Chapter 10
Sanitary Sewer Plan

10.0 Introduction

History

The City's sanitary sewer system dates back to the late 1950s when the first major development was built near East Moore Lake. The sewer lines are almost completely made from clay.

The 1980 Comprehensive Plan concluded that the City's sanitary sewer system was adequate to serve projected residential and commercial/industrial growth through the year 2000. The 1994 Comprehensive Plan Amendment reached the conclusion that the sanitary sewer system was adequate to serve projected residential and commercial / industrial growth through the year 2010. The 2001 Comprehensive Plan concluded that the sanitary sewer system was adequate to serve projected residential and commercial/industrial growth through the year 2010-2015.

Purpose

The purpose of the Fridley sanitary sewer system is to provide a sanitary sewer system that is adequate to serve projected residential and commercial / industrial growth.

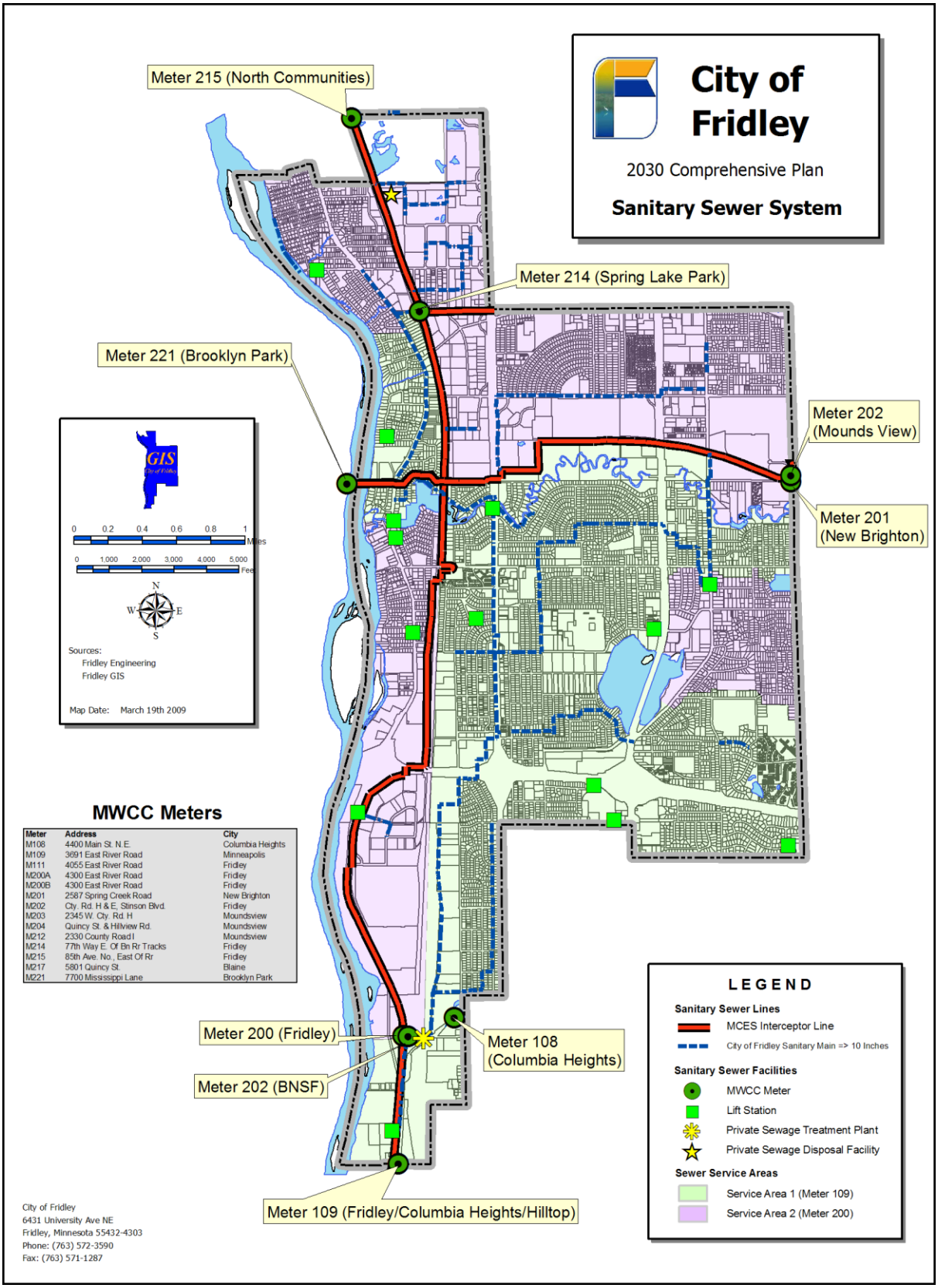
10.1 Sanitary Sewer System

Regional System

Fridley is served by the Metropolitan Disposal System owned and operated by the Metropolitan Council. The waste water flow from the City of Fridley is treated at the Metropolitan Waste Water Treatment Plant located in St. Paul, MN. Three Metropolitan Council Environmental Services (MCES) interceptors convey wastewater generated by the City of Fridley to interceptor 7126. These three interceptors in Fridley are referred to as the 4-FR-440, 4-NS-521, and 4-NS-523 interceptors. Interceptor 7126 currently has an available capacity of 7.05 mgd to provide for the long term needs of the City. This is sufficient capacity to provide for projected demands through 2030. The Metropolitan Council does not have any proposed interceptor improvement projects scheduled in Fridley, but none of the redevelopment plans in this plan are expected to significantly impact sewer service demands in the City.

There are two MCES service areas in the City of Fridley. They are Service Area 1 and Service Area 2. Wastewater flows generated in Service Area 1 are conveyed by the 4-FR-440 interceptor that is owned and operated by the MCES. Wastewater flows generated in Service Area 2 are conveyed by the MCES's 4-NS-521 and 4-NS-523 interceptors. The service areas and interceptors are shown on **Figure 10.1** Sanitary Sewer System. The MCES bills the City for wastewater conveyed through the 4-FR-440, 4-NS-521, and 4-NS-523 interceptors.

Figure 10.1 Sanitary Sewer System



10.2 System Description

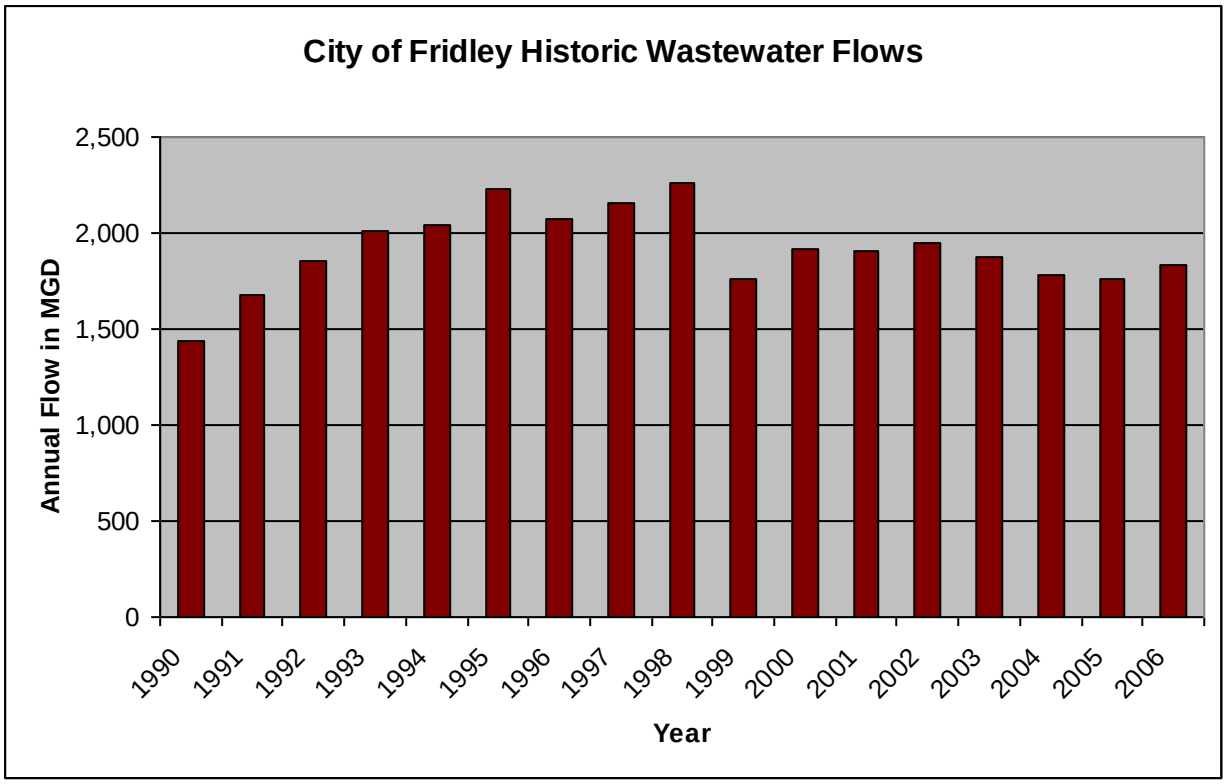
City System

Fridley owns and operates a separate sanitary sewer system that consists of approximately 542,750 lineal feet of pipe varying in size from 3-inch diameter to 33-inch diameter. The system also includes approximately 2,350 manholes. Generally speaking, the sanitary sewer system is a gravity flow system which is possible due to the depth of the Metropolitan Council Environmental Services (MCES) interceptors (see below). However, Fridley's sanitary sewer system also includes 13 sanitary lift stations that pump wastewater flows from localized areas to the gravity system. The locations of the lift stations are shown on **Figure 10.1**. The average wastewater flow for the City in 2006 was 6.70 million gallons per day.

During the 2002-2007 street reconstruction projects, the City televised 280 of the sanitary sewer lines prior to the street reconstruction. Over 72 sanitary service connectors, or wyes, were replaced at the main in conjunction with the street re-construction project. The televising service is used to detect needed repairs.

As illustrated by **Figure 10.2**, overall flow has leveled in the late 1990s and shows a decline in the past 8 years. During these years, population remained static. As Fridley has reached a state of buildout, population projections are anticipated to be flat beyond the next 20 years. Anticipated expansion of commercial areas are limited to less than 100 acres. The static trend of wastewater flows is therefore anticipated to continue and required capacity is satisfied with the existing sanitary sewer collection system.

Figure 10.2 Annual Wastewater Flows In Millions of Gallons



10.3 Projected Wastewater Flow Volume

The projected wastewater flows for the years 2010, 2020, and 2030 are based on the following assumptions:

Residential Wastewater Flow
Projected population multiplied by a unit wastewater generation figure of 90.0 gallons per capita per day (gpcd).

Commercial / Industrial Flow
Projected developed acres multiplied by a unit wastewater generation figure of 1,650 gallons per acre per day (gpad).

Sewer pipe installation at Rice Creek Way and Hickory Street

Commercial and industrial development is the basis of the Development Projections:

Table 10.1 Land Development Projections – Current, 2010 and 2020 (acres)

	2007	2010	2020
Developed Commercial / Industrial Land	1,668	1,668	1728
Available Vacant Land	60	60	0

In 2007, only 60 acres of vacant commercial and industrial land remained. For purposes of projecting wastewater flow, it has been assumed that this acreage will still be undeveloped by the year 2010. Further, it has been assumed that these 60 acres of vacant commercial and industrial land will be developed by the year 2020.

The 2007 population was 27,447 persons. The Metropolitan Council population projections for Fridley are shown on **Table 10.2**.

Table 10.2 Population Projections

	2000	2010	2020	2030
Fridley				
Population	27,449	27,000	26,900	27,500
Households	11,328	11,600	11,900	12,300
Employment	26,257	24,500	26,000	26,600
Anoka County				
Population	298,084	360,270	407,710	425,260
Households	106,428	135,670	157,760	168,690
Employment	100,050	126,680	139,930	151,910
Metro Area				
Population	2,642,062	3,067,500	3,445,600	3,713,900
Households	1,021,456	1,217,400	1,391,000	1,519,500
Employment	1,606,263	1,817,800	1,999,800	2,144,400

Source: Metropolitan Council

Review of water pumping records from the 2001 Water Supply Plan indicates that these unit consumption values should still be valid in 2007. The 2001 Water Supply Plan determined the following average daily unit water consumption values:

Residential = 90 gallons per capita per day (gpcd)

Commercial/Industrial = 1,650 gallons per acre per day (gpad)

With the exception of water used for such outdoor purposes as lawn sprinkling, garden watering and car washing during the summer months, water consumed is returned to the sanitary sewer as wastewater. Water consumption is, therefore, a predictor of wastewater generation. Wastewater flow projections should be based on the average daily water consumption unit values.

The following table projects wastewater flows for the years 2010, 2020, and 2030 based on the population projections, estimates of commercial and industrial land use and the unit wastewater generation values that were presented in the discussion above. These are additionally broken down by the two service areas shown in Figure 10.1 (Sanitary Sewer System) in the extended tabulation.

Table 10.3 2030 Plan Waste Water Flow Projections

	Projected Wastewater Flow In Millions of Gallons Per Day		
	2010	**2020**	**2030**
Total for City of Fridley			
Residential: (population x 90 gpcd)	2.43	2.42	2.48
Commercial / Industrial: (developed acres x 1,650 gpad)	2.75	2.75	2.85
Total Flows	5.18	5.17	5.33
City of Fridley Service Area 1			
Residential: (population x90 gped)	0.66	0.66	0.68
Commercial/Industrial: (developed acres x 1,650 gpad)	0.75	0.75	0.78
Total Flows	1.41	1.41	1.45
City of Fridley Service Area 2			
Residential: (population x 90 gped)	1.77	1.76	1.80
Commercial/Industrial: (developed acres x 1,650 gpad)	2.00	2.00	2.07
Total Flows	3.77	3.76	3.88

Note: "gpcd" refers to gallons per capita per day while "gpad" refers to gallons per acre per day.

Note: The City of Fridley also provides water and sanitary sewer service to residents living in the adjacent communities of Mounds View and New Brighton. The City has Joint Powers Agreements with each of these communities to govern this situation. The 1994 Comprehensive Plan Amendment estimated that the City of Fridley serves 140 persons in the two adjoining communities. However, these additional persons were not included in the population and wastewater flow projections that appear above.

Note: The City of Fridley's calculated projected wastewater flows are higher than those in the Metropolitan Council's System Statement; however, they do not represent a system impact.

Groundwater Remediation Flow

As discussed in the 2001 Comprehensive Plan, there are a number of groundwater remediation sites in the City of Fridley. At these sites, contaminated groundwater was pumped into the City's sanitary sewer for eventual treatment at the MCES Metropolitan Wastewater Treatment Facility. The volume of groundwater pumped into the sanitary sewer are included in **Figure 10.2**, however, they are excluded from the projections in **Table 10.3**. This groundwater volume must be added to the projected volume of wastewater flow before a valid comparison with actual metered flow can be made. The next section will make this correction and will discuss infiltration and inflow in depth.

10.4 Infiltration and Inflow

Infiltration and inflow is clear water that enters a sanitary sewer system. Because it is clear water that does not have to be treated, it should be excluded from the sanitary sewer system to reduce conveyance and treatment costs.

Infiltration is essentially groundwater, which enters the sanitary sewer system through such means as defective pipe joints, manhole walls and broken pipes.

Inflow is essentially stormwater, which enters the sanitary sewer system from such sources such as roof leaders, cellars, yard and foundation drains, and through manhole covers.

Under the assumption that there was excessive infiltration/inflow into the sanitary sewer system, the City undertook and completed a sump pump inspection program in 1995 and an infiltration/inflow analysis in 1997. A continuation of this analysis follows.

The infiltration/inflow estimate compared the annual wastewater volumes to the sum of the volume of water pumped plus the volume of remediated groundwater pumped to the sanitary sewer to determine the volume of infiltration/inflow. In essence, infiltration/inflow was calculated according to the following equation:

> **Estimate of Infiltration/inflow** = Volume of Wastewater – [Volume of Water Pumped – Water not Discharged to Sanitary Sewer + Other Sources of Wastewater]

The volume of water pumped was determined based on annual water pumpage. This is reduced by water known to have been discharged outside the sanitary sewer system.

As noted in the previous section, there are groundwater remediation sites in the City of Fridley. At these sites, contaminated groundwater is pumped into the sanitary sewer for eventual treatment. This volume of remediated groundwater must be added to the volume of water pumped before the

sum can be subtracted from the volume of wastewater to determine an estimated volume of infiltration/inflow.

Each of the remediation sites estimate and report the volume of groundwater pumped to the Metropolitan Council Environmental Services (MCES). This data was obtained from the MCES during the infiltration/inflow analysis.

The summary table below represents the findings of the infiltration/inflow analysis:

Table 10.4 Inflow and Infiltration Estimate (I/I)

Year	Annual Volume In Millions of Gallons				
	Total Wastewater	Water Pumped	Less Water not Discharged to Sewer	Other Sources of Wastewater	Infiltration/ inflow (Est.)
1999	1764	1703	159	108	112
2000	1921	1807	159	107	166
2001	1909	1769	187	87	240
2002	1953	1501	106	99	458
2003	1878	1780	214	106	206
2004	1781	1429	0	89	263
2005	1764	1604	232	95	296
2006	1834	1560	76	87	263

The following table expresses the volumes of remediated groundwater and infiltration/inflow as percentages of the total volume of wastewater:

Table 10.5 Estimated Percentages of Wastewater Volume

Year	Percentage of Total Wastewater Volume	
	Other Sources of Wastewater	Infiltration/inflow
1999	6.1	6.4
2000	5.6	8.7
2001	4.5	12.6
2002	5.1	23.5
2003	5.6	11.0
2004	5.0	14.7
2005	5.4	16.8
2006	4.8	14.3
Average	5.3	13.5

As shown above, the other sources of wastewater, including remediated groundwater and industrial wastewater plant discharge, averaged 5.3 % of the total wastewater volume during the seven years of the data reviewed. Infiltration/inflow, on the other hand, averaged approximately 13.5 % of the total wastewater volume.

As shown in the table above, the volume of infiltration/inflow varies between 6.4 % and 23.5 % of total wastewater volume and averages 13.5 % for the seven study years. The overall trend indicates that more monitoring and a more complete analysis should follow to determine the infiltration/inflow trend. The City needs to continuously monitor this trend, and schedule replacement of its collection system accordingly.

As a more representative and direct examination of infiltration/inflow, a comparison of dry and wet weather flows is provided in **Table 10.6**.

Table 10.6 Maximum Month/Minimum Month Ratio

Year	Wastewater Flow (MG)		
	Maximum Month	Minimum Month	Ratio (%)
1998	212.2	174.7	121
1999	161.4	132.3	122
2000	176.5	148.6	119
2005	165.3	139.7	118
2006	187.2	128.6	146
2007	154.2	121.7	127

Note: 2007 min/max data is through August

The City of Fridley acknowledges the new MCES Inflow/Infiltration goals based on metersheds and peaking factors. The City intends to strive to exclude infiltration/inflow from its sanitary sewer system in order that these goals are met in the future.

Based on data obtained from MCES equipment, the City's maximum month / minimum month ratios for the past eight years are as follows:

10.5 Septic Systems

The City Code requires that all properties be connected to the sanitary sewer system. In 1999, only six properties in the city were served by septic systems. Since then, these properties have been connected to the municipal sanitary sewer system.

10.6 Sanitary Sewer System Maintenance

This section will briefly outline the projects to improve and maintain the sanitary sewer system, including system monitoring and turn-around time and instrumentation upgrades, since the 2001 Comprehensive Plan Amendment.

System Monitoring

An evaluation of the City's thirteen lift stations was commissioned by the City in 1995. This study outlined corrective measures for each of the lift stations to extend their service life through 2010-2015. Following the study, the City of Fridley began a multi-phased program to upgrade each of the lift stations. Four lift stations have been completely retrofitted with new lift stations. Mechanical repairs consisting of new valves and check valves, new motors, motors rebuilt, have taken place in six other stations.
All of the lift stations are now furnished with pressure sensitive transducers. The installation of the transducers has eliminated the older style pump controls, compressors and bubbler system, essentially replacing all of our old electrical panels.

The thirteen lift stations are monitored by a Supervisory Control and Data Acquisition (SCADA) system. This system monitors such alarm conditions as power failure, pump failure, high wet well level, etc. and provides early notification of an impending problem. This early notification feature of the SCADA system increases system reliability.

System Maintenance

The City's Sewer Division began working with contractors in 1996 to install lining in the sanitary sewer mains. Since 2002, this program has rehabilitated 16,077 ft. of corrugated metal pipe, vitrified clay pipe and cast iron pipe. This sanitary sewer lining covers sewer mains from manhole to manhole. Since 2002, an average of 2,500 feet per year of sanitary main lines have been lined.

The City also contracts for cast-in-place. short liners to make spot repairs. These repairs vary from 4 feet to 20 feet in length. With a typical street project, the City averaged about 8-10 spot repairs per year.

Instrumentation Upgrades

In July of 2004, the City's Sewer Department purchased a main line televising camera. This camera has been used for televising all street projects and televising in our general cleaning areas. We also now have a software program that we have incorporated with our televising equipment; the software program is a valuable tool as it allows us the have a complete data base of all our televising reports. All of our data is now stored on DVD versus VHF tapes.

In June of 2000 the City's Sewer Department purchased a new service lateral camera. The service lateral camera is used to televise laterals in street project areas as well as for individual residents that have constant sewer problems with their laterals services. The City's Sewer Department replaced this camera in July of 2007. The new camera records on DVD rather than VHF tapes, which allows for quicker acquisition of records.

Maintenance

The Sewer Department has implemented a very aggressive sewer cleaning program over the past several years. The City's sanitary sewer system is divided into five areas based on flow characteristics; it is the Sewer Department's goal to clean the five areas over a two year period. The Sewer Department has met these goals since year 2000, when our maintenance program changed operations and maintenance guidelines. In 2007, we will have all five areas cleaned over a one-year period. These changes have greatly reduced the number of sanitary overflows and sewer back-ups.

The Sewer Department has replaced and added many new pieces of equipment and tools which allow the City to operate more efficiently. In 2003, the City purchased a trailer vactor. Further equipment purchases where made in 2004 when the City acquired a jetting machine and a main line televising system. In 2006, staff were trained on a new software program for televising sewer line inspection. Then, a new service line camera was installed in 2007 and staff received new cleaning tools for the jetting machine.

Instead of continuing to outsource sewer line televising, the City purchased instrumentation upgrades. In the few years following, the use of the vactor and trailer camera have already paid for themselves based on the amount of money the City would have otherwise spent on contracting for the same services. The equipment purchases aid the City in reaching its goal of providing quality services at affordable prices.

The City recognizes the importance of maintaining its sanitary sewer system and the need to exclude infiltration/inflow. In 1997, the infiltration/inflow analysis began. Although the infiltration/inflow analysis did not result in any system improvements, it did provide for an accurate quantification of remediated groundwater that is being pumped to the sanitary sewer, as well as, an accurate quantification of the volume of infiltration/inflow.

One of the city's stated policies for maintenance of the existing sanitary sewer is:

> *"The City should continue to systematically inspect mains and lines and routinely inspect those in-place sewer lines in residential paving program areas."*

The activities outlined above are indicative of the on-going maintenance and improvement efforts of the City since the 2001 Comprehensive Plan Amendment.

10.7 Future Sanitary Sewer Demand

As described in Section 10.2, based on current Metropolitan Council projections for population, households and employment, the sanitary sewer system is adequate to serve projected residential and commercial / industrial growth through the year 2030.

10.8 Policies

The following policies have been developed based upon the analysis of the existing water supply system. These policies were discussed and debated and related action steps have been developed.

1. Continue use of advanced technology as a preventative measure for sewer maintenance of the community.

2. Inspect sanitary sewer lines at the time of street reconstruction, and rehabilitate as necessary Inspect and rehabilitate all sanitary sewers under roadways when necessary.

3. Continue to clean all sanitary sewer mains on a two year rotation or better.

4. Continue to utilize new camera inspection equipment to reduce private sanitary sewer service backups by assisting owners to identify the condition of their service.

5. Systematically inspect mains and lines and routinely inspect those in-place sewer lines in residential paving program areas using the most updated technologies available.

6. Review all sanitary sewer mains and services prior to reconstruction of roads.

7. Perform follow-up inspection for clear water connections in "wet" areas of the City.

8. Continue an effective sewer cleaning/flushing program, especially in problem areas.

9. Continue to prohibit the use of on-site sewage disposal systems and require connection of existing on-site systems to the municipal system. If connection is not feasible, the City should require biennial inspections, and if necessary, pumping of existing on-site disposal systems.

10. Continue to identify future sanitary sewer infrastructure improvements in the Capital Improvement Plan.

11. Work with the Metropolitan Council Environmental Services (MCES) to ensure the adequacy of its interceptor to handle present and anticipated sewage loads from the City of Fridley when combined with those of growing communities.

12. Encourage properly permitted and constructed facilities for private disposal of septage from individual sewage treatment system within the community.

10.9 Goals and Objectives

As a result of the 2007 neighborhood planning meetings, four main goals emerged. Three of those goals relate to this chapter and are listed below. Also listed below are related objectives associated with these goals.

Goals

1. Maintain Fridley as a desirable place to live.
2. Maintain Fridley as a desirable place to work.
3. Protect Fridley's natural environment

Objectives

The following objectives placed under this goal in Chapter 1 of this plan are the ones which are addressed in this chapter:

1. Maintain a functional sanitary sewer system.
2. Maintain an affordable, efficiently-operated sanitary sewer system.
3. All residential, commercial, industrial, and public facilities to be connected to the sanitary sewer system to protect Fridley's natural resources.

10.10 General Conclusions and Action Steps

The following conclusions were discussed and debated and related action steps have been developed. Action steps reflect the city's general intentions and will guide the community in the attainment of goals.

1. The removal of the charter amendment service fee restrictions will now allow the Fridley sewer utility to be fully-funded over time. Certain measures need to be taken to ensure sustainability of the system.

   Action Step: A system-wide needs assessment needs to be created for the sanitary sewer system and a long-range plan developed for funding a sustainable system

2. While the sanitary sewer system does not appear to be producing excessive I & I, there are indications that I & I flows are not reducing as desired.

   Action Step: Immediately make any repairs necessary to eliminate obvious I & I sources from the sanitary collection system as encountered.

Action Step: Take measures to remove and prevent any infiltration/inflow into the sanitary sewer system, including additional analysis and subsequent evaluation as necessary.

10.11 Summary

Fridley is served by the regional wastewater system that is owned and operated by the Metropolitan Council. Three Metropolitan Council Environmental Services (MCES) interceptors convey wastewater generated by the City of Fridley. To manage sanitary sewer, Fridley owns and operates a separated system from storm sewers. The sanitary sewer system is adequate to manage the projected residential and commercial/industrial development through 2030.