Sanitary Sewer

Introduction

The Metropolitan Council of Environmental Services (MCES) requires that the City submit a Sanitary Sewer Plan as part of the 2040 comprehensive plan update. The comprehensive plan is updated every ten years. The wastewater plan is reviewed to ensure conformance with the 2040 Water Resources Policy Plan and Thrive MSP 2040 to ensure that the Metropolitan Council's regional wastewater system has adequate capacity to serve the future needs of the region in the right locations at the right times. Conformance for wastewater means that, within the Metropolitan Urban Service Area, communities are meeting the overall density expectations identified in Thrive MSP 2040.

Apple Valley has prepared this section of the Comprehensive Plan to demonstrate its conformance to the regional plan. This section of the Utilities chapter summarizes Apple Valley's Comprehensive Sanitary Sewer Plan and provides the specific information needed to meet the 2040 requirements. The Comprehensive Sanitary Sewer Plan serves as an inventory of the City's sanitary trunk facilities and a guide for completing the few remaining trunk sections.

Existing Sanitary Sewer System

General

A review of the City's existing sanitary sewer collection system will provide insight into its ability to convey domestic, commercial and industrial wastewater to the wastewater treatment facility. The existing trunk sewer system is mostly complete with the exception of approximately 500 acres within the southeastern part of the City. This area will be developed as the current sand and gravel mining operations cease. The existing collection system was evaluated for its ability to serve this area as well as remaining undeveloped parcels.

Trunk Sewer System, MCES Interceptors and Intercommunity Connections

The City's trunk sanitary sewer system is shown on Figure 9.1. The trunk system consists of gravity lines ten inches in diameter and greater, lift stations and forcemains. The City is divided into five sewer districts, each defining the limits of service for a separate trunk system.

The Southwest, South Central and Southeast Districts are the largest districts and flow leaves Apple Valley to the south through MCES interceptor lines into Lakeville. The remaining two Districts are the Burnsville and Eagan Outlets (2 in each district) which all flow to the north into Burnsville and Eagan respectively. There are no trunk sewers in the Eagan Outlet. This area is only served by sewer laterals and encompass a regional park, zoo, and small residential area.,

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Wastewater flow leaves Apple Valley at seven different locations at or near the City borders. A list of these locations and their average flows is presented in Table 9.1 These flows all lead from Apple Valley through other municipalities to either the Empire or Seneca WWTPs.

There are approximately 11,181 acres in the City of Apple Valley, of which approximately 487 acres are developable. Of this total, 9,400 acres are served by the MCES Empire wastewater treatment plant (WWTP) located near Pilot Knob Road, 197th Street East and the Vermillion River, in Section 21 of Empire Township. Conveyance to the Empire WWTP is provided by the MCES Interceptor mains beginning at their meters M643, M648, and M644.

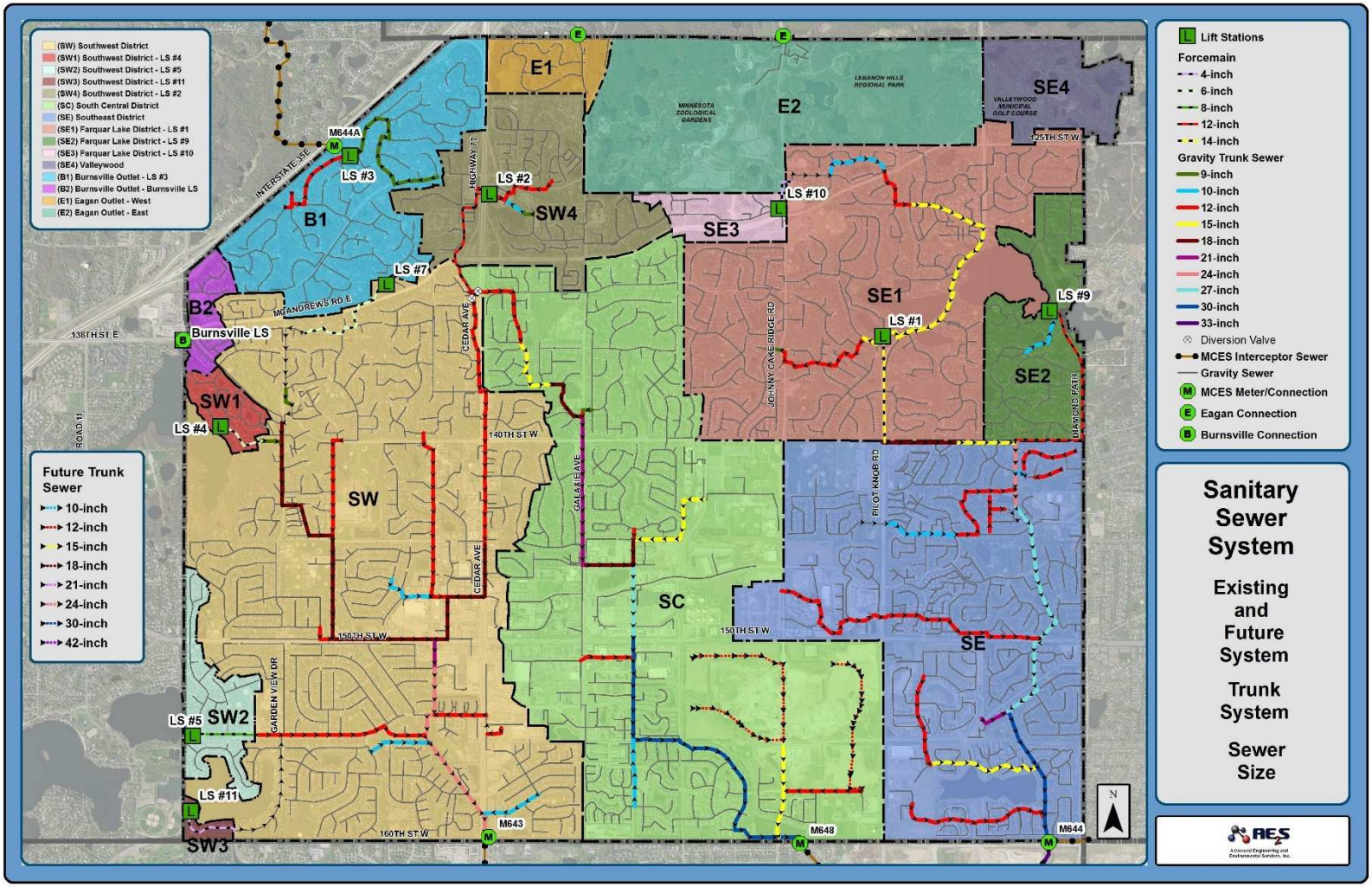
Wastewater from approximately 1,800 acres in the northern portion of Apple Valley is served by the MCES Seneca WWTP located near Comanche Road and State Highway 13 in Section 21 in Eagan. Conveyance to the Seneca plant is provided by the MCES Interceptor main from meter M644A and trunk sewers in the City of Eagan and Burnsville.

Table 9.1 Intercommunity Flows

District	From	To	Average Estimated Flow (MGD)
Southwest (SW)	SW, SW1, SW2, SW3, SW4	MCES M643	1.47
South-Central (SC)	SC	MCES M648	0.87
Southeast (SE)	SE, SE1, SE2, SE3, SE4	MCES M644	1.06
Burnsville Outlet	B1	MCES M644A	0.15
Burnsville Outlet	B2	Burnsville	0.02
Eagan Outlet	E1	Eagan	0.02
Eagan Outlet	E2	Eagan	0.10

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Figure 9.1 Sanitary Sewer System



Lift Stations

The City's sanitary sewer system consists of 9 lift stations ranging in size from a 100 gallon per minute (gpm) to a 2200 gpm lift station. The lift stations have been sized to handle buildout of their respective service areas. Table 9.2 summarizes the capacity information for each of the lift stations. The locations of the lift stations are shown on Figure 9.1.

Table 9.2 Lift Station Capacities

Lift Station No.	Present Capacity (MGD)	Ultimate Capacity (MGD)	Force Main Size (inches)	Capacity in GPM
LS 1	3.16	3.16	14	2200
LS 2	2.016	2.016	12	1400
LS 3	0.936	0.936	8	650
LS 4	0.288	0.288	6	200
LS 5	0.6	0.6	6 and 8	410
LS 7	0.288	0.288	6	200
LS 9	1.915	1.915	12	1330
LS 10	0.216	0.216	4	150
LS 11	0.144	0.144	4	100

Large Sewer Users

At the present time, there are no major industries in Apple Valley whose average daily sewage flow exceeds 50,000 gallons. At this time, no industries in the City require pretreatment of their wastewater before discharge into the City's system.

Existing Wastewater Flows

The total flows are measured by MCES at 4 meter locations leaving the City. Annual, monthly, and hourly flow data is available for the MCES meters. Peak month and peak hourly flow data help determine infiltration and inflow contributions.

The 10-year average annual per capita wastewater flow is approximately 66 gallons per day (GPD) and the average dry weather (winter) per capita wastewater flow is approximately 66 GPD. Water use data is available by customer type and can be used to estimate the breakdown of wastewater flow between residential and other land uses. Water use data indicates that winter residential water use averaged 85% of the total water use over the last 10

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years; thus the residential portion of the average per capita wastewater flow is approximately 56 GPD (85% of 66). When comparing 10-year average dry weather flows to the same winter quarter water usage, the wastewater flow is approximately 97% of the water use. The metered dry weather wastewater flow correlates quite well with the metered water use for the same time period, which indicates some validity to the existing flow data.

Population and Employment Forecasts

The comprehensive wastewater plan is developed in part to portray the condition of the Apple Valley wastewater collection system under future flow conditions assuming that the population and employment forecasts are achieved. The purpose in developing the future plan is to anticipate future changes to the system that may be required and to allow for the development of a sustainable capital improvements program for the wastewater collection system. The Thrive MSP 2040 population, household and employment forecasts (Table 9.3) in 10 year increments through 2040 were used in generating wastewater flow projections and maintain the required consistency with all parts of the comprehensive planning effort.

Table 9.3 Metropolitan Council Projections

Forecast Year	Population	Households	Employment
2010	49,084	18,875	14,279
2020	55,500	21,700	15,800
2030	59,200	23,300	16,400
2040	63,600	24,900	17,100

Table 9.4 presents the projections broken down according to sewered and unsewered components.

Table 9.4 Metropolitan Council Projections (Sewered & Unsewered)

Forecast Year	Component	Population	Households	Employment
2010	MCES Sewered	46,686	17,928	13,714
2010	Unsewered	2,398	947	565
2020	MCES Sewered	54,980	21,500	15,680
2020	Unsewered	520	200	120
2030	MCES Sewered	59,170	23,280	16,400
2030	Unsewered	30	20	0
2040	MCES Sewered	63,520	24,880	17,100
2040	Unsewered	80	20	0

Ref: Metropolitan Council Thrive 2040 Water Resources Policy Plan May 2015

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Tables 9.5 and 9.6 present projections of sewered population, households and employees for the portions of the City served by the Empire and Seneca WWTPs, respectively, as prepared by MCES and presented in its Thrive 2040 Water Resources Policy Plan. Table 9.5 presents projected sewer flows for the City, broken into the Empire and Seneca WWTP service areas, based on MCES projections.

Table 9.5 Projections for Empire WWTP

Year	Population	Households	Employment
2020	50,500	19,700	14,400
2025*	52,500	20,550	14,650
2030	54,500	21,400	14,900
2035*	56,550	22,150	15,150
2040	58,600	22,900	15,400

Ref: Metropolitan Council Thrive 2040 Water Resources Policy Plan May 2015

* Interpolated Values

Table 9.6 Projections for Sceneca WWTP

Year	Population	Households	Employment
2020	4,500	1,800	1,300
2025*	4,600	1,850	1,400
2030	4,700	1,900	1,500
2035*	4,800	1,950	1,600
2040	4,900	2,000	1,700

Ref: Metropolitan Council Thrive 2040 Water Resources Policy Plan May 2015

* Interpolated Values

Sanitary Sewer Flow Projections

General

In an effort to forecast flows for future growth, the land use plan will be utilized. Flow rates will be established for each land use category based upon the anticipated density in units and persons per acre which can be applied to specific undeveloped parcels or redevelopment areas. These unit flow rates can be used to generate average annual flow projections for these specific development areas.

To forecast future flow from existing areas historical flow data, industry standards and current MCES data were used. MCES has indicated that regional data suggests the current overall average annual flow is 85 gallons per capita per day (gpcd). This is lower than the traditional default for sewer design of 100 gpcd.

Furthermore, MCES has prepared future average flow projections for their system based upon 60 gpcd and 15 gallons per day (gpd) per employee. These figures are for new development and anticipate the gradual reduction of wastewater flow from existing development as a result of water conservation practices and the reduction of inflow and infiltration. It is important to note that these flow rates will vary as systems expand and age, so it is prudent to use traditional design values when looking at the design of new lateral sewer or trunk systems.

Land Use

The 2040 Land Use Plan served as the basis for the development of the sanitary sewer flow projections and analysis of the trunk system. Undeveloped land area within the City was determined to be approximately 500 acres. These areas were further defined by type of land use. Land use flow factors were used to allocated projected flows within the sewer model and are presented in Table 9.7.

Table 9.7 Land Use Flow Factors

Land Use Type	Person/Unit	Gal/Cap/Day	Units/Acre	Gal/Acre/Day
Low Density Residential	3.5	100	1.8	630
Medium Density Residential	2.5	80	9	1,800
High Density Residential	2.0	70	14	1,960
Commercial/Industrial				2,000
Mixed Business Campus				1,500
Institutional				1,000
Parks/Recreation				250
Undevelopable (Water/Pond)				0

Peak Flow Factors

The sanitary sewer system must be capable of handling the anticipated peak wastewater flow rate including any infiltration and inflow (I/I). The design peak flow rate can be expressed as a variable ratio to the average flow rate. Curves used to describe this ratio, called the Peak Flow Factor (PFF), indicate a decreasing ratio of peak flow to average flow with increasing average flow.

Peak Flow Factor (PFF) curves have been developed to depict this ratio and MCES has analyzed the extensive flow data within their system to correlate actual peaking factors with the formulated curves. A summary of the design peak flow factors (Figure 9.2 below) based upon current MCES data will be utilized for estimating future peak flows from development areas.

Figure 9.2 Design Peaking Factor Table

Table A-1: MCES Flow Variation Factors for Sewer Design

Average Flow (MGD)	Peak Hourly Flow Factor	Average Flow (MGD)	Peak Hourly Flow Factor
0.00 – 0.11	4.0	1.90 – 2.29	2.8
0.12 – 0.18	3.9	2.30 – 2.89	2.7
0.19 – 0.23	3.8	2.90 – 3.49	2.6
0.24 – 0.29	3.7	3.50 – 4.19	2.5
0.30 – 0.39	3.6	4.20 – 5.09	2.4
0.40 – 0.49	3.5	5.10 – 6.39	2.3
0.50 – 0.64	3.4	6.40 – 7.99	2.2
0.65 – 0.79	3.3	8.00 – 10.39	2.1
0.80 – 0.99	3.2	10.40 – 13.49	2.0
1.00 – 1.19	3.1	13.50 – 17.99	1.9
1.20 – 1.49	3.0	18.00 – 29.99	1.8
1.50 – 1.89	2.9	over 30.00	1.7

MCES has recognized that these peaking factors reflect that sanitary sewers (local and regional) have been designed for an average combined flow for residential, commercial, and industrial contributions of 100 gallons per capita per day. Since the current actual average is approximately 85 gallons per capita per day MCES has adjusted the peak flow factors upward (divided by 0.85) for determining I/I mitigation. This adjustment essentially reflects the available capacity for any additional infiltration and inflow in the system. These are then used to set the peak flow metershed goals for each community. Figure 9.3 below summarizes the peaking factors for MCES metershed goals.

Figure 9.3 MCES Metershed Goal Peaking Factors

Table A-2: Wastewater Flow Variation Factors for Determining Infiltration/ Inflow Mitigation Goals

Average Flow (MGD)	Peak Hourly Flow Factor	Average Flow (MGD)	Peak Hourly Flow Factor
<0.10	4.5	2.51-3.00	3.2
0.11- 0.20	4.4	3.01-3.50	3.1
0.21-0.30	4.3	3.51-4.00	3.0
0.31-0.40	4.2	4.01-4.50	2.9
0.41-0.50	4.1	4.51-5.00	2.8
0.51-0.60	4.0	5.01-6.00	2.7
0.61-0.70	3.9	6.01-8.00	2.6
0.71-0.80	3.8	8.01-10.00	2.5
0.81-1.00	3.7	10.01-12.00	2.4
1.01-1.20	3.6	12.01-16.00	2.3
1.21-1.50	3.5	16.01-20.00	2.2
1.51-2.00	3.4	20.01-30.00	2.1
2.01-2.50	3.3	>30.00	2.0

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Wastewater Flow Projections

When forecasting flows for communities that are mostly developed, historical data is used to determine total flow projections for the community. The 10-year annual average per capita flow rate from Apple Valley is approximately 66 gallons per day (gpd), which is slightly lower than the current overall MCES system average of 85 gpd. This may be an indication of the general trend in water conservation similar to what the City has seen with the water system. It could also be an indication that the overall average I/I in Apple Valley's system is slightly below the metro area system average. While it is expected that water conservation within existing households will continue to improve. The existing sanitary sewer system will continue to age thus for planning purposes the City will use an overall per capita average of 100 gpd for future flow projections. This is a slightly more conservative value than historical data, but it is close to the current metershed goals set by MCES for the City as summarized below in Table 9.8. It is prudent to plan conservatively for long-lived infrastructure needs such as sewer systems.

Table 9.8 Current MCES Metershed Goals

Monitoring Period: Jan 1 – Dec 31, 2018			
Metershed	**Adjusted Total Daily Flow (MGD)**	**Peak Hourly Flow Factor**	**I/I Goal (MGD)**
M643	1.47	3.50	5.13
M644A	0.15	4.40	0.65
M644	1.06	3.60	3.80
M648	0.87	3.70	3.22
Total	3.55		12.80

**Equates to approximately 67 gpcd based upon estimated 2018 population of 52,795.*

Annual average wastewater flow projections through 2040 are summarized below in Table 9.9. These estimates are based upon an overall system average of 85 gallons per capita per day (gpcd), and assumes that there will be no unsewered properties remaining in the future. The projections for Metersheds M643, M644A, and M644 remain relatively the same as existing since that area is already fully developed and not anticipated to have any changes due to redevelopment. The undeveloped area in the southeastern area of the City is served by Metershed M648.

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Table 9.9 Average Annual Wastewater Flow Projections

Year	Projected Total Average Annual Flow (MGD)			
	M643	M644A	M644	M648
2020	1.47	0.31	1.13	0.88
2025	1.47	0.31	1.15	0.94
2030	1.47	0.31	1.16	1.01
2035	1.48	0.32	1.17	1.07
2040	1.48	0.32	1.17	1.15

These projections agree with MCES projections to the Empire and Seneca WWTP. (Table 9.10) Metershed M644A flows to Seneca WWTP and the other metersheds flow to Empire WWTP.

Table 9.10 MCES Projected Flows by Treatment Facility

Year	Projected Avg Flow to Empire WWTP (MGD)	Projected Avg Flow to Seneca WWTP (MGD)	Projected Total Flow (MGD)
2020	3.48	0.31	3.79
2025*	3.56	0.31	3.87
2030	3.64	0.31	3.95
2035*	3.72	0.32	4.04
2040	3.80	0.32	4.12

Ref: Metropolitan Council Thrive 2040 Water Resources Policy Plan May 2015

* Interpolated Values

Sanitary Sewer Trunk System Analysis

General

In order to gain an understanding of the hydraulic capacity of the existing wastewater collection system, a hydraulic model of the key system back bone components of the system was developed. To setup the hydraulic model, information was collected from an extensive database of GIS (Geographic Information System), field data collection and staff knowledge about the lift stations, trunk sewer mains and forcemains. Wastewater flow information was collected from flow monitoring data along with individual water meter data from the customer database to allocate wastewater flows throughout the community. Future sewer flows were determined from information provided by the Land Use Plan in which demands were determined by land use categories for undeveloped areas.

System Design Recommendations

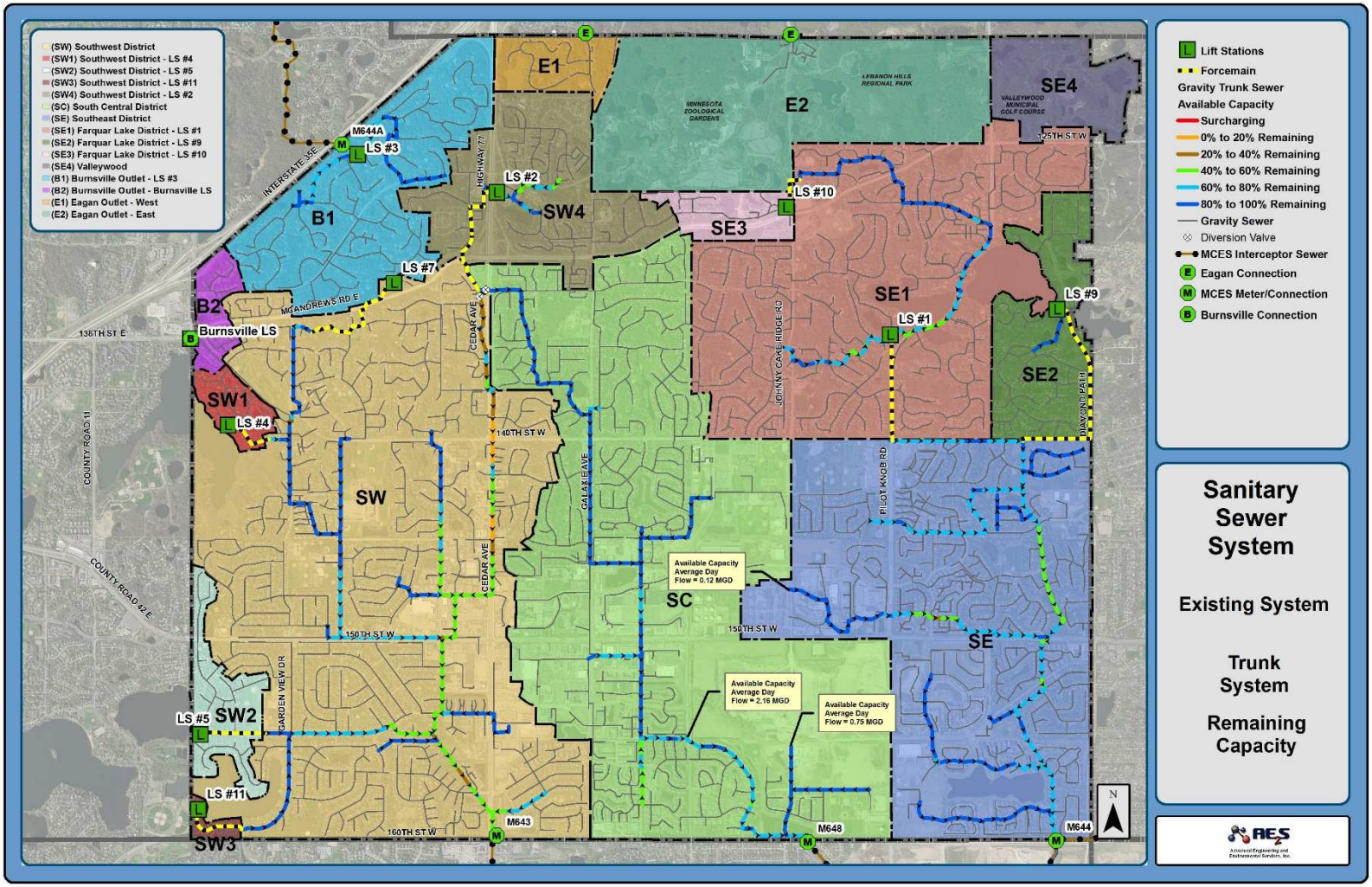
The hydraulic model analysis was performed to determine the available capacity within the existing system. After determination of available capacity, a layout of remaining future gravity sewers was incorporated into the hydraulic model. The potential system was sized based on established sewer design criteria including minimum slopes and minimum velocity. GIS information was utilized to determine ground elevations and preliminary slopes for the extension of sewers considering depth requirements and connections to existing sewers. Trunk sewer was laid out in the undeveloped gravel mining area and flows were allocated based on proposed land use.

Capacity analysis was completed for the trunk sewer system to determine the remaining available capacity within the existing system. A map showing available capacity is shown in Figure 9.4. Analysis using the hydraulic model showed that no areas within the existing system experience surcharging. Surcharging is defined as overloading of the sewer beyond its design capacity. Although no areas surcharge, a few areas of the trunk sewer are within the 10% to 40% remaining capacity and should be reviewed with the model if and when re-development would occur in the future.

Available capacity was labeled at key locations with large undeveloped areas. Future analysis including the addition of 500 acres of undeveloped land showed adequate capacity to handle the planned land use for these areas. It is recommended to use the updated hydraulic model to review future development of these areas as actual development information becomes available.

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Figure 9.4 Sanitary Sewer Trunk System Remaining Capacity



Infiltration and Inflow

General

The Metropolitan Council appointed a task force that met in 2003/2004 to address the impacts of excess inflow and infiltration (I/I) on the regional system. I/I describes clear water that enters wastewater collection systems and consumes capacity of the conveyance and treatment systems. Inflow is typically stormwater that increases peak flow in the wastewater system during and after rainfall events from point sources such as broken manhole covers, sewer cleanouts, sump pumps, foundation drains, and rain leaders. Infiltration is typically groundwater that gradually enters the wastewater system through cracks and openings in sewer mains, service laterals, joints, and deteriorated manholes. It was determined that the cost for source removal of I/I was much more cost effective than the cost to store, convey and treat excess I/I. Therefore, the current program focuses on source removal within the communities and regional system.

In 2009/2010 the Metropolitan Council Demand Charge Task Force reviewed goals of the current program including a possible demand charge. The recommendation was to implement an on-going program similar to the existing I/I program. However, instead of a mandatory demand charge, discretion was left with MCES to institute a demand charge if a community is not working towards meeting its I/I Goal.

Included within the MCES 2040 Water Resources Policy, adopted in May of 2015 and more recently amended, is the establishment of I/I goals for all communities discharging wastewater to the regional system. Communities with excessive I/I will still be required to eliminate it within a reasonable time period. The Council has established I/I goals for each metershed.

The I/I Goal is the maximum allowable discharge to the regional wastewater system expressed as a peak hourly flow rate measured in million gallons per day (mgd). The I/I Goal is equal to the adjusted average dry weather flow (ADF) multiplied by the respective peak hourly factor. The ADF is based upon a 10 year rolling average of meter flow data and is adjusted upward by population growth for future forecasting. As part of the ongoing I/I efforts a procedure manual is updated by the Metropolitan Council for the subsequent program year. The City's Comprehensive Sanitary Sewer Plan addresses the MCES specific requirements.

Existing I/I

Average dry weather (winter) flows can be compared to annual average and peak month flows to determine the amount of I/I entering the system. To understand if groundwater plays a role during dry weather periods, the average dry weather flows can be compared to the water use for that same period. These flows should closely correlate since no wet weather rainfall events or lawn sprinkling occurs in the winter time. For Apple Valley, the dry weather flow averages about 97% of the water use for the same period indicating that there is no base infiltration in the

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winter time. Table 9.11 summarizes average annual, average dry weather and peak month flows for the last 10-years. It also compares the various flows to help quantify the amount of I/I entering the system on an average basis.

Table 9.11 Average Annual Wastewater Flow

Year	Population	Average Annual Flow : AA (MGD)	Average Dry Weather Flow : AD (MGD)	Peak Month Flow : PM (MGD)	Base I/I AA - AD (MGD)	Average Wet Weather I/I PM - AA (MGD	Peak Month to Annual Average Ratio
2007	50,595	3.54	3.52	4.47	0.02	0.93	1.26
2008	51,120	3.40	3.40	4.19	0.00	0.79	1.23
2009	50,149	3.39	3.35	4.10	0.04	0.71	1.21
2010	49,084	3.36	3.33	4.84	0.03	1.48	1.44
2011	50,330	3.38	3.38	4.29	0.00	0.91	1.27
2012	50,340	3.29	3.23	4.69	0.06	1.40	1.43
2013	50,400	3.32	3.29	4.42	0.03	1.10	1.33
2014	50,600	3.28	3.24	4.94	0.04	1.66	1.51
2015	50,161	3.20	3.20	4.15	0.00	0.95	1.30
2016	50,450	3.20	3.19	3.76	0.01	0.56	1.18
Average I/I Flow (MGD)						**1.05**	
Average I/I Per Capita (GPCD)						**20.8**	
Average I/I %						**31**	

Comparing annual average (AA) to average dry weather (AD) the average flow attributable to I/I is approximately 0.02 mgd or 0.5 gallons per capita per day, which could be considered the base I/I. The average peak month (PM) to annual average ratio is 1.31, which not overly excessive when looking at typical peaking factors. This equates to an average I/I contribution of approximately 1.05 mgd during wet weather periods.

By looking at flows over the course of a year it is possible to quantify I/I on an average basis. However, it is much more difficult to determine peak instantaneous or peak hour events that are mostly associated with inflow. A one (1) inch rainfall event could have a large impact on the system or minimal impact depending upon the duration and intensity as well as other factors for each particular event. Typically no two events are the same, and at best patterns can be determined for general rainfall amounts. To pinpoint peak hour events it requires a significant amount of flow monitoring at several locations in a large system. There has been only limited data collected during previous mitigation efforts which makes it is difficult to accurately quantify for the entire system.

On-going Mitigation Plan

The City has a proactive program directed at identifying and correcting I/I, including the following:

- Stringent testing of all new sanitary sewer lines
- Televising of clay pipes as well as areas where problems have been identified.
- Reconstruction projects, including replacing clay pipe with PVC, replacing manhole structures, installing gator wrap around chimney section
- Lining manholes, approximately 1 to 3 annually
- Cured In Place Pipe (CIPP) Lining spot repairs
- Lining entire sections of sanitary sewer lines with reconstruct projects and areas as identified
- Manhole inspection as part of sewer cleaning operations, which are performed daily March through November, weather permitting. Approximately one third of the system is cleaned (and manholes inspected) annually. Manholes are also inspected as part of the televising program. Manholes are repaired as needed. Internal chimney seals are installed on manholes with plastic rings where I/I has been identified.
- Additional manhole inspections (Example Lift Station 4 Project - proposed project lining of structures because of length of time before reconstruct of area)
- Manhole repair, including chemical injection and coatings
- Sewer flow meters in 2018 and 2019 budget – plan is to compare sewer flow data with Advanced Meter Infrastructure (AMI) meter data in select areas
- Sump pump inspection program – to be conducted with the meter replacement project
- Employee education – NPDES annual training
- Resident education – website, newsletters
- Field observation – wet weather manhole inspections & additional observations, such as when conducting a GSOC locate adjacent private parking lot street, crew found a sanitary manhole with a storm grate cover on it. Crew replaced the manhole grate cover with a solid cover and the business was notified.
- City Code that promotes reduced I/I – The current code prohibits owners, occupants or users of any premises to direct into or allow any storm water, surface water, water from air conditioner systems, oil or other material to drain into the sanitary sewer system

Individual Sewage Treatment Systems

The City of Apple Valley currently has an ordinance regulating the installation of on-site wastewater disposal systems. Under this ordinance, the design of the system is reviewed and permitted in accordance with the guidelines of Minnesota Pollution Control Agency Standards MN Rule 7080, 7081, 7082 and its amendments. A copy of the City's ordinance is provided in the Comprehensive Sewer Plan.

The locations of present on-site systems are shown on Figure 9.5. At the present time, no significant problems are known to exist for the existing on-site systems.

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Capital Improvement Program

The City of Apple Valley is committed to providing a sanitary sewer system that meets the City's current and future needs and agrees with MCES goals and projections. Most of the City's trunk system has been constructed. The trunk system will be expanded in the few remaining areas as development proceeds. Based on the computer modeling analysis, the addition of 500 acres of undeveloped land shows adequate capacity in the current system to handle the planned land use for these areas. The hydraulic model will be updated on an on-going bass to review future development of these areas as actual development information becomes available.

Future Capital Improvement Plan (CIP) projects will explore and identify ways to improve the sanitary sewer system, such as during reconstruction projects for sanitary sewer mains, lift stations and forcemains. In addition, the City will continue its current operation, maintenance and I/I reduction efforts as identified previously.

Preventative maintenance is extremely important in the life of a sanitary sewer system. Preventative maintenance includes but not limited to monthly and annual inspections, SCADA monitoring, electrical inspections.

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Figure 9.5 Subsurface Sewage Treatment Systems

