Chapter X Public Sanitary Sewer and Water System Plan

This chapter of the 2030 Comprehensive Guide Plan focuses on the provision of basic utilities (sanitary sewer and public water) to meet the needs existing and future land uses shown on the 2030 land use plan map in Chapter IV – Land Use Plan, and the policies and implementation strategies established in the earlier chapters of the plan. The first section of this chapter examines the existing conditions and future needs of the Minnetonka sanitary sewer system and the second section examines the public water utility system.

The information included in this chapter is derived from detailed sanitary sewer and public water plans prepared for the Minnetonka Public Works Department in 2007 and 2008. The more detailed plans, available at the Public Works offices, should be consulted for specific facility information and detailed program review.

The Minnetonka water and sewer utility began in the 1960s and is generally complete. Today the utility system's accumulated value is approximately $135 million. The sewer and water supply systems are basic services; yet they may have an impact on the future growth of the city, if utility capacities cannot meet the demands of future growth and development in specific areas of the city. The city's utility system capacity is limited and may have to be expanded at some point in certain areas to meet anticipated growth and demand.

A. Sanitary Sewer System

Generally, the sanitary sewer system within the city follows a topographic-based approach to the trunk sewers similar to stormwater management. The topographic divisions allow for a gravity-based sewer system, which reduces overall costs and energy consumption. Lift stations are utilized in instances to serve isolated neighborhoods that are characterized by unique topographic conditions.

The installation of the city sanitary sewer system occurred in the late 1960s and 1970s. Wastewater that is collected within the municipal system flows into regional interceptor sewers, owned and operated by Metropolitan Council Environmental Services (MCES). Treatment of Minnetonka's wastewater occurs at the Blue Lake Treatment facility near Shakopee.

1. Metropolitan Facilities

The city collection system flows in a southerly direction and accesses three separate MCES interceptor sewers. The MCES interceptors that carry Minnetonka wastewater eventually merge with the Chaska interceptor in the central portion of Eden Prairie which carries effluent to the Blue Lake wastewater treatment facility in Shakopee.

The city system, MCES interceptors and flow meters that carry Minnetonka wastewater are identified on Figure X-1.

Interceptor No. 7018 accommodates the north Lake Minnetonka communities and enters Minnetonka at the northwest corner of the city at the TH 101 bridge over Grays Bay and merges with another interceptor at the west central portion of Minnetonka near the intersection of Woodlawn Avenue and Minnetonka Boulevard. The western portion of Interceptor No. 7073 serves the western Lake Minnetonka communities and accommodates municipal trunk connections in the western portion of the city. Interceptor No. 7016 enters

Please Refer to Existing Trunk Sanitary Sewer System Map (Figure X-1)

Minnetonka at its southwest corner and accepts wastewater from the south shore Lake Minnetonka communities and a small area of southwest Minnetonka. It merges with Interceptor No. 7073 near Creek Ridge Trail and Scenic Heights Drive. Wastewater flows from the Minnetonka trunk sewers in the Riley-Purgatory watershed exit the city via this interceptor along the Purgatory Creek floodplain immediately east of the Scenic Heights Drive intersection with CR 62.

Wastewater from the south central area of Minnetonka enters Interceptor No. 7118 in Eden Prairie near the entrance to the Glen Lake Home School on TH 62. This area represents the western portion of the Nine Mile Creek watershed in Minnetonka.

Wastewater from municipal trunk lines in the remaining portion of the city enters MCES Interceptor No. 6801 in Eden Prairie near the Rowland Road/TH 62 underpass. The service area for this intersection is large and represents approximately three-fourths of the area of the city. The MCES interceptor service area accommodates wastewater in the Bassett Creek, Minnehaha Creek and eastern Nine Mile Creek watersheds in the city.

Wastewater from Minnetonka properties flows through the three metropolitan interceptors and is measured at MCES metering stations located along the southern boundary of the city. The flows are metered to determine the allocation of annual operations and maintenance costs of the metropolitan system per community.

2. Municipal System

Nearly all land within the city is developed and is served by the municipal sanitary sewer system. There are only 12 properties that are not served by the city system and rely upon individual sewage treatment systems. For planning purposes, the city is divided into 18 sewer sheds to monitor inflow and infiltration based on the location of MCES interceptors, trunk sewers, location of lift stations, ability to monitor flows, etc.

Infiltration and inflow (I/I) is "clear water" that enters the sanitary sewer collection system. Infiltration is typically groundwater entering the system through defective pipes, laterals, joints, manholes and other appurtenances. Inflow results from direct or cross connections with storm sewers, sump pumps and roof drains or seepage through manhole covers. I/I reduction is critical to eliminate, due to unnecessary capacity restrictions within the collection system and costly treatment of clear water.

The sanitary sewer system is comprised of gravity sewer mains ranging in size from 6 inch laterals that serve smaller neighborhood areas and flow into the trunk sewer mains, to 24-inch trunks that flow to the MCES interceptors sewers. Whenever possible, gravity is utilized to convey wastewater in collection pipes. When terrain does not allow this movement, lift stations are installed to pump wastewater to higher elevation trunk gravity mains.

The city operates and maintains 36 lift stations throughout the city. The largest station is located at the Public Works building on Minnetonka Boulevard and is capable of pumping 10,000 gallons per minute. The city also maintains 47 home lift pumps to provide sewer service to homes that lack elevation for gravity flow. In October of each year, the pumps are inspected and repaired to assure reliable operation.

Maintenance tasks are performed throughout the year to assure that operational problems are minimized. On-going maintenance activities include the following:

- "Jetting" is an operation that sprays the pipe with high-pressure water to remove any blockages that may exist. Failure to remove these blockages may result in basement backups.

- Televising of approximately 20 miles of sewer line is performed on an annual basis. Information from the televising is used to determine the condition of the pipe and identify structural defects for repair before a pipe breaks or creates a blockage.
- The lift stations are inspected twice a year and maintained to assure trouble-free operation. Maintenance includes cleaning the pumps and wet wells, checking the motors, checking the pumps, and inspecting the control panels.

3. Existing and Future Sewer Flows

a. Existing Sewer Flows

The 2005 MCES Sewer Survey information estimated the population of Minnetonka at 51,658 with approximately 15,699 residential connections (single family and multiple family) and 564 non-residential connections.

A capacity analysis for the existing municipal system was completed using a computer model as part of the 2008 *Comprehensive Sanitary Sewer System Plan*. The existing flow rates for the city sewer districts (established for I/I investigation) were determined by measuring trunk mains flows and MCES flow data, where available and calibrated based on existing land use data.

Table X-1 shows the estimated wastewater flow generation rates (obtained through data calibration) for the existing land uses in the city.

Table X-1
Calibrated Estimated Wastewater Flow Generation Rates

Land Use Category	Flow (gallons per acre per day)
Commercial	528
High density residential	1808
Industrial	528
Institutional	528
Low density residential	543
Medium density residential	1085
Office	528
Open Space	0
Park & Recreation	66
Railway	0
Right-of-Way	0
Vacant	0
Mixed Use	528
Utility	0
Water	0

Results from the computer model indicate the existing trunk sewer system has adequate capacity for conveying existing peak flows.

b. Future Sewer Flows

Metropolitan Council population estimates indicates limited increases in population, household and employment growth to 2030 as shown in Table X-2.

Table X-2
Metropolitan Council Forecasts

			Revised Development Framework		
	1990	**2000**	**2010**	**2020**	**2030**
Population	48,370	51,102	51,500	51,500	53,500
Households	18,687	21,267	22,300	23,100	24,000
Employment	35,536	50,471	53,800	56,000	58,600

The estimated unit wastewater flows were modeled to determine the 2030 average day wastewater flows for each sewer district based upon future land uses. Table X-3 shows the future sanitary sewer flows by sewer shed for each time frame.

Table X-3
[1]Future Wastewater Flows by Sewer Shed

District	Existing Avg. Flow (MGD)	2010 Avg. Flow (MGD)	2015 Avg. Flow (MGD)	2020 Avg. Flow (MGD)	2025 Avg. Flow (MGD)	2030 Avg. Flow (MGD)
1	0.228	0.238	0.238	0.238	0.238	0.238
2	0.301	0.301	0.301	0.301	0.301	0.301
3	0.469	0.652	0.652	0.652	0.652	0.652
4	0.397	0.397	0.397	0.397	0.413	0.413
5	0.526	0.526	0.526	0.526	0.526	0.526
6	0.476	0.476	0.476	0.476	0.476	0.476
7	0.355	0.355	0.392	0.474	0.474	0.474
8	0.419	0.419	0.425	0.470	0.470	0.470
9	0.262	0.262	0.262	0.262	0.262	0.262
10	0.657	0.657	0.657	0.657	0.664	0.664
11	0.210	0.210	0.210	0.210	0.210	0.210
12	0.682	0.682	0.693	0.758	0.758	0.758
13	0.236	0.236	0.248	0.248	0.248	0.248
14	0.356	0.356	0.356	0.356	0.356	0.356
15	0.288	0.288	0.303	0.303	0.303	0.303
16	0.390	0.390	0.390	0.390	0.390	0.393
17	0.260	0.260	0.260	0.260	0.260	0.263
18	0.163	0.163	0.163	0.163	0.163	0.163
Total	**6.675**	**6.868**	**6.948**	**7.141**	**7.164**	**7.169**

[1]Future flow projections are greater than MCES system statement and have been completed to model the effect of future redevelopment on the existing trunk sewer system in the event that redevelopment generates additional flow.

Although the Metropolitan Council indicates there will be no increases in 2030 wastewater flow, it is likely 2030 system flows will increase due to redevelopment activity. The

redevelopment activity along with new development of the limited vacant properties remaining in the city are found to be consistent with the Metropolitan Council 2030 forecasts, as discussed in Chapter IV – Land Use Plan.

The capacity of the existing sewer system to serve the potential redevelopment and new development areas was evaluated in the event that wastewater flows increase. Minnetonka's MCES 2030 average day flow allocation should be increased by approximately 494,000 gallons per day (gpd) based on anticipated redevelopment. Figure X-2 shows the existing sewer capacity within the city.

The computer model utilized projected peak flows, based on the increase in average flows, to determine the remaining capacity of the existing trunk sewer system. The impact of increased future flows on the city's existing trunk sewer system is minimal. Projected 2030 average flows would increase by 494,000 gallons per day (gpd) based on anticipated redevelopment. Figure X-3 shows the future system capacity.

The Opus area (Sewer Shed 3) in the southeast corner of the city is an area for more intense development within the city, which makes it difficult to project anticipated 2030 flows. Although increased development intensity has been accounted for in the 2030 model, future flows in this area should be reviewed as each new development scenario occurs to determine any future impacts to the system.

4. Sanitary Sewer System Strategies

The city has established strategies that govern the capacity and operation of the municipal sanitary sewer system. Additionally, goals have been adopted that establish the relationship of the city's system to regional interceptor and treatment plant facilities. This section of the plan describes the city's policies regarding the relationship of the sanitary sewer system to metropolitan facilities, planning and development activities, municipal investments, operations and environmental conditions.

The city has established a coordinated program towards water resource management with the ultimate goal of maintaining unpolluted surface and subsurface waters. The sanitary sewer component of the program is based upon the following two goals:

- To provide high quality sanitary sewer service to the residents and businesses of the city in the most economical manner possible.
- To provide sanitary sewer service that meets the requirements of the 2030 population and employment forecasts of the city.

a. Relationship to Metropolitan System

The city recognizes the importance of a coordinated regional collection and treatment system. The continued investment and maintenance of the system is of prime importance to the city as well as the region. Likewise, anticipating growth and redevelopment to ensure future interceptor and treatment plant capacity is a major goal of the city.

1.) The city will protect the capacity of the interceptor sewers that serve Minnetonka.

2.) The city will work with the Metropolitan Council staff to monitor the metered flows from the Minnetonka system.

b. Inflow and Infiltration

The presence of inflow and infiltration can restrict the capacity of sewer pipes and the treatment facility. The city believes that the reduction of all inflow and infiltration from the

Please Refer to Existing System Capacity Map (Figure X-2)

Please Refer to Future System Capacity Map (Figure X-3)

municipal system and ultimately, the metropolitan system is more cost effective than adding additional capacities to sewage facilities.

1.) Continue to monitor the sanitary sewer system to identify points of inflow and infiltration.

2.) Continue the I/I program to eliminate points of inflow and infiltration to the sanitary sewer system on public property, and require the elimination of inflow and infiltration on private property.

3.) Continue to administer and enforce Chapt. 12, Section 1200 of the City Code of Ordinances prohibiting clear water connections to the sanitary sewer system.

4.) Reduce I/I to below the MCES allowable peak hourly flow rate goal for Minnetonka.

c. Relationship to Land Use Activities

Ideally, the size and capability of a municipality's sanitary sewer system should accommodate planned future growth and development. It is equally important to ensure that land uses and development intensity do not threaten the long term viability of the system.

1.) Design trunk sewer expansions in relation to the planned land use intensities established in Chapter IV - Land Use of the 2030 Comprehensive Guide Plan.

2.) Provide municipal sanitary sewer service to the few remaining uses that rely on individual sewage treatment systems and future development and redevelopment.

3.) Determine whether sufficient sewer system capacity is available to serve the intensity of new development and redevelopment before final development approvals are granted by the city.

4.) Periodically review and evaluate the sewer collection system, metropolitan treatment plant capacity, and the accuracy of metered flow data provided by the Metropolitan Council.

5.) Determine funding responsibility for increased capacity and/or reconstruction of sewer facilities needed to serve the intensity of new development or redevelopment.

d. Municipal Investments

The installation, maintenance and operation of a public utility is a major municipal investment and on-going service that is provided by the city. It is imperative that the municipal investments be preserved over the long term and that major changes to the system provide a positive benefit that is commensurate with the associated cost.

1.) Funding priorities will be placed on maintaining the existing municipal sanitary sewer system.

2.) A financial analysis will be prepared prior to the reconstruction of any portion of the sanitary sewer system.

3.) Funding of future sewer facility improvements will continue to be identified in the Capital Improvements Plan.

e. Municipal Operations and Maintenance

The overall maintenance of the municipal sewer system is an integral activity that is directed towards the long-term preservation of the system. Further, management practices are aimed at responding to customer complaints, system upkeep and continual monitoring.

1.) Maintain operating efficiency, minimize sewage blockages, and reduce the potential for infiltration/inflow.

2.) Continue to improve the city's maintenance and inspection program.

f. Environmental

A goal of the city is to reduce point and non-point pollution sources within the city to the extent possible. The construction of the municipal sanitary sewer system and eventual elimination of private on-site systems is one of the major strategies the city has utilized to achieve this goal.

1.) All individual sewage treatment systems shall comply with requirements of the Minnesota Pollution Control Agency and the Minnesota State Department of Health.

2.) Individual sewage treatment systems shall be discontinued according to city policy when municipal sanitary sewer is available to serve the property.

5. Implementation Tools

The city has adopted several practices and programs to protect the integrity of the sanitary sewer system. These practices are crucial to the future performance and investment required by the utility system because they implement the goals and strategies for the sanitary sewer system.

a. Sanitary Sewer Regulations

The public utility ordinance requires that "properties where cesspools or septic tanks have been in existence prior to construction of a sanitary sewer shall connect with the public sanitary sewer when ... repairs are needed or within two years of service availability, whichever occurs first." Further, the ordinance prescribes the design and manner in which individual connections and use of public sewers are to be made. Generally, uses that threaten the integrity of the sewer system or the capabilities of the Blue Lake treatment facilities, as prescribed by state and federal laws, are prohibited.

The sanitary sewer regulations also limit the amount of inflow into the sanitary sewer system. The ordinance prohibits the flows of "rain water from roofs, yards, lawns, streets, ground water," and polluted drainage, into any public sanitary sewer.

b. Development Regulations

The zoning regulations determine the specific use and development intensity of individual parcels in the community. The use and development intensity result in typical sewer flow calculations that are utilized to "size" the utility systems. Development and use assumptions based upon reasonable application of the zoning regulations are critical for future utility planning purposes. As part of specific project review, a provision of the zoning ordinance requires that utilities be adequate to accommodate the use and development intensity of the proposed project.

The subdivision ordinance requires that property to be developed must be served by the municipal sanitary sewer system. Further, all new sanitary sewer required for development, repair or replacement must be constructed according to city requirements and specifications.

c. Wastewater Assessments and Charges

The construction of the municipal and metropolitan sanitary sewer systems and their on-going operations are financed in several ways. First, a service availability charge (SAC) is allocated to each use by the Metropolitan Council for connection to the regional treatment facilities

and interceptor sewers. The SAC revenue is utilized for debt service and reserved capacity for future expansion of the regional system. The city collects the SAC charges at the time of building permit issuance for the Metropolitan Council.

The construction of the municipal system is paid by developers or through assessments to properties benefitted by the provision of sanitary sewer service and by connection charges for availability and access to the municipal system. On-going operations and maintenance costs of the municipal and regional system are financed by customer charges that are paid on a monthly or quarterly basis. Sewer charges are based upon the total community flow calculated by MCES and the customer category, i.e. residential. A "strength charge" set by MCES is also applied to industrial users dependent upon effluent characteristics. Sewer charges also include local fees, based on the estimates of costs for monitoring, repair and replacement of existing sewer infrastructure.

d. Individual Sewage Treatment Systems

The existing regulations for individual sewage treatment systems (ISTS) relate to connections to the sanitary sewer collection system and the installation of ISTS. The existing ISTS's (approximately 12 remaining) must remain in compliance with the city ISTS provisions of the water and sewer utilities ordinance (Sections 1200 and 1200.15 respectively) and the State Division of Health regulations. The Community Development Department is responsible for coordination and enforcement of these ordinances.

Section 1200.15 of the utilities ordinance provides regulatory procedures for connections to the public sanitary sewer system and regulatory standards for existing ISTS. MPCA requires inspections of ISTS every three years. The city relies on Hennepin County to do these inspections. No new ISTS are permitted in the city.

e. Maintenance Activities and Practices

The Public Works Department is responsible for all maintenance activities associated with the city portion of the sanitary sewer system. Preventative maintenance is conducted by the department on a regular basis and consists of pipeline cleaning and cutting to control tree root intrusion; lift station maintenance monitoring and inspection; manhole repairs and rehabilitation; sewer television, and customer service on a 24 hour, seven day per week basis. The maintenance frequency is based upon inspection and historical data.

f. Infiltration and Inflow (I/I)

The City of Minnetonka, like the majority of the communities in the Metropolitan Twin Cities area, has spent considerable time and energy managing I/I within their sanitary sewer collection system. Currently, the city is mandated to reduce the amount of I/I that flows into the sanitary sewer system during rainstorms.

In 2006, the Metropolitan Council Environmental Services (MCES) implemented a surcharge program designed to encourage metropolitan communities to reduce I/I entering their portion of the sanitary collection system. During a number of significant rainfall events in 2001 and 2005, Minnetonka's I/I flows reached levels that triggered the MCES surcharge.

In February 2006, MCES adopted an I/I Surcharge Program which requires communities within their service area to eliminate excessive I/I over a period of time. All communities exceeding their wastewater flow goal for the period of June 1, 2004 through June 30, 2006 were levied a surcharge fee at the beginning of 2007, spread over five year period through 2011. The surcharge is based on rates established as part of the MCES program. The city has implemented a program and improvements to reduce I/I resulting in elimination of the city's surcharge fee.

The city has embarked on an education, inspection, and repair program to reduce the quantity of I/I. The program has included:

- Investigations including manhole inspections, roof and yard drain inspections on commercial properties, private property sump pump/foundation drain inspections, sanitary sewer pipe cleaning, and closed circuit television inspection (CCTV).
- The completion of a sewer rehabilitation program that includes manhole lid replacement, manhole grouting, and sewer pipe lining.
- Currently, home inspections are being conducted in all areas of the city. If an illegal discharge is found, the city offers a matching grant program to help homeowners pay for improvements necessary to disconnect roof leaders, foundation drains, and sump pumps from the sanitary sewer system.

g. Capital Improvements Program (CIP)

The programming of major sewer capital expenditures is planned and provided for in the utility portion of the city's CIP. While no new trunk sewer or additional facilities are required in the city because the overall system is basically complete, there is a need for lateral sewer pipe extensions, on-going system maintenance and replacement of system components due to age or proposed redevelopment. Lateral sewer service needs to be provided to the few remaining properties that will undergo development and existing residences where service is not currently available. The lateral service extensions are annually programmed in the CIP by developer or resident petition the year preceding proposed construction.

Additionally, on-going maintenance of the sewer system and facilities is programmed in the CIP. The maintenance improvements range from lift pump replacement and lift station improvements to the removal of inadequate sewer pipe and replacement when street reconstruction occurs. Table X-4 shows the long term planned capital improvements for the lift stations.

Table X-4
Lift Station Replacement Program

Lift Station Number	Location	Estimated Rehabilitation Year	Est. Total Replacement Cost
LS29	West 34th Street	1993/2023	$357,500
LS16	Main	1997/2027	$858,000
LS04	Burchlane	1998/2028	$643,500
LS34	Woodgate	1999/2029	$429,000
LS35	Clarion Hills	2001/2030	$286,000
LS21	Opus	2002/2030	$786,500
LS33	Windridge Circle		
LS11	Ford Road	2003/2030	$286,000
LS18	Minnetonka Boulevard	2004/2030	$786,500
LS01	Acorn Ridge	2006/2030	$286,000
LS09	Fairchild Avenue	2007/2030	$572,000
LS19	Moorland Road		

LS13	Glen Lake		
LS22	Pine Lane	2008	$858,000
LS26	Sparrow Road		
LS05	Caribou Drive	2009	$643,500
LS12	Gaywood Drive		
LS03	Brightwood Drive	2010	$572,000
LS20	North Street		
LS28	Waymouth	2011	$572,000
LS31	Whitegate Lane		
LS23	Powderhorn Terrace	2012	$572,000
LS30	Westwood		
LS07	Day Place	2013	$572,000
LS08	Dickson Road		
LS10	Fetterly Road	2014	$572,000
LS14	Lakeshore Avenue		
LS15	MacKenzie Point Road	2015	$572,000
LS17	Minnetoga		
LS25	Sherwood Forest	2016	$715,000
LS27	Tonkawood Court		
LS02	Bantas point Road	2017	$572,000
LS06	Crosby Road		
LS24	Ringer Road	2018	$1,072,500
LS32	Williston Road		
LS36	494/394	2019	$429,000

B. Public Water Supply System

The following public water supply section of the 2030 Comprehensive Guide Plan includes characteristics of the municipal water system and future water supply needs based upon the 2030 land use plan and population, household and employment forecasts for Minnetonka prepared by the Metropolitan Council. The identification of future water supply needs have been developed to assist in the planning of system expansions in an orderly manner and to anticipate future capital expenditures.

Two important components of the plan are strategies to utilize in reducing water demand and an emergency program that can be implemented in the event the water supply system is threatened by contamination, drought, or other catastrophe. The plan has been developed to provide for the delivery and conservation of water in the most efficient manner, since this is one of the more costly services the city provides.

In addition to meeting Minnetonka needs, the city has prepared the Water Emergency and Conservation Plan included in the Appendix X-A to fulfill state mandates that are administered by the Department of Natural Resources, the Department of Health, and the Metropolitan Council. Information included in this section of the comprehensive plan includes a summary of Water Emergency and Conservation Plan.

1. Existing Facilities

The water system is made up of the following components: 18 wells, eight water treatment plants, two booster stations, 260 miles of water main, eight storage facilities and a supervisory control and data acquisition (SCADA) computer control system. The water system supplies an average need of 8 million gallons per day (MGD). During the summer, the water demand can increase to 20 mgd. The system has a theoretical maximum supply capacity of 22.5 mgd.

The entire operational infrastructure is controlled by a supervisory control and data acquisition (SCADA) computer system. A total of 10,700 inputs are received by either radio or fiber-optic communication systems. The SCADA system allows water operators to monitor and control all the well pumps, plants, towers and boosters from a variety of computer terminals.

The water utility is currently permitted to pump a total of 3.2 billion gallons of water annually from 18 wells. Any increase for future growth will require approval by the Minnesota Department of Natural Resources. It is predicted that the current system can meet the needs of the city until 2020.

The water system facilities have been evaluated for capacity and ability to meet existing and projected water demands. In addition, the computer model of the city's distribution system has been updated as part of this planning process. Results from this model predict system pressures and flow rates under "steady state" conditions, and examine the overall hydraulic function of the network of tanks, pumps, treatment plants, and water mains over time through extended period simulations.

Storage, supply, and treatment facilities are shown in Figure X-4.

a. Storage

Existing storage facilities are listed in Table X-5, along with the storage capacity of each facility.

Please Refer to Existing Water Distribution System Map (Figure X-4)

Table X-5
Existing Water Storage Facilities

Name	Elevated or Ground	Capacity (MG)	Overflow HGL (ft)
Somerset	E	0.5	1107
Woodland Hills	E	1.0	1107
Tanglen	E	0.5	1107
Bren Road	G	3.0	1107
Ridgedale	E	2.0	1107
Plymouth Road	E	0.3	1150
Tower Hill	G	5.0	1107
Williston Road	E	0.5	1193
Elevated Total		4.8	
Ground Total		8.0	
Total		12.8	

Storage capacity needs are determined by water system demands and fire protection requirements. In the former case, it is often advised that a water system contain enough storage to supply one average demand day of water use as an emergency reserve. Current average day demands in Minnetonka are approximately 7.8 million gallons per day (MGD).

The calculation of storage capacity needs for fire protection requirements is complicated, and involves the reliable water production (supply) capacity of the system, as well as the needed fire flow rate. Water from ground storage may be limited, in the event of a fire emergency, by the capacity of the pumps which transfer water from the ground storage into the distribution system. However, the tanks listed in Table X-5 as ground storage are placed at high elevation, and therefore operate by gravity on the water system (without the need for transfer pumps).

Some of the city's storage tanks operate at different hydraulic grade lines. The hydraulic grade line represents the highest water elevation in the tank when full, and is related to distribution system water pressure levels. Some of the city's tanks are designed at a higher overflow elevation in order to serve boosted pressure zones on the distribution system.

Isolated portions of the distribution system operate at a higher hydraulic grade in order to serve properties at relatively high elevations while maintaining appropriate water pressure. The locations of these "high pressure zones" are indicated in Figure X-5.

The tanks listed in Table X-5 with a hydraulic grade of 1107 are designed to serve the main pressure zone. The Williston Road Tank, with hydraulic grade of 1193, serves the South High Pressure Zone. The Plymouth Road Tank, with hydraulic grade of 1150, serves the North High Pressure Zone.

These separate pressure zones are effectively separate water systems, though interconnected. During a fire, water from the main pressure zone is only available to the boosted pressure zones by means of booster station pumps. Therefore, each pressure zone

Please Refer to Existing Average Day Pressure (Figure X-5)

needs to be analyzed separately for fire protection water storage capacity needs. The locations of booster stations are also shown on Figure X-2.

Table X-6 presents a calculation of necessary water for fire protection.

Table X-6
Storage Requirements for Fire Protection

	Main Zone	North High Pressure Zone	South High Pressure Zone
Average Daily Water Use in gpd*	6,786,000	165,000	849,000
Maximum / Average Day Ratio	2.6	2.6	2.6
Maximum Day Water Use in gpd	17,643,600	429,000	2,207,400
Maximum Day Water Use in gpm	12,253	298	1,533
Firm Pumping Supply Capacity in gpm	14,321	1,000	2545
ISO Design Fire Fighting Rate in gpm	3,500	2,000	2,000
Fire Fighting Duration in Hours	3	3	3
Design Fire Fighting Volume in gal.	630,000	360,000	360,000
Total Coincident Demand in gpm	15,753	2,298	3,533
Required Draft from Storage in gpm	1,432	1,298	988
Adjusted Fire Fighting Storage in gal	257,670	233,625	177,825
Equalization Storage in gal/day	4,410,900	107,250	551,850
Total Storage Need in gal	4,668,570	340,875	729,675
Existing Elevated Storage in gallons	12,800,000	300,000	500,000

*Water use for high pressure zones estimated based on geographical coverage

The needed fire flow (ISO design fire fighting rate) shown in Table X-6 represents the flow rate of water needed for a fire event. According to the American Water Works Association (AWWA), the minimum fire flow available at any given point in a system should not be less than 500 gpm at a residual pressure of 20 psi. This minimum criterion represents the amount of water required to provide for two standard hose streams on a fire in a typical residential area for residential dwellings with spacing greater than 100 feet. The distance between buildings and the corresponding recommended fire flow for residential areas is summarized in Table X-7.

Table X-7
Recommended Residential Fire Flows

Distance Between Buildings (ft)	Needed Fire Flow (gpm)
More than 100	500
31-100	750
11-30	1000
Less than 11	1500

For commercial and industrial buildings, the needed fire flow rate varies considerably, and is based on several characteristics of individual buildings such as:

- Type of construction
- Type of business that is using the property (occupancy)
- Proximity and characteristics of nearby properties
- Presence or absence of a fire sprinkling system

While the fire flow requirements of commercial and industrial properties should be evaluated on a case-by-case basis, generally municipal water systems should aim to provide 3500 gpm to this type of land use. The Insurance Services Office (ISO), in determining a city's fire insurance classification, only considers flow rates up to 3500 gpm.

For the boosted pressure zones, the needed fire flow is listed at 2000 gpm and the needed storage capacity to provide that rate for three hours is not met by the existing storage facilities serving these pressure zones. The boosted zones cannot reliably sustain fire flows in excess of this amount for three hours. Depending on the occupancy of these areas, the city may want to consider increasing either supply capacity (booster station capacity) or storage capacity to serve these zones, after determining more exact water demands for the pressure zones.

As presented in Table X-6, the main pressure zone has ample storage capacity for both fire protection and emergency reserves.

b. Supply and Treatment

Minnetonka supplies water from 18 wells that vary in depth from 400-500 feet deep, serving eight water treatment plants, which are distributed across the city as shown in X-2. The water supply wells utilize the Prairie du Chien – Jordan aquifer, with capacities varying from 1000 to 1900 gpm. Water treatment plant capacity is shown in Table X-8.

Table X-8
Existing Water Treatment Facilities

WTP No.	Design Capacity (gpm)	Actual Plant Capacity
3	2000	1578
6	2000	1151
11	2400	1527
12	2000	1430
13	3000	2118
14	2000	1295

15	2500	1303
16	5819	5819
	Total Capacity (gpm)	16,221
	Total Capacity (MGD)	23.36
	Firm Capacity (gpm)	14,321
	Firm Capacity (MGD)	20.62

WTP Nos. 3, 6, 11, 12, 13, 14, and 15 utilize chlorination, fluoridation, and gravity sand filtration for iron removal, disinfection, and dental health. In addition, WTP No. 16 utilizes in-line pressure aeration to assist in iron removal and utilizing orthophosphate for corrosion control. Iron and manganese that are dissolved in the water is removed in sand filtration beds.

Water supply facilities must be sized with capacity to reliably meet maximum day demands on the water system. The maximum day demand estimated for 2007 is 20.3 MGD. To reliably meet this demand, supply capacity is often measured by firm capacity, which is the supply capacity with the largest pump out of service. Based on the treatment capacities listed in Table X-4, the water supply is currently able to meet maximum day demands on the system.

The four wells that pump into WTP No. 16 are monitored continuously using a pressure transducer, and have been monitored for approximately two years. No trends have emerged from this data to date. The city plans to continue monitoring these wells.

c. Existing Distribution System

The Minnetonka water system is comprised of water mains ranging in size from 4 inches to 36 inches in diameter. The system has been designed with larger trunk mains serving as primary arteries for transport of water across the city, and smaller lateral mains providing localized service.

Most water pipe is made from ductile iron or plastic materials. The supply and distribution system is computer modeled on a frequent basis to determine the effect of development and growth on the system. It is important that adequate flow and pressure be available for the fire fighting requirements and as determined by the model.

The system serves an elevation range of approximately 830 feet to 1120 feet. Pressures in the distribution system are correlated with elevations, with properties at higher elevations receiving lower pressure and vice-versa. Because services at relatively high elevations have unacceptably low pressures when served by the main pressure zone, two high pressure zones have been created as shown in Figure X-2.

Water is supplied to the high pressure zones using booster stations, which are pumping facilities that raise the pressure of water in the distribution system for serving higher elevations. There are three booster stations currently in operation, with capacities listed in Table X-9.Table X-9

Existing Booster Station Facilities

Name	Capacity (gpm)
Ridgedale	1500
Stonegate	36
Tower Hill	2500

d. Interconnections

The city has a number of watermain interconnections with adjacent cities. Service connections where individual residences are connected to the Minnetonka system include neighborhoods in Deephaven, Eden Prairie, Shorewood, Wayzata, and Woodland. These neighborhoods are supplied by Minnetonka either because the adjacent city does not have a municipal system (Deephaven and Woodland) or because the neighborhood is more effectively served by the Minnetonka system.

There are also several communities that are interconnected to Minnetonka for backup purposes. These communities include Eden Prairie, Hopkins, St Louis Park and Wayzata. The emergency connections operate at slightly different pressures from the city system but are compatible for limited periods of time.

e. Water Demand

1.) Historic water demand

Minnetonka water utility records indicate that in 2005, the average daily water demand for the complete system was 7,139,000 gallons (4958 gpm). The maximum day (MD) demand for 2005 was 17,547,000 gallons (12,185 gpm). Table X-10 presents water demands in Minnetonka from 1996 to 2005.

Table X-10
Historical Water Demands

Year	Total Population	Population Served	Total Connections	Total Water Pumped (MG)	Average Demand (MGD)	Maximum Demand (MGD)	Total Gallons / Capita / Day	MD Peaking Factor
1996	51000	50820	15515	2499.676	6.848		135	
1997	51250	51100	15622	2824	7.737		151	
1998	52000	51856	15702	3193.000	8.748		169	
1999	52691	52553	16154	2830.810	7.756		148	
2000	53083	52963	15849	3302.787	9.049		171	
2001	53083	53014	16032	3133.508	8.585	22.729	162	2.6
2002	51420	51351	16131	2776.900	7.608	12.647	148	1.7
2003	51440	51377	16168	3167.300	8.678	18.659	169	2.2
2004	51658	51601	16203	2644.200	7.244	14.205	140	2.0
2005	51480	51426	16263	2605.800	7.139	17.547	139	2.5

There is not an observable trend in water use over the past ten years.

Table X-10 also presents the maximum day demands for the years 2001 – 2005 and 2001 had the largest peak day in that period. The MD peaking factor is the ratio of maximum day demands to average day demands in a given year. For 2001, that peaking factor was 2.6. This value is assumed for future projections of maximum day demands.

2.) Projected Water Demand

Projected water supply needs, as shown on Table X-11, have been calculated based upon the Metropolitan Council population and employment forecasts and average city water use to determine demand to the year 2030. Further, the projections include the connection of

113 units currently served by the City of Wayzata. The water demand forecasts have been developed to determine average future water needs and are not developed for facility planning purposes.

Average day demand projections are based on population projections and average total per capita demand from the previous five years. Maximum day demand projections are based on average day demand projections and the highest maximum day peaking factor (2.6) of the previous five years.

Table X-11
Projected Water Supply Demand

Year	Population Served	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Projected Demand (MGY)
2007	51,434	7.8	20.3	2847
2008	51,584	7.8	20.4	2847
2009	51,733	7.9	20.4	2884
2010	51,883	7.9	20.5	2884
2011	52,033	7.9	20.6	2884
2012	52,183	7.9	20.6	2884
2013	52,332	8.0	20.7	2920
2014	52,482	8.0	20.7	2920
2015	52,632	8.0	20.8	2920
2016	52,782	8.0	20.9	2920
2020	53,381	8.1	21.1	2957
2030	55,147	8.4	21.8	3066

f. Water Supply Policies, Objectives and Standards for Utility Operations

1.) Water Use and Conservation Policies

The policies listed below are directed towards the operation, improvement, and conservation of the Minnetonka water supply system. It is not anticipated that major expansions to the system will occur due to the status of development within the city. Based upon the inventory and analysis of future demands, the primary focus of the plan is service delivery and water conservation.

a.) The city will provide municipal water service to residents and businesses in the community in the most fiscally responsible manner possible.

b.) The municipal water system service will provide high quality water that will not negatively impact the natural water resources of the community or region.

c.) The emergency preparedness program included in Appendix X-A will allow the city to supply quality water to community users in a prioritized manner that protects the water resource to the extent possible.

2.) Water System Strategies

The following strategies guide operation of the city water supply system:

a.) Expansions to the system will only occur upon demonstration that an adequate water supply exists to serve the area without impacting the existing system.

b.) System expansions shall not occur unless all applicable water conservation measures adopted by the city are considered as part of the expansion plan.

c.) Additional wells shall not be constructed unless protection plans for the specific well source or surface water area have been adopted.

d.) The water system and operation will continue to be structured to encourage water conservation measures.

g. Water Conservation

The City of Minnetonka recognizes that water conservation efforts are needed to reduce overall, long-term demand for water in order to protect the municipal water supply system. If wisely implemented, appropriate water conservation methods should not substantially impact the user and yet should provide for a reasonable supply of water during periods of water shortages. The water conservation program will also serve a regional need in conserving groundwater and surface water resources.

Minnetonka began city-wide water conservation efforts in 1987 as a result of the impacts of the 1987-89 drought. These specific measures included sprinkling bans and educational efforts to reduce water demand. Over the past 20 years, the water conservation programs and educational efforts have expanded and additional measures have been adopted to obtain water conservation information and reduce water wasting practices.

The water conservation goal of the city over the coming years is to continue to reduce water demand on a year-round basis and to reduce seasonal demand by continuing to implement the water conservation regulations and educational programs. It is expected that each of the components of the entire city water supply system will utilize conservation components.

The following describes the various measures the city will use for meeting local and regional water conservation goals:

1.) Unaccounted Water

The city's goal is to reduce unaccounted water losses to less than 10% of water production on an annual basis. Although the average percentage for unaccounted for water use for the last five years is 11 percent, the percentage has been reduced in the last two years.

The city has implemented backwash recycling at the WTP No. 16. Also, a leak detection program has been implemented on a monthly basis for water customers. Each year, approximately half of the water system is surveyed to determine the location and type of water leaks. It is anticipated that these programs will have a positive impact on water loss or unaccountability. The city will continue to monitor this figure in the future to determine if additional efforts are needed.

2.) Residential Water Demand

The average residential gallons per capita per day (GPCD) use for the last five years was 90 GPCD compared to 75 GPCD in 2002 for the metropolitan area. To reduce residential demand a new rate structure was implemented in 2005 with an increasing block structure, and the base volume of water for the minimum charge was eliminated. Water rates are evaluated on an annual basis to determine the cost of service and impacts upon water conservation programs. Future efforts will focus on public education to raise awareness of the need for water conservation.

3.) Water Metering

The American Water Works Association (AWWA) recommends that every water utility meter all water taken into its system and all water distributed from its system at its customer's point of service. An effective metering program relies upon periodic performance testing, repair, repair and maintenance of all meters. AWWA also recommends that utilities conduct regular water audits to ensure accountability.

The residential water meter replacement program was started in 2007 and all non-residential meters were replaced in 2001 with radio-read meters. Additionally, all city wells and the treatment plants are metered.

4.) Water Conservation Regulations

The city's ordinances provide authority to limit the use of water obtained from the municipal water system during times of threatened water supply shortages and to meet water conservation goals. The provisions allows the city to regulate the times of lawn sprinkling, irrigation, car washing, swimming pool filling, air conditioning, or other uses which utilize water.

Violation of water use restrictions is a petty misdemeanor and fines are assessed for violations of conservation ordinances. During periods of critical water shortage, the city may turn off water supply to a property for violations of imposed restrictions, if that customer continues to violate the order following written notification. Ordinances are enforced by public works personnel during the week and by the police and fire departments on weekends.

The city also protects groundwater recharge areas (wetlands, floodplains, and surface water) through its wetland, floodplain, and shoreland districts of the zoning ordinance.

5.) Educational Efforts

The city has implemented an educational program throughout the community to emphasize the benefits of water conservation efforts. The city newsletter, billing inserts, consumer confidence reports, the local newspapers, cable television and other information provided at city events promote the benefits of water conserving measures and the review of conservation regulations.

Additionally, the community, public works and fire departments provide information on water saving fixtures, conservation techniques and interior fire suppression systems. These individuals also provide plumbing code enforcement and advise contractors and homeowners of code requirements. Direct mailing of water and energy conservation programs is conducted by Xcel Energy and Center point Energy as part of its monthly billing procedure.

h. Implementation

Future planned water system capital expenditures are included in the Water Emergency and Conservation Plan included in the Appendix X-A. Generally, most improvements relate to the maintenance, rehabilitation and repair of the various components of the city water system. The capital improvement plan includes funding for the removal of the Fingerhut and Forest Hills water towers in 2009 due to the construction of the larger Williston water tower. Additionally, the city is continuing the water meter replacement program with completion anticipated in 2009.

The capital improvement program does not include increases in water treatment plant capacity, which may eventually be necessary in order to continue to meet the treated water

needs of the city under increasing demands. The city is currently exploring improvements to the existing water treatment plants to increase capacity.

Currently, there are no plans for additional wells for supply capacity. However, the city does recognize that some of its current supply sources could be at risk if aquifer water levels decrease during extended periods of drought. This may create the need for additional sources of supply in the future if ongoing conservation measures are not successful in significantly reducing demands.

Other implementation activities include the following:

1.) Continued data collection and analysis to determine the potential for other demand reduction measures during the summer months.

2.) The continual need to "loop" water mains to provide high water quality and multidirectional service.

3.) The installation of water mains in the northwest portion of the city when under-utilized property undergoes development. This action will also allow for water main "looping" and additional service connections to the Minnetonka system.

4.) Replacement of deficient watermains as part of street reconstruction projects.

5.) Continual review of annual customer water charges.

Appendix X-A

Water Emergency and Conservation Plan

Please Refer to Water Emergency and Conservation Plan (Appendix X-A)