which requires communities within their service area to eliminate excessive I/I. The MCES establishes annual I/I goals for each community discharging wastewater into the Metropolitan Disposal System (MDS) based on average daily flows, adjustments for community growth, and I/I mitigation peaking factors.

Flow metering data is available for St. Paul Park's metershed, and an analysis of this data as it relates to I/I is presented on the following page. The City's strategies, programs, investments, and goals for reducing I/I are listed in this section as well.
I/I Analysis
Currently, St. Paul Park’s sanitary sewer system consists of approximately 25 miles of sanitary main, two lift stations, and 2,400 feet of forcemain. Much of the pre-2000 trunk sewer main in the City is vitrified clay pipe (VCP) and is more susceptible to I/I. The new trunk sewer main installed during recent Street and Utility Improvement Projects is PVC and is less susceptible. Fifty-five percent of the residential housing in the City was constructed before 1970, and only those private services abutting the Street and Utility Improvement Projects listed on the next page have been evaluated for I/I.

The amount of clearwater flow generated within the City was estimated by calculating the average annual and peak month I/I rates, equal to the average wastewater flow minus the base wastewater flow, using data from 2012-2016. The average flow, both annual and monthly, was calculated from MCES meter data. The peak month flow was determined for each year from 2012-2016, and then those peak month flows were averaged to give the value listed in Table 8. The base flow was approximated as the winter water usage, which was calculated as the average water pumped in December and February (January was excluded because it exhibited notably higher pumping rates), from 2012-2016, times a historical ratio of water used to water pumped (presented as Total Water Delivered divided by Total Water Pumped in the City’s Water Supply Plan). The portion of water used by the Andeavor Oil Refinery was subtracted from the winter water usage because it has its own wastewater treatment facility and does not discharge to the City or MCES system.

Table 8. Estimated I/I Rate

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Flow [MGD (%)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Flow</td>
<td>0.332</td>
</tr>
<tr>
<td>Peak Month Flow</td>
<td>0.435</td>
</tr>
<tr>
<td>Base Flow (Winter Water Usage)</td>
<td>0.315</td>
</tr>
<tr>
<td>Average Annual I/I Rate</td>
<td>0.017 (5%)</td>
</tr>
<tr>
<td>Peak Month I/I Rate</td>
<td>0.120 (28%)</td>
</tr>
</tbody>
</table>
I/I Reduction

The City’s strategy for preventing excess I/I includes requiring all development to conform to City standards. City code prohibiting the discharge of stormwater to the sanitary sewer system is excerpted below. City employees check for illegally-connected sump pumps each time a water meter is repaired or replaced. The City also prohibits the connection of rain leaders and passive drain tile to the sanitary sewer system.

Sec. 70-82. - Disposal of surface water.

No person shall discharge or cause to be discharged any stormwater, surface water, groundwater, roof runoff, subsurface drainage, cooling water or unpolluted industrial process water into the sanitary sewer; however, industrial cooling water or unpolluted process waters may be discharged into the sanitary sewer upon written approval of the public works supervisor. Stormwater and other unpolluted drainage may be discharged into only such sewers as are designated by the public works department.

The bulk of the I/I reduction work realized by the City of St. Paul Park is completed as part of its annual Street and Utility Improvement Projects, including sanitary sewer lining, replacement, and reconstruction. The City requires that PVC piping be used in place of VCP in all new construction to reduce the potential for infiltration. The specific costs associated with the sanitary sewer improvements from recent projects are listed in Table 9.

Table 9. I/I Activities Completed

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011 Street and Utility Improvements</td>
<td>$281,000</td>
</tr>
<tr>
<td>2012 Street and Utility Improvements</td>
<td>$86,000</td>
</tr>
<tr>
<td>2014 Street and Utility Improvements</td>
<td>$214,000</td>
</tr>
<tr>
<td>2016 Street and Utility Improvements</td>
<td>$61,000</td>
</tr>
</tbody>
</table>

The City has an ongoing annual review of flows and discussions with consulting engineers to develop the next stage of improvement plans. Going forward, the City of St. Paul Park specifically plans to:

1. Replace all vented casings and covers in the City.
2. Install internal chimney seals on all sanitary structures.
3. Identify regions in the City at greatest risk of I/I by installing flow monitors and conducting smoke testing.

The rehabilitation that has been completed to date has likely reduced I/I in the system, but the remaining I/I continues to be a concern and is being addressed.
COST ESTIMATES AND FINANCING

Table 10 lists the capital improvements proposed for the City’s sanitary sewer system and their estimated costs. Only oversized trunk gravity main (greater than 8-inch) is included.

Table 10. Capital Improvements

<table>
<thead>
<tr>
<th>Year</th>
<th>Item</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing</td>
<td>Street and Utility Improvements</td>
<td>Varies</td>
</tr>
<tr>
<td>2020-2030</td>
<td>6th Street Future Lift Station (240 gpm)</td>
<td>$300,000</td>
</tr>
<tr>
<td></td>
<td>6th Street Forcemain (1,250 LF, 6-inch)</td>
<td>$70,000</td>
</tr>
<tr>
<td></td>
<td>1st Street Gravity Main Upsizing (2,750 LF, from 10-inch to 16-inch)</td>
<td>$300,000</td>
</tr>
<tr>
<td>2030-2040</td>
<td>Grey Cloud Island Drive S Future Lift Station (410 gpm)</td>
<td>$400,000</td>
</tr>
<tr>
<td></td>
<td>Grey Cloud Island Drive S Forcemain (3,500 LF, 8-inch)</td>
<td>$200,000</td>
</tr>
<tr>
<td></td>
<td>2nd Street &amp; 10th Avenue Gravity Main Upsizing (2,450 LF, from 10-inch to 16-inch)</td>
<td>$280,000</td>
</tr>
</tbody>
</table>

SUMMARY AND OUTCOMES

The analysis provided in this Sanitary Sewer Plan is aimed to provide the City of St. Paul Park and the Metropolitan Council assistance in planning for wastewater collection and treatment. It is anticipated that the design flows and criteria outlined will be used for utility planning as development continues within the City. Tables and figures can be utilized to create budget-level estimates and schematic representations of infrastructure improvements, with specific sizing and routing to be determined during the design phase.